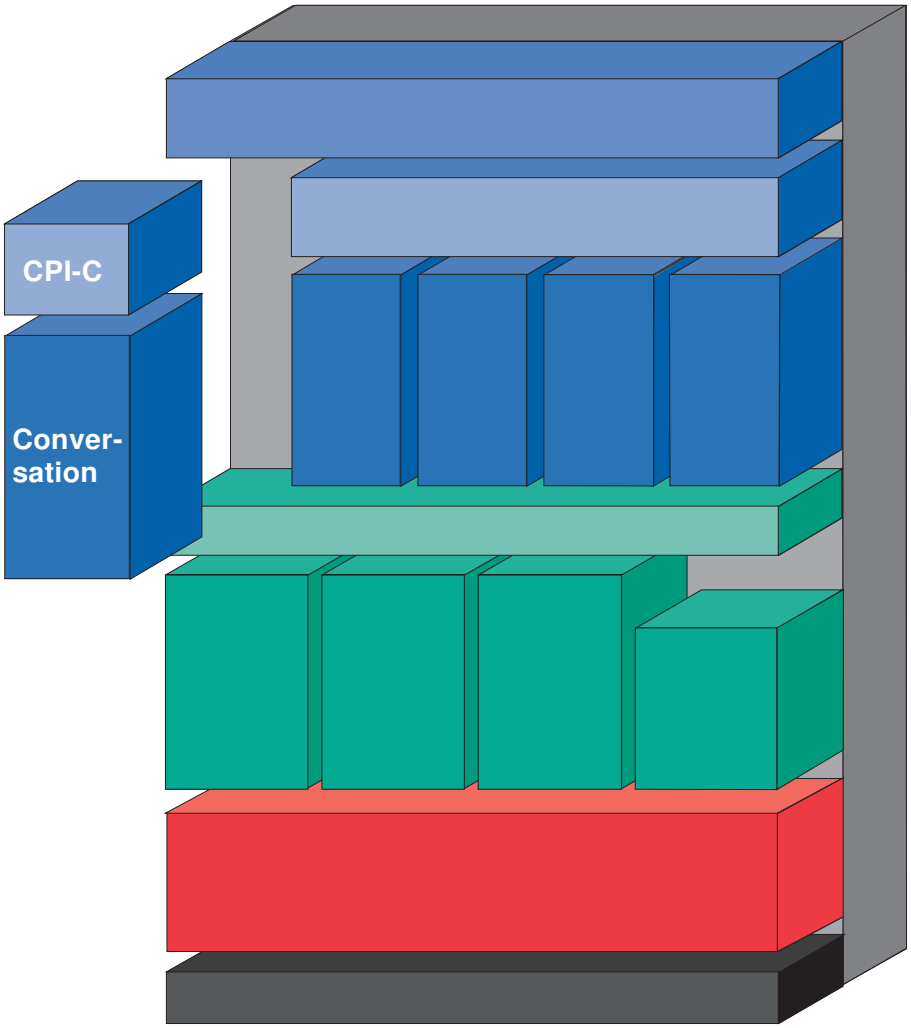
Common Programming Interface
Communications

IBM

CPI-C Specification

Version 2.1



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Common Programming Interface
Communications

IBM

CPI-C Specification

Version 2.1

SC31-6180-02

Note

Before using this document, read the general information under “Notices” on page xv.

1 **Third Edition (January 1996)**

1 This edition replaces and obsoletes the previous edition, SC31-6180-01.

This edition applies to the Common Programming Interface Communications (CPI-C) architecture.

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- Cancel_Conversation (CMCANC)
- Convert_Incoming (CMCNVI)
- Convert_Outgoing (CMCNVO)
- Extract_Security_User_ID (CMESUI)
- Extract_TP_Name (CMETPN)
- Set_Conversation_Security_Password (CMSCSP)
- Set_Conversation_Security_Type (CMSCST)
- Set_Conversation_Security_User_ID (CMSCSU)
- Set_Processing_Mode (CMSPM)
- Specify_Local_TP_Name (CMSLTP)
- Wait_For_Conversation (CMWAIT)

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Contents

Notices xv
Trademarks and Service Marks xvi

Acknowledgements xvii

Part 1. CPI-C 2.0 Architecture 1

Chapter 1. Introduction 5
CPI-C and the Conversational Model 5
Who Should Read This Book 5
What Is New in This Book 6
Additional Information Sources 6
Related APPC/LU 6.2 Publications 6
CD-ROM 6
Functional Levels of CPI Communications 7
CPI-C 1.0 7
CPI-C 1.1 7
X/Open CPI-C 7
CPI-C 1.2 7
CPI-C 2.0 8
X/Open CPI-C 2.0 8
3 CPI-C 2.1 8
Call Table for Functional Levels of CPI-C 9
Naming Conventions—Calls, Characteristics, Variables, and Values 11

Chapter 2. CPI Communications Terms and Concepts 13
Communication across a Network 14
Conversation Types 15
Send-Receive Modes 15
Program Partners 16
Identifying the Partner Program 16
Operating Environment 17
Node Services 19
Side Information 21
Distributed Directory 22
CPI Communications Directory Object 23
Using the Distributed Directory 24
Interaction with Side Information and Set Calls 25
Distributed Security 25
Operating System 26
Program Calls 26
Starter Set Calls 27
Establishing a Conversation 27
Multiple Conversations 27
Partner Program Names 28
Multiple Outbound Conversations 28
Multiple Inbound Conversations 29
Contexts and Context Management 29
Relationship between Contexts and Conversations 30

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Relationship between Contexts and Security Parameters 30
Inbound and Outbound Conversations 30
Conversation Characteristics 31
Modifying and Viewing Characteristics 32
Characteristic Values and CRMs 37
Characteristic Values and Send-Receive Modes 38
Automatic Conversion of Characteristics 39
1 Automatic Data Conversion 40
Data Conversion 41
Data Buffering and Transmission 42
Concurrent Operations 42
Using Multiple Program Threads 43
Non-Blocking Operations 45
Conversation-Level Non-Blocking 46
Queue-Level Non-Blocking 47
Working with Wait Facility 47
Wait Facility Scenario 47
Using Callback Function 48
Canceling Outstanding Operations 48
Non-Blocking Calls and Context Management 48
Conversation Security 49
Program Flow—States and Transitions 50
Support for Resource Recovery Interfaces 52
Coordination with Resource Recovery Interfaces 53
Take-Commit and Take-Backout Notifications 53
The Backout-Required Condition 57
Responses to Take-Commit and Take-Backout Notifications 58
Chained and Unchained Transactions 59
Joining a Transaction 59
Superior and Subordinate Programs 61
Additional CPI Communications States 62
Valid States for Resource Recovery Calls 63
TX Extensions for CPI Communications 64

Chapter 3. Program-to-Program Communication Example Flows 65
Interpreting the Flow Diagrams 65
Starter-Set Flows 66
Example 1: Data Flow in One Direction 67
Example 2: Data Flow in Both Directions 70
Controlling Data Flow Direction 72
Example 3: The Sending Program Changes the Data Flow Direction 72
Example 4: The Receiving Program Changes the Data Flow Direction . . . 74
Verifying Receipt of Data 76
Example 5: Validation of Data Receipt 76
Reporting Errors to Partner 78
Example 6: Reporting Errors 78
Example 7: Error Direction and Send-Pending State 80
Using Full-Duplex Conversations 82
Example 8: Establishing a Full-Duplex Conversation 82
Example 9: Using a Full-Duplex Conversation 84
Example 10: Terminating a Full-Duplex Conversation 86
Using Queue-Level Non-Blocking 88
Example 11: Queue-Level Non-Blocking 88
Accepting Multiple Conversations 90

Example 12: Accepting Multiple Conversations Using Blocking Calls 90
Example 13: Accepting Multiple Conversations Using Conversation-Level Non-Blocking Calls 92
Using the Distributed Directory 94
Example 14: Using the Distributed Directory to Find the Partner Program . 94
Resource Recovery Flows 96
Example 15: Sending Program Issues a Commit 96
Example 16: Successful Commit with Conversation State Change 98
Example 17: Conversation Deallocation before the Commit Call 100

Part 2. CPI-C 2.1 Call Reference 103

Chapter 4. Call Reference 107
Call Syntax 107
Programming Language Considerations 108
Application Generator 108
C 108
COBOL 109
FORTRAN 109
PL/I 109
REXX 109
RPG 110
How to Use the Call References 110
Locations of Key Topics 110
Summary List of Calls and Their Descriptions 111
Accept_Conversation (CMACCP) 116
Accept_Incoming (CMACCI) 118
Allocate (CMALLC) 121
Cancel_Conversation (CMCANC) 128
Confirm (CMCFM) 130
Confirmed (CMCFMD) 134
Convert_Incoming (CMCNVI) 136
Convert_Outgoing (CMCNVO) 138
Deallocate (CMDEAL) 140
Deferred_Deallocate (CMDFDE) 151
Extract_AE_Qualifier (CMEAEQ) 153
Extract_AP_Title (CMEAPT) 155
Extract_Application_Context_Name (CMEACN) 157
Extract_Conversation_Context (CMECTX) 159
Extract_Conversation_State (CMECS) 161
Extract_Conversation_Type (CMECT) 163
Extract_Initialization_Data (CMEID) 165
Extract_Mapped_Initialization_Data (CMEMID) 167
Extract_Maximum_Buffer_Size (CMEMBS) 170
Extract_Mode_Name (CMEMN) 172
Extract_Partner_ID (CMEPID) 174
Extract_Partner_LU_Name (CMEPLN) 177
Extract_Secondary_Information (CMESI) 179
Extract_Security_User_ID (CMESUI) 182
Extract_Send_Receive_Mode (CMESRM) 184
Extract_Sync_Level (CMESL) 186
Extract_TP_Name (CMETPN) 188
Extract_Transaction_Control (CMETC) 190

Flush (CMFLUS) . . . 192
Include_Partner_In_Transaction (CMINCL) . . . 195
Initialize_Conversation (CMINIT) . . . 197
Initialize_For_Incoming (CMINIC) . . . 199
Prepare (CMPREP) . . . 201
Prepare_To_Receive (CMPTR) . . . 204
Receive (CMRCV) . . . 209
Receive_Expedited_Data (CMRCVX) . . . 223
1 Receive_Mapped_Data (CMRCVM) . . . 226
Release_Local_TP_Name (CMRLTP) . . . 239
Request_To_Send (CMRTS) . . . 241
Send_Data (CMSEND) . . . 244
Send_Error (CMSERR) . . . 254
Send_Expedited_Data (CMSNDX) . . . 263
1 Send_Mapped_Data (CMSNDM) . . . 266
Set_AE_Qualifier (CMSAEQ) . . . 275
Set_Allocate_Confirm (CMSAC) . . . 277
Set_AP_Title (CMSAPT) . . . 279
Set_Application_Context_Name (CMSACN) . . . 281
Set_Begin_Transaction (CMSBT) . . . 283
Set_Confirmation_Urgency (CMSCU) . . . 285
Set_Conversation_Security_Password (CMSCSP) . . . 287
Set_Conversation_Security_Type (CMSCST) . . . 289
Set_Conversation_Security_User_ID (CMSCSU) . . . 292
Set_Conversation_Type (CMSCT) . . . 294
Set_Deallocate_Type (CMSDT) . . . 296
Set_Error_Direction (CMSED) . . . 300
Set_Fill (CMSF) . . . 303
Set_Initialization_Data (CMSID) . . . 305
Set_Join_Transaction (CMSJT) . . . 307
Set_Log_Data (CMSLD) . . . 309
1 Set_Mapped_Initialization_Data (CMSMID) . . . 311
Set_Mode_Name (CMSMN) . . . 314
Set_Partner_ID (CMSPID) . . . 316
Set_Partner_LU_Name (CMSPLN) . . . 320
Set_Prepare_Data_Permitted (CMSPDP) . . . 322
Set_Prepare_To_Receive_Type (CMSPTR) . . . 324
Set_Processing_Mode (CMSPM) . . . 326
Set_Queue_Callback_Function (CMSQCF) . . . 329
Set_Queue_Processing_Mode (CMSQPM) . . . 332
Set_Receive_Type (CMSRT) . . . 335
Set_Return_Control (CMSRC) . . . 337
Set_Send_Receive_Mode (CMSSRM) . . . 340
Set_Send_Type (CMSST) . . . 342
Set_Sync_Level (CMSSL) . . . 344
Set_TP_Name (CMSTPN) . . . 347
Set_Transaction_Control (CMSTC) . . . 349
Specify_Local_TP_Name (CMSLTP) . . . 351
Test_Request_To_Send_Received (CMTRTS) . . . 353
Wait_For_Completion (CMWCMP) . . . 356
Wait_For_Conversation (CMWAIT) . . . 359
Extract_Conversation_LUWID (XCECL) . . . 362
Extract_Conversation_Security_User_ID (XCECSU) . . . 364
Extract_Conversation_Workunitid (XCECWU) . . . 366

Extract_Local_Fully_Qualified_LU_Name (XCELFQ) . . . 368
Extract_Remote_Fully_Qualified_LU_Name (XCERFQ) . . . 370
Extract_TP_Name (XCETPN) . . . 372
Identify_Resource_Manager (XCIDRM) . . . 373
Set_Client_Security_User_ID (XCSCUI) . . . 377
Set_Conversation_Security_Password (XCSCSP) . . . 380
Set_Conversation_Security_Type (XCSCST) . . . 382
Set_Conversation_Security_User_ID (XCSCSU) . . . 384
Signal_User_Event (XCSUE) . . . 386
Terminate_Resource_Manager (XCTRRM) . . . 388
Wait_on_Event (XCWOE) . . . 389
VM/ESA Variables and Characteristics . . . 394
  Pseudonyms and Integer Values . . . 394
  Variable Types and Lengths . . . 395
VM/ESA Special Notes . . . 395
  Program-Startup Processing . . . 396
  End-of-Command Processing . . . 396
  Work Units . . . 396
  External Interrupts . . . 397
  Coordination with the SAA Resource Recovery Interface . . . 397
  Additional Conversation Characteristics . . . 397
  TP-Model Applications in VM/ESA . . . 398
    LU 6.2 Communications Model . . . 398
    VM/ESA TP-Model Applications . . . 399
    Implications . . . 400
  VM/ESA-Specific Notes for CPI Communications Routines . . . 401
  VM/ESA Communications Events . . . 403
    The VMCPIC Event . . . 404
    Notes on the VMCPIC Event . . . 405
  Using the Online HELP Facility . . . 406

Part 3. Appendixes . . . 407

Appendix A. Variables and Characteristics . . . 411
Pseudonyms and Integer Values . . . 411
Character Sets . . . 418
Variable Types . . . 421
  Integers . . . 421
  Character Strings . . . 421
Distinguished Name . . . 426
Program Function Identifier (PFID) . . . 427
  PFID Assignment Algorithms . . . 427
Program Binding . . . 429

Appendix B. Return Codes and Secondary Information . . . 431
Return Codes . . . 431
Secondary Information . . . 449
  Application-Oriented Information . . . 450
  CPI Communications-Defined Information . . . 451
  CRM-Specific Secondary Information . . . 460
  Implementation-Related Information . . . 461

Appendix C. State Tables . . . 463

How to Use the State Tables 463
Example 464
Explanation of Half-Duplex State Table Abbreviations 466
Conversation Characteristics ( ) 466
Conversation Queues () 467
Return Code Values [ ] 468
data_received and status_received { , } 470
Table Symbols for the Half-Duplex State Table 471
Effects of Calls to the SAA Resource Recovery Interface on Half-Duplex Conversations 479
Effects of Calls on Half-Duplex Conversations to the X/Open TX Interface . 480
Explanation of Full-Duplex State Table Abbreviations 481
Conversation Characteristics ( ) 481
Conversation Queues () 482
Return Code Values [ ] 483
data_received and status_received { , } 486
Table Symbols for the Full-Duplex State Table 487
Effects of Calls to the SAA Resource Recovery Interface on Full-Duplex Conversations 495
Effects of Calls on Full-Duplex Conversations to the X/Open TX Interface . . 496

Appendix D. Mapping CPI Communications to LU 6.2 and OSI TP CRMs 497
CPI Communications and LU 6.2 CRMs 497
Send-Pending State and the error_direction Characteristic 498
CPI Communications Programs Communicating with APPC Programs . . 499
SNA Service Transaction Programs 499
3 Implementation Considerations 500
Relationship between LU 6.2 Verbs and CPI Communications Calls . . . 500
CPI Communications and OSI TP CRMs for Half-Duplex Conversations . . . 507
Summary of CPI-C ASE Services 507
Mapping CPI-C to OSI TP Services 507
Mapping OSI TP Services to CPI-C for Half-Duplex Conversations 522
Sequencing Rules and State Tables 527
CPI-C ASE Protocol Definition 527
CPI-C ASE Structure and Encoding of APDUs 527
CPI Communications and OSI TP CRMs for Full-Duplex Conversations . . . 527
Mapping OSI TP Services to CPI-C for Full-Duplex Conversations 536
Sequencing Rules and State Tables 541
CPI-C ASE Protocol Definition 541
CPI-C ASE Structure and Encoding of APDUs 541

Appendix E. Application Migration from X/Open CPI-C 543

Appendix F. CPI Communications Extensions for Use with DCE Directory 545
Profile Object 545
Server Object 545
Server Group Object 546
Interaction of Directory Objects 546
CPI-C Name Service Interface 547
CNSI Calls 548
Definition of New Objects 548
Terminology 548
Profile Object 549

Server Object . . . 549
Server Group Object . . . 549
Program Installation Object . . . 550
Encoding Method for Complex Attribute Values . . . 550
Scenarios for Use of CNSI . . . 550
(PFID, *, *) . . . 551
(PFID, SDN, *) . . . 551
(PFID, SGDN, *) . . . 551
(PFID, SDN, resID) . . . 552
(PFID, SGDN, resID) . . . 552
(PFID, PDN, *) . . . 552
(PFID, PDN, resID) . . . 552

Appendix G. CPI Communications 2.1 Conformance Classes . . . 553
Definitions . . . 553
Conformance Requirements . . . 553
Multi-Threading Support . . . 553
CPI-C 2.1 Conformance Classes . . . 553
Functional Conformance Class Descriptions . . . 554
Conversations . . . 554
LU 6.2 . . . 556
OSI TP . . . 556
Recoverable Transactions . . . 557
Unchained Transactions . . . 557
Conversation-Level Non-Blocking . . . 558
Queue-Level Non-Blocking . . . 558
Callback Function . . . 558
Server . . . 559
Data Conversion Routines . . . 559
Security . . . 559
Distributed Security . . . 560
Full-Duplex . . . 560
Expedited Data . . . 560
Directory . . . 560
Secondary Information . . . 561
Initialization Data . . . 561
Automatic Data Conversation . . . 561
Configuration Conformance Class Description . . . 562
OSI TP Addressing Disable . . . 562
Relationship to OSI TP Functional Units and OSI TP Profiles . . . 563
Conformance Class Details . . . 564

Glossary . . . 571

Index . . . 575

Figures

1. Programs Using CPI Communications to Converse through a Network . 14
2. Operating Environment of CPI Communications Program 17
3. Generic Program Interaction with a Distributed Directory 23
4. Program Interaction with CPI Communications and a Distributed Directory 24
5. CRM Interaction with Distributed Security Service 26
6. A Program Using Multiple Outbound CPI Communications Conversations 28
7. A Program Using Multiple Inbound CPI Communications Conversations 29
8. Server Program with Both Inbound and Outbound Conversations 30
9. Commit Tree with Program 1 as Root and Superior 61
10. Data Flow in One Direction 69
11. Data Flow in Both Directions 71
12. The Sending Program Changes the Data Flow Direction 73
13. Changing the Data Flow Direction 75
14. Validation and Confirmation of Data Reception 77
15. Reporting Errors 79
16. Error Direction and Send-Pending State 81
17. Establishing a Full-Duplex Conversation 83
18. Using a Full-Duplex Conversation 85
19. Terminating a Full-Duplex Conversation 87
20. Using Queue-Level Non-Blocking 89
21. Accepting Multiple Conversations Using Blocking Calls 91
22. Accepting Multiple Conversations Using Non-Blocking Calls 93
23. Using the Distributed Directory to Locate the Partner Program 95
24. Establishing a Protected Conversation and Issuing a Successful Commit 97
25. A Successful Commit with Conversation State Change 99
26. Conversation Deallocation Precedes the Commit Call 101
27. LU 6.2 Communications Model 398
28. Creating a TP-Model Application in VM/ESA 399
29. Three Potential Conversation Wrap-Back Scenarios 401
30. Relationship of PFID to Program Installation DNs 427
31. Sample Program Binding Format 430
32. Interactions of Directory Objects 546
33. CPI-C Name Service Interface (CNSI) and CPI Communications 547
34. Program Uses CNSI to Locate PIDN 551

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Tables

1. Versions of CPI Communications . . . 9
2. Characteristics and Their Default Values . . . 33
3. Conversation Characteristic Values that Cannot Be Set for Half-Duplex Conversations . . . 38
4. Conversation Characteristic Values that Cannot Be Set for Full-Duplex Conversations . . . 38
5. Conversation Queues—Associated Calls and Send-Receive Modes . . . 43
6. Calls Returning CM_OPERATION_INCOMPLETE . . . 46
7. Incompatible conversation_security_type and required_user_name_type Values . . . 50
8. Possible Take-Commit Notifications for Half-Duplex Conversations . . . 54
9. Possible Take-Commit Notifications for Full-Duplex Conversations . . . 56
10. Responses to Take-Commit and Take-Backout Notifications . . . 58
11. Responses to the CM_JOIN_TRANSACTION Indication . . . 61
12. CPI Communications States for Protected Conversations . . . 62
13. List of CPI-C Calls and Their Descriptions . . . 111
14. Full-Duplex and Half-Duplex Conversation Queues . . . 333
15. Return Control Options . . . 338
16. VM/ESA Variables/Characteristics and Their Possible Values . . . 394
17. VM/ESA Variable Types and Lengths . . . 395
18. VM/ESA Security Characteristics and Their Default Values . . . 397
19. Variables/Characteristics and Their Possible Values . . . 412
20. Character Sets T61String, 01134, and 00640 . . . 418
21. Variable Types and Lengths . . . 422
22. Fields in the Program Binding . . . 429
23. Secondary Information Types and Associated Return Codes . . . 449
24. Range of Condition Codes for Different Secondary Information Types . . . 450
25. CPI Communications-Defined Secondary Information . . . 451
26. Examples of LU 6.2 CRM-Specific Secondary Information . . . 460
27. Examples of OSI TP CRM-Specific Secondary Information . . . 460
28. Examples of Implementation-Related Secondary Information . . . 461
29. States and Transitions for CPI Communications Calls on Half-Duplex Conversations . . . 472
30. States and Transitions for Protected Half-Duplex Conversations (CPIRR) 479
31. States and Transitions for Protected Half-Duplex Conversations (X/Open TX) . . . 480
32. States and Transitions for CPI Communications Calls on Full-Duplex Conversations . . . 489
33. States and Transitions for Protected Full-Duplex Conversations (CPIRR) 495
34. States and Transitions for Protected Full-Duplex Conversations (X/Open TX) . . . 496
35. Relationship of LU 6.2 Verbs to CPI Communications Calls (Part 1) . . . 501
36. Relationship of LU 6.2 Verbs to CPI Communications Calls (Part 2) . . . 502
37. Relationship of LU 6.2 Verbs to CPI Communications Calls (Part 3) . . . 503
38. Relationship of LU 6.2 Verbs to CPI Communications Calls (Part 4) . . . 504
39. Relationship of LU 6.2 Verbs to CPI Communications Calls (Part 5) . . . 505
40. Relationship of LU 6.2 Verbs to CPI Communications Calls (Part 6) . . . 506
41. Mapping CPI-C Calls to OSI TP Services . . . 507
42. CMALLC - Allocate Mapping . . . 509
43. CMCANC - Cancel_Conversation Mapping . . . 511

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44. CMCFM - Confirm Mapping . . . 511
45. CMCFMD - Confirmed Mapping . . . 511
46. CMDEAL - Deallocate Mapping . . . 512
47. CMDFDE - Deferred_Deallocate Mapping . . . 513
48. CMFLUS - Flush . . . 513
49. CMINCL - Include_Partner_In_Transaction Mapping . . . 513
50. CMPREP - Prepare Mapping . . . 513
51. CMPTR - Prepare_To_Receive Mapping . . . 514
52. CMRTS - Request_To_Send Mapping . . . 514
53. CMRCV - Receive . . . 515
1 54. CMRCVM - Receive_Mapped_Data . . . 515
55. CMSEND - Send_Data Mapping . . . 515
56. CMSERR - Send_Error Mapping . . . 518
1 57. CMSNDM - Send_Mapped_Data . . . 519
58. Mapping OSI TP Services to CPI-C Calls, Parameters, and Conversation Characteristics . . . 522
59. TP-BEGIN-DIALOGUE indication Mapping . . . 524
60. TP-BEGIN-DIALOGUE confirm Mapping . . . 524
61. TP-END-DIALOGUE indication Mapping . . . 525
62. TP-U-ABORT indication Mapping . . . 525
63. TP-P-ABORT indication Mapping . . . 526
64. TP-DEFERRED-END-DIALOGUE, TP-DEFERRED-GRANT-CONTROL, and TP-PREPARE indication Mapping . . . 526
65. Mapping CPI-C Calls on Full-Duplex Conversations to OSI TP Services 527
66. CMALLC - Allocate Mapping . . . 528
67. CMCANC - Cancel_Conversation Mapping . . . 529
68. CMCFMD - Confirmed Mapping . . . 530
69. CMDEAL - Deallocate Mapping . . . 531
70. CMDFDE - Deferred_Deallocate Mapping . . . 532
71. CMINCL - Include_Partner_In_Transaction Mapping . . . 532
72. CMPREP - Prepare Mapping . . . 532
73. CMRCV - Receive . . . 533
74. CMSEND - Send_Data Mapping . . . 533
75. CMSERR - Send_Error Mapping . . . 535
76. Mapping OSI TP Services to CPI-C Calls, Parameters, and Conversation Characteristics . . . 536
77. TP-BEGIN-DIALOGUE indication Mapping . . . 538
78. TP-BEGIN-DIALOGUE confirm Mapping . . . 538
79. TP-END-DIALOGUE indication Mapping . . . 540
80. TP-U-ABORT indication Mapping . . . 540
81. TP-P-ABORT indication Mapping . . . 540
82. TP-DEFERRED-END-DIALOGUE and TP-PREPARE indication Mapping 541
83. Parameter Type Differences . . . 544
84. Sample Calls for CNSI . . . 548
85. Fields in Complex Attributes . . . 550
86. OSI TP Service Functional Units and Corresponding Conformance Classes . . . 563
87. OSI TP Profiles and Corresponding Conformance Classes . . . 563
88. Conformance Class Requirements—Calls . . . 564
89. Conformance Class Requirements—Characteristics, Variables, and Values . . . 566

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IBM is publishing this manual, which documents CPI-C 2.1, on behalf of the CPI-C Implementers' Workshop (CIW).

The CIW is an open forum of CPI-C implementers and users, including as active participants many leading suppliers of information systems and software. Its goals are to enhance the CPI-C architecture, to promote the implementation and use of CPI-C, and to move CPI-C towards standardization.

The CIW maintains the CPI-C architecture and defines extensions to meet new requirements. The extensions for CPI-C 2.1, the latest version of CPI-C, were defined by the CIW.

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Part 1. CPI-C 2.0 Architecture

Chapter 1. Introduction 5
CPI-C and the Conversational Model 5
Who Should Read This Book 5
What Is New in This Book 6
Additional Information Sources 6
Related APPC/LU 6.2 Publications 6
CD-ROM 6
Functional Levels of CPI Communications 7
CPI-C 1.0 7
CPI-C 1.1 7
X/Open CPI-C 7
CPI-C 1.2 7
CPI-C 2.0 8
X/Open CPI-C 2.0 8
3 CPI-C 2.1 8
Call Table for Functional Levels of CPI-C 9
Naming Conventions—Calls, Characteristics, Variables, and Values 11

Chapter 2. CPI Communications Terms and Concepts 13
Communication across a Network 14
Conversation Types 15
Send-Receive Modes 15
Program Partners 16
Identifying the Partner Program 16
Operating Environment 17
Node Services 19
Side Information 21
Distributed Directory 22
CPI Communications Directory Object 23
Using the Distributed Directory 24
Interaction with Side Information and Set Calls 25
Distributed Security 25
Operating System 26
Program Calls 26
Starter Set Calls 27
Establishing a Conversation 27
Multiple Conversations 27
Partner Program Names 28
Multiple Outbound Conversations 28
Multiple Inbound Conversations 29
Contexts and Context Management 29
Relationship between Contexts and Conversations 30
Relationship between Contexts and Security Parameters 30
Inbound and Outbound Conversations 30
Conversation Characteristics 31
Modifying and Viewing Characteristics 32
Characteristic Values and CRMs 37
Characteristic Values and Send-Receive Modes 38
Automatic Conversion of Characteristics 39
1 Automatic Data Conversion 40

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Data Conversion 41
Data Buffering and Transmission 42
Concurrent Operations 42
Using Multiple Program Threads 43
Non-Blocking Operations 45
Conversation-Level Non-Blocking 46
Queue-Level Non-Blocking 47
Working with Wait Facility 47
Wait Facility Scenario 47
Using Callback Function 48
Canceling Outstanding Operations 48
Non-Blocking Calls and Context Management 48
Conversation Security 49
Program Flow—States and Transitions 50
Support for Resource Recovery Interfaces 52
Coordination with Resource Recovery Interfaces 53
Take-Commit and Take-Backout Notifications 53
The Backout-Required Condition 57
Responses to Take-Commit and Take-Backout Notifications 58
Chained and Unchained Transactions 59
Joining a Transaction 59
Superior and Subordinate Programs 61
Additional CPI Communications States 62
Valid States for Resource Recovery Calls 63
TX Extensions for CPI Communications 64

Chapter 3. Program-to-Program Communication Example Flows 65
Interpreting the Flow Diagrams 65
Starter-Set Flows 66
Example 1: Data Flow in One Direction 67
Example 2: Data Flow in Both Directions 70
Controlling Data Flow Direction 72
Example 3: The Sending Program Changes the Data Flow Direction 72
Example 4: The Receiving Program Changes the Data Flow Direction . . . 74
Verifying Receipt of Data 76
Example 5: Validation of Data Receipt 76
Reporting Errors to Partner 78
Example 6: Reporting Errors 78
Example 7: Error Direction and Send-Pending State 80
Using Full-Duplex Conversations 82
Example 8: Establishing a Full-Duplex Conversation 82
Example 9: Using a Full-Duplex Conversation 84
Example 10: Terminating a Full-Duplex Conversation 86
Using Queue-Level Non-Blocking 88
Example 11: Queue-Level Non-Blocking 88
Accepting Multiple Conversations 90
Example 12: Accepting Multiple Conversations Using Blocking Calls 90
Example 13: Accepting Multiple Conversations Using Conversation-Level Non-Blocking Calls 92
Using the Distributed Directory 94
Example 14: Using the Distributed Directory to Find the Partner Program . 94
Resource Recovery Flows 96
Example 15: Sending Program Issues a Commit 96
Example 16: Successful Commit with Conversation State Change 98

Example 17: Conversation Deallocation before the Commit Call 100

Chapter 1. Introduction

This introductory chapter:

- Explains CPI Communications and the conversational model
- Identifies the purpose and audience of this book
- Lists what is new in this book
- Details the availability of additional information sources
- Lists the functional levels of CPI Communications
- Provides a call table with the functional levels of CPI-C
- Explains the naming conventions followed

CPI-C and the Conversational Model

CPI Communications (CPI-C) provides a cross-system-consistent and easy-to-use programming interface for applications that require program-to-program communication. The conversational model of program-to-program communication is commonly used in the industry today, and a wide variety of applications are based on this model. The model is described in terms of two applications—***speaking*** and ***listening***—hence, the term ***conversation***. A conversation is simply a logical connection between two programs that allows the programs to communicate with each other. From an application's perspective, CPI-C provides the function necessary to enable this communication.

The conversational model is implemented in two major communications protocols, Advanced Program-to-Program Communication (APPC) and Open Systems Interconnection Distributed Transaction Processing (OSI TP).[1] The APPC protocol is also referred to as logical unit type 6.2 (LU 6.2). CPI-C provides access to both APPC and OSI-TP.

A primary benefit of this design is that CPI Communications defines a single programming interface to the underlying network protocols across many different programming languages and environments. The interface's rich set of programming services shields the program from details of system connectivity and eases the integration and porting of the application programs across the supported environments.

Who Should Read This Book

This book defines CPI Communications. It is intended for implementors who want to write communications products supporting CPI Communications.

Although this book is designed as an API reference, Chapter 3, “Program-to-Program Communication Example Flows” provides examples for designing application programs using CPI Communications concepts and calls.

[1] International Standardization Organization (ISO) and International Electrotechnical Commission (IEC) standard 10026 1 – 3: *Information Technology – Open Systems Interconnection — Distributed Transaction Processing — Parts 1 – 3*.

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What Is New in This Book

This book includes changes to CPI-C 2.1 architecture.

CPI-C 2.1 Enhancements Providing Support For:

- Enhanced Cancel_Conversation
- Additional return control options
- Accept specific
- Automatic Data Conversion
- Service Transaction Programs

Pseudonym files:

The pseudonym files are no longer included in this publication; however, the CPI-C Implementors' Workshop (CIW) makes them available on the Internet at the following location:

```
URL ftp://networking.raleigh.ibm.com/pub/standards/ciw/pseudo
```

Additional Information Sources

This section lists additional resources for CPI Communications information.

Related APPC/LU 6.2 Publications

The following publications contain introductory level information on CPI-C or APPC:

- *Systems Network Architecture Technical Overview*, GC30-3073
- *CPI-C Programming in C: An Application Developer's Guide to APPC* (John Q. Walker II and Peter J. Schwaller. McGraw-Hill, Inc., 1994, ISBN 0-07-911733-3. Paperback, with diskette), SR28-5597

The following publications contain detailed technical information on CPI-C or APPC:

- *SNA Formats*, GA27-3136
- *SNA LU 6.2 Reference: Peer Protocols*, SC31-6808
- *Systems Network Architecture: Sync Point Services Architecture Reference*, SC31-8134
- *SNA Transaction Programmer's Reference Manual for LU Type 6.2*, GC30-3084

CD-ROM

This publication is also available as a softcopy book. The softcopy book is on an electronic bookshelf and is part of both the *IBM Networking Systems Softcopy Collection Kit* (SK2T-6012) and *The Best of APPC, APPN, and CPI-C* (SK2T-2013) on compact disk read-only memory (CD-ROM).

You can view and search softcopy books by using BookManager* READ products or by using the IBM Library Reader* product included on each CD-ROM. For more information on CD-ROMs and softcopy books, see *IBM Online Libraries: Softcopy Collection Kit User's Guide* (GC28-1700) and BookManager READ documentation.

Functional Levels of CPI Communications

CPI Communications is an evolving interface, embracing functions to meet the growing demands from different application environments and to achieve openness as an industry standard for communications programming. This section contains a brief history of each functional level of CPI Communications and the additional function provided.

CPI-C 1.0

CPI Communications, introduced in 1987, provided the standard base for conversational communications:

- Ability to start and end conversations
- Support for program synchronization through confirmation flows
- Error processing
- Ability to optimize conversation flow (using Flush and Prepare_To_Receive calls)

CPI-C 1.1

CPI-C 1.0 was extended in 1990 to include four areas of new function:

- Support for resource recovery
- Automatic parameter conversion
- Support for communication with non-CPI-C programs
- Local and remote transparency

Note: For more information about the CPI-C 1.1 architecture, see *SAA Common Programming Interface Communications Reference*, SC26-4399-06.

X/Open CPI-C

X/Open adopted CPI-C at the 1.1 level (with the exception of support for resource recovery) to allow X/Open-compliant systems to communicate with systems implementing LU 6.2. The *X/Open Developer's Specification CPI-C*, published in 1990, included several new functions not found in CPI-C 1.1:

- Support for non-blocking calls
- Support for data conversion (beyond parameters)
- Support for security parameters
- Ability to accept multiple conversations

CPI-C 1.2

CPI-C 1.0 was designed to provide a consistent programming interface for communications programming. However, each of its derivatives, namely CPI-C 1.1 and X/Open CPI-C, provided different levels of function. CPI-C 1.2, documented in the first edition of *CPI Communications*, SC31-6180-00, consolidated CPI-C 1.1 and the X/Open extensions, providing function in four areas:

- Support for non-blocking calls—incorporation of X/Open calls
- Support for data conversion—incorporation of X/Open calls
- Support for specification of security parameters—incorporation of X/Open calls
- Ability to accept multiple conversations—new calls to accommodate both X/Open and CPI-C 1.1

CPI-C 2.0

CPI-C 2.0, completed by the CPI-C Implementers' Workshop (CIW) in 1994, provides enhancements to some CPI-C 1.2 functions, as well as offering several new functions:

- Support for full-duplex conversations and expedited data
- Enhanced support for non-blocking processing with the addition of queue-level processing and a callback function
- Support for OSI TP applications
- Support for use of a distributed directory
- Support for use of a distributed security service
- Support for secondary information to determine the cause of a return code
- Definition of conformance classes

X/Open CPI-C 2.0

X/Open CPI-C 2.0 enhances and updates X/Open CPI-C to the CPI-C 2.0 level with the following exceptions:

- Supports only C and COBOL programming languages.
- Does not include distributed directory support. Specifically, the Set_Partner_ID and Extract_Partner_ID calls are not included.
- In the COBOL pseudonym file, X/Open uses COMP-5 for integers—whereas, CIW CPI-C 2.0 uses COMP-4 for integers.

CPI-C 2.1

CPI-C 2.1, completed by the CPI-C Implementors' Workshop (CIW) in 1995, provides the following functions:

- Support for automatic data conversation
- Support for the ability to accept conversations with a specific TP name
- Support for the specification of service TP names
- Support for additional return control options
- Enhancements to the Cancel_Conversations call to allow determination of cancelled operations.

Call Table for Functional Levels of CPI-C

Table 1 lists the calls defined for the different versions of CPI Communications. An X is used to indicate that the call was part of a specific version.

Table 1 (Page 1 of 2). Versions of CPI Communications

Call Name	CPI-C 1.0	CPI-C 1.1	X/Open CPI-C	CPI-C 1.2	CPI-C 2.0	X/Open CPI-C 2.0	CPI-C 2.1
Starter Set							
Accept_Conversation	X	X	X	X	X	X	X
Allocate	X	X	X	X	X	X	X
Initialize_Conversation	X	X	X	X	X	X	X
Receive	X	X	X	X	X	X	X
Send_Data	X	X	X	X	X	X	X
Advanced Function							
for synchronization and control:							
Confirm	X	X	X	X	X	X	X
Confirmed	X	X	X	X	X	X	X
Deferred_Deallocate					X	X	X
Flush	X	X	X	X	X	X	X
Include_Partner_In_Transaction					X	X	X
Prepare					X	X	X
Prepare_To_Receive	X	X	X	X	X	X	X
Receive_Expedited_Data					X	X	X
Request_To_Send	X	X	X	X	X	X	X
Send_Error	X	X	X	X	X	X	X
Send_Expedited_Data					X	X	X
Test_Request_To_Send_Received	X	X	X	X	X	X	X
for modifying conversation characteristics:							
Set_AE_Qualifier					X	X	X
Set_Allocate_Confirm					X	X	X
Set_AP_Title					X	X	X
Set_Application_Context_Name					X	X	X
Set_Begin_Transaction					X	X	X
Set_Confirmation_Urgency					X	X	X
Set_Conversation_Security_Password			X	X	X	X	X
Set_Conversation_Security_Type			X	X	X	X	X
Set_Conversation_Security_User_ID			X	X	X	X	X
Set_Conversation_Type	X	X	X	X	X	X	X
Set_Deallocate_Type	X	X	X	X	X	X	X
Set_Fill	X	X	X	X	X	X	X
Set_Initialization_Data					X	X	X
Set_Join_Transaction					X	X	X
Set_Log_Data	X	X	X	X	X	X	X
Set_Mode_Name	X	X	X	X	X	X	X
Set_Partner_ID					X		X
Set_Partner_LU_Name	X	X	X	X	X	X	X
Set_Prepare_Data_Permitted					X	X	X
Set_Prepare_To_Receive_Type	X	X	X	X	X	X	X
Set_Receive_Type	X	X	X	X	X	X	X
Set_Return_Control	X	X	X	X	X	X	X
Set_Send_Receive_Mode					X	X	X
Set_Send_Type	X	X	X	X	X	X	X
Set_Sync_Level							
CM_NONE	X	X	X	X	X	X	X
CM_CONFIRM	X	X	X	X	X	X	X
CM_SYNC_POINT		X		X	X	X	X

Table 1 (Page 2 of 2). Versions of CPI Communications

Call Name	CPI-C 1.0	CPI-C 1.1	X/Open CPI-C	CPI-C 1.2	CPI-C 2.0	X/Open CPI-C 2.0	CPI-C 2.1
CM_SYNC_POINT_NO_CONFIRM					X	X	X
Set_TP_Name	X	X	X	X	X	X	X
Set_Transaction_Control					X	X	X
for examining information about the conversation and CRM:							
Extract_AE_Qualifier					X	X	X
Extract_AP_Title					X	X	X
Extract_Application_Context_Name					X	X	X
Extract_Conversation_Context				X	X		X
Extract_Conversation_State		X		X	X	X	X
Extract_Conversation_Type	X	X	X	X	X	X	X
Extract_Initialization_Data					X	X	X
Extract_Maximum_Buffer_Size				X	X	X	X
Extract_Mode_Name	X	X	X	X	X	X	X
Extract_Partner_ID					X		X
Extract_Partner_LU_Name	X	X	X	X	X	X	X
Extract_Secondary_Information					X	X	X
Extract_Security_User_ID			—[2]	X	X	X	X
Extract_Send_Receive_Mode					X	X	X
Extract_Sync_Level	X	X	X	X	X	X	X
Extract_TP_Name			X	X	X	X	X
Extract_Transaction_Control					X	X	X
for non-blocking operations:							
Cancel_Conversation			X	X	X	X	X
Set_Processing_Mode			X	X	X	X	X
Set_Queue_Callback_Function					X	X	X
Set_Queue_Processing_Mode					X	X	X
Wait_For_Completion					X	X	X
Wait_For_Conversation			X	X	X	X	X
for accepting multiple conversations:							
Accept_Incoming				X	X	X	X
Initialize_For_Incoming				X	X	X	X
Release_Local_TP_Name				X	X	X	X
Specify_Local_TP_Name			X	X	X	X	X
for data conversion:							
Convert_Incoming			X	X	X	X	X
Convert_Outgoing			X	X	X	X	X
Extract_Mapped_Initialization_Data							X
Receive_Mapped_Data							X
Send_Mapped_Data							X
Set Mapped_Initialization_Data							X

[2] X/Open CPI-C provides an Extract_Conversation_Security_User_ID call that provides similar function.

Naming Conventions—Calls, Characteristics, Variables, and Values

Pseudonyms for the actual calls, characteristics, variables, states, and characteristic values comprising CPI Communications are used throughout this book to enhance understanding and readability.

Where possible, underscores (_) and complete names are used in the pseudonyms. Any phrase in the book that contains an underscore is a pseudonym. For example, Send_Data is the pseudonym for the program call CMSEND, which is used by a program to send information to its conversation partner.

This book uses the following conventions to aid in distinguishing between the four types of pseudonyms:

- **Calls** are shown in all capital letters. Each underscore-separated portion of a call's pseudonym begins with a capital letter. For example, Accept_Conversation is the pseudonym for the actual call name CMACCP.
- **Characteristics** and **variables** used to hold the values of characteristics are in italics (for example, *conversation_type*) and contain no capital letters except those used for abbreviations (for example, *TP_name*).

  In most cases, the parameter used on a call, which corresponds to a program variable, has the same name as the conversation characteristic. Whether a name refers to a parameter, a program variable, or a characteristic is determined by context. In all cases, the value used for the three remains the same.
- **Values** used for characteristics and variables appear in all uppercase letters (such as CM_OK) and represent actual integer values that will be placed into the variable. For a list of the integer values that are placed in the variables, see Table 19 on page 412 in Appendix A, "Variables and Characteristics."
- **States** are used to determine the next set of actions that can be taken in a conversation. States begin with capital letters and appear in bold type, such as **Reset** state. Bold is also used to denote the **Backout-Required** condition.
- **Queues** are used to group related CPI Communications calls. Queue names begin with capital letters. The parts of a queue name are connected with a hyphen.

As a complete example of how pseudonyms are used in this book, suppose a program uses the Set_Return_Control call to set the conversation characteristic of *return_control* to a value of CM_IMMEDIATE.

- "Set_Return_Control (CMSRC)" contains the syntax and semantics of the variables used for the call. It explains that the real name of the program call for Set_Return_Control is CMSRC and that CMSRC has a parameter list of *conversation_ID*, *return_control*, and *return_code*.
- Appendix A, "Variables and Characteristics" provides a complete description of all variables used in the book and shows that the *return_control* variable, which goes into the Set_Return_Control call as a parameter, is a 32-bit integer. This information is provided in Table 21 on page 422.
- Table 19 on page 412 in Appendix A, "Variables and Characteristics" shows that CM_IMMEDIATE is defined as having an integer value of 1. CM_IMMEDIATE is placed into the *return_control* parameter on the call to CMSRC.

- Finally, the *return_code* value CM_OK, which is returned to the program on the CMSRC call, is defined in Appendix B, "Return Codes and Secondary Information." CM_OK means that the call completed successfully.

Note: Pseudonym value names are not actually passed to CPI Communications as a string of characters. Instead, the pseudonyms represent integer values that are passed on the program calls. The pseudonym value names are used to aid readability of the text. Similarly, programs should use translates and equates (depending on the language) to aid the readability of the code. In the above example, for instance, a program equate could be used to define CM_IMMEDIATE as meaning an integer value of 1. The actual program code would then read as described above—namely, that *return_control* is replaced with CM_IMMEDIATE. The end result, however, is that an integer value of 1 is placed into the variable.

Chapter 2. CPI Communications Terms and Concepts

CPI Communications provides a consistent application programming interface for applications that require program-to-program communication. The interface provides access to a rich set of interprogram services, including:

- Sending and receiving data
- Synchronizing processing between programs
- Notifying a partner of errors in the communication

This chapter describes the major terms and concepts used in CPI Communications.

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Communication across a Network

Figure 1 illustrates the logical view of a sample network. It consists of three **communication resource managers**[3] (CRMs): CRM X, CRM Y, and CRM Z. Each CRM has two **logical connections** with two other CRMs; the logical connections are shown as the gray portions of Figure 1 and enable communication between the CRMs. The network shown in Figure 1 is a simple one. In a real network, the number of CRMs and logical connections between the CRMs can be in the tens of thousands or higher.

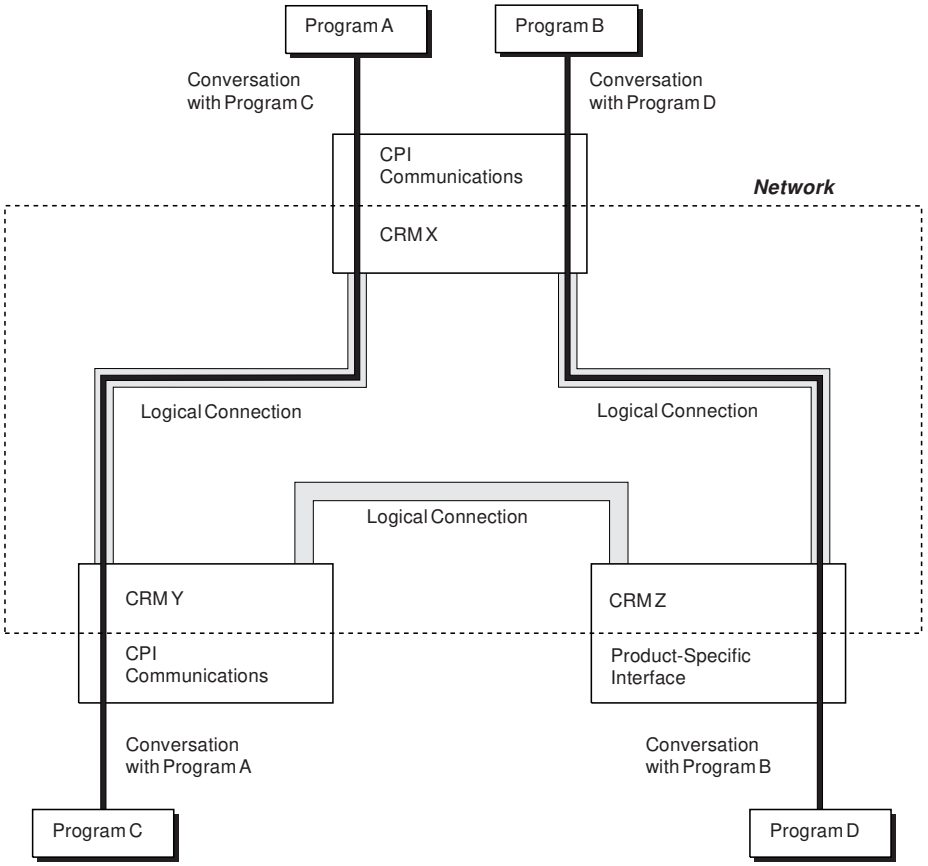

Figure 1. Programs Using CPI Communications to Converse through a Network

The CRMs and the logical connections shown in Figure 1 are generic representations of real networks. If this were an SNA network, the CRMs would be referred to as **logical units** of type 6.2 and the logical connections would be **sessions**. In an OSI network, CRMs are called **application-entities** and the logical connections are **associations**. The physical network, which consists of nodes (processors) and data links between nodes, is not shown in Figure 1 because a program using CPI Communications does not "see" these resources. A program uses the logical network of CRMs, which in turn communicates with and uses the physical network. This manual discusses CRMs of type LU 6.2 and type OSI TP.

[3] Communication resource managers can provide many functions in a network. In this manual, the term **communication resource manager** refers only to resource managers that provide conversation services to CPI Communications programs. Other CRMs might, for example, provide services for remote procedure calls or message-queuing interfaces.

Conversation Types

Just as two CRMs communicate using a logical connection, two programs exchange data using a **conversation**. For example, the conversation between Program A and Program C is shown in Figure 1 as a single bold line between the two programs. The line indicating the conversation is shown on top of the logical connection because a conversation allows programs to communicate "over" the logical connection between the CRMs.

CPI Communications supports two types of conversations:

- **Mapped** conversations allow programs to exchange arbitrary **data records** in data formats agreed upon by the application programmers. CPI Communications supports both the traditional pass through method, where the application program encodes and decodes the data, and external routines that encode and decode user data.
- **Basic** conversations allow programs to exchange data in a standardized format. This format is a stream of data containing 2-byte logical length fields (referred to as LLs) that specify the amount of data to follow before the next length field. The typical data pattern is "LL, data, LL, data." Each grouping of "LL, data" is referred to as a **logical record**.

  Notes:

  1. Because of the detailed manipulation of data and resulting complexity of error conditions, the use of basic conversations is intended for programs with specialized requirements. A more complete discussion of basic and mapped conversations is provided in the "Usage Notes" section of "Send_Data (CMSEND)" on page 244.
  2. Because OSI TP CRMs do not exchange the conversation characteristic that determines whether a conversation will be mapped or basic, the remote application must also issue a Set_Conversation_Type call when basic conversations are being used, to override the default value of CM_MAPPED_CONVERSATION for the *conversation_type* conversation characteristic.

For further information on basic and mapped conversations, refer to *SNA LU 6.2 Reference: Peer Protocols* (SC31-6808) and *SNA Transaction Programmer's Reference Manual for LU Type 6.2* (GC30-3084).

Send-Receive Modes

CPI Communications supports two modes for sending and receiving data on a conversation:

- **Half-duplex**—Only one of the programs has **send control,** the right to send data, at any time. Send control must be transferred to the other program before that program can send data.
- **Full-duplex**—Both programs can send and receive data at the same time. Thus, both programs have send control.

The **send-receive mode** on a conversation is determined at the time the conversation is established using Allocate.

For further information, see “Characteristic Values and Send-Receive Modes” on page 38.

Program Partners

Two programs involved in a conversation are called **partners** in the conversation. If a CRM-CRM logical connection exists, or can be created, between the nodes containing the partner programs, two programs can communicate through the network with a conversation.

The terms local and remote are used to differentiate between different ends of a conversation. If a program is being discussed as **local**, its partner program is said to be the **remote** program for that conversation. For example, if Program A is being discussed, Program A is the local program and Program C is the remote program. Similarly, if Program C is being discussed as the local program, Program A is the remote program. Thus, a program can be both local and remote for a given conversation, depending on the circumstances.

Although program partners generally reside in different nodes in a network, the local and remote programs may, in fact, reside in the same node. Two programs communicate with each other the same way, whether they are in the same or different nodes.

Note: A CPI Communications program may establish a conversation with a program that is using a product-specific programming interface for a particular environment and not CPI Communications. The conversation between Program B and Program D in Figure 1 is an example of such a situation. Some restrictions may apply in this situation, since CPI Communications does not support all available network functions.

Identifying the Partner Program

CPI Communications requires a certain amount of destination information, such as the name of the partner program and the name of the CRM at the partner's node, before it can establish a conversation. Sources for this information include:

- **Program-supplied**
  The program can supply the destination information directly.
- **Side information**
  The program can use data contained in local **side information**. The side information is accessed using an 8-byte **symbolic destination name** or *sym_dest_name*, which identifies the partner program.
- **Distributed directory**
  The program can use a **directory object** contained in a **distributed directory**. The directory object represents a particular installation of a program and is identified by a variable-length **distinguished name** (DN). Programs not having a DN for their partner program can search the directory for objects containing a **program function identifier** (PFID). The PFID is a globally-unique identifier for the function provided by the program.

There are some considerations to keep in mind when using the different techniques:

- Program-supplied information may require recompilation if the address of the partner program changes.
- Use of *sym_dest_name* allows only a small name space of locally-defined names.
- Side information requires local administration on each system.
- Movement of a program may result in update of side information on multiple systems.
- Use of a distributed directory enables destination information to be stored in a single location and accessed by multiple programs.
- As with the *sym_dest_name*, a DN identifies a particular installation of a program and destination information may not be known at program development time. For example, shrink-wrapped programs will not have access to the DN when distributed. Use of the PFID solves this problem by allowing a run-time search of the directory for all program installation objects with a particular functionality.
- "Side Information" on page 21 and "Distributed Directory" on page 22 discuss how existing CPI Communications programs using side information can be migrated to use the distributed directory by using the *sym_dest_name* to identify a side-information entry containing a DN.

Operating Environment

Figure 2 gives a more detailed view of Program A's operating environment. As in Figure 1, the bold black line shows the conversation Program A has established with its partner program. The new line between the program and CPI Communications represents Program A's use of program calls to communicate with CPI Communications. The different types of CPI Communications calls are discussed in "Program Calls" on page 26.

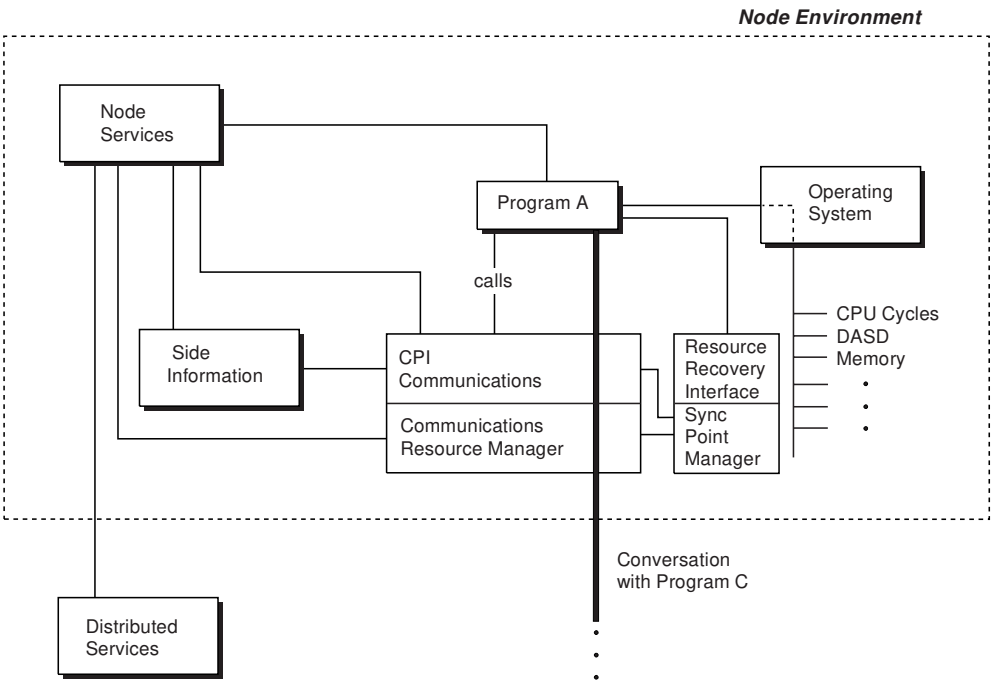

Figure 2. Operating Environment of CPI Communications Program

In addition to the new line with CPI Communications, Figure 2 also shows Program A using several other generic elements:

- Node services
- Side information
- Distributed services
  - Distributed directory
  - Distributed security
- Resource recovery interface
- Operating system

These elements are further discussed within this chapter.

Node Services

Node services represents a number of "utility" functions within the local system environment that are available for CPI Communications and other programming interfaces. These functions are not related to the actual sending and receiving of CPI Communications data, and specific implementations differ from product to product. Node services includes the following general functions:

- Setting and accessing of side information

  This function is required to set up the initial values of the side information and allow subsequent modification. It does not refer to individual program modification of the program's copy of the side information using Set calls, as described in "Conversation Characteristics" on page 31. (Refer to specific product information for details.)

- Setting and accessing of distributed directory information

  Node services is used by programs requiring direct interaction with a distributed directory. For example, a program might need to perform a search of the directory in order to determine the correct destination information. Once the correct object has been determined by making calls to node services, the program can pass the program destination information to CPI Communications. Alternatively, the program may pass a DN or PFID to CPI Communications and CPI Communications will access the directory (using node services) to retrieve the destination information for the program. For more information, see "Distributed Directory" on page 22.

  Note to Implementers: The local node services interface for CPI Communications interaction with the directory will vary based on the type of distributed directory available on the system. Minimum services that should be available from the local directory interface include:

  – Ability to place a program installation object into the directory
  – Ability to retrieve a program binding from a program installation object when the DN for the object is specified
  – Ability to retrieve a list of program bindings when a PFID is specified
  – Ability to remove a program installation object from the directory

  For further information on **program binding**, see "Program Binding" on page 429. Appendix F, "CPI Communications Extensions for Use with DCE Directory" contains a sample definition of a local directory interface for interaction with the Distributed Computing Environment (DCE) Directory.

- Program-startup processing

  A program is started either by receipt of notification that the remote program has issued an Allocate call for the conversation (discussed in greater detail in "Starter-Set Flows" on page 66) or by local (operator) action. In either case, node services sets up the data paths and operating environment required by the program, validates and establishes security parameters under which the program will execute, and then allows the program to begin execution. In the former case, node services receives the notification, retrieves the name of the program to be started and any access security information included in the conversation startup request, and then proceeds as if starting a program by local action.

- Program-termination processing (both normal and abnormal)

The program should terminate all conversations before the end of the program. However, if the program does not terminate all conversations, node services will abnormally deallocate any dangling conversations.

- Providing support for programs with multiple partners

  As is discussed in greater detail in “Multiple Conversations” on page 27, some programs do work on behalf of multiple partners. Each partner is represented by a **context**, or collection of logical attributes. Node services provides the necessary function and support (through system interfaces) to allow the program to manage different partner contexts. See “Contexts and Context Management” on page 29 for more information.

- Acquiring and validating access security information

  Node services provides interfaces for CRMs both to acquire and to validate access security information on behalf of a user. In a distributed system, node services may use a distributed security service that provides authentication services to create or validate the access security information. See "Conversation Security" on page 49 for more information.

Side Information

As was previously discussed in "Identifying the Partner Program," CPI Communications allows a program to identify its partner program with a *sym_dest_name*. The *sym_dest_name* is provided on the Initialize_Conversation call and corresponds to a side-information entry containing destination information for the partner program. The information that needs to be specified in the side-information entry depends on the type of CRM (LU 6.2 or OSI TP) required to contact the program. Each piece of information may have associated attributes such as length and format for *AP_Title* and *AE_Qualifier*.

The possible information specific to a LU 6.2 CRM is:

- ***partner_LU_name***

  Indicates the name of the LU where the partner program is located. This LU name is any name for the remote LU recognized by the local LU for the purpose of allocating a conversation.

The possible information specific to an OSI-TP CRM is:

- ***AP_title***

  When combined with the *AE_qualifier*, the application-process-title indicates the name of the application-entity where the partner program is located. The *AP_title* combined with an *AE_qualifier* is equivalent to a fully qualified *partner_LU_name* in SNA.

- ***AE_qualifier***

  Indicates the application-entity-qualifier, which is used to distinguish between application-entities having the same *AP_title*, if required.

- ***application_context_name***

  Specifies the name of the application context being used on the conversation. An **application context** is a set of operating rules that two programs have agreed to follow.

In addition, the entry may contain the following information, which is not CRM-type dependent.

- ***TP_name***

  Specifies the name of the remote program. *TP_name* stands for "transaction program name." In this manual, *transaction program*, *application program*, and *program* are synonymous, all denoting a program using CPI Communications.

- ***mode_name***

  Used to designate the properties of the logical connection that will be established for the conversation. The properties include, for example, the class of service to be used on the conversation. The system administrator defines a set of mode names used by the local CRM to establish logical connections with

its partners. An LU 6.2 CRM always has the following modes defined for application usage: #BATCH, #BATCHSC, #INTER, and #INTERSC.

- ***distinguished_name***

  Indicates a DN that can be used to access destination information in a distributed directory. The information retrieved from the distributed directory will be used to establish the conversation. Associated attributes of *directory_syntax* and *directory_encoding* may be present. If a *distinguished_name* is present, only the security information from the entry (*conversation_security_type*, *security_user_ID*, and *security_password*) will be used. All other destination information from this side information entry will be ignored.

- ***conversation_security_type***

  Specifies the type of access security information to be included in the conversation startup request. See "Conversation Security" on page 49 for more information.

- ***security_user_ID***

  Specifies the user ID to be used for validation of access to the remote program by the partner system.

- ***security_password***

  Specifies the password to be used with the user ID for validation of access to the remote program by the partner system.

Programs not wanting to use side information can specify a *sym_dest_name* of blanks on the Initialize_Conversation call. For more information, see "Initialize_Conversation (CMINIT)" on page 197.

Distributed Directory

A distributed directory is a service that enables information to be stored in a single location. It is referred to as "distributed" because the information can be accessed from multiple locations in a network using local directory interfaces. The local directory interface (part of node services) handles the communications and information flows required to retrieve the requested information from the directory. Information is stored in the directory by placing it in a directory object. Directory objects may contain many different pieces of information.

Figure 3 shows Program A interacting directly with a local directory interface. When Program A provides a name to node services (**1**), node services accesses the distributed directory (**2** and **3**). The retrieved object is then returned to the program (**4**).

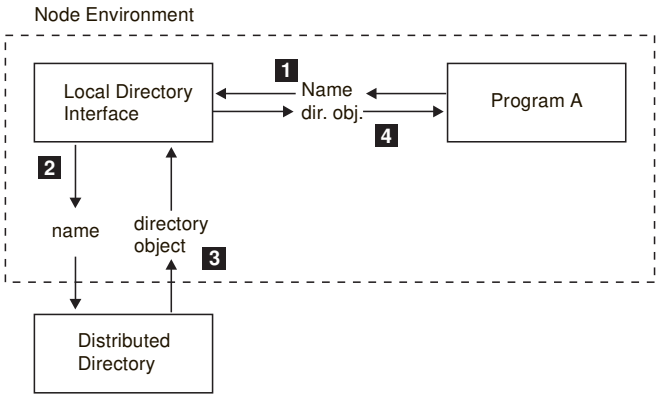

Figure 3. Generic Program Interaction with a Distributed Directory

CPI Communications Directory Object

A directory object that contains the destination information for a single installation of a partner program is referred to as a **program installation object**. A program installation object includes the following information:

- **Program Function Identifier (PFID)**
  A PFID uniquely identifies the function provided by a program. This allows programs installed on multiple systems, with different DNs, to be recognized as providing the same function. For example, multiple installations of a distributed mail application might all have the same PFID. See "Program Function Identifier (PFID)" on page 427 for a more detailed discussion of the PFID.

  Note: On distributed directories supporting attribute types, the PFID attribute type is uniquely identified with a registered ISO object identifier of 1.3.18.0.2.4.13.

- **Program Binding**
  The program binding contains information required by a partner program to establish a conversation with the program. Because multiple CRMs can be used to reach the same program installation, there may be more than one program binding in a single directory object. Each program binding contains the following information:

  – local address (TP_name)

  – mode (mode_name)

  – partner_principal_name—identifies the principal name used by the remote CRM for authentication of conversation startup requests

  – required_user_name_type—identifies the type of user name required for access to the partner program

  – CRM-specific information

    For LU 6.2:

    - partner_LU_name

    For OSI TP:

    - AE_qualifier
    - AP_title
    - application_context_name

Notes:

1. On distributed directories supporting attribute types, the CPI Communications program binding attribute is uniquely identified with a registered ISO object identifier of 1.3.18.0.2.4.14.

   See “Program Binding” on page 429 for guidelines on the specific structure and format of the PFID and program binding.

2. On distributed directories supporting attribute types, the CPI Communications program installation object is uniquely identified as an object class with a registered ISO object identifier of 1.3.18.0.2.6.7.

Using the Distributed Directory

Figure 4 illustrates two ways that a CPI Communications program might use destination information stored in a distributed directory:

- The program accesses the distributed directory directly with a DN to retrieve a program installation object (1 and 2). The program installation object contains a program binding as one of its pieces of information. The program passes the program binding to CPI Communications (3) using the Set_Partner_ID call with the *partner_ID_type* parameter set to CM_PROGRAM_BINDING. CPI Communications then uses the program-binding information to allocate the conversation.
- Instead of accessing the directory itself, the program passes a DN for a program installation object to CPI Communications (3) using the Set_Partner_ID call with a *partner_ID_type* parameter set to CM_DISTINGUISHED_NAME. CPI Communications uses the DN to access the distributed directory and retrieve the program installation object (4). CPI Communications then uses the program-binding information from the object to allocate the conversation.

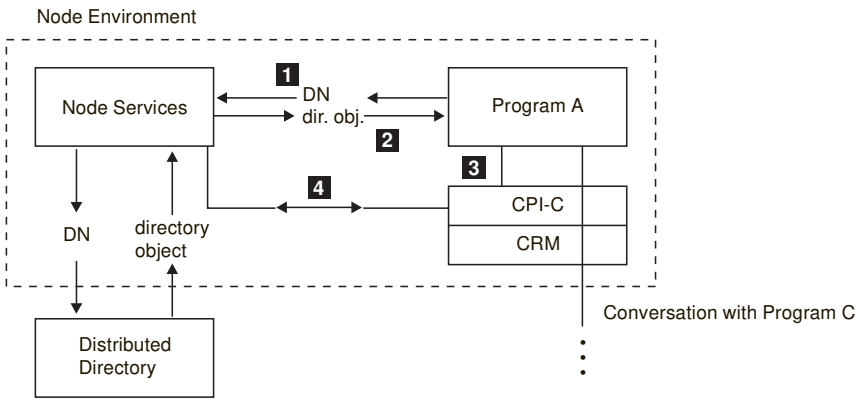

Figure 4. Program Interaction with CPI Communications and a Distributed Directory

Both these examples require the program to provide a DN directly, either to node services or to CPI Communications. There are, however, several other ways a program can access information contained in the distributed directory:

- The program provides a *sym_dest_name* on the Initialize_Conversation call that corresponds to a side information entry containing a DN. CPI Communications will then use the DN to access the distributed directory and retrieve the program binding. After the conversation is allocated, the program can use “Extract_Partner_ID (CMEPID)” to determine the program binding used.

- The program passes a PFID to CPI Communications using “Set_Partner_ID (CMSPID)” with a *partner_ID_type* parameter set to CM_PROGRAM_FUNCTION_ID. CPI Communications uses the PFID to search the distributed directory and retrieve a program installation object providing the appropriate function. CPI Communications then uses the program-binding information from the object to allocate the conversation.
- The program accesses the distributed directory using node services and locates the appropriate directory object (and program binding) using something other than a DN. For example, the program might search the directory for non-CPI-C information to determine the correct program installation object. Once located, the program binding from the directory object can be passed to CPI Communications using “Set_Partner_ID (CMSPID)” with a *partner_ID_type* parameter set to CM_PROGRAM_BINDING.

Interaction with Side Information and Set Calls

CPI Communications does not attempt to integrate destination information from the distributed directory with destination information obtained from Set calls or side information. The following rules apply:

- If the *partner_ID* characteristic is null, CPI Communications will use the values of the destination information obtained from Set calls or side information.
- If a *partner_ID* is non-null, Set calls to provide alternative destination information (other than Set_Partner_ID, Set_Conversation_Security_Type, Set_Security_User_ID, and Set_Security_Password) are not allowed. The program is notified of the error condition with a *return_code* of CM_PROGRAM_PARAMETER_CHECK.
- If a non-null *partner_ID* is available, CPI Communications will use it to establish the conversation. CPI Communications will ignore any other destination information (other than security information) that may have been established by Set calls or side information.

Distributed Security

Distributed security allows a user or system to be defined at a single trusted authentication server using **principal names** rather than user IDs. For example, a user or program accessing three different systems might require three separate sets of user IDs and passwords, one for each system. Using distributed security, a user or system could use a single principal name and password to access all three systems.

Figure 5 shows how a distributed security service works. In this example, the user has already signed on with a principal name and has been authenticated to the local security service interface. After this initial sign-on, the user is not required to provide any additional security information. When the user executes a program that requests a conversation from the CRM (1), the CRM communicates with the local security service interface (2) and retrieves the security information to be sent with the conversation startup request. The local security service communicates with the Authentication Server (3) to determine this information, also referred to as authentication tokens, and returns it to the CRM (4). The CRM then sends the security information to the partner CRM in the conversation startup request (5). When the partner CRM receives the conversation startup request, it accesses its local security service interface and validates the authentication tokens (6 and 7).

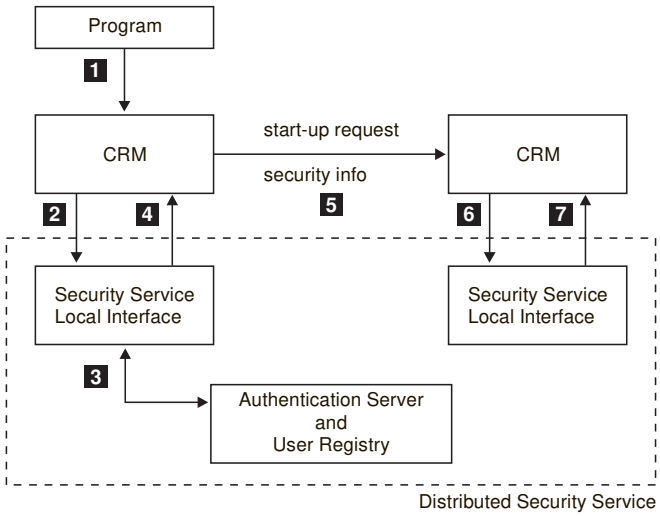

Figure 5. CRM Interaction with Distributed Security Service

Operating System

CPI Communications depends on the operating system for the normal execution and operation of the program. Activities such as linking, invoking, and compiling programs are all described in product documentation.

Program Calls

CPI Communications programs communicate with each other by making program **calls.** These calls are used to establish the **characteristics** of the conversation and to exchange data and control information between the programs. An example of a conversation characteristic is the *send_receive_mode* characteristic, which indicates whether or not both programs may send data at the same time. Conversation characteristics are discussed in greater detail in “Conversation Characteristics” on page 31.

When a program makes a CPI Communications call, the program passes characteristics and data to CPI Communications using **input parameters**. When the call completes, CPI Communications passes data and status information back to the program using **output parameters**.

The *return_code* output parameter is returned for all CPI Communications calls. It indicates whether a call completed successfully or if an error was detected that caused the call to fail. CPI Communications uses additional output parameters on some calls to pass status information to the program. These parameters include the *control_information_received*, *data_received*, and *status_received* parameters. Additionally, the return code may be associated with **secondary information**, which can be used to determine the cause of the return code.

Starter Set Calls

The following six calls are called the starter set.

Initialize_Conversation
Accept_Conversation
Allocate
Send_Data
Receive
Deallocate

These six calls, which provide the core function, allow for simple communication of data between two programs. They are sufficient for writing simple applications that use the initial values for the CPI-C conversation characteristics. They are necessary for writing very complex applications. Example flows using these calls are provided in “Starter-Set Flows” on page 66.

Establishing a Conversation

Here is a simple example of how Program A starts a conversation with Program C:

1. Program A issues the Initialize_Conversation call to prepare to start the conversation. It uses a *sym_dest_name* to designate Program C as its partner program. The CRM returns a unique conversation identifier, the *conversation_ID*. Program A will use this *conversation_ID* in all future calls intended for that conversation.
2. Program A issues an Allocate call to start the conversation.
3. CPI Communications tells the node containing Program C that Program C needs to be started by sending a **conversation startup request** (in LU 6.2, this is an attach) to the partner CRM. The conversation startup request contains information necessary to start the partner program and establish the conversation.
4. Program C is started and issues the Accept_Conversation call. It receives back a unique *conversation_ID* (not necessarily the same as the one provided to Program A). Program C will use its *conversation_ID* in all future calls intended for that conversation.

After issuing their respective Initialize_Conversation and Accept_Conversation calls, both Program A and Program C have a set of default **conversation characteristics** set up for the conversation. The default values established by CPI Communications are discussed in “Conversation Characteristics” on page 31.

Multiple Conversations

In the previous example, Program A established a single conversation with a single partner, but CPI Communications allows a program to communicate with multiple partners using multiple, concurrent conversations:

- **Outbound Conversations**—A program initiates more than one conversation.
- **Inbound Conversations**—A program accepts more than one conversation.

Specific combinations of outbound and inbound conversations are determined by application design. The sections that follow discuss in greater detail the concepts required for multiple conversations.

Partner Program Names

After a program issues Initialize_Conversation to establish its conversation characteristics, a name for its partner program (the TP_Name) is established. This name is transmitted to the remote system in the conversation startup request after the program issues the Allocate call.

At the remote system, the partner program can be started in one of two ways:

- Receipt of a conversation startup request
- Local action

In the first case, node services starts the program named in the conversation startup request. However, if a program is started locally, the program must notify node services of its ability to accept conversations for a given name. The program **associates** a name with itself by issuing the Specify_Local_TP_Name call. The program can **release** a name from association with itself by issuing the Release_Local_TP_Name call.

To accept multiple conversations for different names, the program issues multiple Specify_Local_TP_Name calls, thus associating multiple names with itself.

Note: A locally-started program cannot accept conversations until a name has been associated with the program.

Multiple Outbound Conversations

Figure 6 shows Program A establishing conversations with two partners. For example, a program may need to request data from multiple data bases on different nodes to answer a particular query. The conversation with Program B is initialized with an Initialize_Conversation (CMINIT) call that returns a *conversation_ID* parameter of X. The conversation with Program C is initialized with an Initialize_Conversation call that returns a *conversation_ID* parameter of Y. When Program A issues subsequent calls with a *conversation_ID* of X, CPI Communications will know these calls apply to the conversation with Program B. Similarly, when Program A issues subsequent calls with a *conversation_ID* of Y, CPI Communications will know these calls apply to the conversation with Program C.

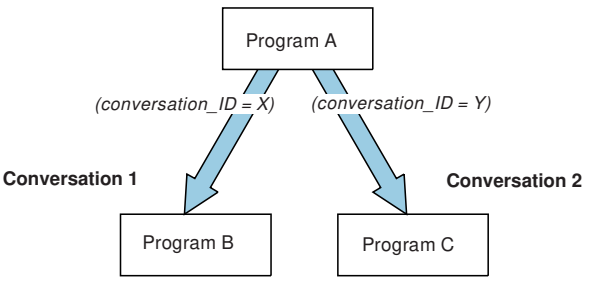

Figure 6. A Program Using Multiple Outbound CPI Communications Conversations

Note: In some implementing environments, Program A can share the *conversation_ID* with another task, allowing that task to issue calls on the conversation with Program C.

Multiple Inbound Conversations

Some programs, often referred to as **server** programs, may need to accept more than one inbound conversation. For example, a server could accept conversations from multiple partners in order to work on the request from one partner while waiting for a second partner's request or work to complete.

This type of application is shown in Figure 7, where Programs D and E have both chosen to initiate conversations with the same partner, Program S.

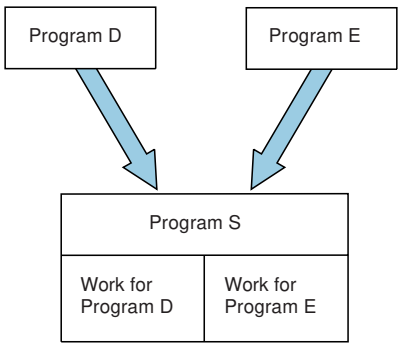

Figure 7. A Program Using Multiple Inbound CPI Communications Conversations

In the simplest case, Program S can accept the two conversations by issuing Accept_Conversation twice. Alternatively, Program S may make use of two advanced calls, Initialize_For_Incoming and Accept_Incoming.

Note: A program would use the advanced calls to achieve greater programming flexibility. See “Non-Blocking Operations” on page 45 for a more detailed discussion. See “Example 12: Accepting Multiple Conversations Using Blocking Calls” on page 90 and “Example 13: Accepting Multiple Conversations Using Conversation-Level Non-Blocking Calls” on page 92 for examples using these calls.

Contexts and Context Management

Node services provides support for programs that perform work on behalf of multiple partners, such as server Program S in the previous example. Each time a program accepts an incoming conversation, a new **context** is created. The context is identified by a system-wide **context identifier** and is used by node services to group logical attributes for the work to be done on behalf of the partner program.

Node services maintains one or more contexts for a program in execution within the node. For each program, there is one distinguished context, the **current context**, within which work is currently being done. A program can manage different contexts by making calls to node services in order to:

- Create a new context
- Terminate a context
- Set the current context
- Retrieve the context identifier of the current context

Note: The discussion of contexts throughout this and following sections assumes a context is maintained on a program basis. However, in a system that supports multi-threaded programs, the context may be maintained on a thread basis.

Relationship between Contexts and Conversations

Each conversation is assigned to a context when it is allocated or accepted.

- An outgoing conversation is assigned to the current context of the program when it issues the Allocate call.
- An incoming conversation is assigned to the new context created when the program accepts the incoming conversation with the Accept_Conversation or Accept_Incoming call.

A program can retrieve the context identifier for a conversation's context by issuing the Extract_Conversation_Context call.

The program's current context is set by node services to the newly created context when an Accept_Conversation or Accept_Incoming call completes successfully with *return_code* set to CM_OK.

Relationship between Contexts and Security Parameters

Security parameters are among the logical attributes maintained by node services for a context. The access security information carried in the conversation startup request is used to set the security parameters for the context created as a result of an incoming conversation. The security parameters for other contexts are based on security information maintained within the system. See “Conversation Security” on page 49 for a complete discussion of conversation security.

Inbound and Outbound Conversations

A program that accepts incoming conversations from multiple program partners must ensure that work is done within the right context. In the expanded server example shown in Figure 8, Program S accepts two conversations, one each from Programs D and E. Two new contexts are created, one for the work done on behalf of Program D and one for the work done on behalf of Program E. Program S can retrieve the context identifier for each conversation by issuing the Extract_Conversation_Context call twice.

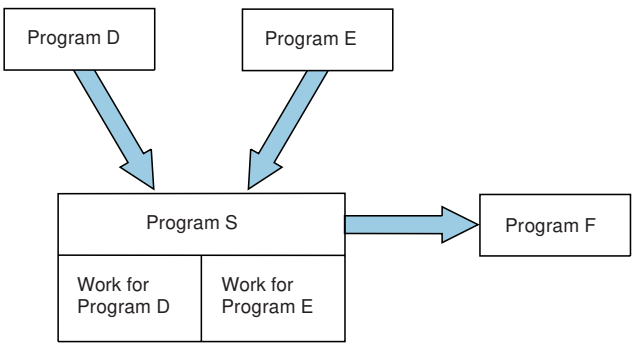

Figure 8. Server Program with Both Inbound and Outbound Conversations

Now consider a scenario where Program S is doing work for Program E and receives a request from Program D. The request is for information that Program S does not have. In this case, Program S allocates a conversation to a third partner, Program F, in order to answer Program D's request.

Before allocating the conversation to Program F, Program S must first ensure that it is using the correct context. It does this by setting the current context to that for Program D. This causes the outgoing conversation to be established using

information, such as the proper security parameters, from the correct context. “Conversation Security” on page 49 provides a complete discussion of how the current context is used by node services to establish security parameters for new conversations.

For more information about establishing and managing conversations, see the following sections:

- “Non-Blocking Operations” on page 45 for use of non-blocking calls
- “Example 1: Data Flow in One Direction” on page 67
- “Example 12: Accepting Multiple Conversations Using Blocking Calls” on page 90
- “Example 13: Accepting Multiple Conversations Using Conversation-Level Non-Blocking Calls” on page 92
- Usage notes for “Accept_Conversation (CMACCP)” on page 116
- Usage notes for “Accept_Incoming (CMACCI)” on page 118
- Usage notes for “Initialize_Conversation (CMINIT)” on page 197
- Usage notes for “Initialize_For_Incoming (CMINIC)” on page 199

Conversation Characteristics

CPI Communications maintains a set of characteristics for each conversation used by a program. These characteristics are established for each program on a per-conversation basis, and the initial values assigned to the characteristics depend on the program's role in starting the conversation. Table 2 on page 33 provides a comparison of the conversation characteristics and initial values as set by the Initialize_Conversation, Accept_Conversation, Initialize_For_Incoming, and Accept_Incoming calls. The uppercase values shown in the table are pseudonyms that represent integer values.

The CPI Communications naming conventions for these characteristics, as well as for calls, variables, and characteristic values, are discussed in “Naming Conventions—Calls, Characteristics, Variables, and Values” on page 11.

Modifying and Viewing Characteristics

In the example in “Establishing a Conversation” on page 27, the programs used the initial set of program characteristics provided by CPI Communications as defaults. However, CPI Communications provides calls that allow a program to modify and view the conversation characteristics for a particular conversation. Restrictions on when a program can issue one of these calls are discussed in the individual call descriptions in Chapter 4, “Call Reference.”

Note: CPI Communications maintains conversation characteristics on a per-conversation basis. Changes to a characteristic will affect only the conversation indicated by the *conversation_ID*. Changes made to a characteristic do not affect future default values assigned, nor do the changes affect the initial system values (in the case of values derived from the side information).

For example, consider the conversation characteristic that defines what type of conversation the initiating program will have, the *conversation_type* characteristic. CPI Communications initially sets this characteristic to CM_MAPPED_CONVERSATION and stores this characteristic value for use in maintaining the conversation. A program can issue the Extract_Conversation_Type call to view this value.

A program can issue the Set_Conversation_Type call (after issuing Initialize_Conversation but before issuing Allocate) to change this value. The change remains in effect until the conversation ends or until the program issues another Set_Conversation_Type call.

The Set calls are also used to prevent programs from attempting incorrect syntactic or semantic changes to conversation characteristics. For example, if a program attempts to change the *conversation_type* after the conversation has already been established (an illegal change), CPI Communications informs the program of its error and disallows the change. Details on this type of checking are provided in the individual call descriptions in Chapter 4, “Call Reference.”

Table 2 (Page 1 of 4). Characteristics and Their Default Values

Name of Characteristic	Initialize_Conversation sets it to:	Accept_Conversation sets it to:	Initialize_For_Incoming sets it to:	Accept_Incoming sets it to:
AE_qualifier	The application-entity qualifier from side information referenced by *sym_dest_name*. If a blank *sym_dest_name* was specified, *AE_qualifier* will be the null string.	For an OSI TP CRM, the initiating *AE_qualifier* received on the conversation startup request. For an LU 6.2 CRM, the null string.	Not set	For an OSI TP CRM, the initiating *AE_qualifier* received on the conversation startup request. For an LU 6.2 CRM, the null string.
AE_qualifier_length	The length of *AE_qualifier*. If a blank *sym_dest_name* was specified, *AE_qualifier_length* will be 0.	The length of *AE_qualifier*	Not set	The length of *AE_qualifier*
AE_qualifier_format	The format of *AE_qualifier*. If a blank *sym_dest_name* was specified, *AE_qualifier_format* will not be meaningful.	For an OSI TP CRM, the format of *AE_qualifier*. For an LU 6.2 CRM, *AE_qualifier_format* is not set.	Not set	For an OSI TP CRM, the format of *AE_qualifier*. For an LU 6.2 CRM, *AE_qualifier_format* is not set.
allocate_confirm	CM_ALLOCATE_NO_CONFIRM	Not applicable	Not applicable	Not applicable
AP_title	The application-process title from side information referenced by *sym_dest_name*. If a blank *sym_dest_name* was specified, *AP_title* will be the null string.	For an OSI TP CRM, the initiating *AP_title* received on the conversation startup request. For an LU 6.2 CRM, the null string.	Not set	For an OSI TP CRM, the initiating *AP_title* received on the conversation startup request. For an LU 6.2 CRM, the null string.
AP_title_length	The length of *AP_title*. If a blank *sym_dest_name* was specified, *AP_title_length* will be 0.	The length of *AP_title*	Not set	The length of *AP_title*
AP_title_format	The format of *AP_title*. If a blank *sym_dest_name* was specified, *AP_title_format* will not be meaningful.	For an OSI TP CRM, the format of *AP_title*. For an LU 6.2 CRM, *AP_title_format_* is not set.	Not set	For an OSI TP CRM, the format of *AP_title*. For an LU 6.2 CRM, *AP_title_format_* is not set.
application_context_name	The application context name from side information referenced by *sym_dest_name*. If a blank *sym_dest_name* was specified, *application_context_name* will be the null string.	For an OSI TP CRM, the initiating *application_context_name* received on the conversation startup request. For an LU 6.2 CRM, the null string.	Not set	For an OSI TP CRM, the initiating *application_context_name* received on the conversation startup request. For an LU 6.2 CRM, the null string.
application_context_name_length	The length of *application_context_name*. If a blank *sym_dest_name* was specified, *application_context_name* will be 0.	The length of *application_context_name*	Not set	The length of *application_context_name*
begin_transaction	CM_BEGIN_IMPLICIT	Not applicable	Not applicable	Not applicable
confirmation_urgency	CM_CONFIRMATION_URGENT	CM_CONFIRMATION_URGENT	CM_CONFIRMATION_URGENT	Not changed by Accept_Incoming
context_ID	Not set	The *context_ID* of the newly created context	Not set	The *context_ID* of the newly created context
context_ID_length	Not set	The length of *context_ID*	Not set	The length of *context_ID*

Table 2 (Page 2 of 4). Characteristics and Their Default Values

Name of Characteristic	Initialize_Conversation sets it to:	Accept_Conversation sets it to:	Initialize_For_Incoming sets it to:	Accept_Incoming sets it to:
conversation_security_type	The security type from side information referenced by *sym_dest_name*. If a blank *sym_dest_name* was specified, *conversation_security_type* will be CM_SECURITY_SAME.	Not applicable	Not applicable	Not applicable
conversation_state	CM_INITIALIZE_STATE	For half-duplex conversations, CM_RECEIVE_STATE. For full-duplex conversations, CM_SEND_RECEIVE_STATE.	CM_INITIALIZE_INCOMING_STATE	For half-duplex conversations, CM_RECEIVE_STATE. For full-duplex conversations, CM_SEND_RECEIVE_STATE.
conversation_type	CM_MAPPED_CONVERSATION	CM_MAPPED_CONVERSATION if the CRM type is OSI TP, or the value received on the conversation startup request if the CRM type is LU 6.2.	CM_MAPPED_CONVERSATION	The value received on the conversation startup request if the CRM type is LU 6.2. Not changed if the CRM type is OSI TP.
deallocate_type	CM_DEALLOCATE_SYNC_LEVEL	CM_DEALLOCATE_SYNC_LEVEL	CM_DEALLOCATE_SYNC_LEVEL	Not changed by Accept_Incoming
directory_encoding	The *directory_encoding* referenced by *sym_dest_name*. If a blank *sym_dest_name* was specified or the side information entry did not contain a *directory_encoding* value, *directory_encoding* will be set to CM_DEFAULT_ENCODING.	Not applicable	Not set	Not applicable
directory_syntax	The *directory_syntax* referenced by *sym_dest_name*. If a blank *sym_dest_name* was specified or the side information entry did not contain a *directory_syntax* value, *directory_syntax* will be set to CM_DEFAULT_SYNTAX.	Not applicable	Not set	Not applicable
error_direction	CM_RECEIVE_ERROR	CM_RECEIVE_ERROR	CM_RECEIVE_ERROR	Not changed by Accept_Incoming
fill	CM_FILL_LL	CM_FILL_LL	CM_FILL_LL	Not changed by Accept_Incoming
initialization_data	Null	The value received on the conversation startup request	Null	The value received on the conversation startup request
initialization_data_length	0	The length of the initialization data received on the conversation startup request	0	The length of the initialization data received on the conversation startup request
log_data	Null	Null	Null	Not changed by Accept_Incoming
join_transaction	Not set	CM_JOIN_IMPLICIT	CM_JOIN_IMPLICIT	Not changed by Accept_Incoming
log_data_length	0	0	0	Not changed by Accept_Incoming
1 *map_name*	Null	Null	Null	Not changed by Accept_Incoming
1 *map_name_length*	0	0	0	Not changed by Accept_Incoming

Table 2 (Page 3 of 4). Characteristics and Their Default Values

Name of Characteristic	Initialize_Conversation sets it to:	Accept_Conversation sets it to:	Initialize_For_Incoming sets it to:	Accept_Incoming sets it to:
mode_name	The mode name from side information referenced by *sym_dest_name*. If a blank *sym_dest_name* was specified, *mode_name* will be the null string.	The mode name for the logical connection on which the conversation startup request arrived	Not set	The mode name for the logical connection on which the conversation startup request arrived
mode_name_length	The length of *mode_name*. If a blank *sym_dest_name* was specified, *mode_name_length* will be 0.	The length of *mode_name*	Not set	The length of *mode_name*
partner_ID	The *distinguished_name* referenced by *sym_dest_name*. If a blank *sym_dest_name* was specified or the side information entry did not contain a *distinguished_name*, *partner_ID* will be the null string.	A program binding containing all available destination information on the partner program.	Not set	A program binding containing all available destination information on the partner program.
partner_ID_length	The length of *partner_ID*. If *partner_ID* is null, *partner_ID_length* will be 0.	The length of *partner_ID*.	Not set	The length of *partner_ID*.
partner_ID_type	CM_DISTINGUISHED_NAME	CM_PROGRAM_BINDING	Not set	CM_PROGRAM_BINDING
partner_ID_scope	CM_EXPLICIT	Not applicable	Not set	Not applicable
partner_LU_name	The partner LU name from side information referenced by *sym_dest_name*. If a blank *sym_dest_name* was specified, *partner_LU_name* will be a single blank.	For an LU 6.2 CRM, the partner LU name for the logical connection on which the conversation startup request arrived. For an OSI TP CRM, *partner_LU_name* is a single blank.	Not set	For an LU 6.2 CRM, the partner LU name for the logical connection on which the conversation startup request arrived. For an OSI TP CRM, *partner_LU_name* is a single blank.
partner_LU_name_length	The length of *partner_LU_name*. If a blank *sym_dest_name* was specified, *partner_LU_name_length* will be 1.	The length of *partner_LU_name*	Not set	The length of *partner_LU_name*
prepare_data_permitted	CM_PREPARE_DATA_NOT_PERMITTED	Not applicable	Not applicable	Not applicable
prepare_to_receive_type	CM_PREP_TO_RECEIVE_SYNC_LEVEL	CM_PREP_TO_RECEIVE_SYNC_LEVEL	CM_PREP_TO_RECEIVE_SYNC_LEVEL	Not changed by Accept_Incoming
processing_mode	CM_BLOCKING	CM_BLOCKING	CM_BLOCKING	Not changed by Accept_Incoming
receive_type	CM_RECEIVE_AND_WAIT	CM_RECEIVE_AND_WAIT	CM_RECEIVE_AND_WAIT	Not changed by Accept_Incoming
return_control	CM_WHEN_SESSION_ALLOCATED	Not applicable	Not applicable	Not applicable
security_password	The security password from side information referenced by *sym_dest_name*. If a blank *sym_dest_name* was specified, *security_password* will be the null string.	Not applicable	Not applicable	Not applicable
security_password_length	The length of *security_password*. If a blank *sym_dest_name* was specified, *security_password_length* will be 0.	Not applicable	Not applicable	Not applicable

Table 2 (Page 4 of 4). Characteristics and Their Default Values

Name of Characteristic	Initialize_Conversation sets it to:	Accept_Conversation sets it to:	Initialize_For_Incoming sets it to:	Accept_Incoming sets it to:
security_user_ID	The security user ID from side information referenced by *sym_dest_name*. If a blank *sym_dest_name* was specified, *security_user_ID* will be the null string.	The value received on the conversation startup request	Not set	The value received on the conversation startup request
security_user_ID_length	The length of *security_user_ID*. If a blank *sym_dest_name* was specified, *security_user_ID_length* will be 0.	The length of *security_user_ID*	Not set	The length of *security_user_ID*
send_receive_mode	CM_HALF_DUPLEX	The value received in the conversation startup request	Not set	The value received in the conversation startup request
send_type	CM_BUFFER_DATA	CM_BUFFER_DATA	CM_BUFFER_DATA	Not changed by Accept_Incoming
sync_level	CM_NONE	The value received on the conversation startup request	Not set	The value received on the conversation startup request
TP_name	The program name from side information referenced by *sym_dest_name*. If a blank *sym_dest_name* was specified, *TP_name* will be a single blank.	The value received on the conversation startup request	Not set	The value received on the conversation startup request
TP_name_length	The length of *TP_name*. If a blank *sym_dest_name* was specified, *TP_name_length* will be 1.	The length of *TP_name*	Not set	The length of *TP_name*
transaction_control	CM_CHAINED_TRANSACTIONS	For an OSI TP CRM, the value received on the conversation startup request. For an LU 6.2 CRM, CM_CHAINED_TRANSACTIONS.	Not set	For an OSI TP CRM, the value received on the conversation startup request. For an LU 6.2 CRM, CM_CHAINED_TRANSACTIONS.

Characteristic Values and CRMs

Some conversation characteristic values are meaningful only for a particular CRM type. For example, an *error_direction* value of CM_SEND_ERROR has meaning only for an LU 6.2 CRM. On the other hand, a *sync_level* value of CM_NONE paired with a *deallocate_type* value of CM_DEALLOCATE_CONFIRM has meaning only for an OSI TP CRM. These CRM-type-sensitive characteristic values and value pairs are listed below:

- For an LU 6.2 CRM:
  - *error_direction* of CM_SEND_ERROR
- For an OSI TP CRM:
  - *allocate_confirm* of CM_ALLOCATE_CONFIRM
  - *prepared_data_permitted* of CM_PREPARE_DATA_PERMITTED
  - *transaction_control* of CM_UNCHAINED_TRANSACTIONS
  - *sync_level* of CM_NONE paired with *deallocate_type* of CM_DEALLOCATE_CONFIRM
  - *sync_level* of CM_SYNC_POINT paired with *deallocate_type* of CM_DEALLOCATE_CONFIRM
  - *sync_level* of CM_SYNC_POINT paired with *deallocate_type* of CM_DEALLOCATE_FLUSH
  - *sync_level* of CM_SYNC_POINT_NO_CONFIRM paired with *deallocate_type* of CM_DEALLOCATE_CONFIRM
  - *sync_level* of CM_SYNC_POINT_NO_CONFIRM paired with *deallocate_type* of CM_DEALLOCATE_FLUSH
  - *sync_level* of CM_SYNC_POINT_NO_CONFIRM paired with *send_receive_mode* of CM_HALF_DUPLEX

CPI Communications considers a conversation to be **using a particular CRM type** if either one of the following events occurs:

- The program has successfully set a characteristic value or value pair for the conversation that is meaningful only for that CRM type.
- The conversation has been allocated on that CRM type.

When the conversation is using a particular CRM type, the implications are:

- The program will receive a CM_PROGRAM_PARAMETER_CHECK return code if it attempts to set any characteristic value that is meaningful only for a different CRM type.

  For example, suppose a program has successfully set the *allocate_confirm* characteristic on a conversation to CM_ALLOCATE_CONFIRM, using the Set_Allocate_Confirm call. CPI Communications now considers this conversation to be using an OSI TP CRM. If the program then issues a Set_Error_Direction call on the conversation with *error_direction* set to CM_SEND_ERROR, the program will receive a CM_PROGRAM_PARAMETER_CHECK return code.

  Details on this type of checking are provided in the individual call descriptions in Chapter 4, “Call Reference” on page 107.

- The conversation will only be allocated on that CRM type.

  If a conversation is using one CRM type and complete destination information is available for both CRM types, the Allocate call will try to establish a logical connection using only the destination information for the CRM type being used.

Characteristic Values and Send-Receive Modes

Table 3 lists the values of conversation characteristics that are not applicable to a **half-duplex conversation**, a conversation with *send_receive_mode* set to CM_HALF_DUPLEX. Table 4 lists the values of conversation characteristics that are not applicable to a **full-duplex conversation**, a conversation with *send_receive_mode* set to CM_FULL_DUPLEX.

Table 3. Conversation Characteristic Values that Cannot Be Set for Half-Duplex Conversations

Characteristic Name	Inapplicable Values
sync_level	CM_SYNC_POINT_NO_CONFIRM (for conversations using an LU 6.2 CRM only)

Table 4. Conversation Characteristic Values that Cannot Be Set for Full-Duplex Conversations

Characteristic Name	Inapplicable Values
confirmation_urgency	all values
deallocate_type	CM_DEALLOCATE_CONFIRM (for conversations using an LU 6.2 CRM only)
error_direction	all values
prepare_to_receive_type	all values
processing_mode	all values
send_type	CM_SEND_AND_CONFIRM CM_SEND_AND_PREP_TO_RECEIVE
sync_level	CM_CONFIRM CM_SYNC_POINT

On a conversation with a particular send-receive mode:

- The program will receive a CM_PROGRAM_PARAMETER_CHECK if it attempts to set any characteristic value that is not applicable to that send-receive mode.
- The Set_Send_Receive_Mode call will return with CM_PROGRAM_PARAMETER_CHECK if a previously set *deallocate_type*, *send_type*, or *sync_level* characteristic value is not applicable to the send-receive mode specified on the call.

The following calls cannot be issued on full-duplex conversations and will receive a CM_PROGRAM_PARAMETER_CHECK return code on a full-duplex conversation:

- Confirm
- Confirmed (for conversations using an LU 6.2 CRM only)
- Prepare_To_Receive
- Request_To_Send
- Set_Confirmation_Urgency
- Set_Error_Direction
- Set_Prepare_To_Receive_Type
- Set_Processing_Mode
- Test_Request_To_Send_Received

Automatic Conversion of Characteristics

Some conversation characteristics affect only the function of the local program; the remote program is not aware of their settings. An example of this kind of conversation characteristic is *receive_type*. Other conversation characteristics, however, are transmitted to the remote program or CRM and, thus, affect both ends of the conversation. For example, the local CRM transmits the *TP_name* characteristic to the remote CRM as part of the conversation startup process.

When an LU 6.2 CRM is used, CPI Communications requires that these transmitted characteristics be encoded as EBCDIC characters. For this reason, CPI Communications automatically converts these characteristics to EBCDIC when they are used as parameters on CPI Communications calls on non-EBCDIC systems. The conversion of characteristics not in character set 00640 is implementation dependent (see Table 20 on page 418). When an OSI TP CRM is used, the transfer syntax is negotiated by the underlying support. CPI Communications automatically converts these characteristics to the transfer syntax when they are used as parameters on CPI Communications calls.

This means programmers can use the native encoding of the local system when specifying these characteristics on Set calls. Likewise, when these characteristics are returned by Extract calls, they are represented in the local system's native encoding.

The following conversation characteristics may be automatically converted by CPI Communications:

AE_qualifier Specified on the Extract_AE_Qualifier and Set_AE_Qualifier calls.

AP_Title Specified on the Extract_AP_Title and Set_AP_Title calls.

application_context_name
Specified on the Extract_Application_Context_Name and Set_Application_Context_Name calls.

initialization_data Specified on the Extract_Initialization_Data and Set_Initialization_Data calls.

log_data Specified on the Set_Log_Data call.

mode_name Specified on the Extract_Mode_Name and Set_Mode_Name calls.

partner_LU_name Specified on the Extract_Partner_LU_Name and Set_Partner_LU_Name calls.

security_password Specified on the Set_Conversation_Security_Password call.

security_user_ID Specified on the Extract_Security_User_ID and Set_Conversation_Security_User_ID calls.

TP_name Specified on the Set_TP_Name and Extract_TP_Name calls. Refer to “SNA Service Transaction Programs” on page 499 for special handling of SNA Service Transaction Program names.

Automatic Data Conversion

Automatic data conversion allows two mapped conversation programs to exchange data records in a manner that insulates a program from concerns about how the partner program views the data record. This is accomplished by encoding and decoding data records using routines that are external to the user application. These routines can be written by a systems administrator, some other qualified group, or a vendor. The MAP_NAME is used to access the correct routine. Within the SNA architecture this would be a separate routine which the underlying layers would access. A particular implementation may either have the user link edit the routine into the application program or use dynamic link libraries. The results are the same to the end user. Within the OSI architecture this name would instruct the U-ASE (the OSI TP entity responsible for encoding and decoding user data) what specific U-ASE ASN.1 structure to use. When a data record is received the reverse process occurs with the decoder recognizing what it received and generating the appropriate local MAP_NAME.

When an application program is moving data between homogeneous systems and intends to perform all manipulation of the data within the application program itself, it may use the network like a pipe and simply send and receive buffers of data. The program can also accomplish this by using pure Send_Data and Receive calls. It can also accomplish this by using Send_Mapped_data and Receive_Mapped_Data calls and not supplying a map name or supplying one with all blanks. The SNA routine the vendor installed routine which supports CPI-C 1.0 mapped conversations. The OSI routine is the Unstructured Data Transfer U-ASE (UDT).

The MAP_NAME is a 1 to 64 character local name defined by the person who wrote the encode/decode routine. Both sides of the conversation could have different local names for the same mapping function. This might occur when a transaction traveled across an organizational boundary where the naming could not be coordinated. An example would be two companies which use an industry standard data record and have independently created a MAP_NAME for the data record. SNA maps the local MAP_NAME to a globally unique network MAP_NAME. The globally unique name is provided by a systems administrator. OSI uses the application context to define, among other things, the abstract syntax's (ASN.1 encodings) the conversation can use. The MAP_NAME is a local name established by a systems administrator for the U-ASE to identify what encoding to use. Again, the two different systems may have different MAP_NAMES. Unlike SNA, OSI does not transmit a MAP_NAME across the network. Instead the self defining nature of ASN.1 automatically performs this function. The encode/decode routines need not be mirror images of each other. The ability to manipulate the user data before it is sent or received by the application program allows the application programmer insulation from the network. The receiver may only require a subset of the data that was sent, therefore only specific fields are delivered to the program. This allows changes in the data a program sends to occur without requiring every receiving program to change, only the decoding routines need change. The sending program may send a subset of the required data with the encoding routine filling in the missing fields.

Automatic data conversion assumes that both partners operate correctly. There may be cases where Send_Data and Receive calls are mixed with Send_Mapped_Data and Receive_Mapped_Data. These calls can be mixed if the following assumptions are met:

1. Both partners use equivalent map routines.
2. The Send_Data partner's map routine can recognize the incoming buffer and encode correctly. For LU 6.2, the map routine will generate the correct map name and send it to the partner.
3. The Receive_Data partner application code is able to recognize the decoded buffer and act accordingly.

The send/receive mapped data routines all use a Map_Name_Length of 0 to 64. A zero length indicates a NULL map name and the use of either the LU 6.2 supplied map routine or the OSI UD ASE, depending on the underlying CRM.

Data Conversion

Program-to-program communication typically involves a variety of computer systems and languages. Because each system or language has its own way of representing equivalent data, data conversion support is needed for the application program to overcome the differences in data representations from different environments.

With the Convert_Incoming and Convert_Outgoing calls, CPI Communications provides limited data conversion for character data in the user buffer. These calls may be used to write a program that is independent of the partner program's local character set:

- Before issuing a Send_Data call, the program may issue the Convert_Outgoing call to convert the application data in the local encoding to the corresponding EBCDIC hexadecimal codes.
- After receiving data from a Receive call, the program may issue the Convert_Incoming call to convert the EBCDIC hexadecimal codes to the corresponding local representation of the data.

These two calls provide limited data conversion support for character data that belongs to character set 00640, as specified in Appendix A, “Variables and Characteristics.” See the usage notes under “Convert_Incoming (CMCNVI)” on page 136 and “Convert_Outgoing (CMCNVO)” on page 138.

With the Send_Mapped_Data, Receive_Mapped_Data, Set_Mapped_Initialization_Data, and Extract_Mapped_Initialization_Data calls, CPI-C provides access to sophisticated routines for conversion of data in the user buffer before it is sent or received. These routines may be used to write programs that are independent of encoding of the partner program. This allows the encode/decode routine to change the order of the fields, selectively receive fields, and supply missing fields when sending.

These calls should not be used when using the OSI Unstructured Data Transfer U-ASE or CPI-C 1.0 mapped conversations. If you desire to use these calls for uniformity with other programs the MAP_NAME should be set to blanks and/or MAP_NAME_LENGTH set to zero.

Data Buffering and Transmission

If a program uses the initial set of conversation characteristics, data is not automatically sent to the remote program after a Send_Data has been issued, except when the send buffer at the local system overflows. As shown in the starter-set flows, the startup of the conversation and subsequent data flow can occur anytime after the program call to Allocate. This is because the system stores the data in internal buffers and groups transmissions together for efficiency.

A program can exercise explicit control over the transmission of data by using one of the following calls to cause the buffered data's immediate transmission:

- Confirm
- Deallocate
- Deferred_Deallocate
- Flush
- Include_Partner_In_Transaction
- Prepare
- Prepare_To_Receive
- Receive (in **Send** state) with *receive_type* set to CM_RECEIVE_AND_WAIT (*receive_type*'s default setting)
- Send_Error

The use of Receive in **Send** state and the use of Deallocate have already been shown in "Starter-Set Flows" on page 66. The other calls are discussed in the following examples.

Concurrent Operations

CPI Communications provides for concurrent call operations (multiple call operations in progress simultaneously) on a conversation by grouping calls in logical associations or **conversation queues**. Calls associated with one queue are processed independently of calls associated with other queues or with no queue. Table 5 on page 43 shows the different conversation queues and calls associated with them.

The send-receive mode of the conversation determines what queues are available for the conversation. Table 5 on page 43 shows the send-receive modes for which the conversation queues are available.

A program may initiate concurrent operations by using multiple program threads on systems with multi-threading support. See "Using Multiple Program Threads" on page 43. Alternatively, a program may use queue-level non-blocking support to regain control when a call operation on a queue cannot complete immediately. The call operation remains in progress. The program may issue a call associated with another queue or perform other processing. Queue-level non-blocking is described in "Queue-Level Non-Blocking" on page 47.

Only one call operation is allowed to be in progress on a given conversation queue at a time. If a program issues a call associated with a queue that has a previous call operation still in progress, the later call returns with the CM_OPERATION_NOT_ACCEPTED return code.

Using Multiple Program Threads

While CPI Communications itself does not provide multi-threading support, some implementations are designed to work with multi-threading support in the base operating system and to allow multi-threaded programs to use CPI Communications. On such a system, a program may create separate threads to initiate concurrent operations on a conversation. For example, a program may create separate threads to handle the send and receive operations on a full-duplex conversation, where the Send-Data and Receive calls are associated with the Send and Receive queues, respectively. Each thread's operation proceeds independently; in particular, the sending thread may continue to send data to the partner program while the receiving thread is waiting for a Receive call to complete.

It is the responsibility of the program to ensure that action taken by one thread does not interfere with action taken by another thread. For example, unexpected results may occur if two threads issue calls associated with the same queue, or if one thread modifies the value of a conversation characteristic that affects the processing of a call issued by another thread.

Table 5 (Page 1 of 2). Conversation Queues—Associated Calls and Send-Receive Modes

Conversation Queue	CPI Communications Calls	Send-Receive Mode
Initialization	Accept_Incoming Allocate Extract_Mapped_Initialization_Data Set_AE_Qualifier Set_Allocate_Confirm Set_AP_Title Set_Application_Context_Name Set_Conversation_Security_Password Set_Conversation_Security_Type Set_Conversation_Security_User_ID Set_Conversation_Type Set_Initialization_Data Set_Mapped_Initialization_Data Set_Mode_Name Set_Partner_ID Set_Partner_LU_Name Set_Return_Control Set_Send_Receive_Mode Set_Sync_Level Set_Transaction_Control Set_TP_Name	Half-duplex and full-duplex
Send	Confirmed Deallocate Deferred_Deallocate Flush Include_Partner_In_Transaction Prepare Send_Data Send_Error Send_Mapped_Data Set_Deallocate_Type Set_Log_Data Set_Prepare_Data_Permitted Set_Send_Type	Full-duplex
Receive	Receive Receive_Mapped_Data Set_Fill Set_Receive_Type	Full-duplex

Table 5 (Page 2 of 2). Conversation Queues—Associated Calls and Send-Receive Modes

Send-Receive	Confirm Confirmed Deallocate Deferred_Deallocate Flush Include_Partner_In_Transaction Prepare Prepare_To_Receive Receive 2 Receive_Mapped_Data Send_Data 2 Send_Mapped_Data Send_Error Set_Confirmation_Urgency Set_Deallocate_Type Set_Error_Direction Set_Fill Set_Log_Data Set_Prepare_Data_Permitted Set_Prepare_To_Receive_Type Set_Receive_Type Set_Send_Type	Half-duplex
Expedited-Send	Request_To_Send (Half-duplex only) Send_Expedited_Data	Half-duplex and full-duplex
Expedited-Receive	Receive_Expedited_Data	Half-duplex and full-duplex
Determined by the queue named on the call	Set_Queue_Callback_Function Set_Queue_Processing_Mode	Half-duplex and full-duplex

Note: The following calls are not associated with any queue.

- Accept_Conversation
- Cancel_Conversation
- Convert_Incoming
- Convert_Outgoing
- Extract_*
- Initialize_Conversation
- Initialize_For_Incoming
- Release_Local_TP_Name
- Set_Begin_Transaction
- Set_Join_Transaction
- Set_Processing_Mode
- Specify_Local_TP_Name
- Test_Request_To_Send_Received
- Wait_For_Conversation
- Wait_For_Completion

Non-Blocking Operations

CPI Communications supports two processing modes for its calls:

- **Blocking**—The call operation completes before control is returned to the program. If the call operation is unable to complete immediately, it "blocks," and the program is forced to wait until the call operation finishes. While waiting, the program is unable to perform other processing or to communicate with any of its other partners.
- **Non-blocking**—If possible, the call operation completes immediately and control is returned to the program. However, if while processing the call CPI Communications determines that the call operation cannot complete immediately, control is returned to the program even though the call operation has not completed. The call operation remains in progress, and completion of the call operation occurs at a later time.

Note: This section describes non-blocking operations for a single-threaded program, but similar considerations apply to a program issuing CPI Communications calls on multiple threads. Specifically, only the thread that issues a call is blocked if the call is processed in blocking mode and cannot complete immediately. When the program uses non-blocking support, control is returned to the calling thread if the call operation cannot complete immediately. That thread may then perform other processing, including issuing calls on the same conversation.

When the non-blocking processing mode applies to a call and the call operation cannot complete immediately, CPI Communications returns control to the program with a return code of CM_OPERATION_INCOMPLETE. The call operation remains in progress as an **outstanding operation**, and the program is allowed to perform other processing.

The following calls can return the CM_OPERATION_INCOMPLETE return code:

Table 6. Calls Returning CM_OPERATION_INCOMPLETE

Accept_Incoming
Allocate
Confirm
Confirmed
Deallocate
Deferred_Deallocate
Flush
Include_Partner_In_Transaction
Prepare
Prepare_To_Receive
Receive
Receive_Expedited_Data
1 Receive_Mapped_Data
Request_To_Send
Send_Data
Send_Error
Send_Expedited_Data
1 Send_Mapped_Data

CPI Communications provides two levels of support for programs using the non-blocking processing mode: **conversation** level and **queue** level. These are discussed in the sections below. Until a program chooses a non-blocking level for a conversation, all calls on the conversation are processed in blocking mode.

Note: A program may choose to use conversation-level non-blocking or queue-level non-blocking, but not both, on a given conversation. Once set, the level of non-blocking used on a conversation cannot be changed. Additionally, the level of non-blocking used depends on the *send_receive_mode* characteristic. The program can choose to use either level of non-blocking support on a half-duplex conversation. However, the program can use only queue-level non-blocking on a full-duplex conversation.

Conversation-Level Non-Blocking

Conversation-level non-blocking allows only one outstanding operation on a conversation at a time. The program chooses conversation-level non-blocking by issuing the Set_Processing_Mode (CMSPM) call to set the *processing_mode* conversation characteristic. The *processing_mode* characteristic indicates whether subsequent calls on the conversation are to be processed in blocking or non-blocking mode.

If *processing_mode* is set to CM_NON_BLOCKING and a call receives the CM_OPERATION_INCOMPLETE return code, the call operation becomes an outstanding operation on the conversation. The program must issue the Wait_For_Conversation (CMWAIT) call to determine when the outstanding operation is completed and to retrieve the return code for that operation. CPI Communications keeps track of all conversations using conversation-level non-blocking and having an outstanding operation, and responds to a subsequent Wait_For_Conversation call with the conversation identifier of one of those conversations when the operation on it completes.

With conversation-level non-blocking, only one call operation is allowed to be in progress on the conversation at a time. Any call (except Cancel_Conversation)

issued on the conversation while the previous call operation is still in progress gets the CM_OPERATION_NOT_ACCEPTED return code.

A conversation does not change conversation state when a call on that conversation gets the CM_OPERATION_INCOMPLETE return code. Instead, the state transition occurs when a subsequent Wait_For_Conversation call completes and indicates that the conversation has a completed operation. The conversation enters the state called for by a combination of the operation that completed, the return code for that operation (the *conversation_return_code* value returned on the Wait_For_Conversation call), and the other factors that determine state transitions.

Queue-Level Non-Blocking

In contrast to conversation-level non-blocking, queue-level non-blocking allows more than one outstanding operation per conversation. CPI Communications allows programs using queue-level non-blocking to have one outstanding operation per queue simultaneously.

With queue-level non-blocking, the processing mode is set on a queue basis. The program chooses queue-level non-blocking by issuing the Set_Queue_Processing_Mode (CMSQPM) or Set_Queue_Callback_Function (CMSQCF) call to set the queue processing mode for a specified queue. Until the program sets the processing mode for a queue, all calls associated with that queue are processed in blocking mode. Calls not associated with any queue are processed in blocking mode and are always completed before control is returned to the program.

Working with Wait Facility

When using the Set_Queue_Processing_Mode call, the program manages multiple outstanding operations with **outstanding-operation identifiers**, or OOIDs. CPI Communications creates and maintains a unique OOID for each queue. Additionally, a program may choose to associate a **user field** with an outstanding operation. The user field is provided as an aid to programming, and might be used to contain, for example, the address of a data structure with return parameters for an outstanding operation.

When a call receives the CM_OPERATION_INCOMPLETE return code, the call operation becomes an outstanding operation on the conversation queue with which the call is associated. The program must issue the Wait_For_Completion call to wait for the operation to complete and to obtain the corresponding OOID and user field.

Wait Facility Scenario

Here is a scenario of how a program might use queue-level non-blocking on a full-duplex conversation:

1. The program uses the Set_Queue_Processing_Mode call to set the processing mode for the Send queue to non-blocking. It also supplies a user field that contains the address of a parameter list for the Send_Data call and receives back an OOID from CPI Communications that is unique to the Send queue.
2. The program next uses the Set_Queue_Processing_Mode call to set the processing mode for the Receive queue to non-blocking. This time it supplies a user field that contains the address of a parameter list for the Receive call. It

receives back an OOID from CPI Communications that is unique to the Receive queue.

3. The program issues a Send_Data call, which returns CM_OPERATION_INCOMPLETE, followed by a Receive call, which also returns CM_OPERATION_INCOMPLETE. If the program attempted to issue another call associated with either queue, it would receive a CM_OPERATION_NOT_ACCEPTED return code because there can be only one outstanding operation at a time per queue. Note that when a call on a conversation receives a CM_OPERATION_INCOMPLETE return code, the conversation does not change state.
4. The program can now issue a Wait_For_Completion call to wait for both outstanding operations at the same time. It does this by specifying a list of OOIDs for the outstanding operations it wants to wait for. When the Wait_For_Completion call returns, it indicates which operations have completed (if any), along with a list of user fields. The state transition triggered by the completed operation occurs when the Wait_For_Completion call completes.
5. The program uses the parameter-list address in the user field to determine the results of a given completed operation.

Using Callback Function

An alternative use of queue-level non-blocking is to establish a **callback function** and a user field for the conversation queue using the Set_Queue_Callback_Function (CMSQCF) call. When an outstanding operation completes, the program is interrupted and the callback function is called (passing the user field and call ID for the completed operation as input data). See "Set_Queue_Callback_Function (CMSQCF)" for details. When the callback function returns, the program continues from where it was interrupted.

Canceling Outstanding Operations

A program may use the Cancel_Conversation (CMCANC) call to end a conversation. The call terminates all the call operations in progress on the conversation. The terminated call operations returns a code of CM_CONVERSATION_CANCELED

Non-Blocking Calls and Context Management

In general, the program's current context is set by node services to the newly created context when an Accept_Conversation or Accept_Incoming call completes successfully with a return code of CM_OK. However, if Accept_Incoming is issued as a non-blocking call and returns with a CM_OPERATION_INCOMPLETE return code, the program's current context will not be changed. A new context is not created until the Accept_Incoming call operation subsequently completes successfully as a result of the Wait_For_Conversation or Wait_For_Completion call. The program can then use the Extract_Conversation_Context call to determine the context to which the conversation was assigned. Because Wait_For_Conversation and Wait_For_Completion do not cause a change of context, the program is responsible for issuing the appropriate node services call to establish the correct current context.

Conversation Security

Many systems control access to system resources through security parameters associated with a request for access to those resources. In particular, a CRM working in conjunction with node services can control access to its programs and conversation resources using access security information carried in the conversation startup request.

The conversation startup request contains one of the following forms of access security information:

- No access security information
- The user ID of the user on whose behalf access to the remote program is requested
- The user ID and a password for the user on whose behalf access to the remote program is requested
- Authentication tokens generated by a distributed security service for the user on whose behalf access to the remote program is requested.

The access security information in the conversation startup request depends on the values of the security conversation characteristics and comes from the following sources:

- The system administrator can provide security parameters in the side information. These are used to establish security characteristics when the program issues the Initialize_Conversation call.
- The program can override the values from side information and set the security characteristics directly using the Set_Conversation_Security_Type, Set_Conversation_Security_User_ID, and Set_Conversation_Security_Password calls.
- When the program allocates a conversation with *conversation_security_type* set to CM_SECURITY_SAME, CM_SECURITY_DISTRIBUTED or CM_SECURITY_MUTUAL, the security parameters for the program's current context are used to generate the access security information. This may involve the use of a distributed security service. The access security information is sent to the remote CRM in the conversation startup request.

The required_user_name_type field in the program binding may be used to specify the type of user name required by the remote system.

- “NONE” indicates the remote system accepts and processes requests that do not contain access security information.
- “LOCAL” indicates the remote system requires a user ID that is valid at the remote system. User IDs may be sent for CM_SECURITY_PROGRAM, CM_SECURITY_PROGRAM_STRONG, CM_SECURITY_SAME, CM_SECURITY_DISTRIBUTED and CM_SECURITY_MUTUAL requests.
- “PRINCIPAL” indicates the remote system requires a principal name from the distributed security service. Principal names are sent for CM_SECURITY_SAME, CM_SECURITY_DISTRIBUTED and CM_SECURITY_MUTUAL requests.

Certain combinations of values of *conversation_security_type* and required_user_name_type field (from the program binding) cause the local CRM to

reject the Allocate call with a *return_code* of CM_SECURITY_NOT_SUPPORTED. Table 7 on page 50 shows the incompatible values.

Table 7. Incompatible conversation_security_type and required_user_name_type Values

required_user_name_type	conversation_security_type
LOCAL	CM_SECURITY_NONE
PRINCIPAL	CM_SECURITY_NONE
PRINCIPAL	CM_SECURITY_PROGRAM
PRINCIPAL	CM_SECURITY_PROGRAM_STRONG

In addition to supporting access security information on conversation startup requests, the OSI standard includes the ability to perform re-authentication during a conversation. A program requests re-authentication by making OSI TP implementation-specific calls to node services. Security protocols for OSI TP CRMs are defined in standard ISO/IEC 11586 part 1, *Generic Upper Layers Security*.

For an OSI TP CRM, the application context identifies to the program developer which conversation security type should be used.

When a program is started as a result of an incoming conversation startup request or when an already started program accepts an incoming conversation, node services uses the access security information to validate the user's access to the program and to establish the security parameters for the resulting context.

The program that accepts an incoming conversation may examine the *security_user_ID* for that conversation by issuing the Extract_Security_User_ID call.

Program Flow—States and Transitions

As implied throughout the discussion so far, a program written to make use of CPI Communications is written with the remote program in mind. The local program issues a CPI Communications call for a particular conversation knowing that, in response, the remote program will issue another CPI Communications call (or its equivalent) for that same conversation. To explain this two-sided programming scenario, CPI Communications uses the concept of a conversation state. The **state** that a conversation is in determines what the next set of actions may be. When a conversation leaves a state, it makes a **transition** from that state to another.

A CPI Communications conversation can be in one of the following states:

State	Description
Reset	There is no conversation for this *conversation_ID*.
Initialize	Initialize_Conversation has completed successfully and a *conversation_ID* has been assigned for this conversation.
Send	The program is able to send data on this conversation. This state is applicable only for half-duplex conversations.
Receive	The program is able to receive data on this conversation. This state is applicable only for half-duplex conversations.

State	Description
Send-Pending	The program has received both data and send control on the same Receive call. See “Example 7: Error Direction and Send-Pending State” on page 80 for a discussion of the **Send-Pending** state. This state is applicable only for half-duplex conversations.
Confirm	A confirmation request has been received on this conversation; that is, the remote program issued either a Confirm call or a Send_Data call with *send_type* set to CM_SEND_AND_CONFIRM, and is waiting for the local program to issue Confirmed. After responding with Confirmed, the local program's end of the conversation enters **Receive** state. This state is applicable only for half-duplex conversations.
Confirm-Send	A confirmation request and send control have both been received on this conversation; that is, the remote program issued a Prepare_To_Receive call with the *prepare_to_receive_type* set to CM_PREP_TO_RECEIVE_SYNC_LEVEL and either the *sync_level* is CM_CONFIRM, or the *sync_level* is CM_SYNC_POINT and the conversation is not currently included in a transaction. After responding with Confirmed, the local program's end of the conversation enters **Send** state. This state is applicable only for half-duplex conversations.
Confirm-Deallocate	A confirmation request and deallocation notification have both been received on this conversation. For a half-duplex conversation, the remote program issued a Deallocate call in one of the following situations: • *deallocate_type* is set to CM_DEALLOCATE_CONFIRM. • *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL and *sync_level* is set to CM_CONFIRM. • *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL, *sync_level* is set to CM_SYNC_POINT, and the conversation is not currently included in a transaction. For a full-duplex conversation, the remote program issued a Deallocate call with the *deallocate_type* set to CM_DEALLOCATE_CONFIRM.
Initialize-Incoming	Initialize_For_Incoming has completed successfully and a *conversation_ID* has been assigned for this conversation. The program may accept an incoming conversation by issuing Accept_Incoming on this conversation.
Send-Receive	The program can send and receive data on this conversation. This state is applicable only for full-duplex conversations.
Send-Only	The program can only send data on this conversation. This state is applicable only for full-duplex conversations.
Receive-Only	The program can only receive data on this conversation. This state is applicable only for full-duplex conversations.

A conversation starts out in **Reset** state and moves into other states, depending on the calls made by the program for that conversation and the information received from the remote program. The current state of a conversation determines what calls the program can or cannot make.

Since there are two programs for each conversation (one at each end), the state of the conversation *as seen by each program* may be different. The state of the conversation depends on which end of the conversation is being discussed. Consider a half-duplex conversation where Program A is sending data to Program C. Program A's end of the conversation is in **Send** state, but Program C's end is in **Receive** state.

Note: CPI Communications keeps track of a conversation's current state, as should the program. If a program issues a CPI Communications call for a conversation that is not in a valid state for the call, CPI Communications will detect this error and return a *return_code* value of CM_PROGRAM_STATE_CHECK.

The following additional states are required for programs using a *sync_level* of CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM:

- **Defer-Receive** (for half-duplex conversations only)
- **Defer-Deallocate**
- **Prepared**
- **Sync-Point**
- **Sync-Point-Send** (for half-duplex conversations only)
- **Sync-Point-Deallocate**

"Support for Resource Recovery Interfaces" discusses synchronization point processing and describes these additional states.

For a complete listing of program calls, possible states, and state transitions, see Appendix C, "State Tables."

Support for Resource Recovery Interfaces

This section describes how application programs can use CPI Communications in conjunction with a resource recovery interface. A **resource recovery interface** provides access to services and facilities that use two-phase commit protocols to coordinate changes to distributed resources.

While CPI Communications' sync point functions can be used with other resource recovery interfaces, this book describes how CPI Communications works with the Systems Application Architecture* (SAA*) CPI Resource Recovery and X/Open TX resource recovery interfaces. For information about performing synchronization point processing with the SAA resource recovery interface, see *SAA Common Programming Interface: Resource Recovery Reference* (SC31-6821) and read the documentation for the appropriate operating environment. For information on using the X/Open TX resource recovery interface, see *Distributed Transaction Processing: The TX (Transaction Demarcation) Specification*, published by X/Open Company Limited, ISBN: 1-872630-65-0.

Note: The following discussion is intended for programmers using CPI Communications advanced functions. Readers not interested in a high degree of synchronization need not read this section.

A CPI Communications conversation can be used with a resource recovery interface only if its *sync_level* characteristic is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM. This kind of conversation is called a **protected conversation**.

Coordination with Resource Recovery Interfaces

A program communicates with a resource recovery interface by establishing **synchronization points**, or **sync points**, in the program logic. A sync point is a reference point during transaction processing to which resources can be restored if a failure occurs. The program uses a resource recovery interface's commit call to establish a new sync point or a resource recovery interface's backout call to return to a previous sync point. The processing and the changes to resources that occur between one sync point and the next are collectively referred to as a **transaction** or a **logical unit of work**.

In turn, the resource recovery interface invokes a component of the operating environment called a **sync point manager (SPM)** or a **transaction manager**. The SPM coordinates the commit or backout processing among all the protected resources involved in the sync point transaction.

The commitment or backout of protected resources is done on a context basis. Only those changes to protected resources, including protected conversations, that belong to the program's current context when the commit or backout call is issued are committed or backed out. Therefore, prior to issuing the commit or backout call, the program must ensure that the current context is the context for which the commit or backout is intended.

For example, Program S in Figure 7 on page 29 has two distinct contexts, one for Program D and one for Program E. If Program S decides to commit or back out the work that it has done for Program D, it must set the current context to ensure that only the resources associated with Program D will be affected. For more information on contexts, see “Contexts and Context Management” on page 29.

Take-Commit and Take-Backout Notifications

When a program issues a Prepare, commit, or backout call, CPI Communications cooperates with the resource recovery interface by passing synchronization information to its conversation partner. This sync point information consists of take-commit and take-backout notifications.

When the program issues a Prepare or commit call, CPI Communications returns a **take-commit notification** to the partner program in the *status_received* parameter for a Receive call issued by the partner. The sequence of CPI Communications calls issued before the Prepare or resource recovery commit call determines the value of the take-commit notification returned to the partner program. In addition to requesting that the partner program establish a sync point, the take-commit notification also contains conversation state transition information.

Table 8 and Table 9 show the *status_received* values that CPI Communications uses as take-commit notifications, the conditions under which each of the values may be received, and the state changes resulting from their receipt.

Table 8 (Page 1 of 2). Possible Take-Commit Notifications for Half-Duplex Conversations

status_received **Value**	**Conditions for Receipt**
CM_TAKE_COMMIT	The partner program issued a commit call, or a Prepare call with the *prepare_data_permitted* conversation characteristic set to CM_PREPARE_DATA_NOT_PERMITTED, while its end of the conversation was in **Send** or **Send-Pending** state. The local program's end of the conversation is in **Sync-Point** state and will be placed back in **Receive** state once the local program issues a successful commit call.
CM_TAKE_COMMIT_SEND	The partner program issued a commit call, or a Prepare call with the *prepare_data_permitted* conversation characteristic set to CM_PREPARE_DATA_NOT_PERMITTED, while its end of the conversation was in **Defer-Receive** state. The local program's end of the conversation is in **Sync-Point-Send** state and will be placed in **Send** state once the local program issues a successful commit call.
CM_TAKE_COMMIT_DEALLOCATE	The partner program issued a commit call, or a Prepare call with the *prepare_data_permitted* conversation characteristic set to CM_PREPARE_DATA_NOT_PERMITTED, either while its end of the conversation was in **Defer-Deallocate** state or after issuing a Deferred_Deallocate call. The local program's end of the conversation is in **Sync-Point-Deallocate** state and will be placed in **Reset** state once the local program issues a successful commit call.
CM_TAKE_COMMIT_DATA_OK	The partner program issued a Prepare call with the *prepare_data_permitted* conversation characteristic set to CM_PREPARE_DATA_PERMITTED while its end of the conversation was in **Send** or **Send-Pending** state. The local program's end of the conversation is in **Sync-Point** state and will be placed back in **Receive** state once the local program issues a successful commit call.
CM_TAKE_COMMIT_SEND_DATA_OK	The partner program issued a Prepare call with the *prepare_data_permitted* conversation characteristic set to CM_PREPARE_DATA_PERMITTED while its end of the conversation was in **Defer-Receive** state. The local program's end of the conversation is in **Sync-Point-Send** state and will be placed in **Send** state once the local program issues a successful commit call.

Table 8 (Page 2 of 2). Possible Take-Commit Notifications for Half-Duplex Conversations

status_received **Value**	**Conditions for Receipt**
CM_TAKE_COMMIT_DEALLOC_DATA_OK	The partner program issued a Prepare call with the *prepare_data_permitted* conversation characteristic set to CM_PREPARE_DATA_PERMITTED, either while its end of the conversation was in **Defer-Deallocate** state or after issuing a Deferred_Deallocate call. The local program's end of the conversation is in **Sync-Point-Deallocate** state and will be placed in **Reset** state once the local program issues a successful commit call.

Table 9. Possible Take-Commit Notifications for Full-Duplex Conversations

status_received **Value**	**Conditions for Receipt**
CM_TAKE_COMMIT	The partner program issued a commit call, or the conversation is using an LU 6.2 CRM and the partner program issued a Prepare call, while its end of the conversation was in **Send-Receive** state. The local program's end of the conversation is in **Sync-Point** state and will be placed back in **Send-Receive** state once the local program issues a successful commit call.
CM_TAKE_COMMIT_DEALLOCATE	The partner program issued a commit call, or the conversation is using an LU 6.2 CRM and the partner program issued a Prepare call, either while its end of the conversation was in **Defer-Deallocate** state or after issuing a Deferred_Deallocate call. The local program's end of the conversation is in **Sync-Point-Deallocate** state and will be placed in **Reset** state once the local program issues a successful commit call.
CM_TAKE_COMMIT_DATA_OK	The conversation is using an OSI TP CRM, and the partner program issued a Prepare call while its end of the conversation was in **Send-Receive** state. The local program's end of the conversation is in **Sync-Point** state and will be placed back in **Send-Receive** state once the local program issues a successful commit call.
CM_TAKE_COMMIT_DEALLOC_DATA_OK	The conversation is using an OSI TP CRM, and the partner program issued a Prepare call, either while its end of the conversation was in **Defer-Deallocate** state or after issuing a Deferred_Deallocate call. The local program's end of the conversation is in **Sync-Point-Deallocate** state and will be placed in **Reset** state once the local program issues a successful commit call.

When the program issues a backout call, or when a system failure or a problem with a protected resource causes the SPM to initiate a backout operation, CPI Communications returns a **take-backout notification** to the partner program. CPI Communications returns this notification as one of the following values in the *return_code* parameter:

- CM_TAKE_BACKOUT
- CM_DEALLOCATED_ABEND_BO
- CM_DEALLOCATED_ABEND_SVC_BO (basic conversations only)
- CM_DEALLOCATED_ABEND_TIMER_BO (basic conversations only)
- CM_RESOURCE_FAIL_NO_RETRY_BO
- CM_RESOURCE_FAILURE_RETRY_BO
- CM_DEALLOCATED_NORMAL_BO

CPI Communications can return a take-backout notification on any of the following calls issued by the partner program:

- Confirm
- Deallocate(S)[4]
- Extract_Conversation_State
- Flush
- Prepare
- Prepare_To_Receive
- Receive
- Send_Data
- Send_Error

The Backout-Required Condition

Upon receipt of a take-backout notification on a protected conversation, the conversation's context is placed in the **Backout-Required** condition. This condition is not a conversation state, because it applies to all of the program's protected resources for that context, possibly including multiple conversations.

A context may be placed in the **Backout-Required** condition in one of the following ways:

- When CPI Communications returns a take-backout notification
- When the program issues a Cancel_Conversation call, a Deallocate call *deallocate_type* set to CM_DEALLOCATE_ABEND, or when a Send_Data call with *send_type* set to CM_SEND_AND_DEALLOCATE and *deallocate_type* set to CM_DEALLOCATE_ABEND. When one of these calls is successfully issued, CPI Communications places the context in the **Backout-Required** condition.

When a context is placed in the **Backout-Required** condition, the program should issue a resource recovery backout call. Until it issues a backout call, the program will be unable to successfully issue any of the following CPI Communications calls for any of its protected conversations within that context. The CM_PROGRAM_STATE_CHECK return code will be returned if the program issues any of the following calls:

- Allocate
- Confirm
- Confirmed
- Deallocate (unless *deallocate_type* is set to CM_DEALLOCATE_ABEND)
- Flush
- Prepare
- Prepare_To_Receive
- Receive
- Request_To_Send
- Send_Data
- Send_Error
- Test_Request_To_Send_Received

[4] Deallocate(S) refers to a Deallocate call issued with the *deallocate_type* set to CM_DEALLOCATE_SYNC_LEVEL and the *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM.

Responses to Take-Commit and Take-Backout Notifications

A program usually issues a commit or backout call in response to a take-commit notification, and a backout call in response to a take-backout notification. In some cases, however, the program may respond to one of these notifications with a CPI Communications call instead of a commit or backout call. Table 10 shows the calls a program can use to respond to take-commit and take-backout notifications, the result of issuing each call, and any further action required by the program.

Table 10. Responses to Take-Commit and Take-Backout Notifications

Notification Received	Possible Response	Reason for Response	Result of Response	Further Action Required
Take-Commit[1]	Commit	The program agrees that it can commit (or has committed) all protected resources.	The commit request is spread to other programs in the transaction.	None
	Backout	The program disagrees with the commit request.	A backout request is spread to other programs in the transaction, including the program that issued the original commit call.	None
	Deallocate (Abend)[2] or Cancel_ Conversation	The program has detected an error condition that prevents it from continuing normal processing.	The conversation's context is placed in the **Backout-Required** condition.	The program should issue a resource recovery backout call.
	Send_Error[3]	The program has detected an error in received data or some other error that may be correctable.	The SPM backs out the transaction, and both programs are informed of the backout.	Depends on the response from the partner program.
Take-Backout	Commit	This is an error in program logic.	The commit call is treated as though it were a backout call, and the backout request is spread to other programs in the transaction.	None
	Backout	The program agrees to the backout request.	The backout request is spread to other programs in the transaction.	None
	Deallocate (Abend)[2] or Cancel_ Conversation	The program has detected an error condition that prevents it from continuing normal processing.	The conversation's context is placed in the **Backout-Required** condition.	The program should issue a resource recovery backout call.

[1] If the take-commit indicator ended in *_DATA_OK, the partner may also send data before making any of the other possible responses.
[2] "Deallocate (Abend)" refers to the CPI Communications Deallocate call with a *deallocate_type* of CM_DEALLOCATE_ABEND.
[3] The program can respond with a Send_Error call only when using a half-duplex conversation.

Chained and Unchained Transactions

When a program is using the X/Open TX resource recovery interface, it may choose when the next transaction is started after the current transaction ends. Specifically, if the TX Transaction_Control variable is set to:

- TX_CHAINED, a commit call ends the current transaction and immediately begins the next transaction and establishes a new sync point.
- TX_UNCHAINED, a commit call ends the current transaction but does not begin the next transaction. The program must issue the tx_begin call to the X/Open TX interface to start the next transaction and to establish a new sync point.

For a conversation using an OSI TP CRM, the program that initializes a conversation may use the Set_Transaction_Control call to specify whether it wants to use chained or unchained transactions for the conversation. The remote program may determine whether chained or unchained transactions are being used for the conversation by issuing the Extract_Transaction_Control call. A conversation using an LU 6.2 CRM must use chained transactions.

In a conversation using **chained** transactions, if a commit call ends the current transaction and immediately begins the next transaction, the conversation is automatically included in that next transaction and is always a protected conversation. If the commit call does not immediately start the next transaction, the conversation is deallocated by the system, and the program is notified of the deallocation by a CM_RESOURCE_FAILURE_RETRY return code.

For a conversation using **unchained** transactions, when a commit call ends the current transaction, the conversation is not automatically included in the next transaction. Until the next transaction is started and the conversation is included in that transaction, the conversation is not a protected conversation, and any commit or backout processing does not apply to that conversation. After the next transaction is started, the conversation is included in that transaction, and becomes a protected conversation again, when the program requests that the partner program join the transaction.

The TX Transaction_Control variable and the CPI Communications *transaction_control* conversation characteristic are independent. There are four possible combinations:

- TX_CHAINED and CM_CHAINED_TRANSACTIONS
- TX_CHAINED and CM_UNCHAINED_TRANSACTIONS
- TX_UNCHAINED and CM_CHAINED_TRANSACTIONS
- TX_UNCHAINED and CM_UNCHAINED_TRANSACTIONS

Joining a Transaction

For a conversation using chained transactions, when the local program issues an Allocate call after setting the *sync_level* to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM and the remote program issues an Accept_Conversation or Accept_Incoming call, the remote program automatically joins the transaction.

For a conversation using unchained transactions, when a new transaction is started, the local program has the following two ways of requesting that the partner join the transaction.

1. By making an **implicit** request — The local program can issue a Set_Begin_Transaction call with a *begin_transaction* value of CM_BEGIN_IMPLICIT, followed by any of the following CPI Communications calls from **Initialize**, **Send**, **Send-Pending**, or **Send-Receive** states.

   - Allocate
   - Confirm
   - Include_Partner_In_Transaction
   - Prepare
   - Prepare_To_Receive
   - Receive
   - Send_Data
   - Send_Error

   In this case, when the local program issues the second CPI Communications call, the remote program receives a *status_received* value of CM_JOIN_TRANSACTION.

   Note: If the local program is not in transaction when one of the above calls is made, the *begin_transaction* characteristic is ignored, and the partner program is not requested to join a transaction.

2. By making an **explicit** request — The local program can issue a Set_Begin_Transaction call with a *begin_transaction* value of CM_BEGIN_EXPLICIT. At this point, no indication is sent to the remote program. The remote program does not receive the CM_JOIN_TRANSACTION value until the local program issues an Include_Partner_In_Transaction call.

Normally, if the remote program receives the request to join the transaction, it joins automatically. When using the X/Open TX resource recovery interface, the program can issue a tx_info() call to see whether or not it is in transaction mode.

When using the X/Open TX resource recovery interface, the program can choose not to join automatically. In this case, the program must issue a Set_Join_Transaction call with *join_transaction* set to CM_JOIN_EXPLICIT. This call should be issued in the **Initilize_Incoming** state, so that it has an effect at the following Accept_Incoming call. If a program uses CM_JOIN_EXPLICIT, it should extract the *transaction_control* characteristic after a successful Accept_Incoming call. If the value is CM_CHAINED_TRANSACTIONS, the program should join the transaction by issuing a tx_begin() call. If the value is CM_UNCHAINED_TRANSACTIONS, the program is informed with a CM_JOIN_TRANSACTION *status_received* value if it is to join the transaction. In any case, the program might first do any local work that is not for inclusion in the remote program's transaction before joining the transaction. Instead of issuing a tx_begin() call, the program also might reject the request to join the transaction by issuing a Deallocate call with a *deallocate_type* of CM_DEALLOCATE_ABEND or a CM_DEALLOCATE_ABEND or a Cancel_Conversation call.

Table 11 on page 61 shows the ways a program can respond to a CM_JOIN_TRANSACTION indication.

Table 11. Responses to the CM_JOIN_TRANSACTION Indication

Notification Received	Possible Response	Reason for Response	Result of Response	Further Action Required
Join-Transaction	tx_begin	The program agrees to join the distributed transaction.	The local program is included in the distributed transaction.	None
	Deallocate (Abend) [1] or Cancel_ Conversation	The program rejects the request to join the distributed transaction.	The conversation with the requester is terminated.	None

[1] "Deallocate (Abend)" refers to the CPI Communications Deallocate call with a *deallocate_type* of CM_DEALLOCATE_ABEND.

Superior and Subordinate Programs

The concept of superior and subordinate programs applies only for conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM that are are using an OSI TP CRM.

The **superior** program is the program that initiates the conversation (using the Initialize_Conversation call). A program that issues the Accept_Conversation or Accept_Incoming call is a **subordinate** of the superior program.

Figure 9 shows a commit tree with seven programs participating in the transaction.

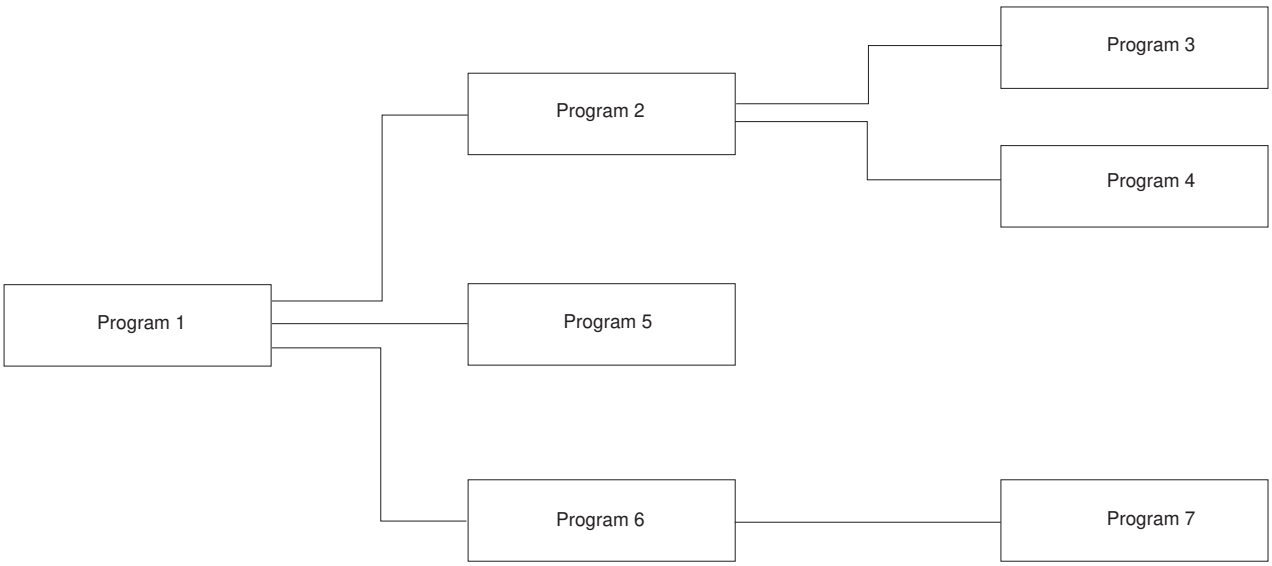

Figure 9. Commit Tree with Program 1 as Root and Superior

In this example, Program 1 is the superior program in its conversations with Programs 2, 5, and 6, which are all its subordinates. Similarly, Program 2 is the superior in its conversations with Programs 3 and 4, and Program 6 is the superior in its conversation with Program 7.

Only the superior program that initiated the transaction (program 1 in this case) can issue the initial commit call to end the transaction. However, any of the superior

programs in the transaction (in this example, Programs 1, 2, and 6) can issue the Deferred_Deallocate call to their subordinates (but not to their superiors).

In addition, the Include_Partner_In_Transaction, Prepare, Set_Begin_Transaction, and Set_Prepare_Data_Permitted calls may be issued only by the superior program. These calls return a CM_PROGRAM_PARAMETER_CHECK return code when they are issued by the subordinate.

Additional CPI Communications States

In addition to the conversation states described in "Program Flow—States and Transitions" on page 50, the states described in Table 12 are required when a program uses a protected CPI Communications conversation (that is, with the *sync_level* characteristic set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM).

Table 12 (Page 1 of 2). CPI Communications States for Protected Conversations

State	Description
Defer-Receive	The local program's end of the conversation will enter **Receive** state after a synchronization call completes successfully. The synchronization call may be a resource recovery commit call or a CPI Communications Flush or Confirm call. A conversation enters **Defer-Receive** state when the local program issues a Prepare_To_Receive call with *prepare_to_receive_type* set to CM_PREP_TO_RECEIVE_SYNC_LEVEL and *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, or when it issues a Send_Data call with *send_type* set to CM_SEND_AND_PREP_TO_RECEIVE, *prepare_to_receive_type* set to CM_PREP_TO_RECEIVE_SYNC_LEVEL, and *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM. **Defer-Receive** state is applicable for half-duplex conversations only.
Defer-Deallocate	The local program has requested that the conversation be deallocated after a commit operation has completed; that is, the conversation is included in a transaction, and the program has issued a Deallocate call with *deallocate_type* set to CM_DEALLOCATE_SYNC_LEVEL and *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, or it has issued a Send_Data call with *send_type* set to CM_SEND_AND_DEALLOCATE, *deallocate_type* set to CM_DEALLOCATE_SYNC_LEVEL, and *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM. The conversation will not be deallocated until a successful commit operation takes place.
Prepared	The local program has issued a Prepare call to request that the remote program prepare its resources for commitment.
Sync-Point	The local program issued a Receive call and was given a *return_code* of CM_OK and a *status_received* of CM_TAKE_COMMIT or CM_TAKE_COMMIT_DATA_OK. After a successful commit operation, a half-duplex conversation will return to **Receive** state, while a full-duplex conversation will return to **Send-Receive** state.

Table 12 (Page 2 of 2). CPI Communications States for Protected Conversations

State	Description
Sync-Point-Send	The local program issued a Receive call and was given a *return_code* of CM_OK and a *status_received* of CM_TAKE_COMMIT_SEND or CM_TAKE_COMMIT_SEND_DATA_OK. After a successful commit operation, the conversation will be placed in **Send** state. **Sync-Point-Send** state is applicable for half-duplex conversations only.
Sync-Point-Deallocate	The local program issued a Receive call and was given a *return_code* of CM_OK and a *status_received* of CM_TAKE_COMMIT_DEALLOCATE or CM_TAKE_COMMIT_DEALLOC_DATA_OK. After a successful commit operation, the conversation will be deallocated and placed in **Reset** state.

Valid States for Resource Recovery Calls

A program must ensure that there are no outstanding operations on its protected conversations within a context before issuing a resource recovery call for that context. If a resource recovery call is issued while there is an outstanding operation on a protected conversation, the program receives from the resource recovery interface a return code indicating an error.

All protected conversations within a context must be in one of the following states for the program to issue a commit call for that context:

- **Reset**
- **Initialize**
- **Initialize-Incoming**
- **Send**
- **Send-Pending**
- **Defer-Receive**
- **Defer-Deallocate**
- **Prepared**
- **Send-Receive**
- **Sync-Point**
- **Sync-Point-Send**
- **Sync-Point-Deallocate**

If a commit call is issued from any other conversation state, the program receives from the resource recovery interface a return code indicating an error. The program can also receive an error return code if the conversation was in **Send** or **Send-Receive** state when the commit call was issued, and the program had started but had not finished sending a basic conversation logical record.

A backout call can be issued in any state.

TX Extensions for CPI Communications

If the subordinate program uses the X/Open TX resource recovery interface and the *join_transaction* characteristic has the value CM_JOIN_IMPLICIT, the TX State Table, in the *X/Open TX Specification*, changes in the following ways:

- An incoming conversation request causes an implicit tx_set_transaction-control() call in the following way:
  - If the value of the CPI-C *transaction_control* characteristic is TX_CHAINED_TRANSACTIONS, the TX *transaction_control* characteristic changes to TX_CHAINED.
  - If the value of the CPI-C *transaction_control* characteristic is TX_UNCHAINED_TRANSACTIONS, the TX *transaction_control* characteristic changes to TX_UNCHAINED.
- An incoming *join_transaction* request causes an implicit tx_begin() call. This causes implicit TX state changes.

The program can use the tx_info() call to determine if it is in transaction mode and to determine the value of the TX *transaction_control* characteristic.

Chapter 3. Program-to-Program Communication Example Flows

This chapter provides example flows of how two programs using CPI Communications can exchange information and data in a controlled manner.

The examples are divided into these sections:

- "Starter-Set Flows" on page 66
- "Controlling Data Flow Direction" on page 72
- "Verifying Receipt of Data" on page 76
- "Reporting Errors to Partner" on page 78
- "Using Full-Duplex Conversations" on page 82
- "Using Queue-Level Non-Blocking" on page 88
- "Accepting Multiple Conversations" on page 90
- "Using the Distributed Directory" on page 94
- "Resource Recovery Flows" on page 96

In addition to these sample flows, a simple COBOL application using CPI Communications calls is provided on the diskette that came with this manual.

Interpreting the Flow Diagrams

In the flow diagrams shown in this chapter (for example, Figure 10 on page 69), vertical dotted lines indicate the components involved in the exchange of information between systems. The horizontal arrows indicate the direction of the flow for that step. The numbers lined up on the left side of the flow are reference points to the flow and indicate the progression of the calls made on the conversation. These same numbers correspond to the numbers under the **Step** heading of the text description for each example.

The call parameter lists shown in the flows are not complete; only the parameters of particular interest to the flows being discussed are shown. A complete description of each CPI Communications call and the required parameters can be found in Chapter 4, "Call Reference."

A complete discussion of all possible timing scenarios is beyond the scope of the chapter. Where appropriate, such discussion is provided in the individual call descriptions in Chapter 4, "Call Reference."

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Starter-Set Flows

This section provides examples of programs using the CPI Communications starter-set calls:

- “Example 1: Data Flow in One Direction” on page 67 demonstrates a flow of data in only one direction (only the initiating program sends data).
- “Example 2: Data Flow in Both Directions” on page 70 describes a bidirectional flow of data (the initiating program sends data and then allows the partner program to send data).

Example 1: Data Flow in One Direction

Figure 10 on page 69 shows an example of a conversation where the flow of data is in only one direction.

The steps shown in Figure 10 are:

Step	Description
1	To communicate with its partner program, Program A must first establish a conversation. Program A uses the Initialize_Conversation call to tell CPI Communications that it wants to: • Initialize a conversation • Identify the conversation partner (using *sym_dest_name*) • Ask CPI Communications to establish the identifier that the program will use when referring to the conversation (the *conversation_ID*). Upon successful completion of the Initialize_Conversation call, CPI Communications assigns a *conversation_ID* and returns it to Program A. The program must store the *conversation_ID* and use it on all subsequent calls intended for that conversation.
2	No errors were found on the Initialize_Conversation call, and the *return_code* is set to CM_OK. Two major tasks are now accomplished: • CPI Communications has established a set of conversation characteristics for the conversation, based on the *sym_dest_name*, and uniquely associated them with the *conversation_ID*. • The default values for the conversation characteristics, as listed in "Initialize_Conversation (CMINIT)" on page 197, have been assigned. (For example, the conversation now has *conversation_type* set to CM_MAPPED_CONVERSATION.)
3	Program A asks that a conversation be started with an Allocate call (see "Allocate (CMALLC)" on page 121) using the *conversation_ID* previously assigned by the Initialize_Conversation call.
4	If a logical connection between the systems is not already available, one is activated. Program A and Program C can now have a conversation.
5	A *return_code* of CM_OK indicates that the Allocate call was successful and the system has allocated the necessary resources to the program for its conversation. Program A's conversation is now in **Send** state and Program A can begin to send data. **Note:** In this example, the error conditions that can arise (such as no logical connections available) are not discussed. See "Allocate (CMALLC)" on page 121 for more information about the error conditions that can result.

Example Flows

Step	Description
6 and **7**	Program A sends data with the Send_Data call (described in "Send_Data (CMSEND)" on page 244) and receives a *return_code* of CM_OK. Until now, the conversation may not have been established because the conversation startup request may not be sent until the first flow of data. In fact, any number of Send_Data calls can be issued before CPI Communications actually has a full buffer, which causes it to send the startup request and data. Step **6** shows a case where the amount of data sent by the first Send_Data is greater than the size of the local system's send buffer (a system-dependent property), which is one of the conditions that triggers the sending of data. The request for a conversation is sent at this time. **Notes:** 1. Some implementations may choose to transmit the conversation startup request as part of the Allocate processing. 2. The local program can ensure that the remote program is connected as soon as possible by issuing Flush (CMFLUS) immediately after Allocate (CMALLC). For a complete discussion of transmission conditions and how to ensure the immediate establishment of a conversation and transmission of data, see "Data Buffering and Transmission" on page 42.
8 and **9**	Once the conversation is established, the remote program's system takes care of starting Program C. The conversation on Program C's side is in **Reset** state and Program C issues a call to Accept_Conversation, which places the conversation into **Receive** state. The Accept_Conversation call is similar to the Initialize_Conversation call in that it equates a *conversation_ID* with a set of conversation characteristics (see "Accept_Conversation (CMACCP)" on page 116 for details). Program C, like Program A in Step **2**, receives a unique *conversation_ID* that it will use in all future CPI Communications calls for that particular conversation. As discussed in "Conversation Characteristics" on page 31, some of Program C's defaults are based on information contained in the conversation startup request.
10 and **11**	Once its end of the conversation is in **Receive** state, Program C begins whatever processing role it and Program A have agreed upon. In this case, Program C accepts data with a Receive call (as described in "Receive (CMRCV)" on page 209). Program A could continue to make Send_Data calls (and Program C could continue to make Receive calls), but, for the purposes of this example, assume that Program A only wanted to send the data contained in its initial Send_Data call.
12	Program A issues a Deallocate call (see "Deallocate (CMDEAL)" on page 140) to send any data buffered in the local system and release the conversation. Program C issues a final Receive, shown here in the same step as the Deallocate, to check that it has all the received data.
13 and **14**	The *return_code* of CM_DEALLOCATED_NORMAL tells Program C that the conversation is deallocated. Both Program C and Program A finish normally. **Note:** Only one program should issue Deallocate; in this case it was Program A. If Program C had issued Deallocate after receiving CM_DEALLOCATED_NORMAL, an error would have resulted.

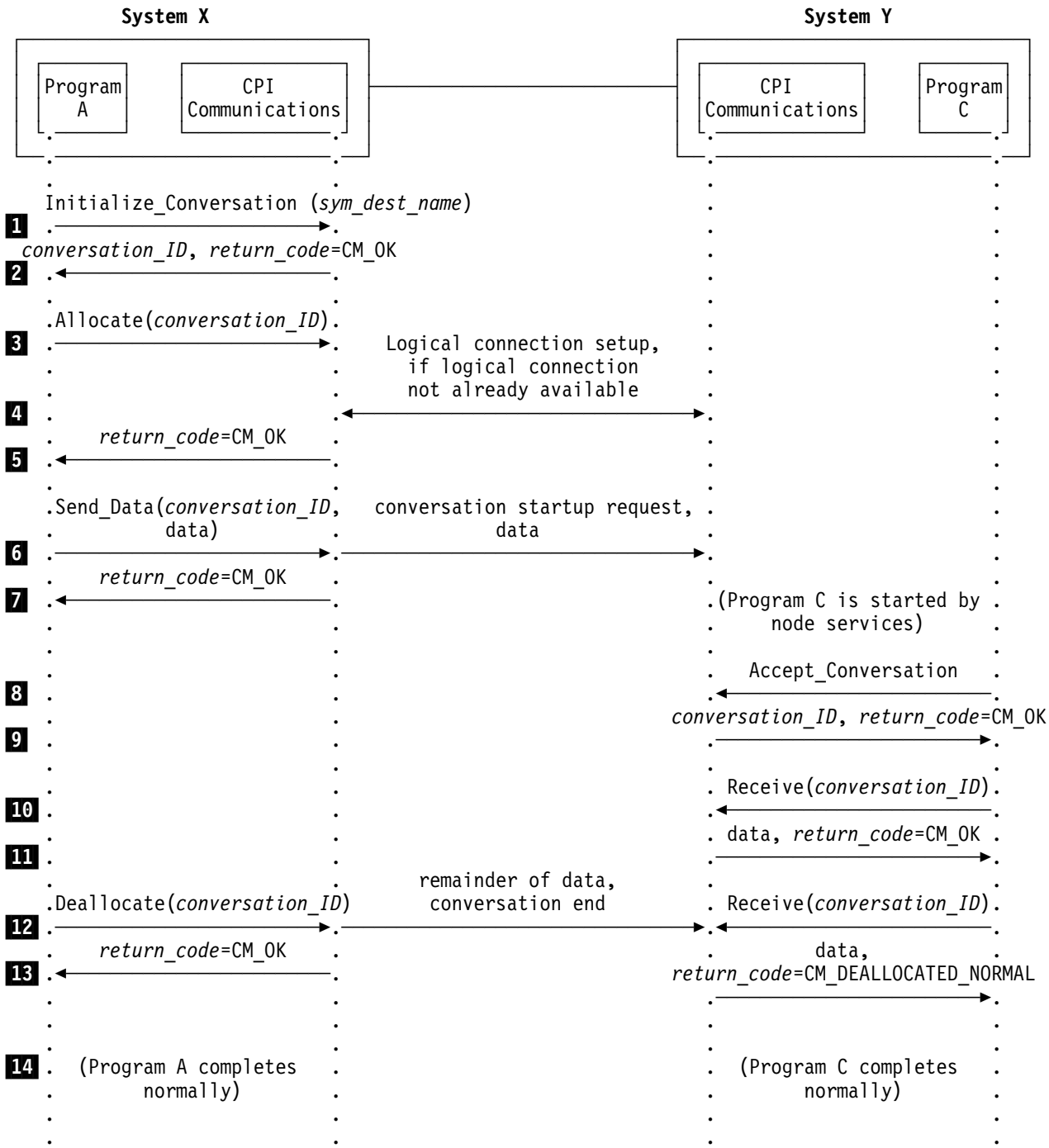

Figure 10. Data Flow in One Direction

Example 2: Data Flow in Both Directions

Figure 11 shows a conversation in which the flow of data is in both directions. It describes how two programs using starter-set calls can initiate a change of control over who is sending the data.

The steps shown in Figure 11 are:

Step	Description
1 through 4	Program A is sending data and Program C is receiving data. **Note:** The conversation in this example is already established with the default characteristics. Program A's end of the conversation is in **Send** state, and Program C's is in **Receive** state.
5	After sending some amount of data (an indeterminate number of Send_Data calls), Program A issues the Receive call while its end of the conversation is in **Send** state. As described in "Receive (CMRCV)" on page 209, this call causes the remaining data buffered at System X to be sent and permission to send to be given to Program C. Program A's end of the conversation is placed in **Receive** state, and Program A waits for a response from Program C. **Note:** See "Example 3: The Sending Program Changes the Data Flow Direction" on page 72 for alternate methods that allow Program A to continue processing. Program C issues a Receive call in the same way it issued the two prior Receive calls.
6	Program C receives not only the last of the data from Program A, but also a *status_received* parameter set to CM_SEND_RECEIVED. The value of CM_SEND_RECEIVED notifies Program C that its end of the conversation is now in **Send** state.
7	As a result of the *status_received* value, Program C issues a Send_Data call. The data from this call, on arrival at System X, is returned to Program A as a response to the Receive it issued in Step 5. At this point, the flow of data has been completely reversed and the two programs can continue whatever processing their logic dictates. To give control of the conversation back to Program A, Program C would simply follow the same procedure that Program A executed in Step 5.
8 through 10	Programs A and C continue processing. Program C sends data and Program A receives the data.

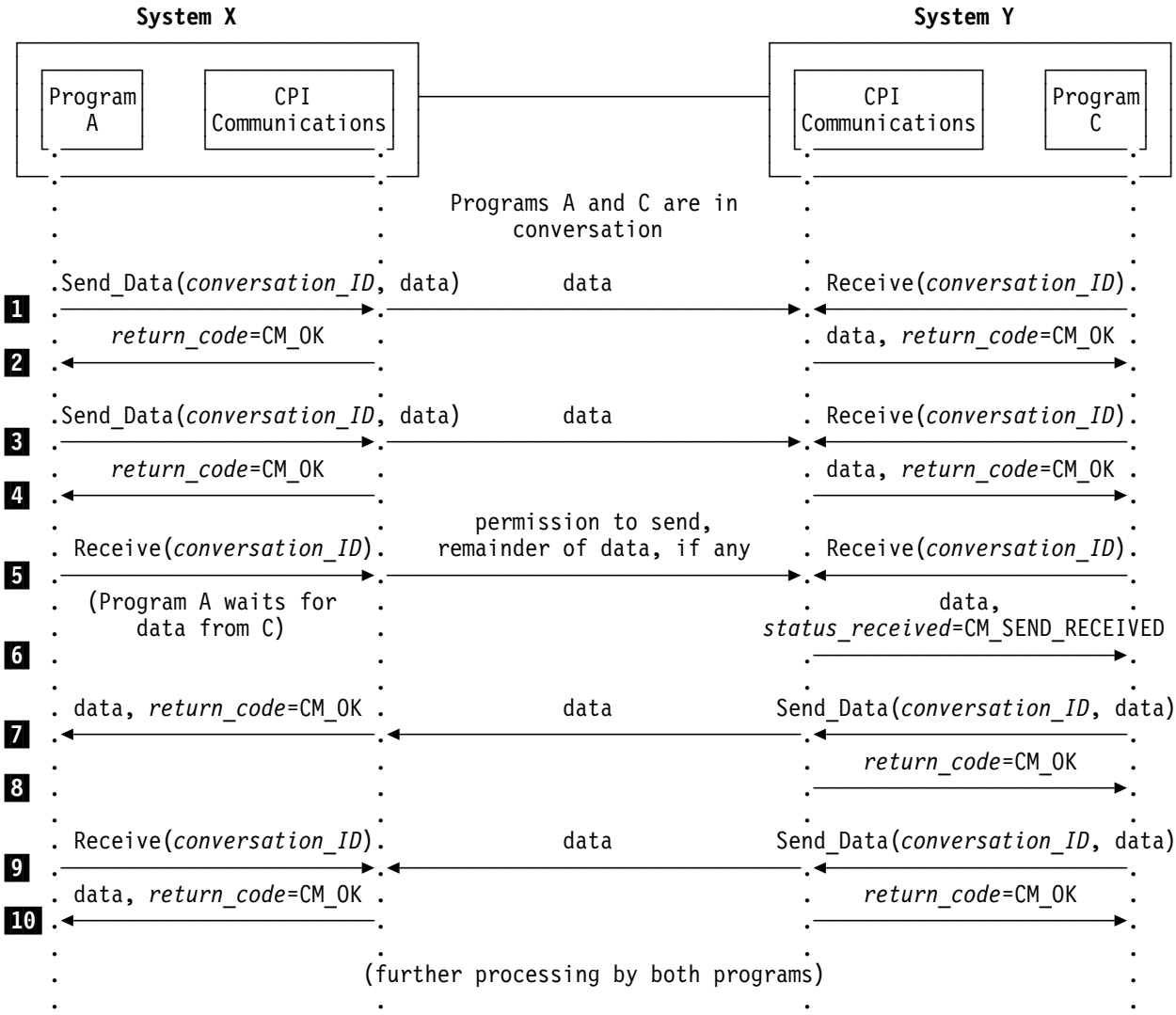

Figure 11. Data Flow in Both Directions

Controlling Data Flow Direction

This section discusses how a program can exercise control over the data flow direction:

- "Example 3: The Sending Program Changes the Data Flow Direction" shows how to use the Prepare_To_Receive call to change the direction of the data flow on a half-duplex conversation.
- "Example 4: The Receiving Program Changes the Data Flow Direction" shows how to use the Request_To_Send call to request a change in the direction of the data flow on a half-duplex conversation.

Example 3: The Sending Program Changes the Data Flow Direction

Figure 12 is a variation on the function provided by the flow shown in "Example 2: Data Flow in Both Directions" on page 70. When the data flow direction changes, Program A can continue processing instead of waiting for data to arrive on this half-duplex conversation.

The steps shown in Figure 12 are:

Step	Description
1 through 6	The program begins the same as "Example 1: Data Flow in One Direction" on page 67. Program A establishes the conversation and makes the initial transmission of data.
7 through 10	Program A makes use of an advanced-function call, Prepare_To_Receive, (described in "Prepare_To_Receive (CMPTR)" on page 204), which sends an indication to Program C that Program A is ready to receive data. This call also flushes the data buffer and places Program A's end of the conversation into **Receive** state. It does not, as did the Receive call when used with the initial conversation characteristics in effect, force Program A to pause and wait for data from Program C to arrive. Program A continues processing while data is sent to Program C.
11 through 13	Program C, started by System Y's reception of the conversation startup request and buffered data, makes the Accept_Conversation and Receive calls. Program A finishes its processing and issues its own Receive call. It will now wait until data is received (Step 15).
14 through 16	The *status_received* on the Receive call made by Program C, which is set to CM_SEND_RECEIVED, tells Program C that the conversation is in **Send** state. Program C can now issue the Send_Data call. Program A receives the data. **Note:** There is a way for Program A to check periodically to see if the data has arrived, without waiting. After issuing the Prepare_To_Receive call, Program A can use the Set_Receive_Type call to set the *receive_type* conversation characteristic equal to CM_RECEIVE_IMMEDIATE. This call changes the nature of all subsequent Receive calls issued by Program A (until a further call to Set_Receive_Type is made). If a Receive is issued with the *receive_type* set to CM_RECEIVE_IMMEDIATE, the program retains control of processing without waiting. It receives data back if data is present, and a *return_code* of CM_UNSUCCESSFUL if no data has arrived. This method of receiving data is not shown in Figure 12. For further discussion of this alternate flow, see "Set_Receive_Type (CMSRT)" on page 335 and "Receive (CMRCV)" on page 209.

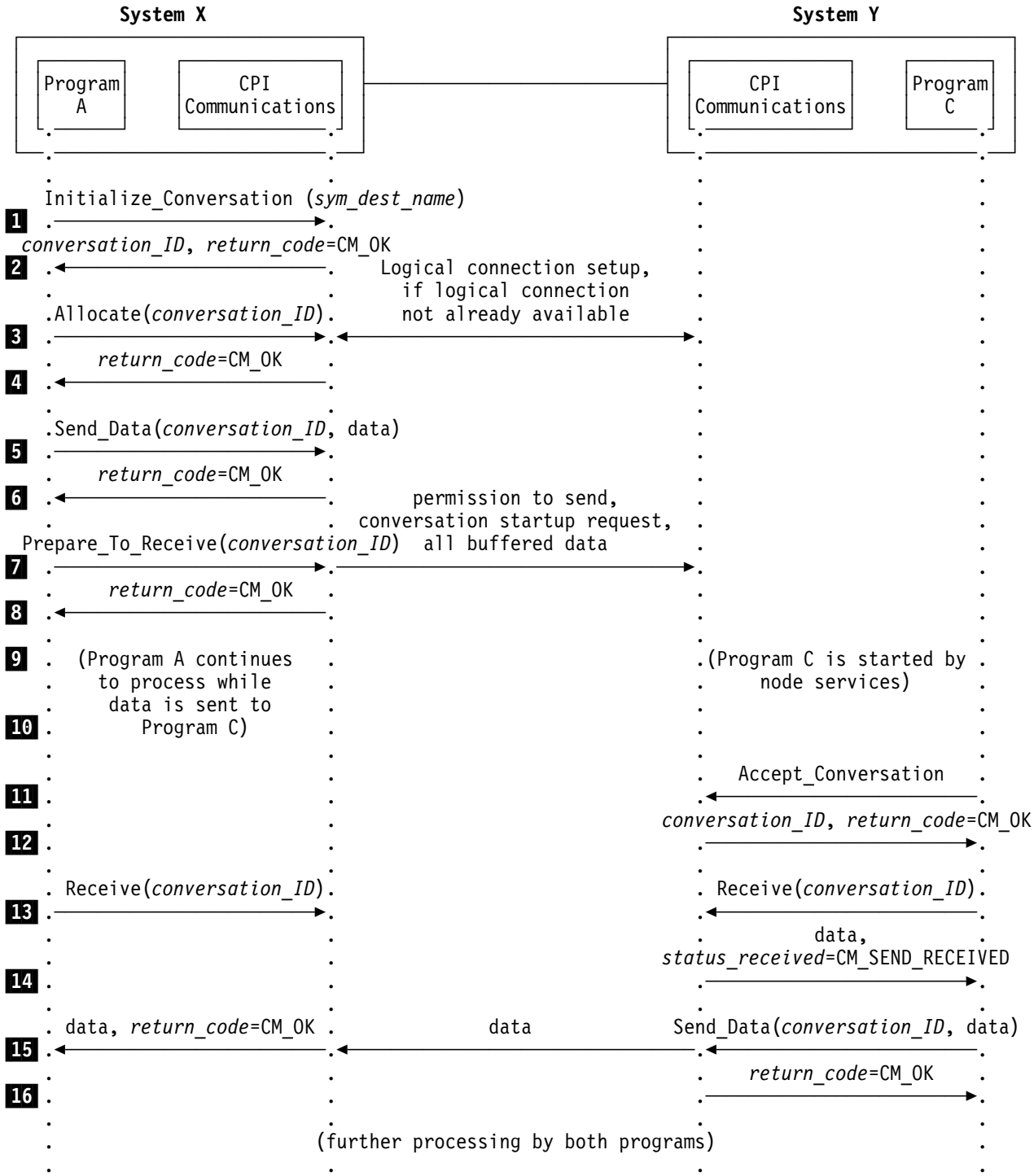

Figure 12. The Sending Program Changes the Data Flow Direction

Example 4: The Receiving Program Changes the Data Flow Direction

Figure 13 shows how a program on the receiving side of a half-duplex conversation can request a change in the direction of data flow with the Request_To_Send call. (See “Request_To_Send (CMRTS)” on page 241 for more information.) In this example, Programs A and C have already established a conversation using the default conversation characteristics.

The steps shown in Figure 13 are:

Step	Description
1 and 2	Program A is sending data and Program C is receiving the data.
3 and 4	Program C issues a Request_To_Send call in order to begin sending data. Program A will be notified of this request on the return value of the next call issued by Program A (Send_Data in this case, Step 6).
5 and 6	Program A issues a Send_Data request, and the call returns with *control_information_received* set equal to CM_REQ_TO_SEND_RECEIVED.
7 and 8	In reply to the Request_To_Send, Program A issues a Prepare_To_Receive call, which allows Program A to continue its own processing and passes permission to send to Program C. The call also forces the buffer at System X to be flushed. It leaves the conversation in **Receive** state for Program A. **Note:** Program A does not have to reply to the Request_To_Send call immediately (as it does in this example). See “Example 3: The Sending Program Changes the Data Flow Direction” on page 72 for other possible responses. Program C continues with normal processing by issuing a Receive call and receives Program A’s acceptance of the Request_To_Send on the *status_received* parameter, which is set to CM_SEND_RECEIVED. The conversation is now in **Send** state for Program C.
9 and 10	Program C can now transmit data. Because Program C has only one instance of data to transmit, it first changes the *send_type* conversation characteristic by issuing Set_Send_Type. Setting *send_type* to a value of CM_SEND_AND_PREP_TO_RECEIVE means that Program C’s end of the conversation will return to **Receive** state after Program C issues a Send_Data call. It also forces a flushing of the system's data buffer.
11	Program C issues the Send_Data call and its end of the conversation is placed in **Receive** state. The data and permission-to-send indication are transmitted from System Y to System X. Program A, meanwhile, has finished its own processing and issued a Receive call (which is perfectly timed, in this diagram).
12	Program A receives the data requested and, because of the value of the *status_received* parameter (which is set to CM_SEND_RECEIVED), knows that the conversation has been returned to **Send** state.
13 and 14	The original processing flow continues: Program A issues a Send_Data call and Program C issues a Receive call.

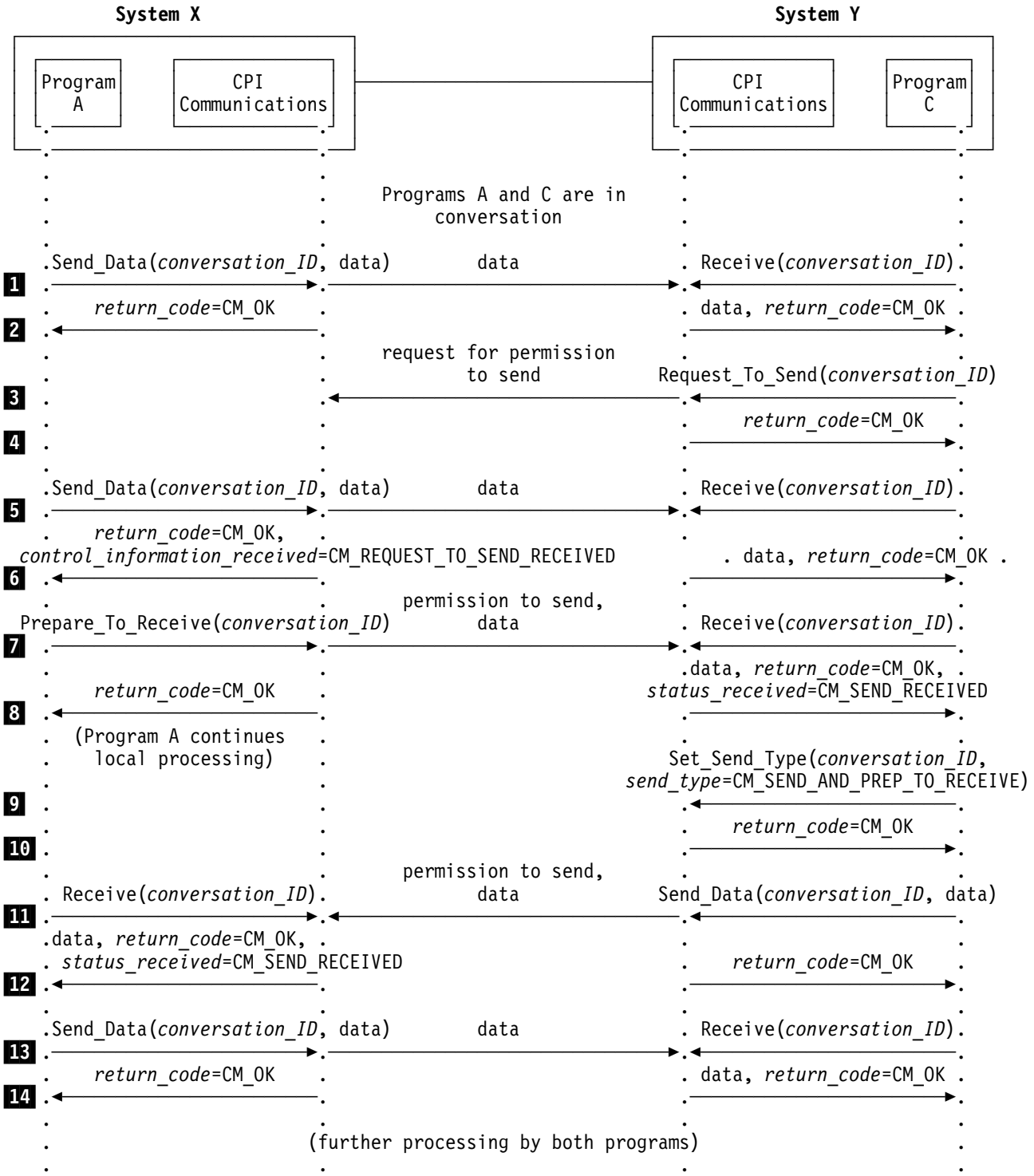

Figure 13. Changing the Data Flow Direction

Verifying Receipt of Data

This section provides an example of a program validating receipt of data.

Example 5: Validation of Data Receipt

Figure 14 on page 77 shows how a program can use the Confirm and Confirmed calls on a half-duplex conversation to verify receipt of its sent data. The Flush call is also shown.

The steps shown in Figure 14 are:

Step	Description
1 and 2	As before, Program A issues the Initialize_Conversation call to initialize the conversation.
3 and 4	Program A issues a new call, Set_Sync_Level, to set the *sync_level* characteristic to CM_CONFIRM. **Note:** Program A must set the *sync_level* characteristic before issuing the Allocate call (Step 5) for the value to take effect. Attempting to change the *sync_level* after the conversation is allocated results in an error condition. See "Set_Sync_Level (CMSSL)" on page 344 for a detailed discussion of the *sync_level* characteristic and the meaning of CM_CONFIRM.
5 and 6	Program A issues the Allocate call to start the conversation.
7 and 8	Program A uses the Flush call (see "Flush (CMFLUS)" on page 192) to make sure that the conversation is immediately established. If data is present, the local system buffer is emptied and the contents are sent to the remote system. Since no data is present, only the conversation startup request is sent to establish the conversation. At System Y, the conversation startup request is received. Program C is started and begins processing.
9 and 10	Program A issues a Send_Data call. Program C issues an Accept_Conversation call.
11	Program A issues a Confirm call to make sure that Program C has received the data and performed any data validation that Programs A and C have agreed upon. Program A is forced to wait for a reply.
12 and 13	Program C issues a Receive call and receives the data with *status_received* set to CM_CONFIRM_RECEIVED.
14 and 15	Because *status_received* is set to CM_CONFIRM_RECEIVED, indicating a confirmation request, the conversation has been placed into **Confirm** state. Program C must now issue a Confirmed call. After Program C makes the Confirmed call (see "Confirmed (CMCFMD)" on page 134), the conversation returns to **Receive** state. Meanwhile, at System X, the confirmation reply arrives and the CM_OK *return_code* is sent back to Program A.
16	Program A continues with further processing. **Note:** Unlike the previous examples in which a program could bypass waiting, this example demonstrates that use of the Confirm call forces the program to wait for a reply.

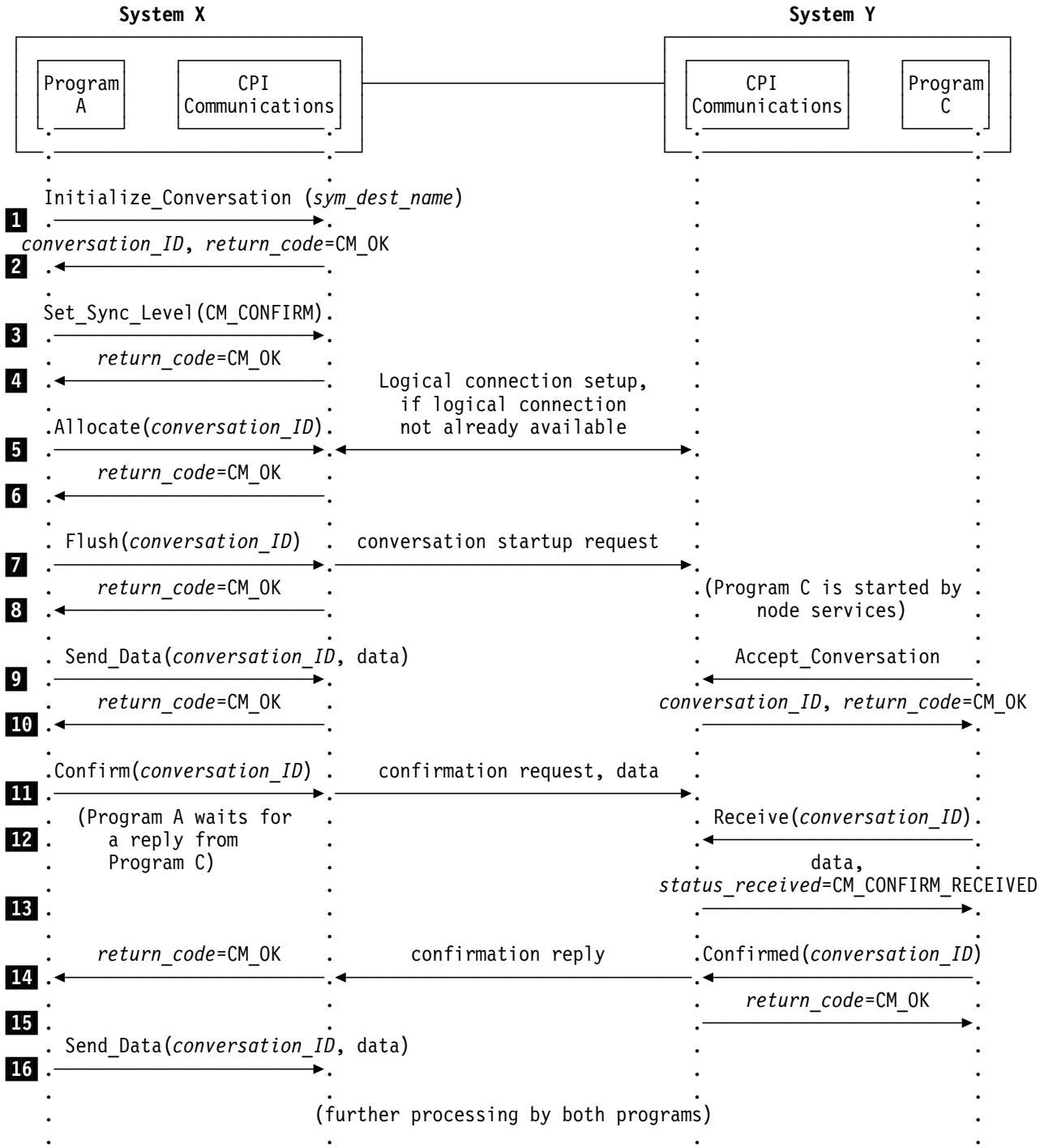

Figure 14. Validation and Confirmation of Data Reception

Reporting Errors to Partner

All the previous examples assumed that no errors were found in the data, and that the receiving program was able to continue receiving data. However, in some cases the local program may detect an error in the data or may find that it is unable to receive more data (for example, its buffers are full) and cannot wait for the remote program to honor a request-to-send request.

This section provides two examples of error reporting:

- "Example 6: Reporting Errors" shows how to use the Send_Error call to report errors in the data flow on a half-duplex conversation.
- "Example 7: Error Direction and Send-Pending State" shows how to use the **Send-Pending** state and the *error_direction* characteristic to resolve an ambiguous error condition that can occur when a program receives both a change-of-direction indication and data for a Receive call on a half-duplex conversation.

Example 6: Reporting Errors

Figure 15 is an example of programs using a half-duplex conversation. This example describes the simplest type of error reporting, an error found while receiving data. "Example 7: Error Direction and Send-Pending State" on page 80 describes a more complicated use of Send_Error.

The steps shown in Figure 15 are:

Step	Description
1 and 2	Program A is sending data and Program C is receiving data. The initial characteristic values set by Initialize_Conversation and Accept_Conversation are in effect.
3 and 4	Program C encounters an error on the received data and issues the Send_Error call. The local system sends control information to System X indicating that the Send_Error has been issued and purges all data contained in its buffer.
5 and 6	Meanwhile, Program A has sent more data. This data is purged because System X knows that a Send_Error has been issued at System Y (the control information sent in Step 3). After System X sends control information to System Y, a *return_code* of CM_OK is returned to Program C and the conversation is left in **Send** state. Program A learns of the error (and possibly lost data) when it receives back the *return_code*, which is set to CM_PROGRAM_ERROR_PURGING. Program A's end of the conversation is also placed into **Receive** state, in a parallel action to the now-new **Send** state of the conversation for Program C.
7 and 8	Program C issues a Send_Data call, and Program A receives the data using the Receive call. Programs A and C continue processing normally.

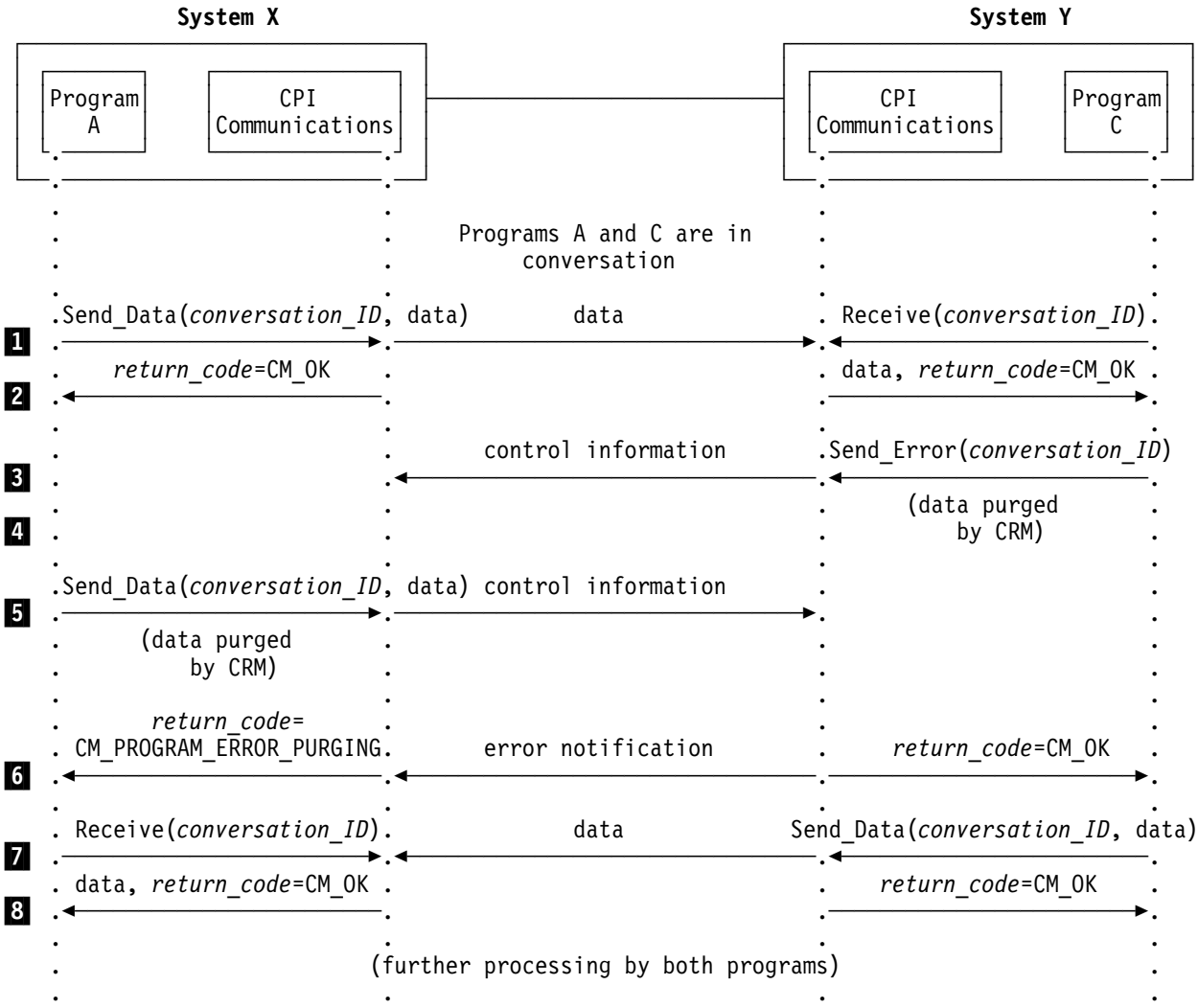

Figure 15. Reporting Errors

Example 7: Error Direction and Send-Pending State

Figure 16 on page 81 shows how to use the **Send-Pending** state and the *error_direction* characteristic to resolve an ambiguous error condition that can occur when a program receives both a change of direction indication and data on a Receive call.

This example applies only to a half-duplex conversation using an LU 6.2 CRM.

The steps shown in Figure 16 are:

Step	Description
1 and 2	The conversation has already been established using the default conversation characteristics. Program A is sending data in **Send** state and Program C is receiving data in **Receive** state.
3	Program A issues the Receive call to begin receiving data and its end of the conversation enters **Receive** state.
4 and 5	Program C issues a Receive and is notified of the change in the conversation's state by the *status_received* parameter, which is set to CM_SEND_RECEIVED. The reception of both data and CM_SEND_RECEIVED on the same Receive call places Program C's end of the conversation into **Send-Pending** state. Two possible error conditions can now occur: • Program C, while processing the data just received, discovers something wrong with the data (as was discussed in "Example 6: Reporting Errors"). This is an error in the "receive" direction of the data. • Program C finishes processing the data and begins its send processing. However, it discovers that it cannot send a reply. For example, the received data might contain a query for a particular database. Program C successfully processes the query but finds that the database is not available when it attempts to access that database. This is an error in the "send" direction of the data. The *error_direction* characteristic is used to indicate which of these two conditions has occurred. A program sets *error_direction* to CM_RECEIVE_ERROR for the first case and sets *error_direction* to CM_SEND_ERROR for the second.
6 and 7	In this example, Program C encounters a send error and issues Set_Error_Direction to set the *error_direction* characteristic to CM_SEND_ERROR. **Note:** The *error_direction* characteristic was not set in the previous example because Program C did not receive send control with the data and, consequently, the conversation did not enter **Send-Pending** state. The *error_direction* characteristic is relevant only when the conversation is in **Send-Pending** state.
8	Program C issues Send_Error. Because CPI Communications knows the conversation is in **Send-Pending** state, it checks the *error_direction* characteristic and notifies the CPI Communications component at System X which type of error has occurred. Program A receives the error information in the *return_code*. The *return_code* is set to CM_PROGRAM_NO_TRUNC because Program C set *error_direction* to CM_SEND_ERROR. If *error_direction* had been set to CM_RECEIVE_ERROR, Program A would have received a *return_code* of CM_PROGRAM_ERROR_PURGING (as in the previous example).
9 through 11	Program C notifies Program A of the exact nature of the problem and both programs continue processing.

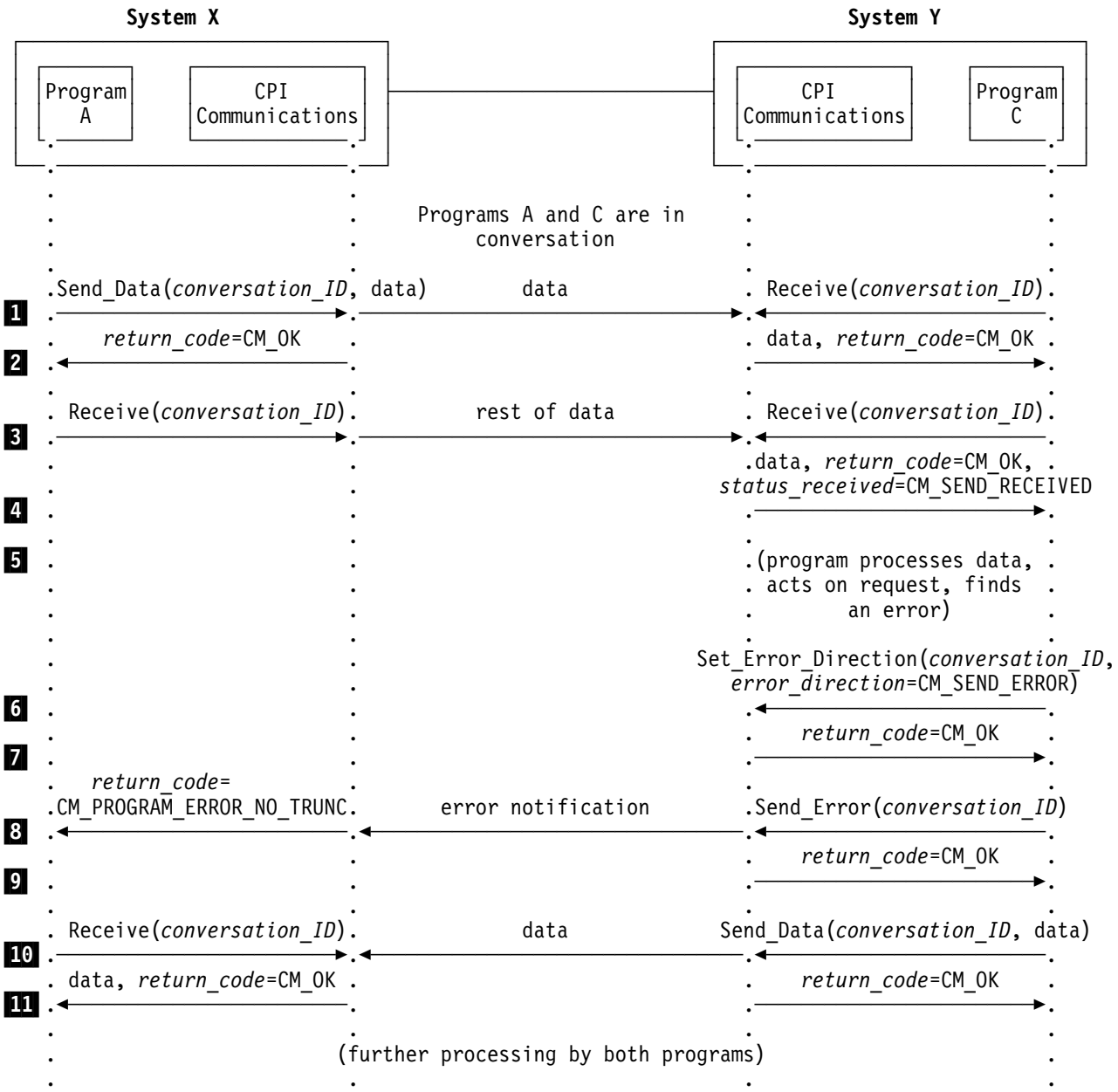

Figure 16. Error Direction and Send-Pending State

Using Full-Duplex Conversations

This section provides examples of programs using full-duplex conversation flows:

- "Example 8: Establishing a Full-Duplex Conversation" describes how a full-duplex conversation is established.
- "Example 9: Using a Full-Duplex Conversation" on page 84 describes how a full-duplex conversation is used to send and receive data.
- "Example 10: Terminating a Full-Duplex Conversation" on page 86 describes how a full-duplex conversation can be terminated.

Example 8: Establishing a Full-Duplex Conversation

Figure 17 on page 83 is an example of how a full-duplex conversation is set up.

The steps shown in Figure 17 are:

Step	Description
1 and 2	Program A initializes a conversation using the Initialize_Conversation call.
3 and 4	The default value of the *send_receive_mode* characteristic is set to CM_HALF_DUPLEX. Since the program wants to have a full-duplex conversation, it issues the Set_Send_Receive_Mode call to set the *send_receive_mode* characteristic to CM_FULL_DUPLEX.
5 through 7	Program A allocates the full-duplex conversation. Program A's conversation state changes from **Initialize** state to **Send_Receive** state, and Program A can begin to send and receive data.
8 and 9	Program A sends data with the Send_Data call and receives a *return_code* of CM_OK. The request for a conversation is sent at this time, and it carries the *send_receive_mode*.
10 and 11	The remote system starts Program C. The conversation on Program C's side is in **Reset** state. Program C accepts the conversation, and the conversation state changes to **Send-Receive** state. Some of Program C's conversation characteristics are based on information contained in the conversation startup request. In particular, the *send_receive_mode* is set to CM_FULL_DUPLEX.
12 and 13	Progam C issues Extract_Send_Receive_Mode to determine whether the conversation is half-duplex or full-duplex; the returned *send_receive_mode* value indicates that it is a full-duplex conversation.
14 and 15	Once its end of the conversation is in **Send-Receive** state, Program C begins whatever processing role it and Program A have agreed upon. In this case, Program C receives data with a Receive call.

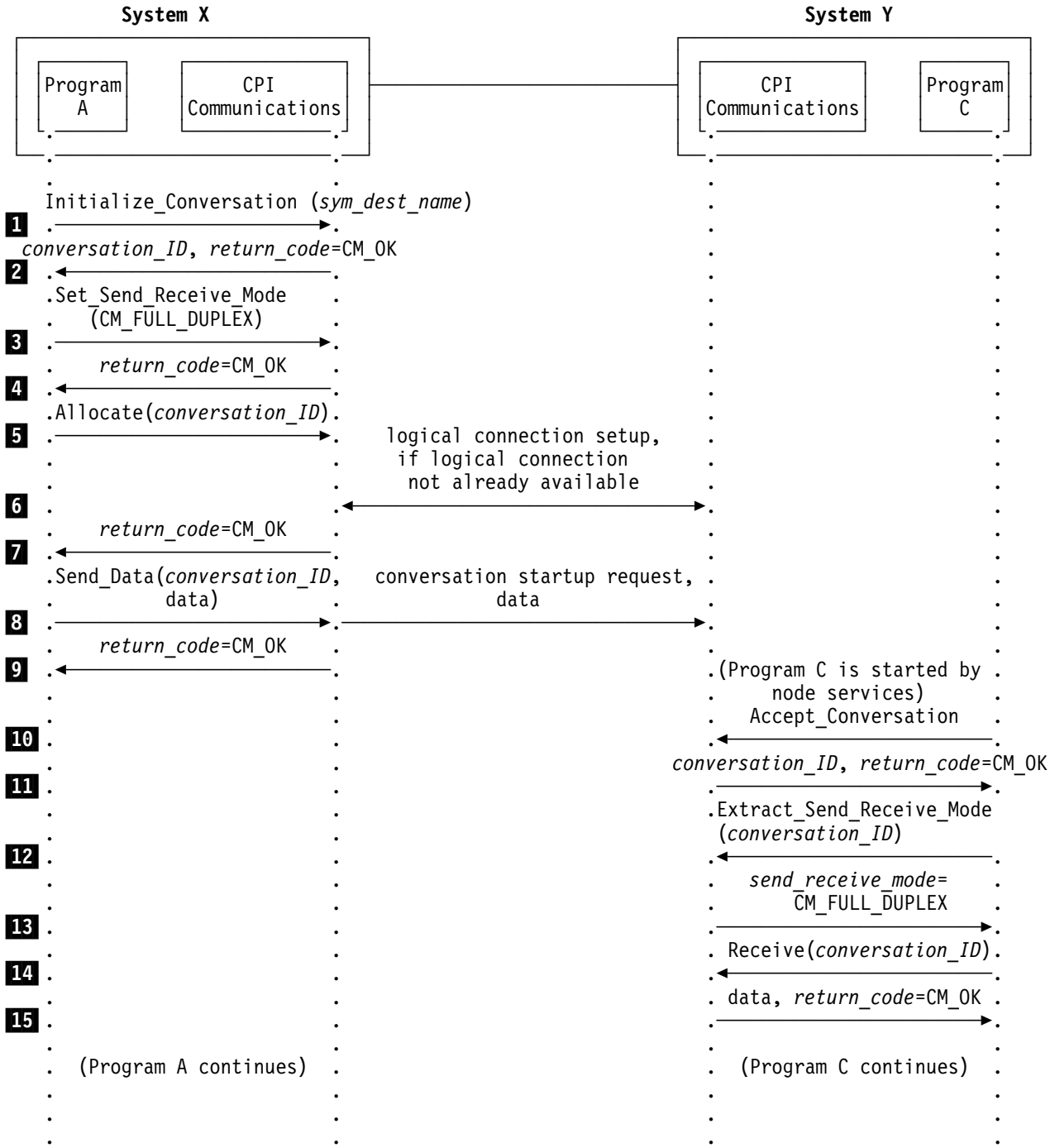

Figure 17. Establishing a Full-Duplex Conversation

Example 9: Using a Full-Duplex Conversation

Figure 18 on page 85 shows an example of how a full-duplex conversation is used to send and receive data.

The steps shown in Figure 18 are:

Step	Description
1	Programs A and C are in a full-duplex conversation. Both Program A's and Program C's ends of the conversation are in **Send-Receive** state. Both programs can issue a Send_Data call or a Receive call. In this example, Program A wants to receive a response to some previous request it sent to Program C, and so it issues the Receive call.
2	Program C issues a Send_Data call to send data to Program A. In this example, the data is sent to Program A right away.
3	Program A receives data from program C.
4 and 5	Both programs issue Send_Data calls, and the calls complete successfully.
6 and 7	Both programs issue Receive calls, and the Receive calls complete successfully. The state of the conversation at Program A and Program C continues to be **Send-Receive** state.

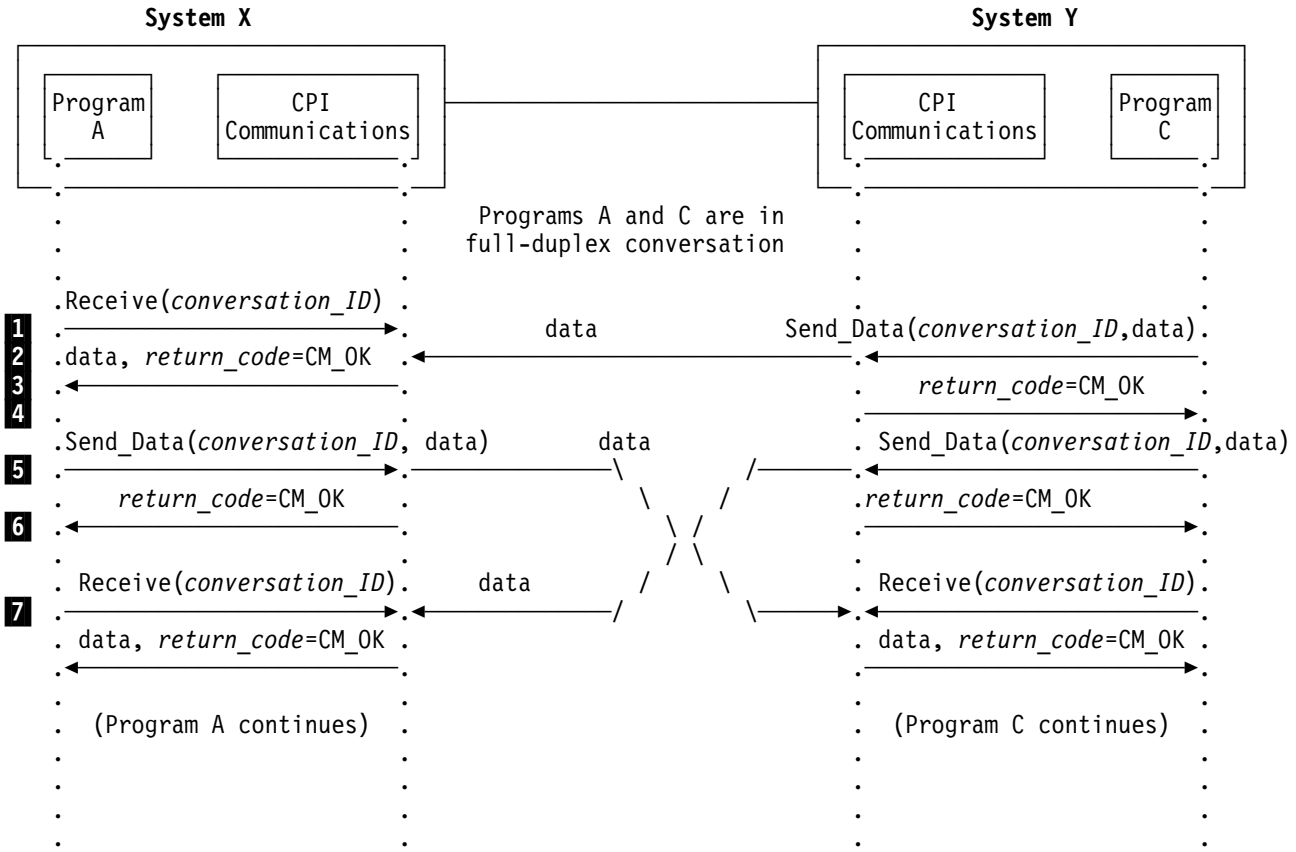

Figure 18. Using a Full-Duplex Conversation

Example 10: Terminating a Full-Duplex Conversation

Figure 19 on page 87 shows an example of how a full-duplex conversation can be terminated.

The steps shown in Figure 19 are:

Step	Description
1 and 2	The state of the conversation at Program A and Program C is **Send-Receive** state. Program A issues a Send_Data call, which completes successfully. Note that the data is not actually sent to the partner program but is buffered.
3 and 4	Program A has finished sending all data, and issues a Deallocate call.
	When the call completes successfully, the data in the CRM's buffers is flushed to the partner along with a deallocation notification. The conversation state at Program A's end now makes a transition to **Receive-Only** state. Program A can no longer send any data on this conversation.
5 and 6	Program C's end is in **Send-Receive** state, and Program C issues a Receive call. Program C gets back data and a return code of CM_DEALLOCATED_NORMAL. Program C's end of the conversation now enters **Send_Only** state. Program C can no longer receive any data on this conversation.
7	Program C issues a Send_Data call, and the data gets sent to Program A.
8 and 9	Program A issues a Receive call and gets data.
10	Program C's end of the conversation is in **Send-Only** state, and Program C has finished sending data. It issues a Deallocate call for the *conversation_ID*.
	Program A issues a Receive call to receive data.
11	Program A gets a return code of CM_DEALLOCATED_NORMAL, and its end of the conversation goes from **Receive-Only** state to **Reset** state.
	Program C gets a return code of CM_OK for the Deallocate call it issued earlier. Its end of the conversation goes from **Send-Only** state to **Reset** state.

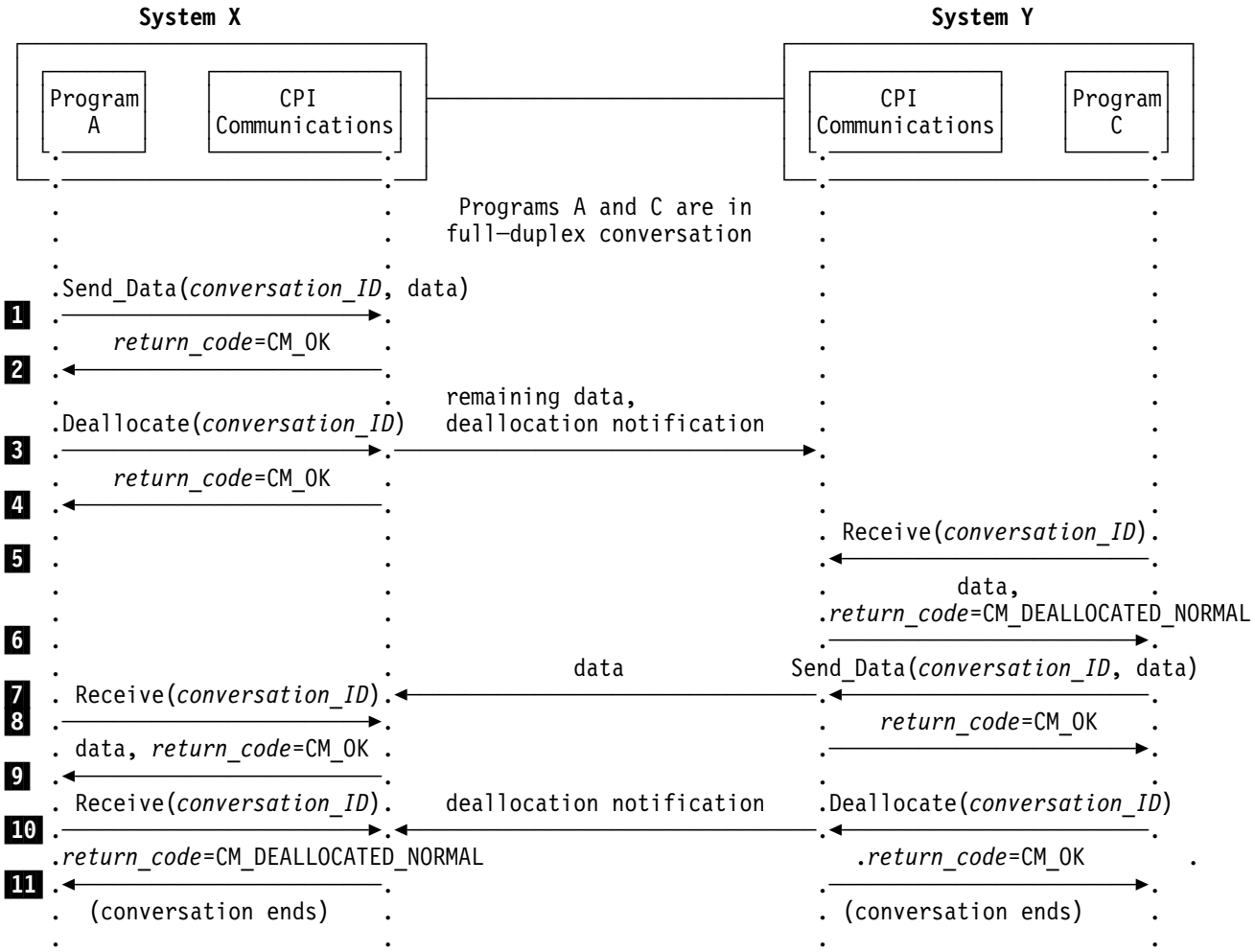

Figure 19. Terminating a Full-Duplex Conversation

Using Queue-Level Non-Blocking

This section provides an example of a program using queue-level non-blocking.

Example 11: Queue-Level Non-Blocking

Figure 20 on page 89 shows an example of a program that uses queue-level non-blocking.

The steps shown in Figure 20 are:

Step	Description
1	In a full-duplex conversation, the state of the conversation at Program A and Program C is **Send-Receive** state. Program A issues Set_Queue_Processing_Mode to set the processing mode for its Send queue to CM_NON_BLOCKING. It also specifies a user field, `uf_send`, as a pointer to the parameters on the Send_Data call. When the Set_Queue_Processing_Mode call completes successfully, Program A receives an OOID, `OOID1`, that is unique to the Send queue.
2	Program A also issues Set_Queue_Processing_Mode to set the processing mode for its Receive queue to CM_NON_BLOCKING. This time it specifies a user field, `uf_rcv`, as a pointer to the parameters on the Receive call. When the Set_Queue_Processing_Mode call completes successfully, Program A receives an OOID, `OOID2`, that is unique to the Receive queue.
3	Program A issues a Receive call. Because no incoming data is ready to be received, the call is suspended and returns CM_OPERATION_INCOMPLETE.
4	Program A issues a Send_Data call, which also returns CM_OPERATION_INCOMPLETE because of transmission buffer shortage.
5	Program C sends data to Program A, which will satisfy the outstanding Receive call.
6	Program A issues Wait_For_Completion to wait for both outstanding operations. It does so by specifying `OOID1` and `OOID2` in the *OOID_list*. To indicate that the Receive call has completed, the Wait_For_Completion call returns an index value 2 and `uf_rcv`, which are associated with the Receive call. Program A can now use the returned user field, `uf_rcv`, to examine the return code of the Receive call.

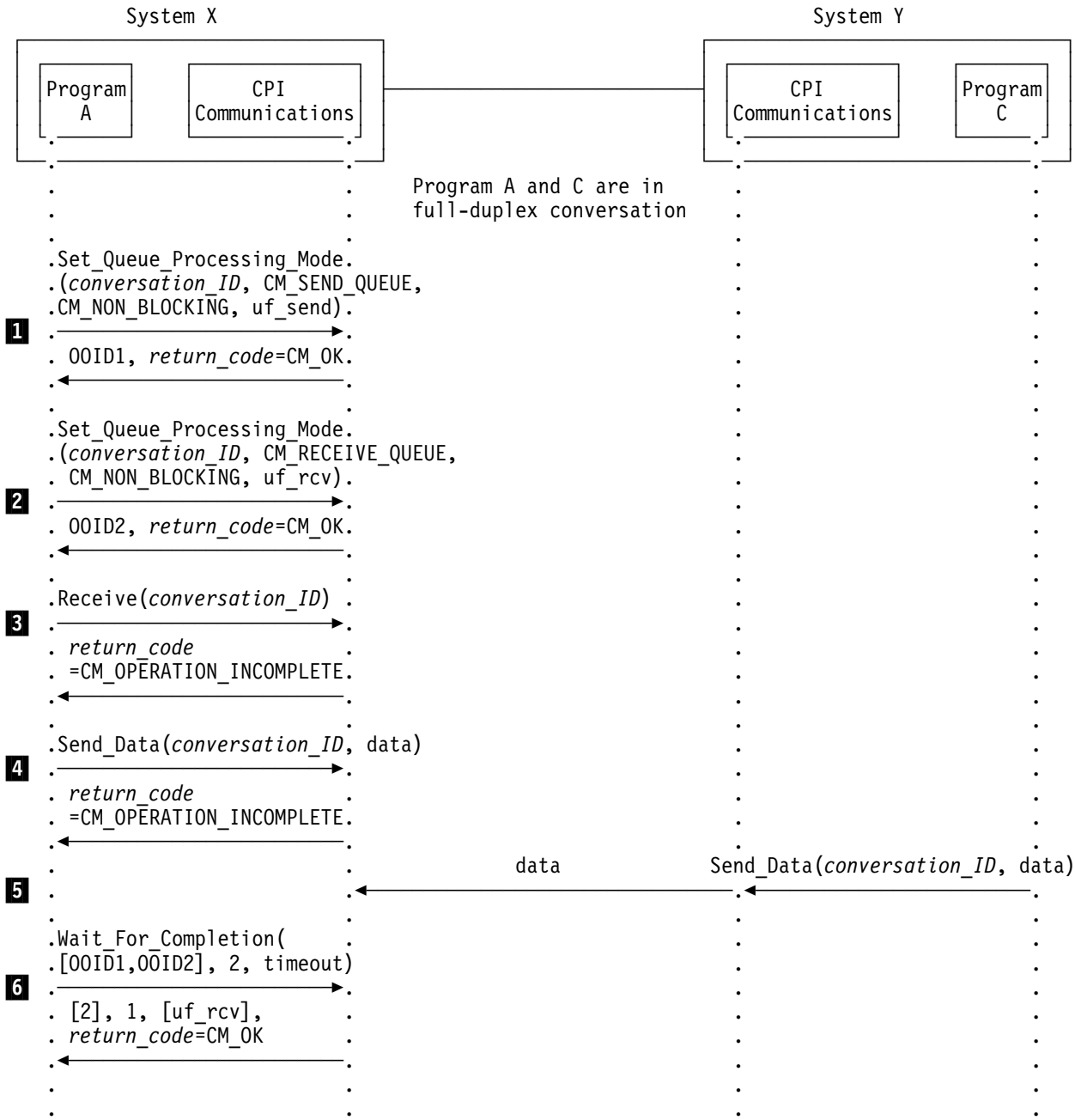

Figure 20. Using Queue-Level Non-Blocking

Accepting Multiple Conversations

This section provides examples of programs accepting multiple conversations:

- "Example 12: Accepting Multiple Conversations Using Blocking Calls" shows a program that uses blocking calls to accept multiple incoming half-duplex conversations.
- "Example 13: Accepting Multiple Conversations Using Conversation-Level Non-Blocking Calls" shows a program that uses non-blocking calls to accept multiple incoming half-duplex conversations.

Example 12: Accepting Multiple Conversations Using Blocking Calls

Figure 21 on page 91 shows an example of a program that uses blocking calls to accept multiple incoming half-duplex conversations.

The steps shown in Figure 21 are:

Step	Description
1	Program C is started as the result of a local operation and informs node services that it is ready to accept conversation startup requests for a program named "PAYROLL" by issuing the Specify_Local_TP_Name (CMSLTP) call.
2	Program C initializes the conversation on the accepting side by issuing the Initialize_For_Incoming call. Upon successful completion of this call, the conversation is in **Initialize-Incoming** state.
3	Program C accepts the incoming conversation with the Accept_Incoming call. The *conversation_ID* returned on the Initialize_For_Incoming call is supplied on the Accept_Incoming call. This call blocks until the conversation startup request arrives. The *processing_mode* characteristic is initialized to the default value of CM_BLOCKING by the Initialize_For_Incoming call.
4	Program A uses the Initialize_Conversation call to initialize conversation characteristics for an outgoing conversation to Program C. In this example, the TP name characteristic is set to "PAYROLL".
5	Program A allocates the conversation, supplying the *conversation_ID* returned by the Initialize_Conversation call. In this example, the conversation startup request is sent as part of the Allocate processing. When System Y receives the conversation startup request, the Accept_Incoming call completes. A new context is created, and the conversation is assigned to that context. Node services sets Program C's current context to the new context.
6 and 7	Program C is ready to accept a second conversation, and it issues the Initialize_For_Incoming and Accept_Incoming calls. Again, the Accept_Incoming call blocks until a conversation startup request arrives at System Y.
8 and 9	Program B on System Z initializes and allocates a conversation to "PAYROLL". When System Y receives the conversation startup request, the Accept_Incoming call completes with a return code of CM_OK. Another new context is created and the new conversation is assigned to that context. Node services sets Program C's current context to the new context.

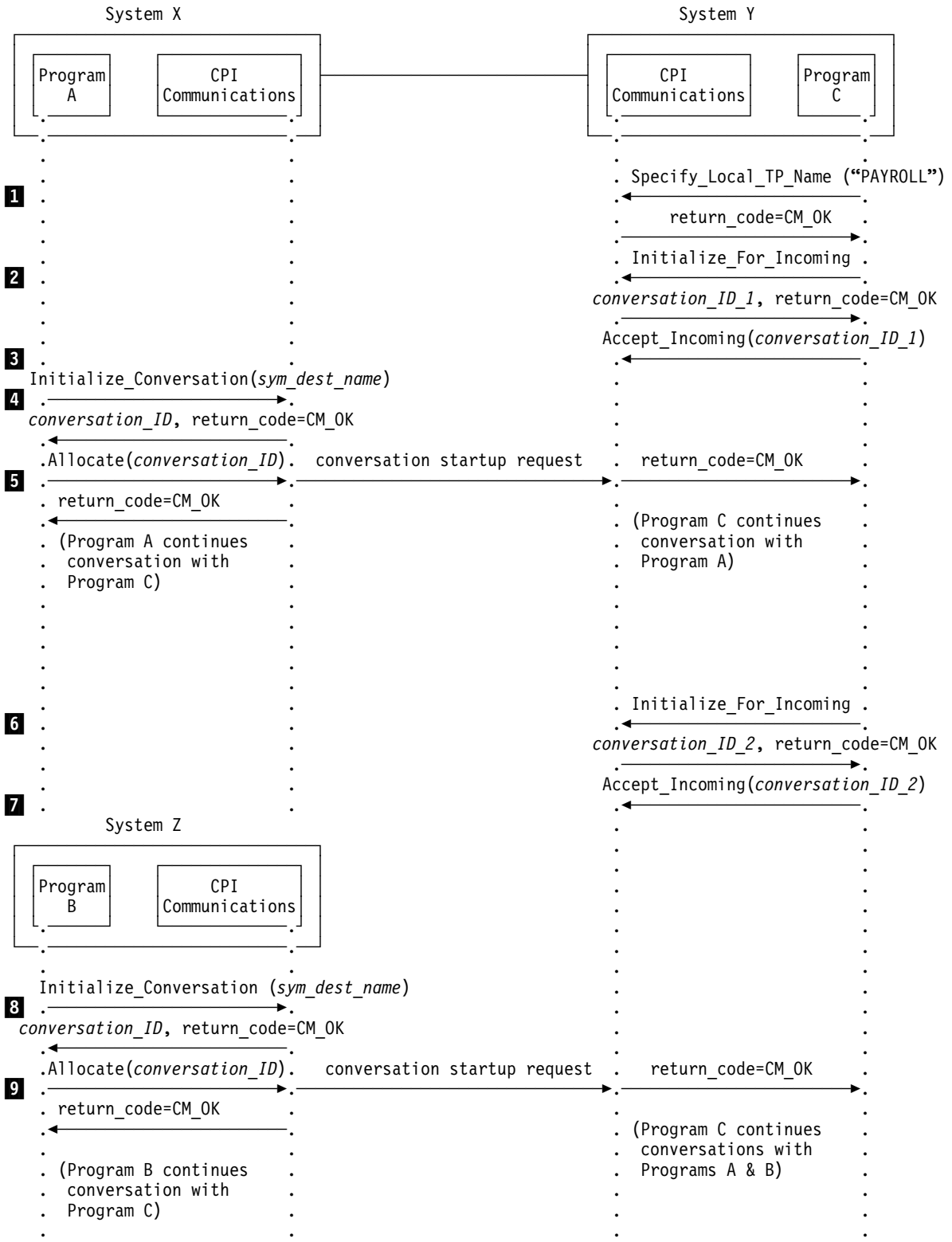

Figure 21. Accepting Multiple Conversations Using Blocking Calls

Example 13: Accepting Multiple Conversations Using Conversation-Level Non-Blocking Calls

Figure 22 on page 93 shows an example of a program that uses conversation-level non-blocking calls to accept multiple incoming half-duplex conversations.

The steps shown in Figure 22 are:

Step	Description
1	Program C is started as the result of a local operation and informs node services that it is ready to accept conversation startup requests for a program named “PAYROLL” by issuing the Specify_Local_TP_Name call.
2	Program C prepares for an incoming conversation by issuing the Initialize_For_Incoming call. Upon successful completion of this call, the conversation is in **Initialize-Incoming** state. **Note:** The Initialize_For_Incoming call is required in this case since the conversation will be accepted in a non-blocking processing mode. The Accept_Conversation call cannot be used because it is a blocking call. A *conversation_ID* is needed to set the processing mode and none is available prior to issuing the Accept_Conversation call.
3 and 4	Program C sets the processing mode for the conversation to non-blocking and issues the Accept_Incoming call. Since no conversation is currently available, CM_OPERATION_INCOMPLETE is returned.
5	Program C waits for an incoming conversation with the Wait_For_Conversation call.
6	Program A prepares to allocate a conversation by issuing Initialize_Conversation to initialize the conversation characteristics. In this example, the TP name characteristic is set to “PAYROLL”.
7	Program A allocates a conversation. In this example, the conversation startup request is sent as part of the Allocate processing. When System Y receives the conversation startup request, the Wait_For_Conversation call completes, returning *conversation_ID_1*. A new context is created, and the conversation is assigned to that context. The program's current context is not changed.
8	Program C issues another Initialize_For_Incoming call to prepare to accept a second incoming conversation.
9 and 10	The Set_Processing_Mode call is used to set the processing mode for the conversation to non-blocking prior to issuing the Accept_Incoming call. Since there is no conversation startup request to receive, the call completes with CM_OPERATION_INCOMPLETE.
11	Program C again issues a Wait_For_Conversation call to wait for activity on either *conversation_ID_1* or *conversation_ID_2*.
12	Program B on System Z initializes conversation characteristics in preparation for allocating a conversation. In this example, the TP name characteristic is set to “PAYROLL”.
13	Program B allocates a conversation to Program C. In this example, the conversation startup request is sent as part of the Allocate processing. When System Y receives the conversation startup request, the outstanding Wait_For_Conversation call completes, returning *conversation_ID_2*. Another new context is created and the new conversation is assigned to that context. The program's current context is not changed.

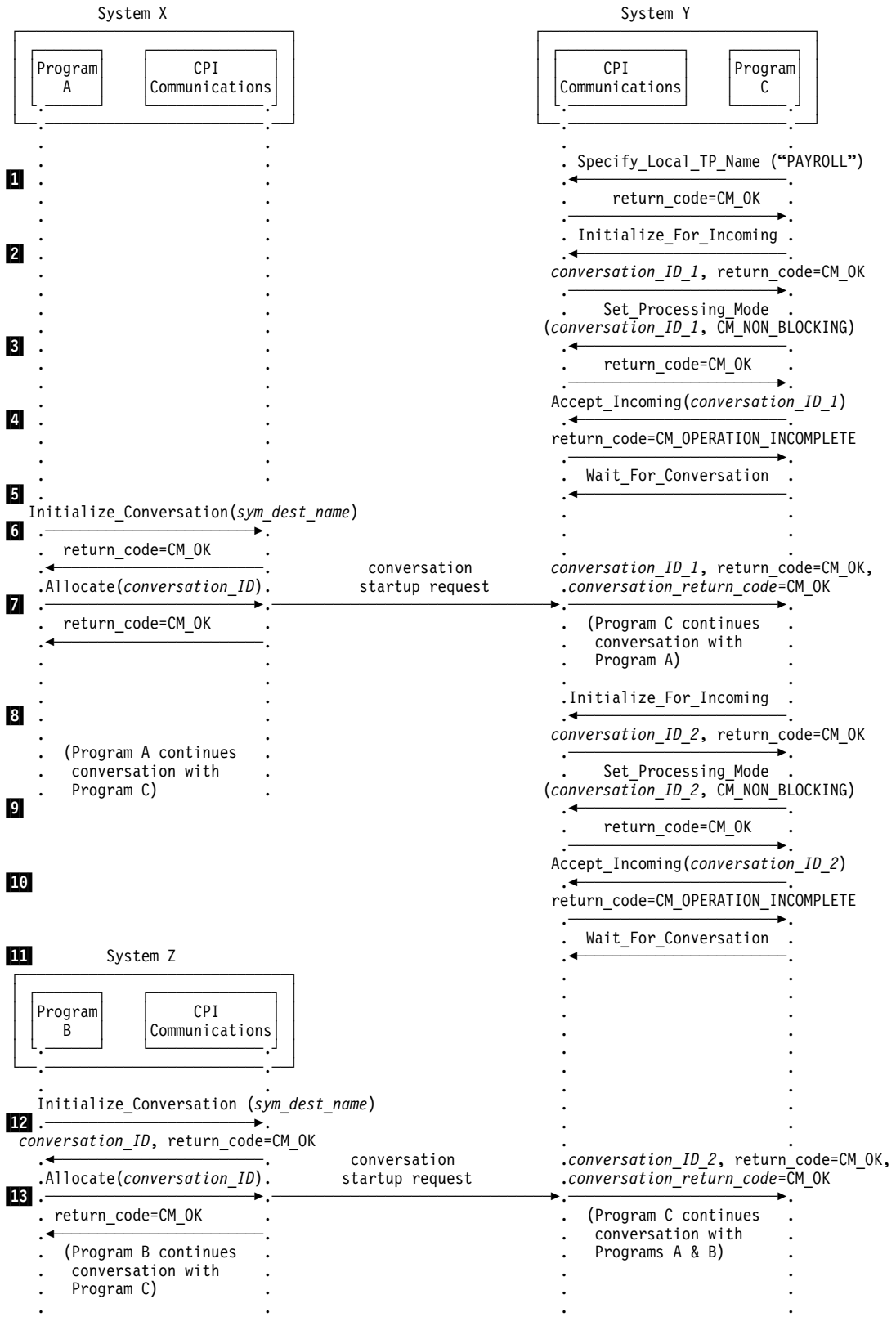

Figure 22. Accepting Multiple Conversations Using Non-Blocking Calls

Using the Distributed Directory

This section provides an example of a program using the distributed directory to locate the partner program.

Example 14: Using the Distributed Directory to Find the Partner Program

Figure 23 is a variation on the function provided by the flow shown in “Example 1: Data Flow in One Direction” on page 67. In this case, the program directly provides a distinguished name so as to access information contained in the distributed directory.

The steps shown in Figure 23 are:

Step	Description
1 and 2	Program A establishes the conversation and retrieves a *conversation_ID* using a *sym_dest_name* of all blanks.
3 and 4	Program A uses the Set_Partner_ID call to provide a distinguished name to CPI Communications. To provide a program binding or PFID, Program A could use the same call and set the *partner_ID_type* parameter to CM_PROGRAM_BINDING or CM_PROGRAM_FUNCTION_ID.
5 and 6	When Program A issues the Allocate call, CPI Communications uses the distinguished name it received in 3 to retrieve a program binding from the distributed directory. This information is then used to establish a logical connection with the partner CRM and allocate a conversation with Program C.
7 and 8	After the conversation has been successfully allocated, the program can issue the Extract_Partner_ID call to retrieve the specific program binding, as shown in Step 7. The *partner_ID* parameter returned in Step 8 contains the program binding used to allocate the conversation with Program C. Note that the *partner_ID* field, which contained a distinguished name prior to the Allocate, has now been updated to contain a program binding.
9 and 10	Program A begins to send data to its partner program and continues with further processing.

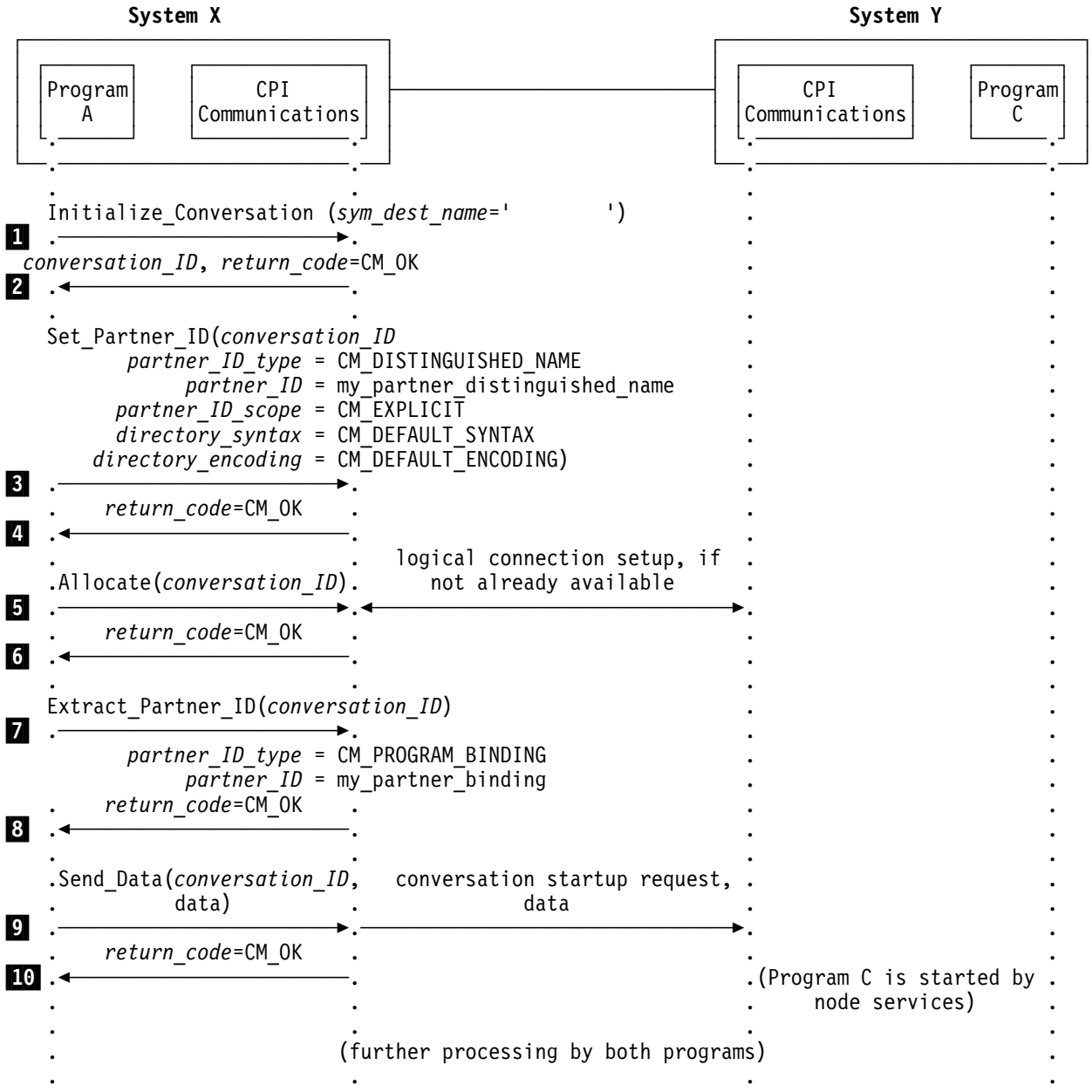

Figure 23. Using the Distributed Directory to Locate the Partner Program

Resource Recovery Flows

This section provides examples of resource recovery flows. These examples use CPI Communications with the resource recovery commit call. The acronym **RR/SPM** is used in the following examples to represent the resource recovery interface functioning in conjunction with a sync point manager. The actual resource recovery call names and return codes depend on the resource recovery interface being used.

- "Example 15: Sending Program Issues a Commit" shows how to use a protected conversation with a resource recovery commit call to establish a synchronization point for protected resources on a half-duplex conversation.
- "Example 16: Successful Commit with Conversation State Change" shows a successful resource recovery commit operation with a conversation state change on a half-duplex conversation.
- "Example 17: Conversation Deallocation before the Commit Call" shows a resource recovery commit call issued after a CPI Communications Deallocate call on a half-duplex conversation.

Example 15: Sending Program Issues a Commit

This example shows a program sending data on a protected half-duplex conversation and issuing a resource recovery commit call. A protected conversation is one in which the *sync_level* has been set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM. This synchronization level tells CPI Communications that the program will use the calls of a resource recovery interface to manage the changes made to protected resources.

The steps shown in Figure 24 are:

Step	Description
1 through **6**	To communicate with its partner program, Program A must first establish a conversation. It uses the Set_Sync_Level call in step **3** to request that the conversation be protected.
7	Program A sends data, and Program C issues a Receive call that allows it to receive the data.
8	Both Program A and Program C get return codes indicating that their respective calls have completed successfully.
9	Program A issues a resource recovery commit call to make all of the updates permanent and to advance all of the protected resources to a new synchronization point. Program C's end of the conversation is still in **Receive** state and it issues a second Receive call.
10	On System X, a request to commit is sent from the sync point manager to the CPI Communications component. The CPI Communications component of System X propagates the request to its counterpart, the CPI Communications component of System Y, using the CPI Communications conversation. Any data remaining in Program A's send buffer is flushed at this point.
11	Program C's Receive call executes successfully and it receives the take-commit notification from the CPI Communications component of System Y.
12	Program C responds to the take-commit notification by issuing a resource recovery commit call.
13	Commit-processing protocols are exchanged between the two sync point managers.
14	Both Program A and Program C receive return codes that indicate successful completion of the commit operation. Program A can now send more data to Program C.

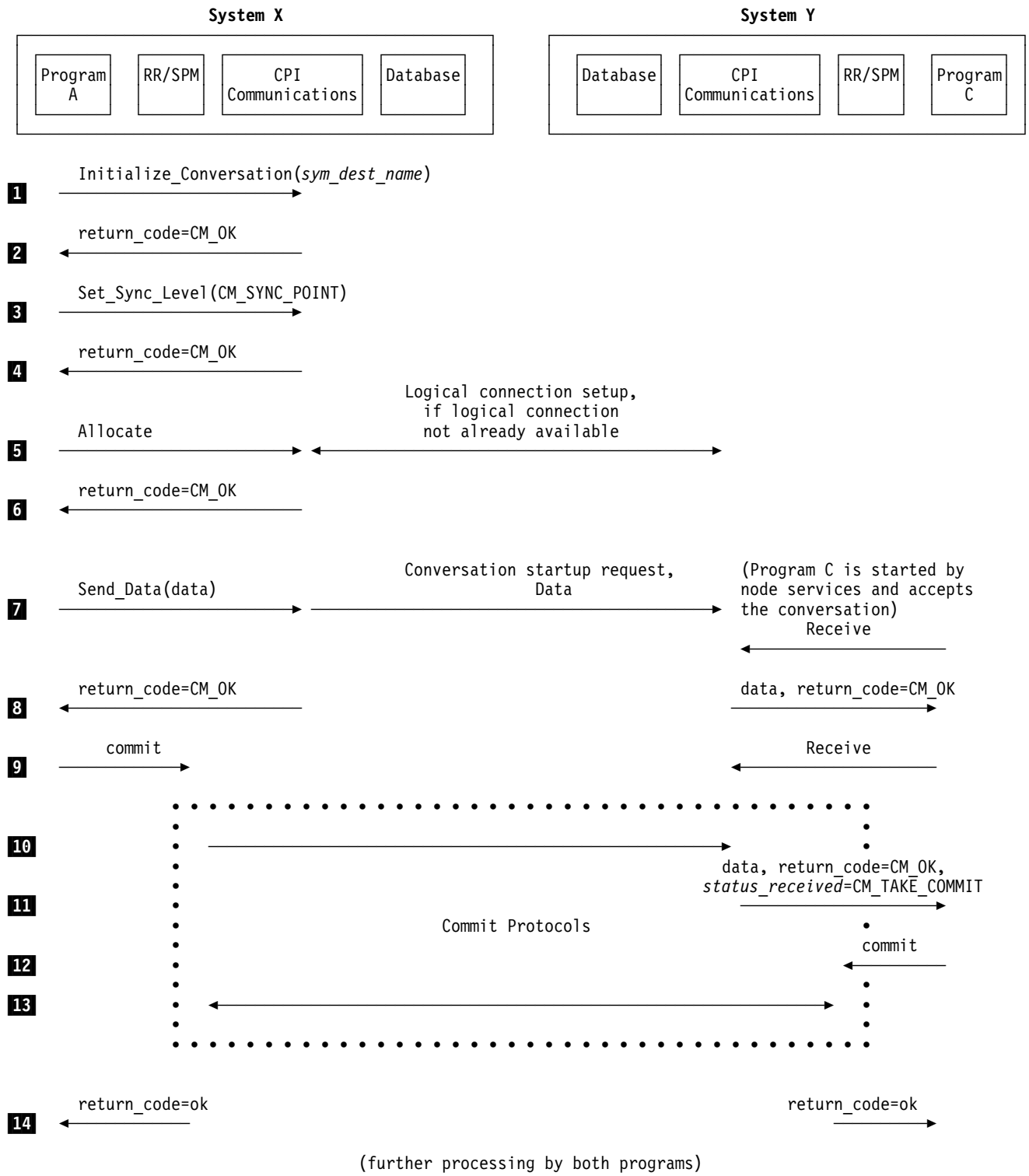

Figure 24. Establishing a Protected Conversation and Issuing a Successful Commit

Example 16: Successful Commit with Conversation State Change

Figure 25 on page 99 shows a successful commit with a conversation state change on a half-duplex conversation.

The steps shown in Figure 25 are:

Step	Description
1	Program C's end of a protected conversation is in **Receive** state. It issues a Receive call.
2 and 3	Program A wants its side of the CPI Communications conversation to be changed from **Send** to **Receive** state after it issues its next commit call. To do this, Program A uses the Set_Prepare_To_Receive_Type call to set the *prepare_to_receive_type* conversation characteristic to CM_PREP_TO_RECEIVE_SYNC_LEVEL.
4 and 5	Program A issues a Prepare_To_Receive call. Because the *prepare_to_receive_type* conversation characteristic is set to CM_PREP_TO_RECEIVE_SYNC_LEVEL, Program A's side of the conversation is now in **Defer-Receive** state until Program A issues a commit call.
6	Program A issues a resource recovery commit call in **Defer-Receive** state. If the call completes successfully, Program A's end of the conversation will be placed in **Receive** state.
7	The sync point manager of System X sends Program A's request to commit to the CPI Communications component of System X, which passes it to the CPI Communications component of System Y. Any data remaining in Program A's send buffer is flushed at this point.
8	Because Program A was in **Defer-Receive** state when it issued the commit call, the CPI Communications component of System Y returns the take-commit notification to Program C as a CM_TAKE_COMMIT_SEND value in the *status_received* parameter. This value means that if Program C completes a commit call successfully, its end of the conversation will be placed in **Send** state.
9	Program C responds to the take-commit notification with a resource recovery commit call.
10 through 12	The database managers and the sync point managers on the two systems participate in the protocol flows necessary to accomplish the commit.
13	Both commit calls end successfully.
14	Program A's end of the conversation is now in **Receive** state and it issues a Receive call. Program C's end of the conversation is in **Send** state and it issues a Send_Data call. **Note:** If the commit is unsuccessful and responses indicating backout are received on the commit calls by Programs A and C, the conversation states for Programs A and C are reset to their values at the time of the last sync point. The program can retrieve the current conversation state by using the CPI Communications Extract_Conversation_State call.

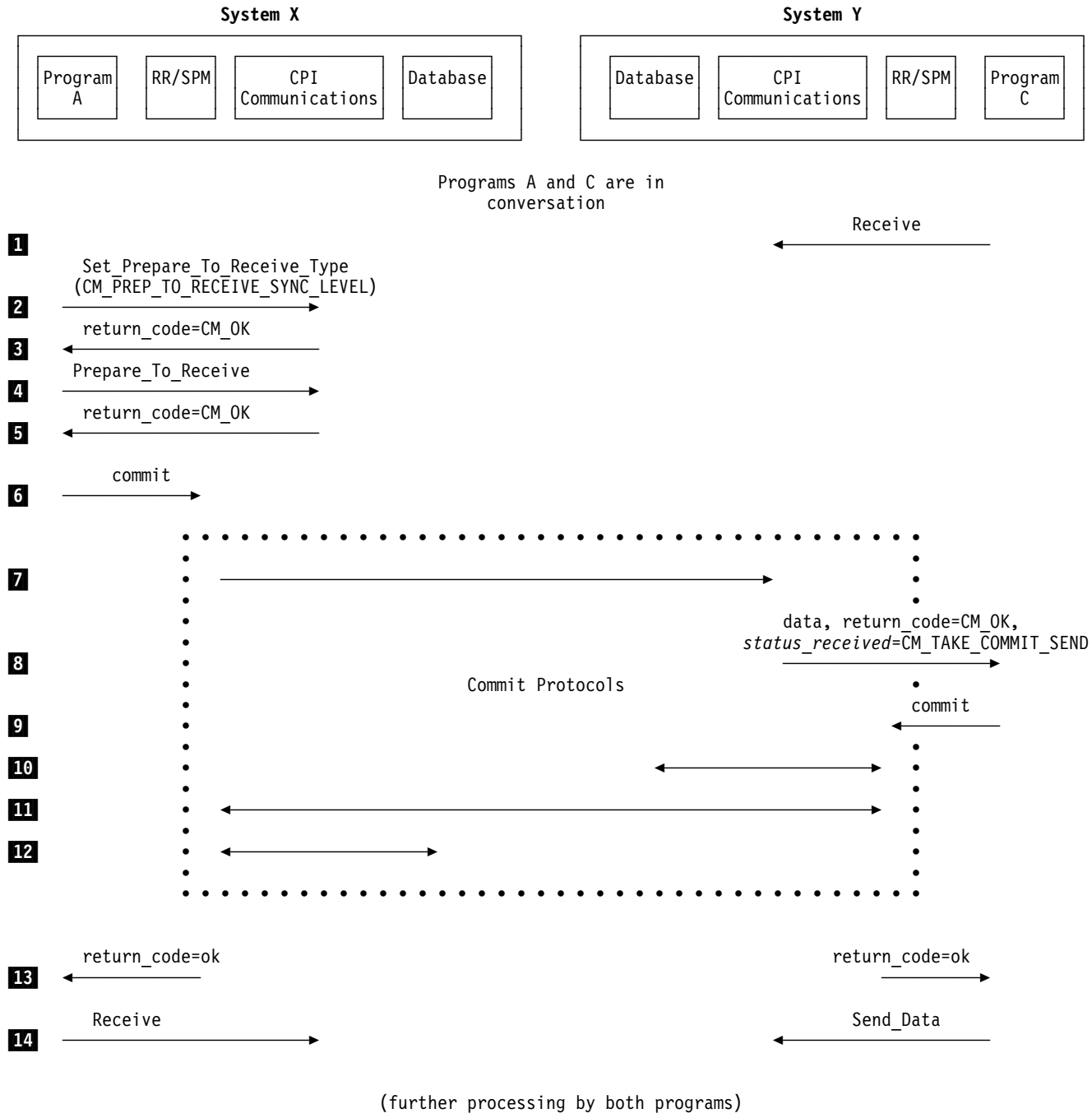

Figure 25. A Successful Commit with Conversation State Change

Example 17: Conversation Deallocation before the Commit Call

Figure 26 on page 101 shows a commit call issued after a CPI Communications Deallocate call on a half-duplex conversation.

The steps shown in Figure 26 are:

Step	Description
1	Program C's end of a protected conversation is in **Receive** state. It issues a Receive call.
2 and 3	Program A wants to deallocate the conversation after issuing a commit call. To accomplish this, Program A chooses to issue a Set_Deallocate_Type call with the *deallocate_type* parameter set to CM_DEALLOCATE_SYNC_LEVEL.
4 and 5	Program A next issues a Deallocate call. CPI Communications completes the call, and places Program A's side of the conversation in **Defer-Deallocate** state.
6	Program A issues a resource recovery commit call. If the call completes successfully, Program A's end of the conversation will be deallocated (put in **Reset** state).
7	The sync point manager of System X sends Program A's request to commit to the CPI Communications component of System X, which passes it to the CPI Communications component of System Y. Any data remaining in Program A's send buffer is flushed at this point.
8	Because Program A's end of the conversation was in **Defer-Deallocate** state when Program A issued the commit call, Program C receives the take-commit notification as a CM_TAKE_COMMIT_DEALLOCATE value in the *status_received* parameter of its Receive call.
9	Program C responds to the take-commit notification by issuing a resource recovery commit call. The CM_TAKE_COMMIT_DEALLOCATE value means that if this commit is successful, Program C's end of the conversation will be deallocated (put in **Reset** state).
10 through 12	The database managers and the sync point managers on the two systems participate in the protocol flows necessary to accomplish the commit.
13	Both commit calls end successfully. **Note:** If the commit is unsuccessful and responses indicating backout are received on the commit calls by Programs A and C, the conversation is not deallocated. The conversation states for Programs A and C are reset to their values at the time of the last sync point. The program can retrieve the current conversation state by using the CPI Communications Extract_Conversation_State call.

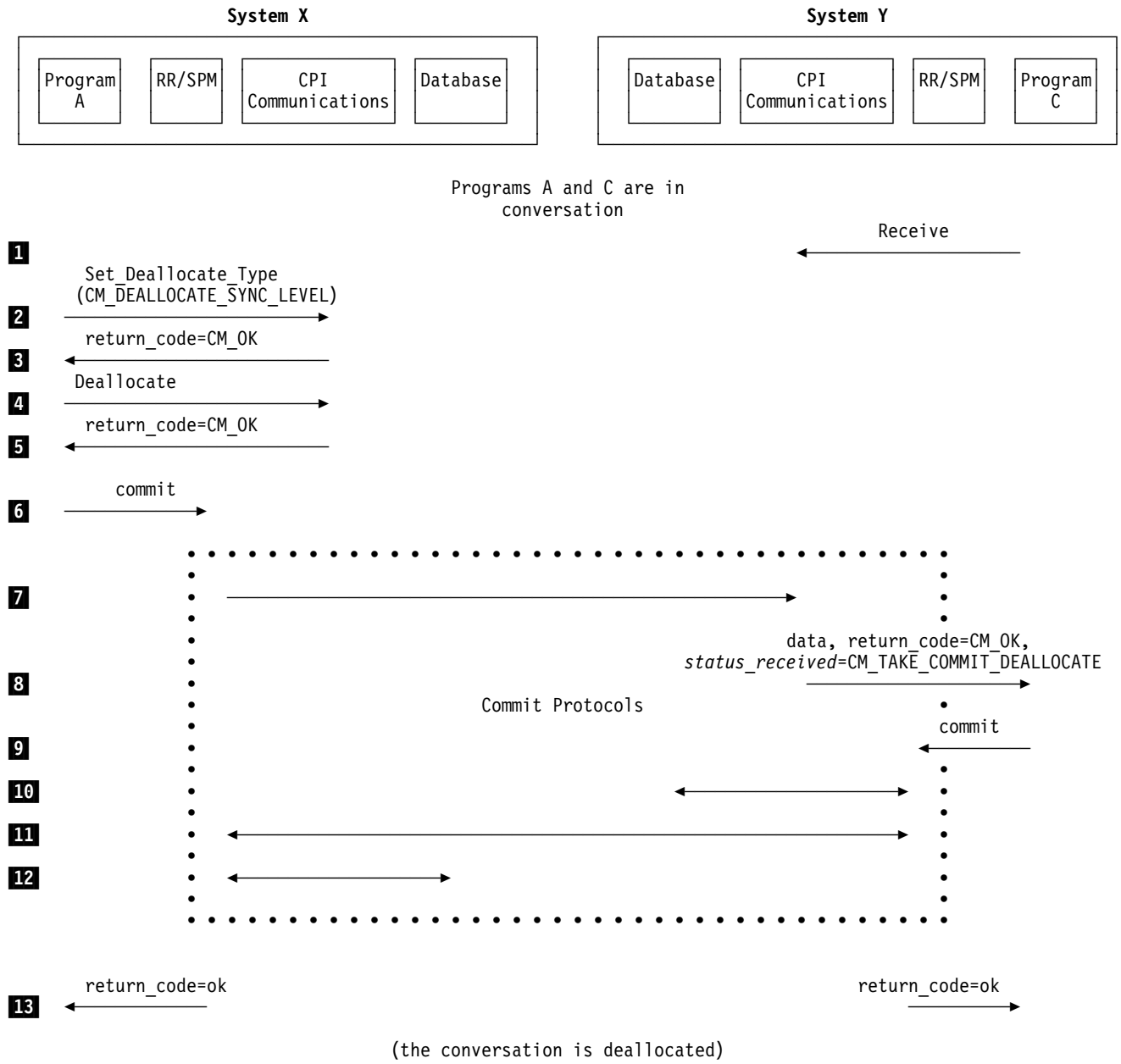

Figure 26. Conversation Deallocation Precedes the Commit Call

Part 2. CPI-C 2.1 Call Reference

Chapter 4. Call Reference 107
Call Syntax 107
Programming Language Considerations 108
Application Generator 108
C 108
COBOL 109
FORTRAN 109
PL/I 109
REXX 109
RPG 110
How to Use the Call References 110
Locations of Key Topics 110
Summary List of Calls and Their Descriptions 111
Accept_Conversation (CMACCP) 116
Accept_Incoming (CMACCI) 118
Allocate (CMALLC) 121
Cancel_Conversation (CMCANC) 128
Confirm (CMCFM) 130
Confirmed (CMCFMD) 134
Convert_Incoming (CMCNVI) 136
Convert_Outgoing (CMCNVO) 138
Deallocate (CMDEAL) 140
Deferred_Deallocate (CMDFDE) 151
Extract_AE_Qualifier (CMEAEQ) 153
Extract_AP_Title (CMEAPT) 155
Extract_Application_Context_Name (CMEACN) 157
Extract_Conversation_Context (CMECTX) 159
Extract_Conversation_State (CMECS) 161
Extract_Conversation_Type (CMECT) 163
Extract_Initialization_Data (CMEID) 165
Extract_Mapped_Initialization_Data (CMEMID) 167
Extract_Maximum_Buffer_Size (CMEMBS) 170
Extract_Mode_Name (CMEMN) 172
Extract_Partner_ID (CMEPID) 174
Extract_Partner_LU_Name (CMEPLN) 177
Extract_Secondary_Information (CMESI) 179
Extract_Security_User_ID (CMESUI) 182
Extract_Send_Receive_Mode (CMESRM) 184
Extract_Sync_Level (CMESL) 186
Extract_TP_Name (CMETPN) 188
Extract_Transaction_Control (CMETC) 190
Flush (CMFLUS) 192
Include_Partner_In_Transaction (CMINCL) 195
Initialize_Conversation (CMINIT) 197
Initialize_For_Incoming (CMINIC) 199
Prepare (CMPREP) 201
Prepare_To_Receive (CMPTR) 204
Receive (CMRCV) 209
Receive_Expedited_Data (CMRCVX) 223
Receive_Mapped_Data (CMRCVM) 226

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Release_Local_TP_Name (CMRLTP) 239
Request_To_Send (CMRTS) 241
Send_Data (CMSEND) 244
Send_Error (CMSERR) 254
Send_Expedited_Data (CMSNDX) 263
1 Send_Mapped_Data (CMSNDM) 266
Set_AE_Qualifier (CMSAEQ) 275
Set_Allocate_Confirm (CMSAC) 277
Set_AP_Title (CMSAPT) 279
Set_Application_Context_Name (CMSACN) 281
Set_Begin_Transaction (CMSBT) 283
Set_Confirmation_Urgency (CMSCU) 285
Set_Conversation_Security_Password (CMSCSP) 287
Set_Conversation_Security_Type (CMSCST) 289
Set_Conversation_Security_User_ID (CMSCSU) 292
Set_Conversation_Type (CMSCT) 294
Set_Deallocate_Type (CMSDT) 296
Set_Error_Direction (CMSED) 300
Set_Fill (CMSF) 303
Set_Initialization_Data (CMSID) 305
Set_Join_Transaction (CMSJT) 307
Set_Log_Data (CMSLD) 309
1 Set_Mapped_Initialization_Data (CMSMID) 311
Set_Mode_Name (CMSMN) 314
Set_Partner_ID (CMSPID) 316
Set_Partner_LU_Name (CMSPLN) 320
Set_Prepare_Data_Permitted (CMSPDP) 322
Set_Prepare_To_Receive_Type (CMSPTR) 324
Set_Processing_Mode (CMSPM) 326
Set_Queue_Callback_Function (CMSQCF) 329
Set_Queue_Processing_Mode (CMSQPM) 332
Set_Receive_Type (CMSRT) 335
Set_Return_Control (CMSRC) 337
Set_Send_Receive_Mode (CMSSRM) 340
Set_Send_Type (CMSST) 342
Set_Sync_Level (CMSSL) 344
Set_TP_Name (CMSTPN) 347
Set_Transaction_Control (CMSTC) 349
Specify_Local_TP_Name (CMSLTP) 351
Test_Request_To_Send_Received (CMTRTS) 353
Wait_For_Completion (CMWCMP) 356
Wait_For_Conversation (CMWAIT) 359
Extract_Conversation_LUWID (XCECL) 362
Extract_Conversation_Security_User_ID (XCECSU) 364
Extract_Conversation_Workunitid (XCECWU) 366
Extract_Local_Fully_Qualified_LU_Name (XCELFQ) 368
Extract_Remote_Fully_Qualified_LU_Name (XCERFQ) 370
Extract_TP_Name (XCETPN) 372
Identify_Resource_Manager (XCIDRM) 373
Set_Client_Security_User_ID (XCSCUI) 377
Set_Conversation_Security_Password (XCSCSP) 380
Set_Conversation_Security_Type (XCSCST) 382
Set_Conversation_Security_User_ID (XCSCSU) 384
Signal_User_Event (XCSUE) 386

Terminate_Resource_Manager (XCTRRM) 388
Wait_on_Event (XCWOE) 389
VM/ESA Variables and Characteristics 394
Pseudonyms and Integer Values 394
Variable Types and Lengths 395
VM/ESA Special Notes 395
Program-Startup Processing 396
End-of-Command Processing 396
Work Units 396
External Interrupts 397
Coordination with the SAA Resource Recovery Interface 397
Additional Conversation Characteristics 397
TP-Model Applications in VM/ESA 398
LU 6.2 Communications Model 398
VM/ESA TP-Model Applications 399
Implications 400
VM/ESA-Specific Notes for CPI Communications Routines 401
VM/ESA Communications Events 403
The VMCPIC Event 404
Notes on the VMCPIC Event 405
Using the Online HELP Facility 406

Chapter 4. Call Reference

This chapter describes the CPI Communications calls. Also, this chapter provides the function of each call and any optional setup calls that can be issued before the call being described. In addition, the following information is provided:

- **Communications Resource Manager Box**

  The CRM box identifies the CRMs on which the call is applicable. The possible values are LU 6.2 and OSI TP.

- **Format**

  The format used to program the call.

  Note: The actual syntax used to program the calls in this chapter depends on the programming language used. See “Call Syntax” for specifics.

- **Parameters**

  The parameters that are required for the call. Parameters are identified as *input* parameters (that is, set by the calling program and used as input to CPI Communications) or *output* parameters (that is, set by CPI Communications before returning control to the calling program).

- **State Changes**

  The changes in the conversation state that can result from this call. See “Program Flow—States and Transitions” on page 50 for more information on conversation states.

- **Usage Notes**

  Additional information that applies to the call.

- **Related Information**

  Where to find additional information related to the call.

Call Syntax

CPI Communications calls can be made from application programs written in a number of high-level programming languages.

In addition to the above programming languages, other languages may support CPI Communications calls in certain environments.

This book uses a general call format to show the name of the CPI Communications call and the parameters used. This is an example of that format:

```
CALL CMPROG (parm0,
             parm1,
             parm2,
               .
               .
             parmN)
```

where `CMPROG` is the name of the call, and `parm0, parm1, parm2,` and `parmN` represent the parameter list described in the individual call description.

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This format would be translated into the following syntax for each of the supported languages:

Application Generator (CSP)

```
CALL CMPROG parm0,parm1,parm2,...parmN
```

C

```
CMPROG (parm0,parm1,parm2,...parmN)
```

COBOL

```
CALL "CMPROG" USING parm0,parm1,parm2,...parmN
```

FORTRAN

```
CALL CMPROG (parm0,parm1,parm2,...parmN)
```

PL/I

```
CALL CMPROG (parm0,parm1,parm2,...parmN)
```

REXX

```
ADDRESS CPICOMM 'CMPROG parm0 parm1 parm2 ...  parmN'
```

RPG

```
CALL 'CMPROG'
PARM           parm1
PARM           parm2
 .              .
 .              .
 .              .
PARM           parmN
```

Programming Language Considerations

This section describes programming language considerations to keep in mind when writing and running a program that uses CPI Communications. Sample pseudonym files are on the diskette that came with this manual. Customized pseudonym files or datasets for supported programming languages may be available on systems that implement CPI Communications.

Note: Some programming language processors (compilers and interpreters) may not support the asynchronous modification of a program's variables by another process. Use of non-blocking operations is not possible by programs using these language processors.

Application Generator

Cross System Product (CSP) is the implementing product for the Application Generator common programming interface.

No special considerations apply to CPI Communications programs written in CSP.

C

The following notes apply to C programs using CPI Communications calls:

- When passing an integer value as a parameter, prefix the parameter name with an ampersand (&) so that the value is passed by reference.
- To pass a parameter as a string literal, surround it with double quotes rather than single quotes.

- To enable asynchronous updates of program variables, the return parameters on a non-blocking call must be declared using the `volatile` qualifier as defined in ANSI C.

COBOL

The following notes apply to COBOL programs using CPI Communications calls:

- Because COBOL does not support the underscore character (_), the underscores in COBOL pseudonyms are replaced with dashes (-). For example, COBOL programmers use CM-IMMEDIATE as a pseudonym value name in their programs instead of CM_IMMEDIATE.
- Each argument in the parameter list must be called (listed) by name.
- Each variable in the parameter list must be level 01.
- Number variables must be full words (at least five but less than ten “9”s) and they must be COMP-4, not zoned decimal.

FORTRAN

The following notes apply to FORTRAN programs using CPI Communications calls:

- The EXTERNAL statement may be required for each CPI Communications call that is issued, depending on the environment being used. The PRAGMA statement may also be required. EXTERNAL and PRAGMA statements may be included in the FORTRAN pseudonym file provided for a given environment.
- To enable asynchronous updates of program variables, the return parameters on a non-blocking call must be declared using the `VOLATILE` qualifier.

PL/I

The following notes apply to PL/I programs using CPI Communications calls:

- Numbers in the parameter list must be declared, initialized, and passed as variables.
- ENTRY declaration statements should be used for each CPI Communications call that is issued. ENTRY declaration statements may be included in the PL/I pseudonym file provided for a given environment.
- To enable asynchronous updates of program variables, the return parameters on a non-blocking call must be declared using the `ABNORMAL` qualifier.

REXX

The following notes apply to REXX programs using CPI Communications calls:

- REXX programs must use the ADDRESS CPICOMM statement to access CPI Communications calls. These calls are not accessible through the REXX CALL statement interface.
- Character strings returned by CPI Communications calls are stored in variables with the maximum allowable length. (Maximum lengths are shown in Appendix A, “Variables and Characteristics.”) However, there is a returned length variable associated with the returned character string, which allows use of the REXX function

  ```
  LEFT(returned_char_string,returned_length)
  ```

  to get the correct amount of data.

(This note does not apply to returned fixed-length character strings. For instance, a *conversation_ID* returned from the Accept_Conversation call always has a length of 8 bytes.)

RPG

The following note applies to RPG programs using CPI Communications calls:

- Because RPG supports only variable names with lengths of 1–6 characters, the pseudonym names for RPG have been abbreviated. For example, RPG programmers should use IMMED as a pseudonym name in their programs instead of CM_IMMEDIATE.

How to Use the Call References

Here is an example of how the information in this chapter can be used in connection with the rest of the book. The example describes how to use the Set_Return_Control call to set the conversation characteristic of *return_control* to a value of CM_IMMEDIATE.

- "Set_Return_Control (CMSRC)" on page 337 contains the semantics of the variables used for the call. It explains that the real name of the program call for Set_Return_Control is CMSRC and that CMSRC has a parameter list of *conversation_ID*, *return_control*, and *return_code*.
- "Call Syntax" on page 107 shows the syntax for the programming language being used.
- Appendix A, "Variables and Characteristics" provides a complete description of all variables used in the book and shows that the *return_control* variable, which goes into the call as a parameter, is a 32-bit integer. This information is provided in Table 21 on page 422.
- Table 19 on page 412 in Appendix A, "Variables and Characteristics" shows that CM_IMMEDIATE, which is placed into the *return_control* parameter on the call to CMSRC, is defined as having an integer value of 1.
- Finally, the *return_code* value CM_OK, which is returned to the program on the CMSRC call, is defined in Appendix B, "Return Codes and Secondary Information." CM_OK means that the call completed successfully.

Locations of Key Topics

The following table provides a summary list of program calls in pseudonym sequence. Against each pseudonym is shown the actual call name, a brief description, and the call's location in this chapter. Key-topic discussions and where they occur are:

- "Naming Conventions—Calls, Characteristics, Variables, and Values" on page 11 describes the naming conventions used throughout the book.
- "Data Buffering and Transmission" on page 42 discusses program control over data transmission.
- "Usage Notes" of "Request_To_Send (CMRTS)" on page 242 discusses how a conversation enters **Receive** state.
- "Usage Notes" of "Send_Data (CMSEND)" on page 251 describes the use of logical records and LL fields on basic conversations.

Summary List of Calls and Their Descriptions

Table 13 (Page 1 of 5). List of CPI-C Calls and Their Descriptions

Pseudonym	Call	Description	Page
Accept_Conversation	CMACCP	Used by a program to accept an incoming conversation.	116
Accept_Incoming	CMACCI	Used by a program to accept an incoming conversation previously initialized with the Initialize_For_Incoming call.	118
Allocate	CMALLC	Used by a program to establish a conversation.	121
Cancel_Conversation	CMCANC	Used by a program to end a conversation immediately.	128
Confirm	CMCFM	Used by a program to send a confirmation request to its partner.	130
Confirmed	CMCFMD	Used by a program to send a confirmation reply to its partner.	134
Convert_Incoming	CMCNVI	Used by a program to change the encoding of a character string from EBCDIC to the local encoding used by the program.	136
Convert_Outgoing	CMCNVO	Used by a program to change the encoding of a character string from the local encoding used by the program to EBCDIC.	138
Deallocate	CMDEAL	Used by a program to end a conversation.	140
Deferred_Deallocate	CMDFDE	Used by a program to end a conversation following successful completion of the current transaction.	151
Extract_AE_Qualifier	CMEAEQ	Used by a program to view the current *ae_qualifier* conversation characteristic.	153
Extract_AP_Title	CMEAPT	Used by a program to view the current *ap_title* conversation characteristic.	155
Extract_Application_Context_Name	CMEACN	Used by a program to view the current *application_context_name* conversation characteristic.	157
Extract_Conversation_Context	CMECTX	Used by a program to extract the *context_ID* for a conversation.	159
Extract_Conversation_State	CMECS	Used by a program to view the current state of a conversation.	161
Extract_Conversation_Type	CMECT	Used by a program to view the current *conversation_type* conversation characteristic.	163
Extract_Initialization_Data	CMEID	Used by a program to extract the current *initialization_data* conversation characteristic.	165
Extract_Mapped_Initialization_Data	CMEMID	Used by a program to extract the *initialization_data* conversation characteristic for mapped initialization data.	167
Extract_Maximum_Buffer_Size	CMEMBS	Used by a program to extract the maximum buffer size supported by the system.	170

Table 13 (Page 2 of 5). List of CPI-C Calls and Their Descriptions

Pseudonym	Call	Description	Page
Extract_Mode_Name	CMEMN	Used by a program to view the current *mode_name* conversation characteristic.	172
Extract_Partner_ID	CMEPID	Used by a program to view the current *partner_ID* conversation characteristic.	174
Extract_Partner_LU_Name	CMEPLN	Used by a program to view the current *partner_LU_name* conversation characteristic.	177
Extract_Secondary_Information	CMESI	Used by a program to extract secondary information associated with the return code for a given call.	179
Extract_Security_User_ID	CMESUI	Used by a program to view the current *security_user_ID* conversation characteristic.	182
Extract_Send_Receive_Mode	CMESRM	Used by a program to view the current *send_receive_mode* conversation characteristic.	184
Extract_Sync_Level	CMESL	Used by a program to view the current *sync_level* conversation characteristic.	186
Extract_TP_Name	CMETPN	Used by a program to determine the *TP_name* characteristic's value for a given conversation.	188
Extract_Transaction_Control	CMETC	Used by a program to extract the *transaction_control* characteristic's value for a given conversation.	190
Flush	CMFLUS	Used by a program to flush the local CRM's send buffer.	192
Include_Partner_In_Transaction	CMINCL	Used by a program to include a partner program in a transaction.	195
Initialize_Conversation	CMINIT	Used by a program to initialize the conversation characteristics for an outgoing conversation.	197
Initialize_For_Incoming	CMINIC	Used by a program to initialize the conversation characteristics for an incoming conversation.	199
Prepare	CMPREP	Used by a program to prepare a subordinate for a commit operation.	201
Prepare_To_Receive	CMPTR	Used by a program to change a conversation from **Send** to **Receive** state in preparation to receive data.	204
Receive	CMRCV	Used by a program to receive data.	209
Receive_Expedited_Data	CMRCVX	Used by a program to receive expedited data from its partner.	223
Receive_Mapped_Data	CMRCVM	Used by a program to receive mapped data to its partner.	226
Release_Local_TP_Name	CMRLTP	Used by a program to release a name.	239
Request_To_Send	CMRTS	Used by a program to notify its partner that it would like to send data.	241
Send_Data	CMSEND	Used by a program to send data.	244

Table 13 (Page 3 of 5). List of CPI-C Calls and Their Descriptions

Pseudonym	Call	Description	Page
Send_Error	CMSERR	Used by a program to notify its partner of an error that occurred during the conversation.	254
Send_Expedited_Data	CMSNDX	Used by a program to send expedited data to its partner.	263
Send_Mapped_Data	CMSNDM	Used by a program to send mapped data to its partner	266
Set_AE_Qualifier	CMSAEQ	Used by a program to set the *ae_qualifier* conversation characteristic.	275
Set_Allocate_Confirm	CMSAC	Used by a program to set the *allocate_confirm* conversation characteristic.	277
Set_AP_Title	CMSAPT	Used by a program to set the *ap_title* conversation characteristic.	279
Set_Application_Context_Name	CMSACN	Used by a program to set the *application_context_name* conversation characteristic.	281
Set_Begin_Transaction	CMSBT	Used by a program to set the *begin_transaction* conversation characteristic.	283
Set_Confirmation_Urgency	CMSCU	Used by a program to set the *confirmation_urgency* conversation characteristic.	281
Set_Conversation_Security_Password	CMSCSP	Used by a program to set the *security_password* conversation characteristic.	287
Set_Conversation_Security_Type	CMSCST	Used by a program to set the *conversation_security_type* conversation characteristic.	289
Set_Conversation_Security_User_ID	CMSCSU	Used by a program to set the *security_user_ID* conversation characteristic.	292
Set _Conversation_Type	CMSCT	Used by a program to set the *conversation_type* conversation characteristic.	294
Set_Deallocate_Type	CMSDT	Used by a program to set the *deallocate_type* conversation characteristic.	296
Set_Error_Direction	CMSED	Used by a program to set the *error_direction* conversation characteristic.	300
Set_Fill	CMSF	Used by a program to set the *fill* conversation characteristic.	303
Set_Initialization_Data	CMSID	Used by a program to set the *initialization_data* conversation characteristic.	305
Set_Join_Transaction	CMSJT	Used by a program to set the *join_transaction* conversation characteristic.	307
Set_Log_Data	CMSLD	Used by a program to set the *log_data* conversation characteristic.	309

Table 13 (Page 4 of 5). List of CPI-C Calls and Their Descriptions

Pseudonym	Call	Description	Page
Set_Mapped_Initialization_Data	CMSMID	Used by a program to set the initialization_data conversation characteristic for mapped initialization data.	311
Set_Mode_Name	CMSMN	Used by a program to set the *mode_name* conversation characteristic.	314
Set_Partner_ID	CMSPID	Used by a program to set the *partner_ID* conversation characteristic.	316
Set_Partner_LU_Name	CMSPLN	Used by a program to set the *partner_LU_name* conversation characteristic.	320
Set_Prepare_Data_Permitted	CMSPDP	Used by a program to set the *prepare_data_permitted* conversation characteristic.	322
Set_Prepare_To_Receive_Type	CMSPTR	Used by a program to set the *prepare_to_receive_type* conversation characteristic.	324
Set_Processing_Mode	CMSPM	Used by a program to set the *processing_mode* conversation characteristic.	326
Set_Queue_Callback_Function	CMSQCF	Used by a program to set a callback function and a user field for a given conversation queue and to set the queue's processing mode to CM_NON_BLOCKING.	329
Set_Queue_Processing_Mode	CMSQPM	Used by a program to set the processing mode for a given conversation queue and to associate an outstanding-operation identifier (OOID) and a user field with the queue.	332
Set_Receive_Type	CMSRT	Used by a program to set the *receive_type* conversation characteristic.	335
Set_Return_Control	CMSRC	Used by a program to set the *return_control* conversation characteristic.	337
Set_Send_Receive_Mode	CMSSRM	Used by a program to set the *send_receive_mode* conversation characteristic.	340
Set_Send_Type	CMSST	Used by a program to set the *send_type* conversation characteristic.	342
Set_Sync_Level	CMSSL	Used by a program to set the *sync_level* conversation characteristic.	344
Set_TP_Name	CMSTPN	Used by a program to set the *TP_Name* conversation characteristic.	347
Set_Transaction_Control	CMSTC	Used by a program to set the *transaction_control* conversation characteristic.	349
Specify_Local_TP_Name	CMSLTP	Used by a program to associate a name with itself.	351
Test_Request_To_Send_Received	CMTRTS	Used by a program to determine whether or not the remote program is requesting to send data.	353

Table 13 (Page 5 of 5). List of CPI-C Calls and Their Descriptions

Pseudonym	Call	Description	Page
Wait_For_Completion	CMWCMP	Used by a program to wait for completion of one or more outstanding operations represented in a specified outstanding-operation-ID (OOID) list.	356
Wait_For_Conversation	CMWAIT	Used by a program to wait for the completion of any conversation-level outstanding operation.	359

Accept_Conversation (CMACCP)

LU 6.2	OSI TP

The Accept_Conversation (CMACCP) call accepts an incoming conversation. Like Initialize_Conversation, this call initializes values for various conversation characteristics. The difference between the two calls is that the program that will later allocate the conversation issues the Initialize_Conversation call, and the partner program that will accept the conversation after it is allocated issues the Accept_Conversation call.

Format

```
CALL CMACCP(conversation_ID,
            return_code)
```

Parameters

conversation_ID *(output)*
Specifies the conversation identifier assigned to the conversation. CPI Communications supplies and maintains the *conversation_ID*. When the *return_code* is set equal to CM_OK, the value returned in this parameter is used by the program on all subsequent calls issued for this conversation.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_DEALLOCATED_ABEND
  This value indicates, that CPI Communications deallocated the incoming conversation because an implicit call of tx_set_transaction_control or tx_begin failed.
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - No incoming conversation exists.
  - No name is associated with the program. A program associates a name with itself by issuing the Specify_Local_TP_Name call.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

For half-duplex conversations, when *return_code* is set equal to CM_OK, the conversation enters **Receive** state.

For full-duplex conversations, when *return_code* is set equal to CM_OK, the conversation enters **Send-Receive** state.

Usage Notes

1. For each conversation, CPI Communications assigns a unique identifier (the *conversation_ID*) that the program uses in all future calls intended for that conversation. Therefore, the program must issue the Accept_Conversation call before any other calls can refer to the conversation.
2. There may be a system-defined limit on the number of conversations that a program can accept or allocate, but CPI Communications imposes no limit.
3. For a list of the conversation characteristics that are initialized when the Accept_Conversation call completes successfully, see Table 2 on page 33.
4. CPI Communications makes incoming conversations available to programs based upon names that are associated with the program. Specifically, those names associated with the program at the time the Accept_Conversation call is issued are used to satisfy that Accept_Conversation call. These names come either from locally defined information or from execution of the Specify_Local_TP_Name call. An implementation may place restrictions on the actions that a program may take before issuing Accept_Conversation in order to properly identify programs with associated names.
5. An implementation may choose to specify a minimum time before returning CM_PROGRAM_STATE_CHECK when no incoming conversation has arrived for the program.
6. Accept_Conversation always functions as if the *processing_mode* were set to CM_BLOCKING. A program that must be able to accept incoming conversations in a non-blocking mode should use the Initialize_For_Incoming and Accept_Incoming calls. The processing mode for the conversation can be set to CM_NON_BLOCKING prior to issuing Accept_Incoming.
7. A new context is created as a result of the successful completion of the Accept_Conversation call, and the conversation is assigned to the new context. The program's current context is set to the new context by node services.

Related Information

"Conversation Characteristics" on page 31 provides a comparison of the conversation characteristics set by Initialize_For_Incoming, Initialize_Conversation, and Accept_Conversation.

"Example 1: Data Flow in One Direction" on page 67 shows an example program flow using the Accept_Conversation call to accept a half-duplex conversation.

"Example 8: Establishing a Full-Duplex Conversation" on page 82 shows an example program flow using an Accept_Conversation call to accept a full-duplex conversation.

"Initialize_Conversation (CMINIT)" on page 197 describes how the conversation characteristics are initialized for the program that allocates the conversation.

Accept_Incoming (CMACCI)

LU 6.2	OSI TP

A program uses the Accept_Incoming (CMACCI) call to accept an incoming conversation that has previously been initialized with the Initialize_For_Incoming call and to complete the initialization of the conversation characteristics.

Before issuing the Accept_Incoming call, a program has the option of issuing one of the following calls:

CALL CMSPM – Set_Processing_Mode
CALL CMSQPM – Set_Queue_Processing_Mode
CALL CMSQCF – Set_Queue_Callback_Function

Format

```
CALL CMACCI(conversation_ID,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier of a conversation that has been initialized for an incoming conversation.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_DEALLOCATED_ABEND
  This value indicates, that CPI Communications deallocated the incoming conversation because an implicit call of tx_set_transaction_control or tx_begin failed.
- CM_OPERATION_INCOMPLETE
- CM_CONVERSATION_CANCELED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates that the *conversation_ID* specifies an unassigned conversation identifier.
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - The conversation is not in **Initialize-Incoming** state.
  - No name is associated with the program. A program associates a name with itself by issuing the Specify_Local_TP_Name call.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

For half-duplex conversations, when *return_code* is set to CM_OK, the conversation enters **Receive** state.

For full-duplex conversations, when *return_code* is set to CM_OK, the conversation enters **Send-Receive** state.

Usage Notes

1. The Accept_Incoming call can be used only when an Initialize_For_Incoming call has already completed.
2. When Accept_Incoming successfully completes, CPI Communications initializes those conversation characteristics that use values from the conversation startup request. See Table 2 on page 33 for a list of the conversation characteristics and how they are set by Initialize_For_Incoming and Accept_Incoming.
3. If Accept_Incoming is issued as a blocking call and no incoming conversation is available for the program, the call blocks until a conversation startup request arrives. The program can ensure that it is not placed in a wait state by taking one of the following actions before issuing the Accept_Incoming call:
   - For conversation-level non-blocking — set the *processing_mode* characteristic to CM_NON_BLOCKING by using the Set_Processing_Mode call
   - For queue-level non-blocking — set the processing mode for the Initialization queue to CM_NON_BLOCKING by using the Set_Queue_Callback_Function call or the Set_Queue_Processing_Mode call.
4. If the program has successfully issued a Set_Processing_Mode call, the subsequent Accept_Incoming call will complete only when the conversation startup request is for a half-duplex conversation.
5. There may be a system-defined limit on the number of conversations that a program can accept or allocate, but CPI Communications imposes no limit.
6. CPI Communications makes incoming conversations available to programs based upon names that are associated with the program. Specifically, those names associated with the program at the time the Accept_Incoming call is issued are used to satisfy that Accept_Incoming call. These names come either from locally defined information or from execution of the Specify_Local_TP_Name call. An implementation may place restrictions on the actions that a program may take before issuing Accept_Incoming in order to properly identify programs with associated names.
7. A new context is created as a result of the successful completion of the Accept_Incoming call, and the conversation is assigned to the new context. If Accept_Incoming completes successfully with *return_code* set to CM_OK, the program's current context is set to the new context by node services. If Accept_Incoming is issued with *processing_mode* set to CM_NON_BLOCKING and gets the CM_OPERATION_INCOMPLETE return code, the program's current context is not changed if the Accept_Incoming call operation subsequently completes successfully as a result of the Wait_For_Conversation call.

Related Information

"Conversation Characteristics" on page 31 provides a comparison of the conversation characteristics set by Initialize_For_Incoming and Accept_Incoming.

"Example 12: Accepting Multiple Conversations Using Blocking Calls" on page 90 and "Example 13: Accepting Multiple Conversations Using Conversation-Level Non-Blocking Calls" on page 92 show example program flows using the Initialize_For_Incoming and Accept_Incoming calls.

"Initialize_For_Incoming (CMINIC)" on page 199 describes how the *conversation_ID* supplied on Accept_Incoming is assigned.

"Set_Processing_Mode (CMSPM)" on page 326 describes setting the *processing mode* conversation characteristic.

"Set_Queue_Callback_Function (CMSQCF)" on page 329 describes the how to set a callback function and related information for a non-blocking conversation queue.

"Set_Queue_Processing_Mode (CMSQPM)" on page 332 describes how to set the processing mode for a non-blocking conversation queue.

The calls beginning with "Extract" in this chapter are used to examine conversation characteristics established by the Accept_Incoming call.

Allocate (CMALLC)

LU 6.2	OSI TP

A program uses the Allocate (CMALLC) call to establish a basic or mapped conversation (depending on the *conversation_type* characteristic) with its partner program. The partner program is specified in the *TP_name* characteristic.

Before issuing the Allocate call, a program has the option of issuing one or more of the following calls:

CALL CMSAEQ – Set_AE_Qualifier
CALL CMSAC – Set_Allocate_Confirm
CALL CMSAPT – Set_AP_Title
CALL CMSACN – Set_Application_Context_Name
CALL CMSBT – Set_Begin_Transaction
CALL CMSCSP – Set_Conversation_Security_Password
CALL CMSCST – Set_Conversation_Security_Type
CALL CMSCSU – Set_Conversation_Security_User_ID
CALL CMSCT – Set_Conversation_Type
CALL CMSID – Set_Initialization_Data
1 CALL CMSMID – Set_Mapped_Initialization_Data
CALL CMSMN – Set_Mode_Name
CALL CMSPLN – Set_Partner_LU_Name
CALL CMSPM – Set_Processing_Mode
CALL CMSQCF – Set_Queue_Callback_Function
CALL CMSQPM – Set_Queue_Processing_Mode
CALL CMSRC – Set_Return_Control
CALL CMSSRM – Set_Send_Receive_Mode
CALL CMSSL – Set_Sync_Level
CALL CMSTPN – Set_TP_Name
CALL CMSTC – Set_Transaction_Control

Format

```
CALL CMALLC(conversation_ID,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier of an initialized conversation.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have the following values:

- CM_OK
- CM_OPERATION_INCOMPLETE
2 - CM_CONVERSATION_CANCELED

- CM_RETRY_LIMIT_EXCEEDED
  This value indicates that the system-specified retry limit was exceeded.
- CM_SEND_RCV_MODE_NOT_SUPPORTED
- CM_SYNC_LVL_NOT_SUPPORTED_SYS
- CM_PARAMETER_ERROR
  This value indicates one of the following:
  - The *mode_name* characteristic (set from side information or by Set_Mode_Name) specifies a mode name that is not recognized by the LU as being valid.
  - The *mode_name* characteristic (set from side information or by Set_Mode_Name) specifies a mode name that the local program does not have the authority to specify. For example, SNASVCMG requires special authority with LU 6.2.
  - The *TP_name* characteristic (set from side information or by Set_TP_Name) specifies a transaction program name that the local program does not have the appropriate authority to allocate a conversation to. For example, SNA service programs require special authority with LU 6.2. (For more information, see "SNA Service Transaction Programs" on page 499.)
  - The *TP_name* characteristic (set from side information or by Set_TP_Name) specifies an SNA service transaction program and *conversation_type* is set to CM_MAPPED_CONVERSATION.
  - The *partner_LU_name* characteristic (set from side information or by Set_Partner_LU_Name) specifies a partner LU name that is not recognized as being valid.
  - The *AP_title* characteristic (set from side information or using the Set_AP_Title call) or the *AE_qualifier* characteristic (set from side information or using the Set_AE_Qualifier call), or the *application_context_name* characteristic (set from side information or using the Set_Application_Context_Name call) specifies an AP title or an AE qualifier or an application context name that is not recognized as being valid.
  - The *conversation_security_type* characteristic is CM_SECURITY_PROGRAM or CM_SECURITY_PROGRAM_STRONG, and the *security_password* characteristic or the *security_user_ID* characteristic (set from side information or by SET calls), or both, are null.
  - The *conversation_security_type* is set to CM_SECURITY_DISTRIBUTED or CM_SECURITY_MUTUAL and the partner principal name (set from the program binding) is null or is not recognized by the CRM as being valid.
  - A *partner_ID* characteristic was provided that caused a search of the distributed directory, but no program binding was retrieved.
  - The program binding for the conversation, either specified directly on the Set_Partner_ID call or obtained from the distributed directory, was invalid.
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - The conversation is not in **Initialize** state.
  - The *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, *transaction_control* is set to CM_CHAINED_TRANSACTIONS, and the conversation's context is not in transaction.
  - For a conversation with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, the conversation's context is in the

Backout-Required condition. New protected conversations cannot be allocated for a context when it is in this condition.
  - The program has issued a successful Accept_Conversation or Accept_Incoming call on a conversation with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM and using an OSI TP CRM, and the program has not issued a Receive call on this conversation.
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates that the *conversation_ID* specifies an unassigned conversation identifier.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR
- CM_SECURITY_NOT_SUPPORTED
  This value indicates that the requested conversation security type could not be provided. This is either because the remote system does not accept the requested type of security from the local system or because the requested security does not transport the type of required user name identified in the program binding.

If *conversation_security_type* is set to CM_SECURITY_MUTUAL, *return_code* can have the following values:

- CM_SECURITY_NOT_VALID
  This value indicates that the remote system rejected the conversation startup request due to a security-related error.
- CM_SECURITY_MUTUAL_FAILED
  This value indicates that the remote system could not be successfully authenticated.
- CM_CONVERSATION_TYPE_MISMATCH
- CM_PIP_NOT_SPECIFIED_CORRECTLY
- CM_SYNC_LVL_NOT_SUPPORTED_PGM
- CM_TPN_NOT_RECOGNIZED
- CM_TP_NOT_AVAILABLE_NO_RETRY
- CM_TP_NOT_AVAILABLE_RETRY
- CM_RESOURCE_FAILURE_NO_RETRY
- CM_RESOURCE_FAILURE_RETRY

In addition, when *return_control* is set to CM_WHEN_SESSION_ALLOCATED, CM_WHEN_CONWINNER_ALLOCATED, or CM_WHEN_SESSION_FREE, the *return_code* can have the following values:

- CM_ALLOCATE_FAILURE_NO_RETRY
- CM_ALLOCATE_FAILURE_RETRY

If *return_control* is set to CM_IMMEDIATE, *return_code* can have the following value:

- CM_UNSUCCESSFUL

  This value indicates that the logical connection is not immediately available.

State Changes

For half-duplex conversations, when *return_code* is set to CM_OK, the conversation enters **Send** state.

For full-duplex conversations, when *return_code* is set to CM_OK, the conversation enters **Send-Receive** state.

Usage Notes

1. An allocation error resulting from the local system's failure to obtain a logical connection for the conversation is reported on the Allocate call. An allocation error resulting from the remote system's rejection of the conversation startup request is reported on a subsequent conversation call, unless *conversation_security_type* is set to CM_SECURITY_MUTUAL. In this case, the allocation error is reported on the Allocate call.
2. For CPI Communications to establish the conversation, CPI Communications must first establish a logical connection between the local system and the remote system, if such a connection does not already exist.
3. Depending on the circumstances, the local system can send the conversation startup request to the remote system as soon as it allocates a logical connection for the conversation. The local system can also buffer the conversation startup request until it accumulates enough information for transmission (from one or more subsequent Send_Data calls), or until the local program issues a subsequent call other than Send_Data that explicitly causes the system to flush its send buffer. The amount of information sufficient for transmission depends on the characteristics of the logical connection allocated for the conversation and can vary from one logical connection to another.
4. The local program can ensure that the remote program is connected as soon as possible by issuing Flush (CMFLUS) immediately after Allocate (CMALLC).
5. A set of security parameters is established for the conversation, based on the values of the security characteristics. See "Conversation Security" on page 49 for more information on conversation security.
6. When *return_control* is set to CM_IMMEDIATE, the call completes immediately, regardless of the processing mode in effect for the Allocate call. If a logical connection is not available, *return_code* is set to CM_UNSUCCESSFUL.
7. When a program allocates a conversation, the program's current context at the time the Allocate call is issued becomes the new conversation's context. If the program has multiple contexts (for example, as a result of accepting multiple conversations), it must ensure that the current context is set to the appropriate context before allocating the new conversation.
8. Initialization data specified by use of the Set_Initialization_Data (CMSID) call is sent to the remote program along with the conversation startup request. The remote program may extract the initialization data with the Extract_Initialization_Data (CMEID) call.
9. Initialization data specified by the use of the Set_Mapped_Initialization_Data (CMSMID) call is sent to the remote program along with the conversation startup request. The remote program may extract the initialization data with the Extract_Mapped_Initialization_Data (CMEMID) call.
10. By using the Set_Allocate_Confirm call, the program allocating the conversation may request notification that the remote program has confirmed its acceptance of the conversation.
11. If a conversation is using a particular CRM type, the Allocate call tries to establish a conversation using only the destination information for that CRM type.
12. If a program specifies destination information for both an OSI TP CRM and an LU 6.2 CRM but only one set of information is complete, the Allocate call tries

only the destination for which CPI Communications has complete information. If complete destination information exists for use of both an LU 6.2 CRM and an OSI TP CRM, the Allocate call tries to establish a logical connection using one and then the other destination. Only if both attempts fail does the Allocate call return either CM_ALLOCATE_FAILURE_* or CM_UNSUCCESSFUL.

13. CPI Communications programs can provide multiple program bindings for use on Allocate:

    - The program specifies a *distinguished_name* (either in side information or using the Set_Partner_ID call) that identifies a directory object containing multiple program bindings.
    - The program specifies a PFID with the Set_Partner_ID call that identifies multiple program installation objects with, possibly, multiple program bindings.
    - The program issues the Set_Partner_ID call with *partner_ID_scope* set to CM_REFERENCE. This allows CPI Communications to locate alternative installations of the same function if unable to establish a logical connection using the program binding obtained from the specified DN.
    - A program may use the Set_Partner_ID call with *partner_ID_type* set to CM_PROGRAM_BINDING and provide a *partner_ID* characteristic that contains multiple program bindings.

    In each of these cases, CPI Communications uses all available bindings to attempt to establish a logical connection, retrying until a logical connection is established or all bindings have been tried. The order of bindings used is determined by the method used. For example, a CM_REFERENCE option implies an ordering; the DN specified should be tried first. Alternatively, some implementations may be able to determine a “least cost” or “closest” partner and create an ordering based on network topology. Where no ordering for the bindings exists, random selection is enforced.

    Although no retry limit is provided at the CPI Communications level, a retry limit may be imposed by the local system to control the effects of retry. The form of this limit is system-specific; however, if a limit exists and is reached, the program is informed of this condition with a return code of CM_RETRY_LIMIT_EXCEEDED on the Allocate.

14. When *conversation_security_type* is CM_SECURITY_DISTRIBUTED or CM_SECURITY_MUTUAL, then the partner principal name must be set via a program binding before the Allocate. This can be done explicitly using the CMSPID call with *partner_ID_type* set to CM_PROGRAM_BINDING or implicitly using a directory.

15. Various *conversation_security_type* values and required_user_name_type values (from the program binding) cause the local CRM to reject an Allocate request with a *return_code* of CM_SECURITY_NOT_SUPPORTED. The incompatible combinations are shown in Table 7 on page 50.

Related Information

“Contexts and Context Management” on page 29 defines contexts and discusses how application programs can manage multiple contexts.

“Example 1: Data Flow in One Direction” on page 67 shows an example program flow using the Allocate call to establish a half-duplex conversation.

"Data Buffering and Transmission" on page 42 discusses control methods for data transmission.

"Example 8: Establishing a Full-Duplex Conversation" on page 82 shows an example program flow using an Allocate call to establish a full-duplex conversation.

"Extract_Conversation_Context (CMECTX)" on page 159 discusses the *context_ID* characteristic.

"Extract_Partner_ID (CMEPID)" on page 174 discusses the *partner_ID* characteristic.

"Set_AE_Qualifier (CMSAEQ)" on page 275 discusses the *AE_qualifier* conversation characteristic.

"Set_Allocate_Confirm (CMSAC)" on page 277 discusses the *allocate_confirm* conversation characteristic and explains an option for confirming acceptance of the conversation.

"Set_AP_Title (CMSAPT)" on page 279 discusses the *AP_title* conversation characteristic.

"Set_Application_Context_Name (CMSACN)" on page 281 discusses the *application_context_name* conversation characteristic.

"Set_Begin_Transaction (CMSBT)" on page 283 discusses the *begin_transaction* conversation characteristic.

"Set_Conversation_Security_Password (CMSCSP)" on page 287 discusses the *security_password* conversation characteristic.

"Set_Conversation_Security_Type (CMSCST)" on page 289 discusses the *conversation_security_type* conversation characteristic.

"Set_Conversation_Security_User_ID (CMSCSU)" on page 292 discusses the *security_user_ID* conversation characteristic.

"Set_Conversation_Type (CMSCT)" on page 294 discusses the *conversation_type* characteristic.

"Set_Initialization_Data (CMSID)" on page 305 and "Extract_Initialization_Data (CMEID)" on page 165 discuss the *initialization_data* conversation characteristic.

"Set_Mode_Name (CMSMN)" on page 314 discusses the *mode_name* conversation characteristic.

"Set_Partner_ID (CMSPID)" on page 316 discusses the *partner_ID* characteristic.

"Set_Mapped_Initialization_Data (CMSMID)" on page 311 discusses the *initialization_data conversation* characteristic for mapped initialization data.

"Set_Partner_LU_Name (CMSPLN)" on page 320 discusses the *partner_LU_name* conversation characteristic.

"Set_Processing_Mode (CMSPM)" on page 326 describes setting the *processing_mode* conversation characteristic.

"Set_Queue_Callback_Function (CMSQCF)" on page 329 discusses how to set a callback function and related information for a conversation queue.

"Set_Queue_Processing_Mode (CMSQPM)" on page 332 discusses how to set the processing mode for a conversation queue.

"Set_Return_Control (CMSRC)" on page 337 discusses the *return_control* characteristic.

"Set_Send_Receive_Mode (CMSSRM)" on page 340 discusses how to set the send-receive mode for a conversation.

"Set_Sync_Level (CMSSL)" on page 344 discusses the *sync_level* conversation characteristic.

"Set_TP_Name (CMSTPN)" on page 347 discusses the *TP_name* conversation characteristic.

"Set_Transaction_Control (CMSTC)" on page 349 discusses the *transaction_control* conversation characteristic.

"Program Binding" on page 429 describes the format of a program binding.

"SNA Service Transaction Programs" on page 499 discusses SNA service transaction programs.

Cancel_Conversation (CMCANC)

LU 6.2	OSI TP

A program uses Cancel_Conversation (CMCANC) to end a conversation immediately. Cancel_Conversation can be issued at any time, regardless of whether a previous operation is still in progress on the conversation.

Cancel_Conversation results in the immediate termination of any operations in progress on the specified conversation. The terminated operations will have a return code value of CM_CONVERSATION_CANCELLED. No other guarantees are given on the results of the terminated operations. For example, when a Cancel_Conversation call has been issued while a non-blocking Send_Data call is outstanding, the program cannot determine how much data was actually moved from the application buffer, nor can the program rely on the validity of any of the output parameters, except the return_code, for the terminated Send_Data call.

Format

```
CALL CMCANC(conversation_ID,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates that the *conversation_ID* specifies an unassigned conversation identifier.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

When *return_code* is set to CM_OK, the conversation enters **Reset** state.

Usage Notes

1. From the perspective of the local program, the conversation is terminated immediately. However, CPI Communications may not be able to notify the remote program until a later time.
2. A program is most likely to use the Cancel_Conversation call when a conversation with an outstanding operation must be terminated immediately.
3. The remote program will be notified of the termination of the conversation with the CM_DEALLOCATED_ABEND or CM_RESOURCE_FAILURE_RETRY return code or, if the conversation has *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM and backout is required, with the

CM_DEALLOCATED_ABEND_BO or CM_RESOURCE_FAILURE_RETRY_BO return code.

Note: For half-duplex conversations, if the conversation is using an LU 6.2 CRM and the remote program has issued Send_Error with its end of the conversation in **Receive** state, the incoming information containing notice of CM_DEALLOCATED_ABEND is purged, and a CM_DEALLOCATED_NORMAL or CM_DEALLOCATED_NORMAL_BO return code is reported instead of CM_DEALLOCATED_ABEND or CM_DEALLOCATED_ABEND_BO, respectively. See "Send_Error (CMSERR)" on page 254 for a complete discussion.

4. Program-supplied log data is not sent to the remote system as a result of a Cancel_Conversation call.
5. When Cancel_Conversation is issued for a protected conversation, the conversation's context may be placed in the **Backout-Required** condition.
6. If the Cancel_Conversation call is the first operation on the conversation following an Accept (CMACCP) or Accept_Incoming (CMACCI) call and an OSI TP CRM is being used, then any initialization data specified by the use of the Set_Initialization_Data (CMSID) or Set_Mapped_Initialization_Data (CMSMID) call is sent to the remote program.

Related Information

"Non-Blocking Operations" on page 45 discusses the use of non-blocking operations.

"Extract_Mapped_Initialization_Data (CMEMID)" on page 167 discusses the extract initialization_data conversation characteristic for mapped initialization data.

"Set_Initialization_Data (CMSID)" on page 305 and "Extract_Initialization_Data (CMEID)" on page 165 discuss the *initialization_data* conversation characteristic.

"Set_Mapped_Initialization_Data (CMSMID)" on page 311 discusses the initialization_data conversation characteristic for mapped initialization data.

"Wait_For_Conversation (CMWAIT)" on page 359 and "Wait_For_Completion (CMWCMP)" on page 356 describe the normal completion of non-blocking operations.

Confirm (CMCFM)

LU 6.2	OSI TP

The Confirm (CMCFM) call is used by a local program to send a confirmation request to the remote program and then wait for a reply. The remote program replies with a Confirmed (CMCFMD) call. The local and remote programs use the Confirm and Confirmed calls to synchronize their processing of data.

Notes:

1. The *sync_level* conversation characteristic for the *conversation_ID* specified must be set to CM_CONFIRM or CM_SYNC_POINT to use this call. The Set_Sync_Level (CMSSL) call is used to set a conversation's synchronization level.
2. The Confirm call can be issued only on a half-duplex conversation.

Format

```
CALL CMCFM(conversation_ID,
           control_information_received,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

control_information_received *(output)*
Specifies the variable containing an indication of whether or not control information has been received.

The *control_information_received* variable can have one of the following values:

- CM_NO_CONTROL_INFO_RECEIVED
  Indicates that no control information was received.
- CM_REQ_TO_SEND_RECEIVED (half-duplex conversations only)
  The local program received a request-to-send notification from the remote program. The remote program issued Request_To_Send, requesting the local program's end of the conversation to enter **Receive** state, which would place the remote program's end of the conversation in **Send** state. See "Request_To_Send (CMRTS)" on page 241 for further discussion of the local program's possible responses.
- CM_ALLOCATE_CONFIRMED (OSI TP CRM only)
  The local program received confirmation of the remote program's acceptance of the conversation.

- CM_ALLOCATE_CONFIRMED_WITH_DATA (OSI TP CRM only)
  The local program received confirmation of the remote program's acceptance of the conversation. The local program may now issue an Extract_Initialization_Data (CMEID) call to receive the initialization data.
- CM_ALLOCATE_REJECTED_WITH_DATA (OSI TP CRM only)
  The remote program rejected the conversation. The local program may now issue an Extract_Initialization_Data (CMEID) call to receive the initialization data.

  This value will be returned with a return code of CM_OK. The program will receive a CM_DEALLOCATED_ABEND return code on a later call on the conversation.
- CM_EXPEDITED_DATA_AVAILABLE (LU 6.2 CRM only)
  Expedited data is available to be received.
- CM_RTS_RCVD_AND_EXP_DATA_AVAIL (half-duplex conversations and LU 6.2 CRM only)
  The local program received a request-to-send notification from the remote program and expedited data is available to be received.

Notes:

1. If *return_code* is set to CM_PROGRAM_PARAMETER_CHECK or CM_PROGRAM_STATE_CHECK, the value contained in *control_information_received* has no meaning.
2. When more than one piece of control information is available to be returned to the program, it will be returned in the following order:
   - CM_ALLOCATE_CONFIRMED, CM_ALLOCATE_CONFIRMED_WITH_DATA, or CM_ALLOCATE_REJECTED_WITH_DATA
   - CM_RTS_RCVD_AND_EXP_DATA_AVAIL
   - CM_REQ_TO_SEND_RECEIVED
   - CM_EXPEDITED_DATA_AVAILABLE
   - CM_NO_CONTROL_INFO_RECEIVED

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK (remote program replied Confirmed)
- CM_OPERATION_INCOMPLETE
- CM_CONVERSATION_CANCELED
- CM_CONVERSATION_TYPE_MISMATCH
- CM_PIP_NOT_SPECIFIED_CORRECTLY
- CM_SECURITY_NOT_VALID
- CM_SYNC_LVL_NOT_SUPPORTED_PGM
- CM_SYNC_LVL_NOT_SUPPORTED_SYS
- CM_SEND_RCV_MODE_NOT_SUPPORTED
- CM_TPN_NOT_RECOGNIZED
- CM_TP_NOT_AVAILABLE_NO_RETRY
- CM_TP_NOT_AVAILABLE_RETRY
- CM_DEALLOCATED_ABEND
- CM_PROGRAM_ERROR_PURGING
- CM_RESOURCE_FAILURE_NO_RETRY
- CM_RESOURCE_FAILURE_RETRY
- CM_DEALLOCATED_ABEND_SVC (basic conversations only)
- CM_DEALLOCATED_ABEND_TIMER (basic conversations only)

- CM_SVC_ERROR_PURGING (basic conversations only)
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - The conversation is not in **Send**, **Send-Pending**, or **Defer-Receive** state.
  - The conversation is basic and in **Send** state, and the program started but did not finish sending a logical record.
  - For a conversation with *sync_level* set to CM_SYNC_POINT, the conversation's context is in the **Backout-Required** condition. The Confirm call is not allowed for this conversation while its context is in this condition.
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *sync_level* conversation characteristic is set to CM_NONE or CM_SYNC_POINT_NO_CONFIRM.
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *send_receive_mode* of the conversation is CM_FULL_DUPLEX.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR
- The following values are returned only when *sync_level* is set to CM_SYNC_POINT:
  - CM_TAKE_BACKOUT
  - CM_DEALLOCATED_ABEND_BO
  - CM_DEALLOCATED_ABEND_SVC_BO (basic conversations only)
  - CM_DEALLOCATED_ABEND_TIMER_BO (basic conversations only)
  - CM_RESOURCE_FAIL_NO_RETRY_BO
  - CM_RESOURCE_FAILURE_RETRY_BO
  - CM_INCLUDE_PARTNER_REJECT_BO

State Changes

When *return_code* is set to CM_OK:

- The conversation enters **Send** state if the program issued the Confirm call with the conversation in **Send-Pending** state.
- The conversation enters **Receive** state if the program issued the Confirm call with the conversation in **Defer-Receive** state.
- No state change occurs if the program issued the Confirm call with the conversation in **Send** state.

Usage Notes

1. The program that issues Confirm waits until a reply from the remote partner program is received. (This reply is made using the Confirmed call.)
2. The program can use this call for various application-level functions. For example:
   - The program can issue this call immediately following an Allocate call to determine if the conversation was allocated before sending any data.
   - The program can issue this call to determine if the remote program received the data sent. The remote program can respond by issuing a Confirmed call if it received and processed the data without error, or by issuing a Send_Error call if it encountered an error. The only other valid response from the remote program is the issuance of the Deallocate call

with *deallocate_type* set to CM_DEALLOCATE_ABEND or the Cancel_Conversation call.

3. The send buffer of the local system is flushed as a result of this call.
4. When *control_information_received* indicates that expedited data is available, subsequent calls with this parameter will continue to return the notification until the expedited data has been received.

Related Information

"Example 5: Validation of Data Receipt" on page 76 shows an example program using the Confirm call.

"Confirmed (CMCFMD)" on page 134 provides information on the remote program's reply to the Confirm call.

"Request_To_Send (CMRTS)" on page 241 provides a complete discussion of the *control_information_received* parameter.

"Set_Allocate_Confirm (CMSAC)" on page 277 describes how a program can request that the remote program confirm its acceptance of the conversation.

"Set_Sync_Level (CMSSL)" on page 344 explains how programs specify the level of synchronization processing.

Confirmed (CMCFMD)

LU 6.2	OSI TP

A program uses the Confirmed (CMCFMD) call to send a confirmation reply to the remote program. The local and remote programs can use the Confirmed and Confirm calls to synchronize their processing.

A program can issue the Confirmed call on a full-duplex conversation only when deallocating a conversation that is using an OSI TP CRM.

Format

```
CALL CMCFMD(conversation_ID,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_OPERATION_INCOMPLETE
- 2 CM_CONVERSATION_CANCELED
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - For a half-duplex conversation, the conversation is not in **Confirm**, **Confirm-Send**, or **Confirm-Deallocate** state.
  - For a full-duplex conversation, the conversation is not in **Confirm-Deallocate** state.
  - For a conversation with *sync_level* set to CM_SYNC_POINT, the conversation's context is in the **Backout-Required** condition. The Confirmed call is not allowed for this conversation while its context is in this condition.
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *send_receive_mode* is set to CM_FULL_DUPLEX and the conversation is using an LU 6.2 CRM.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

For a half-duplex conversation, when *return_code* is set to CM_OK:

- The conversation enters **Receive** state if the program received the *status_received* parameter set to CM_CONFIRM_RECEIVED on the preceding Receive call—that is, if the conversation was in **Confirm** state.

- The conversation enters **Send** state if the program received the *status_received* parameter set to CM_CONFIRM_SEND_RECEIVED on the preceding Receive call — that is, if the conversation was in **Confirm-Send** state.
- The conversation enters **Reset** state if the program received the *status_received* parameter set to CM_CONFIRM_DEALLOC_RECEIVED on the preceding Receive call—that is, if the conversation was in **Confirm-Deallocate** state.

For a full-duplex conversation, when *return_code* is set to CM_OK, the conversation enters **Reset** state if the program received a *status_received* value of CM_CONFIRM_DEALLOC_RECEIVED on the preceding Receive call—that is, if the conversation was in **Confirm-Deallocate** state.

Usage Notes

1. For a half-duplex conversation, the local program can issue this call only as a reply to a confirmation request; the call cannot be issued at any other time. A confirmation request is generated (by the remote system) when the remote program makes a call to Confirm. The remote program that has issued Confirm will wait until the local program responds with Confirmed.
2. For a half-duplex conversation, the program can use this call for various application-level functions. For example, the remote program may send data followed by a confirmation request (using the Confirm call). When the local program receives the confirmation request, it can issue a Confirmed call to indicate that it received and processed the data without error.

Related Information

"Example 5: Validation of Data Receipt" on page 76 shows an example program using the Confirmed call.

"Confirm (CMCFM)" on page 130 provides more information on the Confirm call.

"Receive (CMRCV)" on page 209 provides more information on the *status_received* parameter.

"Set_Sync_Level (CMSSL)" on page 344 explains how programs specify the level of synchronization processing.

Convert_Incoming (CMCNVI)

LU 6.2	OSI TP

The Convert_Incoming (CMCNVI) call is used to change the encoding of a character string from EBCDIC to the local encoding used by the program.

Format

```
CALL CMCNVI(buffer,
            buffer_length,
            return_code)
```

Parameters

buffer *(input/output)*
Specifies the buffer containing the string to be converted. The contents of the string will be replaced by the results of the conversion.

buffer_length *(input)*
Specifies the number of characters in the string to be converted.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates that the *buffer_length* is invalid for the range permitted by the implementation.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call causes no state changes.

Usage Notes

1. When the EBCDIC hexadecimal codes, specified in Table 20 on page 418, represent the encoding for the data transmitted across the network, the Convert_Incoming call can be used to convert the EBCDIC hexadecimal codes to the corresponding local representation of the data.
2. Convert_Incoming converts data on a character-by-character basis. Since the program may use character values beyond those defined in Table 20 on page 418, care must be taken in the use of Convert_Incoming in that it may generate implementation-dependent results if applied to a string that contains such values.
3. A program may be written to be independent of the encoding (such as ASCII or EBCDIC) of the partner program by sending and receiving EBCDIC data records with the help of the Convert_Outgoing and Convert_Incoming calls. The sending program calls Convert_Outgoing to convert the data record to EBCDIC before sending it. The receiving program calls Convert_Incoming to

convert the EBCDIC data record to the appropriate encoding for its environment.

4. If the local encoding is EBCDIC, the Convert_Incoming call does not change the buffer contents.

Related Information

"Data Conversion" on page 41 provides information about data conversion and the Convert_Incoming call.

"Convert_Outgoing (CMCNVO)" on page 138 provides information about the Convert_Outgoing call.

"Receive_Mapped_Data (CMRCVM)" on page 226 provides information about receiving mapped partner data.

"Send_Mapped_Data (CMSNDM)" on page 266 provides information about sending mapped partner data.

Convert_Outgoing (CMCNVO)

LU 6.2	OSI TP

The Convert_Outgoing (CMCNVO) call is used to change the encoding of a character string to EBCDIC from the local encoding used by the program.

Format

```
CALL CMCNVO(buffer,
            buffer_length,
            return_code)
```

Parameters

buffer *(input/output)*
Specifies the buffer containing the string to be converted. The contents of the string will be replaced by the results of the conversion.

buffer_length *(input)*
Specifies the number of characters in the string to be converted.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates that the *buffer_length* is invalid for the range permitted by the implementation.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call causes no state changes.

Usage Notes

1. When the EBCDIC hexadecimal codes, specified in Table 20 on page 418, represent the encoding for the data transmitted across the network, the Convert_Outgoing call can be used to convert the data supplied by the program from the local encoding to the corresponding EBCDIC hexadecimal codes.
2. Convert_Outgoing converts data on a character-by-character basis. Since the program may use character values beyond those defined in Table 20 on page 418, care must be taken in the use of Convert_Outgoing in that it may generate implementation-dependent results if applied to a string which contains such values.
3. A program may be written to be independent of the encoding (such as ASCII or EBCDIC) of the partner program by sending and receiving EBCDIC data records with the help of the Convert_Outgoing and Convert_Incoming calls. The sending program calls Convert_Outgoing to convert the data record to EBCDIC before sending it. The receiving program calls Convert_Incoming to

convert the EBCDIC data record to the appropriate encoding for its environment.

4. If the local encoding is EBCDIC, the Convert_Outgoing call does not change the buffer contents.

Related Information

"Data Conversion" on page 41 provides information about data conversion and the Convert_Outgoing call.

"Convert_Incoming (CMCNVI)" on page 136 provides information about the Convert_Incoming call.

"Receive_Mapped_Data (CMRCVM)" on page 226 provides information about receiving mapped partner data.

"Send_Mapped_Data (CMSNDM)" on page 266 provides information about sending mapped partner data.

Deallocate (CMDEAL)

LU 6.2	OSI TP

A program uses the Deallocate (CMDEAL) call to end a conversation. The *conversation_ID* is no longer assigned when the conversation is deallocated as part of this call.

For a half-duplex conversation, the deallocation can either be completed as part of this call or deferred until the program issues a resource recovery call. If the Deallocate call includes the function of the Flush or Confirm call, depending on the *deallocate_type* characteristic, the deallocation is completed as part of this call.

For a full-duplex conversation, the deallocation may be deferred until the program issues a resource recovery commit call. If the Deallocate call includes abnormal deallocation or the function of the Confirm call, depending on the *deallocate_type* characteristic, the deallocation is completed as part of this call. If the Deallocate call includes the function of the Flush call, depending on the *deallocate_type* characteristic, then the program can no longer send data to the partner. The deallocation is completed if the conversation was in **Send-Only** state before this call. Otherwise, the conversation goes to **Receive-Only** state. In this latter case, the deallocation is completed when a terminating error condition occurs, either this program or the partner program deallocates the conversation abnormally or cancels it, or the partner program deallocates the conversation using the function of the Flush call.

Before issuing the Deallocate call, a program has the option of issuing one or both of the following calls to set deallocation parameters:

CALL CMSDT – Set_Deallocate_Type
CALL CMSLD – Set_Log_Data

Format

```
CALL CMDEAL(conversation_ID,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier of the conversation to be ended.

return_code *(output)*
Specifies the result of the call execution.

The following return codes apply to half-duplex conversations.

For any of the following conditions:

- *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL and either *sync_level* is set to CM_NONE or the conversation is in **Initialize-Incoming** state
- *deallocate_type* is set to CM_DEALLOCATE_FLUSH
- *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL, *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM, but the conversation is not currently included in a transaction

the *return_code* variable can have one of the following values:

- CM_OK (deallocation is completed)
- CM_OPERATION_INCOMPLETE
- 2 CM_CONVERSATION_CANCELED
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - The conversation is not in **Send**, **Send-Pending** or **Initialize-Incoming** state.
  - The conversation is basic and in **Send** state; and the program started but did not finish sending a logical record.
  - The *deallocate_type* is set to CM_DEALLOCATE_FLUSH, and the conversation is currently included in a transaction.
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates that the *conversation_ID* specifies an unassigned conversation identifier.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

If the *deallocate_type* conversation characteristic is set to CM_DEALLOCATE_ABEND, the *return_code* variable can have one of the following values:

- CM_OK (deallocation is completed)
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates that the *conversation_ID* specifies an unassigned conversation identifier.
- CM_OPERATION_NOT_ACCEPTED
- CM_OPERATION_INCOMPLETE
- 2 CM_CONVERSATION_CANCELED
- CM_PRODUCT_SPECIFIC_ERROR

For any of the following conditions:

- *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL and the *sync_level* is set to CM_CONFIRM
- *deallocate_type* is set to CM_DEALLOCATE_CONFIRM
- *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL, *sync_level* is set to CM_SYNC_POINT, but the conversation is not currently included in a transaction

the *return_code* variable can have one of the following values:

- CM_OK (deallocation is completed)
- CM_OPERATION_INCOMPLETE

- CM_CONVERSATION_CANCELED
- CM_CONVERSATION_TYPE_MISMATCH
- CM_PIP_NOT_SPECIFIED_CORRECTLY
- CM_SECURITY_NOT_VALID
- CM_SYNC_LVL_NOT_SUPPORTED_PGM
- CM_SYNC_LVL_NOT_SUPPORTED_SYS
- CM_SEND_RCV_MODE_NOT_SUPPORTED
- CM_TPN_NOT_RECOGNIZED
- CM_TP_NOT_AVAILABLE_NO_RETRY
- CM_TP_NOT_AVAILABLE_RETRY
- CM_DEALLOCATED_ABEND
- CM_PROGRAM_ERROR_PURGING
- CM_RESOURCE_FAILURE_NO_RETRY
- CM_RESOURCE_FAILURE_RETRY
- CM_DEALLOCATED_ABEND_SVC (basic conversations only)
- CM_DEALLOCATED_ABEND_TIMER (basic conversations only)
- CM_SVC_ERROR_PURGING
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - The conversation is not in **Send** or **Send-Pending** state.
  - The conversation is basic and in **Send** state; and the program started but did not finish sending a logical record.
  - The *deallocate_type* is set to CM_DEALLOCATE_CONFIRM, and the conversation is currently included in a transaction.
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates that the *conversation_ID* specifies an unassigned conversation identifier.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

If the *deallocate_type* conversation characteristic is set to CM_DEALLOCATE_SYNC_LEVEL, *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and the conversation is included in a transaction, the *return_code* variable can have one of the following values:

- CM_OK
  Deallocation is deferred until the program issues a resource recovery commit call. If the commit call is successful, the conversation will be deallocated normally. If the commit is not successful or if the program issues a resource recovery backout call instead of a commit, the conversation will not be deallocated. Instead, the conversation will be restored to the state it was in at the previous synchronization point.

  Table 30 on page 479 and Table 31 on page 480 show how resource recovery calls affect CPI Communications conversation states.
- CM_OPERATION_INCOMPLETE
- CM_CONVERSATION_CANCELED
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - The conversation is not in **Send** or **Send-Pending** state.
  - The conversation is basic and in **Send** state, and the program started but did not finish sending a logical record.
  - The conversation's context is in the **Backout-Required** condition.
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:

  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The conversation is using an OSI TP CRM, and the program is not the superior for the conversation.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

The following return codes apply to full-duplex conversations.

For any of the following conditions:

- *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL and either *sync_level* is set to CM_NONE or the conversation is in **Initialize-Incoming** state
- *deallocate_type* is set to CM_DEALLOCATE_FLUSH
- *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL, *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM, but the conversation is not currently included in a transaction

the *return_code* variable can have one of the following values:

- CM_OK
  Deallocation is completed if this call was issued in **Send-Only** or **Initialize-Incoming** state. Otherwise, the call was issued in **Send-Receive** state and the conversation goes to **Receive-Only** state. In this latter case, the conversation will later get deallocated when a terminating error condition occurs, either this program or the partner program deallocates the conversation abnormally or cancels it, or the partner program deallocates the conversation using the function of the Flush call.
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - The conversation is not in **Send-Receive** or **Send-Only** or **Initialize-Incoming** state.
  - The conversation is basic and in **Send-Receive** or **Send-Only** state, and the program started but did not finish sending a logical record.
  - The local program has received a *status_received* value of CM_JOIN_TRANSACTION and must issue a tx_begin call to the X/Open TX interface to join the transaction.
  - The *deallocate_type* is set to CM_DEALLOCATE_FLUSH, and the conversation is currently included in a transaction.
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates that the *conversation_ID* specifies an unassigned conversation identifier.
- CM_ALLOCATION_ERROR
- CM_DEALLOCATED_ABEND
- CM_DEALLOCATED_ABEND_SVC
- CM_DEALLOCATED_ABEND_TIMER
- CM_RESOURCE_FAILURE_NO_RETRY
- CM_RESOURCE_FAILURE_RETRY
- CM_DEALLOCATED_NORMAL
- CM_OPERATION_NOT_ACCEPTED
- CM_OPERATION_INCOMPLETE
- CM_CONVERSATION_CANCELED
- CM_PRODUCT_SPECIFIC_ERROR

If the *deallocate_type* conversation characteristic is set to CM_DEALLOCATE_ABEND, the *return_code* variable can have one of the following values:

- CM_OK (deallocation is completed)
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates that the *conversation_ID* specifies an unassigned conversation identifier.
- CM_OPERATION_NOT_ACCEPTED
- CM_OPERATION_INCOMPLETE
- CM_CONVERSATION_CANCELED
- CM_PRODUCT_SPECIFIC_ERROR

If the *deallocate_type* conversation characteristic is set to CM_DEALLOCATE_CONFIRM, the *return_code* variable can have one of the following values:

- CM_OK (deallocation is completed)
- CM_DEALLOCATE_CONFIRM_REJECT
  This value indicates that the partner program rejected the confirmation request. The conversation is not deallocated.
- CM_ALLOCATION_ERROR
- CM_DEALLOCATED_ABEND
- CM_RESOURCE_FAILURE_NO_RETRY
- CM_RESOURCE_FAILURE_RETRY
- CM_DEALLOCATED_NORMAL
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - The conversation is not in **Send-Receive** state.
  - The conversation is basic and in **Send-Receive** state, and the program started but did not finish sending a logical record.
  - The local program has received a *status_received* value of CM_JOIN_TRANSACTION and must issue a tx_begin call to the X/Open TX interface to join the transaction.
  - The *deallocate_type* is set to CM_DEALLOCATE_CONFIRM, and the conversation is currently included in a transaction.
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates that the *conversation_ID* specifies an unassigned conversation identifier.
- CM_PRODUCT_SPECIFIC_ERROR
- CM_OPERATION_INCOMPLETE
- CM_CONVERSATION_CANCELED
- CM_OPERATION_NOT_ACCEPTED

If the *deallocate_type* conversation characteristic is set to CM_DEALLOCATE_SYNC_LEVEL, *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM, and the conversation is included in a transaction, the *return_code* variable can have one of the following values:

- CM_OK
  Deallocation is deferred until the program issues a resource recovery commit call. If the commit call is successful, the conversation will be deallocated normally. If the commit is not successful or if the program issues a resource recovery backout call instead of a commit, the conversation will not be deallocated. Instead, the conversation will be restored to the state it was in at the previous synchronization point.

Table 30 on page 479 and Table 31 on page 480 show how resource recovery calls affect CPI Communications conversation states.

- CM_OPERATION_INCOMPLETE
- CM_CONVERSATION_CANCELED
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - The conversation is not in **Send-Receive** state.
  - The conversation is basic and in **Send-Receive** state, and the program started but did not finish sending a logical record.
  - The conversation's context is in the **Backout-Required** condition.
  - The local program has received a *status_received* value of CM_JOIN_TRANSACTION and must issue a tx_begin call to the X/Open TX interface to join the transaction.
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The conversation is using an OSI TP CRM, and the program is not the superior for the conversation.
- CM_ALLOCATION_ERROR
- CM_TAKE_BACKOUT
- CM_DEALLOCATED_ABEND_BO
- CM_DEALLOCATED_ABEND_SVC_BO
- CM_DEALLOCATED_ABEND_TIMER_BO
- CM_RESOURCE_FAILURE_RETRY_BO
- CM_RESOURCE_FAIL_NO_RETRY_BO
- CM_INCLUDE_PARTNER_REJECT_BO
- CM_CONV_DEALLOC_AFTER_SYNCPT
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

For half-duplex conversations, when *return_code* indicates CM_OK:

- The conversation enters **Reset** state if *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL and either *sync_level* is set to CM_NONE or the conversation is in **Initialize-Incoming** state, or if *deallocate_type* is set to CM_DEALLOCATE_FLUSH, CM_DEALLOCATE_CONFIRM, or CM_DEALLOCATE_ABEND.
- The conversation enters **Reset** state if *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL, *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, but the conversation is not currently included in a transaction.
- The conversation enters **Defer-Deallocate** state if *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL, *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and the conversation is included in a transaction.

For full-duplex conversations, when *return_code* indicates CM_OK:

- The conversation enters **Reset** state if *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL and either *sync_level* is set to CM_NONE or the conversation is in **Initialize-Incoming** state, or if *deallocate_type* is set to CM_DEALLOCATE_CONFIRM or CM_DEALLOCATE_ABEND.

- The conversation enters **Reset** state if *deallocate_type* is set to CM_DEALLOCATE_FLUSH, or if *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL and *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM but the conversation is not currently included in a transaction, and the current state is **Send-Only** state.
- The conversation enters **Receive-Only** state if *deallocate_type* is set to CM_DEALLOCATE_FLUSH, or if *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL and *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM but the conversation is not currently included in a transaction, and the current state is **Send-Receive** state.
- The conversation enters **Defer-Deallocate** state if *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL, *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM, and the conversation is included in a transaction.

Usage Notes

1. The execution of Deallocate includes the flushing of the local system's send buffer if any of the following conditions is true:
   - *deallocate_type* is set to CM_DEALLOCATE_FLUSH or CM_DEALLOCATE_CONFIRM
   - *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL, *sync_level* is CM_NONE or CM_CONFIRM
   - *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL and *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, but the conversation is not currently included in a transaction.

   If *deallocate_type* is CM_DEALLOCATE_SYNC_LEVEL, *sync_level* is CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and the conversation is included in a transaction, the local system's send buffer will not be flushed until a resource recovery commit or backout call is issued by the program or the sync point manager.
2. If a conversation has *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, CPI Communications does not allow the conversation to be deallocated with a *deallocate_type* of CM_DEALLOCATE_CONFIRM or CM_DEALLOCATE_FLUSH unless *transaction_control* is set to CM_UNCHAINED_TRANSACTIONS and the conversation is not currently included in a transaction.
3. If *deallocate_type* is set to CM_DEALLOCATE_ABEND and the *log_data_length* characteristic is greater than zero, the system formats the supplied log data into the appropriate format. The data supplied by the program is any data the program wants to have logged. The data is logged on the local system's error log and is also sent to the remote system for logging there.
4. The remote program receives the deallocate notification by means of a *return_code* or *status_received* indication, as follows:
   - CM_DEALLOCATED_NORMAL *return_code*
     This return code indicates that the local program issued Deallocate with the *deallocate_type* set to CM_DEALLOCATE_FLUSH, or with the *deallocate_type* set to CM_DEALLOCATE_SYNC_LEVEL and *sync_level* set to CM_NONE, or with *deallocate_type* set to CM_DEALLOCATE_SYNC_LEVEL, *sync_level* set to

CM_SYNC_POINT_NO_CONFIRM, and the conversation not currently included in a transaction.

For a full-duplex conversation, this return code is returned on the Receive call, and if the conversation is using an OSI TP CRM, it is also returned on calls associated with the Send queue.

- CM_DEALLOCATED_ABEND *return_code*
  This indicates that the local program issued Deallocate with *deallocate_type* set to CM_DEALLOCATE_ABEND.

  For a full-duplex conversation, this return code is returned on the Receive call, and if the conversation is using an OSI TP CRM, it is also returned on some calls associated with the Send queue.

  Note: For a half-duplex conversation, if the conversation is using an LU 6.2 CRM and the remote program has issued Send_Error with its end of the conversation in **Receive** state, the incoming information containing notice of CM_DEALLOCATED_ABEND is purged and a CM_DEALLOCATED_NORMAL *return_code* is reported instead of CM_DEALLOCATED_ABEND. See "Send_Error (CMSERR)" on page 254 for a complete discussion.

- CM_DEALLOCATED_ABEND_BO *return_code*
  This indicates that the local program issued Deallocate with the *deallocate_type* set to CM_DEALLOCATE_ABEND and with the conversation included in a transaction.

  Note: For a half-duplex conversation, if the conversation is using an LU 6.2 CRM and the remote program has issued Send_Error with its end of the conversation in **Receive** state, the incoming information containing notice of CM_DEALLOCATED_ABEND_BO is purged and a CM_DEALLOCATED_NORMAL_BO *return_code* is reported instead of CM_DEALLOCATED_ABEND_BO. See "Send_Error (CMSERR)" on page 254 for a complete discussion.

- CM_CONFIRM_DEALLOC_RECEIVED *status_received* indication
  This indicates that the local program issued Deallocate with the *deallocate_type* set to CM_DEALLOCATE_CONFIRM, or with *deallocate_type* set to CM_DEALLOCATE_SYNC_LEVEL and *sync_level* set to CM_CONFIRM, or with *deallocate_type* set to CM_DEALLOCATE_SYNC_LEVEL and *sync_level* set to CM_SYNC_POINT, but with the conversation not currently included in a transaction.

- CM_TAKE_COMMIT_DEALLOCATE *status_received* indication
  This indicates that the local program issued a resource recovery commit call after issuing a Deallocate call with *deallocate_type* set to CM_DEALLOCATE_SYNC_LEVEL and *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and with the conversation included in a transaction.

5. The program should terminate all conversations before the end of the program. However, if the program does not terminate all conversations, node services will abnormally deallocate any dangling conversations. The way abnormal deallocation is accomplished is implementation-specific.
6. When a Deallocate call is issued with *deallocate_type* set to CM_DEALLOCATE_ABEND and *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, the conversation's context may be placed in the **Backout-Required** condition.
7. If the conversation is using an OSI TP CRM and the Deallocate call with *deallocate_type* of CM_DEALLOCATE_ABEND is the first operation on the specified conversation following an Accept_Conversation (CMACCP) or Accept_Incoming (CMACCI) call, then any initialization data specified by use of the Set_Initialization_Data call is sent to the remote program.

8. If the Deallocate call on a full-duplex conversation is issued with the *deallocate_type* set to CM_DEALLOCATE_ABEND, the conversation is deallocated.

   If the conversation is not currently included in a transaction, outstanding calls associated with both the local and the remote programs get return codes as follows:

   At the local program, all outstanding operations are terminated. No guarantee is given on the results of the terminated operation.

   At the remote program,

   - Other than Confirmed and Set calls, a new or outstanding call associated with the Send queue gets CM_DEALLOCATED_ABEND, and the conversation goes to **Receive-Only** or **Reset** state if it was in **Send-Receive** or **Send-Only** state, respectively.
   - Any data sent by the partner before it issued the Deallocate call can be received, after which the next Receive call will get CM_DEALLOCATED_ABEND. The conversation is now in **Reset** state.
   - Calls associated with the Expedited-Send queue until the conversation goes to **Reset** state get CM_CONVERSATION_ENDING. An outstanding call is terminated when the conversation goes to **Reset** state. No guarantee is given on the results of the terminated operation.
   - Calls associated with the Expedited-Receive queue until the conversation goes to **Reset** state get CM_CONVERSATION_ENDING after any available expedited data has been received. An outstanding call is terminated when the conversation goes to **Reset** state. No guarantee is given on the results of the terminated operation.

   If the conversation is currently included in a transaction, then calls associated with the local Receive queue and the remote Receive queue, as well as certain calls associated with the remote Send queue, get CM_DEALLOCATED_ABEND_BO and the conversation goes to **Reset** state. Calls associated with the expedited data queues get the same return codes as when the conversation is not included in a transaction.

9. For a full-duplex conversation in **Send-Receive** state, when CM_DEALLOCATED_ABEND is returned to a call associated with the Send queue, the program can terminate the conversation by issuing Receive calls until it gets the CM_DEALLOCATED_ABEND return code that takes it to **Reset** state, or by issuing a Deallocate call with *deallocate_type* set to CM_DEALLOCATED_ABEND.

10. For a full-duplex conversation, if any of the following conditions is true:

    – *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL and *sync_level* is set to CM_NONE
    – *deallocate_type* is set to CM_DEALLOCATE_FLUSH
    – *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL and *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM, but the conversation is not currently included in a transaction

    then the program can no longer send data on the conversation when a Deallocate call issued in **Send-Receive** state completes, and the *conversation_ID* is no longer assigned when a Deallocate call issued in **Send-Only** state completes.

If *deallocate_type* is set to CM_DEALLOCATE_CONFIRM, or if *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL and *sync_level* is set to CM_SYNC_POINT but the conversation is not currently included in a transaction, then the *conversation_ID* is no longer assigned when the conversation is deallocated after confirmation.

If *deallocate_type* is CM_DEALLOCATE_ABEND, then the *conversation_ID* is no longer assigned when the conversation is deallocated as part of this call.

11. **Note to Implementers:** a Deallocate call with *deallocate_type* set to CM_DEALLOCATE_ABEND issued on a basic conversation implies the LU 6.2 protocol boundary return code of DEALLOCATE_ABEND_PROG. No separate parameter value is supported since a separate value would not provide any additional function. In LU 6.2, the sense data 08640000 maps to a return code of DEALLOCATE_ABEND for mapped conversations and to DEALLOCATE_ABEND_PROG for basic conversations. It does not appear useful to require the application to check for different return codes that have the same meaning depending on the conversation type.

Related Information

"Example 1: Data Flow in One Direction" on page 67 shows an example program flow using the Deallocate call for a half-duplex conversation.

"Example 10: Terminating a Full-Duplex Conversation" on page 86 shows how a full-duplex conversation can be deallocated.

"Set_Deallocate_Type (CMSDT)" on page 296 discusses the *deallocate_type* characteristic and its possible values.

"Set_Log_Data (CMSLD)" on page 309 discusses the *log_data* characteristic.

Deferred_Deallocate (CMDFDE)

OSI TP

A program uses the Deferred_Deallocate (CMDFDE) call to end a conversation upon successful completion of the current transaction.

Deferred_Deallocate may be issued at any time during the transaction. Unlike the Deallocate call, it does not need to be the last call on the conversation. Deferred_Deallocate does not invalidate the conversation identifier.

Note: The Deferred_Deallocate (CMDFDE) call has meaning only when an OSI TP CRM is being used for the conversation.

Format

```
CALL CMDFDE(conversation_ID,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_OPERATION_INCOMPLETE
- CM_CONVERSATION_CANCELED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - This value indicates the *conversation_ID* specifies an unassigned identifier.
  - The conversation is not using an OSI TP CRM.
  - The program is not the superior for the conversation.
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - The conversation is not in **Send** or **Send-Pending** state (for half-duplex conversations) or **Send-Receive** state (for full-duplex conversations).
  - The conversation is not currently included in a transaction.
- CM_TAKE_BACKOUT
- CM_DEALLOCATED_ABEND_BO
- CM_RESOURCE_FAILURE_RETRY_BO
- CM_RESOURCE_FAIL_NO_RETRY_BO
- CM_INCLUDE_PARTNER_REJECT_BO
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

The following return codes apply to half-duplex conversations.

- CM_SYNC_LVL_NOT_SUPPORTED_SYS
- CM_SEND_RCV_MODE_NOT_SUPPORTED
- CM_TPN_NOT_RECOGNIZED
- CM_TP_NOT_AVAILABLE_NO_RETRY
- CM_TP_NOT_AVAILABLE_RETRY
- CM_PROGRAM_ERROR_PURGING

The following return code applies to full-duplex conversations.

- CM_ALLOCATION_ERROR

State Changes

This call does not cause an immediate state change. However, one of the following occurs after the transaction completes:

- If the transaction completes successfully, the conversation enters **Reset** state and the *conversation_id* is no longer assigned.
- If the transaction does not complete successfully, the conversation returns to the state it was in at the beginning of the transaction, and the *conversation_id* remains valid. If the conversation was initialized during the transaction, the conversation returns to the state it was in following conversation establishment.

Usage Notes

1. Once a commit call completes successfully for this transaction, a Deferred_Deallocate call performs the same function as a Deallocate (CMDEAL) call with *deallocate_type* set to CM_DEALLOCATE_SYNC_LEVEL and *sync_level* set to either CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM.
2. If the transaction does not complete successfully and is backed out, longer in effect.

Related Information

"Deallocate (CMDEAL)" on page 140 discusses conversation deallocation in more detail.

Extract_AE_Qualifier (CMEAEQ)

OSI TP

The local program uses the Extract_AE_Qualifier (CMEAEQ) call to extract the *AE_qualifier* conversation characteristic for a given conversation. The value is returned to the application in the *AE_qualifier* parameter.

The *AE_qualifier* conversation characteristic identifies the OSI application-entity qualifier associated with the remote program.

Format

```
CALL CMEAEQ(conversation_ID,
            AE_qualifier,
            AE_qualifier_length,
            AE_qualifier_format,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

AE_qualifier *(output)*
Specifies the variable containing the application-entity-qualifier for the remote program. The variable must be defined with a length of at least 1024 bytes.

Note: Unless *return_code* is set to CM_OK, the value of *AE_qualifier* is not meaningful.

AE_qualifier_length *(output)*
Specifies the variable containing the length of the returned *AE_qualifier* parameter.

Note: Unless *return_code* is set to CM_OK, the value of *AE_qualifier_length* is not meaningful.

AE_qualifier_format *(output)*
Specifies the variable containing the format of the returned *AE_qualifier* parameter. The *AE_qualifier_format* variable can have one of the following values:

- CM_DN
  Specifies that the *AE_qualifier* is a distinguished name.
- CM_INT_DIGITS
  Specifies that the *AE_qualifier* is an integer represented as a sequence of decimal digits.

Note: Unless *return_code* is set to CM_OK, the value of *AE_qualifier_format* is not meaningful.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK

- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates that the *conversation_ID* specifies an unassigned identifier.
- CM_PROGRAM_STATE_CHECK
  This value indicates that the *conversation_ID* specifies a conversation in **Initialize-Incoming** state.
- CM_OPERATION_NOT_ACCEPTED
  This value indicates that the program has chosen conversation-level non-blocking for the conversation and a previous call operation is still in progress.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause any state changes.

Usage Notes

1. This call does not change the *AE_qualifier*, *AE_qualifier_length*, or *AE_qualifier_format* for the specified conversation.
2. The *AE_qualifier* may be either a distinguished name or an integer represented as a sequence of decimal digits. Distinguished names may have any format and syntax that can be recognized by the local system.
3. The call is not associated with any conversation queue. When a conversation uses queue-level non-blocking, the call does not return CM_OPERATION_NOT_ACCEPTED.

Related Information

"Set_AE_Qualifier (CMSAEQ)" on page 275 and "Side Information" on page 21 provide more information on the *AE_qualifier* conversation characteristic.

Extract_AP_Title (CMEAPT)

OSI TP

A program uses the Extract_AP_Title (CMEAPT) call to extract the *AP_title* characteristic for a given conversation. The value is returned to the application in the *AP_title* parameter.

The *AP_title* conversation characteristic identifies the OSI application-process title associated with the remote program.

Format

```
CALL CMEAPT(conversation_ID,
            AP_title,
            AP_title_length,
            AP_title_format,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

AP_title *(output)*
Specifies the variable containing the title of the application-process where the remote program is located. The variable must be defined with a length of at least 1024 bytes.

Note: Unless *return_code* is set to CM_OK, the value of *AP_title* is not meaningful.

AP_title_length *(output)*
Specifies the variable containing the length of the returned *AP_title* parameter.

Note: Unless *return_code* is set to CM_OK, the value of *AP_title_length* is not meaningful.

AP_title_format *(output)*
Specifies the variable containing the format of the returned *AP_title* parameter. The *AP_title_format* variable can have one of the following values:

- CM_DN
  Specifies that the *AP_title* is a distinguished name.
- CM_OID
  Specifies that the *AP_title* is an object identifier.

Note: Unless *return_code* is set to CM_OK, the value of *AP_title_format* is not meaningful.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_PARAMETER_CHECK

This value indicates that the *conversation_ID* specifies an unassigned identifier.

- CM_PROGRAM_STATE_CHECK
  This value indicates that the *conversation_ID* specifies a conversation in **Initialize-Incoming** state.
- CM_OPERATION_NOT_ACCEPTED
  This value indicates that the program has chosen conversation-level non-blocking for the conversation and a previous call operation is still in progress.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause any state changes.

Usage Notes

1. This call does not change the *AP_title*, *AP_title_length*, or *AP_title_format* for the specified conversation.
2. The *AP_title* may be either a distinguished name or an object identifier. Distinguished names may have any format and syntax that can be recognized by the local system. Object identifiers are represented as a series of digits by periods (for example, *n.nn.n.nnn*).
3. The call is not associated with any conversation queue. When a conversation uses queue-level non-blocking, the call does not return CM_OPERATION_NOT_ACCEPTED on the conversation.

Related Information

"Set_AP_Title (CMSAPT)" on page 279 and "Side Information" on page 21 provide more information on the *AP_title* conversation characteristic.

Extract_Application_Context_Name (CMEACN)

OSI TP

Extract_Application_Context_Name (CMEACN) is used by a program to extract the *application_context_name* characteristic for a given conversation. The value is returned to the application in the *application_context_name* parameter.

The *application_context_name* conversation characteristic identifies the OSI application context used on the conversation.

Format

```
CALL CMEACN(conversation_ID,
            application_context_name,
            application_context_name_length,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

application_context_name *(output)*
Specifies the application context name that is to be used on the conversation. The variable must be defined with a length of at least 256 bytes.

Note: Unless *return_code* is set to CM_OK, the value of *application_context_name* is not meaningful.

application_context_name_length *(output)*
Specifies the length of the application context name that is to be used on the conversation.

Note: Unless *return_code* is set to CM_OK, the value of *application_context_name_length* is not meaningful.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates that the *conversation_ID* specifies an unassigned identifier.
- CM_PROGRAM_STATE_CHECK
  This value indicates that the *conversation_ID* specifies a conversation in **Initialize-Incoming** state.

- CM_OPERATION_NOT_ACCEPTED
  This value indicates that the program has chosen conversation-level non-blocking for the conversation and a previous call operation is still in progress.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause any state changes.

Usage Notes

1. This call does not change the *application_context_name* or the *application_context_name_length* conversation characteristic for the specified conversation.
2. The application context name is an object identifier and is represented as a series of digits separated by periods. For example, the application context defined by the Open Systems Environment Implementers' Workshop (OIW) for UDT with Commit Profiles is represented as "1.3.14.15.5.1.0" and the application context for Application Supported Transactions using UDT is represented as "1.3.14.15.5.2.0".
3. The call is not associated with any conversation queue. When a conversation uses queue-level non-blocking, the call does not return CM_OPERATION_NOT_ACCEPTED on the conversation.

Related Information

"Set_Application_Context_Name (CMSACN)" on page 281 and "Side Information" on page 21 provide more information on the *application_context_name* conversation characteristic.

Extract_Conversation_Context (CMECTX)

LU 6.2	OSI TP

Extract_Conversation_Context (CMECTX) is used by a program to extract the context identifier for a conversation.

The *conversation_context* conversation characteristic identifies which partner program is associated with the work being done by the local program.

Format

```
CALL CMECTX(conversation_ID,
            context_ID,
            context_ID_length,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

context_ID *(output)*
Specifies the variable containing the context identifier for this conversation. The variable must be defined with a length of at least 32 bytes.

Note: Unless *return_code* is set to CM_OK, the value of *context_ID* is not meaningful.

context_ID_length *(output)*
Specifies the variable containing the length of the returned *context_ID* parameter.

Note: Unless *return_code* is set to CM_OK, the value of *context_ID_length* is not meaningful.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates that the *conversation_ID* specifies an unassigned conversation identifier.
- CM_PROGRAM_STATE_CHECK
  This value indicates that the conversation is in **Initialize** or **Initialize-Incoming** state.

- CM_OPERATION_NOT_ACCEPTED
  This value indicates that the program has chosen conversation-level non-blocking for the conversation and a previous call operation is still in progress.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. This call does not change the *context_ID* for the specified conversation.
2. A program may want to determine the context for a conversation prior to allocating a new conversation. The program would issue Extract_Conversation_Context to get the *context_ID* and then would use node services to set that context as the current context prior to issuing the Allocate call for the new conversation.
3. The call is not associated with any conversation queue. When a conversation uses queue-level non-blocking, the call does not return CM_OPERATION_NOT_ACCEPTED on the conversation.

Related Information

"Contexts and Context Management" on page 29 defines contexts and discusses how application programs can manage multiple contexts.

Extract_Conversation_State (CMECS)

LU 6.2	OSI TP

A program uses the Extract_Conversation_State (CMECS) call to extract the conversation state for a given conversation. The value is returned in the *conversation_state* parameter.

The *conversation_state* conversation characteristic identifies the state of the conversation with respect to the local program.

Format

```
CALL CMECS(conversation_ID,
           conversation_state,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

conversation_state *(output)*
Specifies the conversation state that is returned to the local program. For half-duplex conversations, the *conversation_state* can be one of the following:

- CM_INITIALIZE_STATE
- CM_SEND_STATE
- CM_RECEIVE_STATE
- CM_SEND_PENDING_STATE
- CM_CONFIRM_STATE
- CM_CONFIRM_SEND_STATE
- CM_CONFIRM_DEALLOCATE_STATE
- CM_DEFER_RECEIVE_STATE
- CM_DEFER_DEALLOCATE_STATE
- CM_SYNC_POINT_STATE
- CM_SYNC_POINT_SEND_STATE
- CM_SYNC_POINT_DEALLOCATE_STATE
- CM_INITIALIZE_INCOMING_STATE
- CM_PREPARED_STATE

For full-duplex conversations, the *conversation_state* can be one of the following:

- CM_INITIALIZE_STATE
- CM_CONFIRM_DEALLOCATE_STATE
- CM_DEFER_DEALLOCATE_STATE
- CM_SYNC_POINT_STATE
- CM_SYNC_POINT_DEALLOCATE_STATE
- CM_INITIALIZE_INCOMING_STATE
- CM_SEND_ONLY_STATE
- CM_RECEIVE_ONLY_STATE
- CM_SEND_RECEIVE_STATE
- CM_PREPARED_STATE

Note: Unless *return_code* is set to CM_OK, the value of *conversation_state* is not meaningful.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:.

- CM_OK
- CM_PROGRAM_PARAMETER_CHECK
  This return code indicates that the *conversation_ID* specifies an unassigned conversation identifier.
- CM_TAKE_BACKOUT
  This value is returned only when all of the following conditions are true:
  - The *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and the conversation is included in a transaction.
  - The conversation is not in **Initialize**, **Initialize-Incoming**, **Confirm-Deallocate**, **Send-Only**, or **Receive-Only** state.
  - The conversation's context is in the **Backout-Required** condition.
  - The program is using protected resources that must be backed out.
- CM_OPERATION_NOT_ACCEPTED
  This value indicates that the program has chosen conversation-level non-blocking for the conversation and a previous call operation is still in progress.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. This call can be used to discover the state of a conversation after it has been backed out during a resource recovery backout operation.
2. The call is not associated with any conversation queue. When a conversation uses queue-level non-blocking, the call does not return CM_OPERATION_NOT_ACCEPTED on the conversation.

Related Information

“Support for Resource Recovery Interfaces” on page 52 provides more information on using resource recovery interfaces.

Extract_Conversation_Type (CMECT)

LU 6.2	OSI TP

A program uses the Extract_Conversation_Type (CMECT) call to extract the *conversation_type* characteristic's value for a given conversation. The value is returned in the *conversation_type* parameter.

The *conversation_type* conversation characteristic identifies whether the data exchange on the conversation will follow basic or mapped rules.

Format

```
CALL CMECT(conversation_ID,
           conversation_type,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

conversation_type *(output)*
Specifies the conversation type that is returned to the local program. The *conversation_type* can be one of the following:

- CM_BASIC_CONVERSATION
  Indicates that the conversation is allocated as a basic conversation.
- CM_MAPPED_CONVERSATION
  Indicates that the conversation is allocated as a mapped conversation.

Note: Unless *return_code* is set to CM_OK, the value of *conversation_type* is not meaningful.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_PROGRAM_PARAMETER_CHECK
  This return code indicates that the *conversation_ID* specifies an unassigned conversation identifier.
- CM_PROGRAM_STATE_CHECK
  This value indicates that the *conversation_ID* specifies a conversation in **Initialize-Incoming** state.
- CM_OPERATION_NOT_ACCEPTED
  This value indicates that the program has chosen conversation-level non-blocking for the conversation and a previous call operation is still in progress.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. This call does not change the *conversation_type* for the specified conversation.
2. The call is not associated with any conversation queue. When a conversation uses queue-level non-blocking, the call does not return CM_OPERATION_NOT_ACCEPTED on the conversation.

Related Information

"Set_Conversation_Type (CMSCT)" on page 294 provides more information on the *conversation_type* characteristic.

Extract_Initialization_Data (CMEID)

OSI TP

A program uses the Extract_Initialization_Data (CMEID) call to extract the *initialization_data* and *initialization_data_length* conversation characteristics received from the remote program for a given conversation. The values are returned to the program in the *initialization_data* and *initialization_data_length* parameters.

The *initialization_data* conversation characteristic contains program-supplied data that is sent to, or received from, the remote program during conversation initialization.

The Extract_Initialization_Data call is used by the recipient of the conversation to extract the incoming initialization data received from the initiator of the conversation. It may be issued following the Accept_Conversation or Accept_Incoming call.

When the conversation is using an OSI TP CRM, the Extract_Initialization_Data call may also be used by the initiator of the conversation to extract the incoming initialization data from the recipient of the conversation. In this case, the call may be issued following receipt of a *control_information_received* value of CM_ALLOCATE_CONFIRMED_WITH_DATA or CM_ALLOCATE_REJECTED_WITH_DATA.

Format

```
CALL CMEID(conversation_ID,
           initialization_data,
           requested_length,
           initialization_data_length,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

initialization_data *(output)*
Specifies the variable containing the initialization data. Initialization data may be from 0 to 10000 bytes.

Note: Unless *return_code* is set to CM_OK, the value of *initialization_data* is not meaningful.

requested_length *(input)*
Specifies the length of the *initialization_data* variable to contain the initialization data.

initialization_data_length *(output)*
If *return_code* is CM_OK, the output value of this parameter specifies the size of the *initialization_data* variable in bytes. If *return_code* is CM_BUFFER_TOO_SMALL, this parameter indicates the size of the *initialization_data* to be extracted.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned identifier.
  - The *requested_length* specifies a value less than 0.
- CM_BUFFER_TOO_SMALL
  The *requested_length* specifies a value that is less than the size of the *initialization_data* characteristic to be extracted. The *initialization_data* characteristic is not returned, but the *initialization_data_length* parameter is set to indicate the size required.
- CM_PROGRAM_STATE_CHECK
  This value indicates that the *conversation_ID* specifies a conversation in **Initialize-Incoming** state.
- CM_OPERATION_NOT_ACCEPTED
  This value indicates that the program has chosen conversation-level non-blocking for the conversation and a previous call operation is still in progress.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause any state changes.

Usage Notes

1. This call does not change the value of the *initialization_data* or the *initialization_data_length* characteristic for the specified conversation.
2. The program that initiates the conversation (issues Initialize_Conversation) must set *allocate_confirm* to CM_ALLOCATE_CONFIRM if it is expecting initialization data to be returned from the remote program following its confirmation of acceptance of the conversation.
3. The call is not associated with any conversation queue. When a conversation uses queue-level non-blocking, the call does not return CM_OPERATION_NOT_ACCEPTED on the conversation.

Related Information

"Extract_Mapped_Initialization_Data (CMEMID)" on page 167 describes information about extracting the initialization_data conversation characteristic for mapped initialization data.

"Set_Mapped_Initialization_Data (CMSMID)" on page 311 describes how the initialization data is set by the remote program.

Extract_Mapped_Initialization_Data (CMEMID)

OSI TP

A program uses the Extract_Mapped_Initialization_Data (CMEMID) call to extract the *initialization_data* and *initialization_data_length* conversation characteristics received from the remote program for a given conversation after they have been processed by the underlying map routine. The *map_name* identifies the data so that it can be processed properly. The values are returned to the program in the *initialization_data* and *initialization_data_length* parameters.

The *initialization_data* conversation characteristic contains program-supplied data that is sent to, or received from, the remote program during conversation initialization.

The Extract_Mapped_Initialization_Data call is used by the recipient of the conversation to extract the incoming initialization data received from the initiator of the conversation and transformed by the underlying map routine. It may be issued following the Accept_Conversation or Accept_Incoming call.

The Extract_Mapped_Initialization_Data call may be used by the initiator of the conversation to extract the incoming initialization data from the recipient of the conversation after it has been processed by the U-ASE. The Extract_Initialization_Data call may also be used by the initiator of the conversation to extract the incoming initialization data from the recipient of the conversation. In this case, the call may be issued following receipt of a *control_information_received* value of CM_ALLOCATE_CONFIRMED_WITH_DATA or CM_ALLOCATE_REJECTED_WITH_DATA.

Format

```
CALL CMEMID(conversation_ID,
            map_name,
            map_name_length,
            initialization_data,
            requested_length,
            initialization_data_length,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

map_name *(output)*
Specifies the variable containing the mapping function used to decode the data record. The length of the variable must be at least 64 bytes.

map_name_length *(output)*
Specifies the variable containing the length of the returned_map name parameter.

Note: Unless *return_code* is set to CM_OK, the value of *initialization_data* is not meaningful.

requested_length *(input)*
Specifies the length of the *initialization_data* variable to contain the initialization data.

initialization_data_length *(output)*
If *return_code* is CM_OK, the output value of this parameter specifies the size of the *initialization_data* variable in bytes. If *return_code* is CM_BUFFER_TOO_SMALL, this parameter indicates the size of the *initialization_data* to be extracted.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned identifier.
  - The *requested_length* specifies a value less than 0.
  - The *conversation_type* characteristic is set to CM_BASIC_CONVERSATION.
- CM_BUFFER_TOO_SMALL
  The *requested_length* specifies a value that is less than the size of the *initialization_data* characteristic to be extracted. The *initialization_data* characteristic is not returned, but the *initialization_data_length* parameter is set to indicate the size required.
- CM_UNKNOWN_MAP_NAME_RECEIVED
  The received data requires a map routine that the local map function does not support. The buffer contains the unprocessed user data.
- CM_MAP_ROUTINE_ERROR
  The map routine encountered a problem with the received data. The buffer contains the unprocessed user data.
- CM_PROGRAM_STATE_CHECK
  This value indicates that the *conversation_ID* specifies a conversation in **Initialize-Incoming** state.
- CM_OPERATION_NOT_ACCEPTED
  This value indicates that the program has chosen conversation-level non-blocking for the conversation and a previous call operation is still in progress.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause any state changes.

Usage Notes

1. This call does not change the value of the *initialization_data* or the *initialization_data_length* characteristic for the specified conversation.
2. The program that initiates the conversation (issues Initialize_Conversation) must set *allocate_confirm* to CM_ALLOCATE_CONFIRM if it is expecting initialization data to be returned from the remote program following its confirmation of acceptance of the conversation.

3. The call is not associated with any conversation queue. When a conversation uses queue-level non-blocking, the call does not return CM_OPERATION_NOT_ACCEPTED on the conversation.
4. The *received_length* is local information from the map routine. The receive_length value is calculated by the map routine after all transformations are completed.
5. If CM_BUFFER_TOO_SMALL is returned, *Initialization_data* wil have been set to the length required to receive the data. You can allocate a larger buffer in which to receive the data and reissue the call or perform other user specified actions.

Related Information

"Extract_Initialization_Data (CMEID)" on page 165 describes how the mapped initialization data is set by the remote program.

"Set_Initialization_Data (CMSID)" on page 305 describes how the set initialization data is sent to the remote program.

Extract_Maximum_Buffer_Size (CMEMBS)

LU 6.2	OSI TP

A program uses the Extract_Maximum_Buffer_Size (CMEMBS) call to extract the maximum buffer size supported by the system.

The *maximum_buffer_size* conversation characteristic contains the value of the largest supported buffer size on the local system.

Format

```
CALL CMEMBS(maximum_buffer_size,
            return_code)
```

Parameters

maximum_buffer_size *(output)*
Specifies the variable containing the maximum buffer size supported by the system.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call causes no state changes.

Usage Notes

This call can be used to find out the maximum buffer size supported by the system, when the maximum value is not known during program development. The value in *maximum_buffer_size* determines the largest amount of data the program can send in a Send_Data call or extract in an Extract_Secondary_Information call.

The largest amount of data that can be received by the program in a Receive call is:

- For a basic conversation
  - 32767, if the *fill* characteristic is set to CM_FILL_LL
  - The value of *maximum_buffer_size*, if the *fill* characteristic is set to CM_FILL_BUFFER
- For a mapped conversation
  - The value of *maximum_buffer_size*. The program should be aware that the CM_INCOMPLETE_DATA_RECEIVED value of the *data_received* parameter on the Receive call may be returned when the local maximum buffer size is less than the program partner's maximum buffer size.

Extract_Mode_Name (CMEMN)

LU 6.2	OSI TP

A program uses the Extract_Mode_Name (CMEMN) call to extract the *mode_name* characteristic's value for a given conversation. The value is returned to the program in the *mode_name* parameter.

The *mode_name* conversation characteristic is a name that is used to identify the network properties requested for the conversation. When the conversation is using an OSI TP CRM, the *mode_name* used during conversation initialization is not available to the recipient of the conversation.

Format

```
CALL CMEMN(conversation_ID,
           mode_name,
           mode_name_length,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

mode_name *(output)*
Specifies the variable containing the mode name. The mode name designates the network properties for the logical connection allocated, or to be allocated, which will carry the conversation specified by the *conversation_ID*.

Note: Unless *return_code* is set to CM_OK, the value of *mode_name* is not meaningful.

mode_name_length *(output)*
Specifies the variable containing the length of the returned *mode_name* parameter. The variable must be defined with a length of at least 8 bytes.

Note: Unless *return_code* is set to CM_OK, the value of *mode_name_length* is not meaningful.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates that the *conversation_ID* specifies an unassigned conversation identifier.
- CM_PROGRAM_STATE_CHECK
  This value indicates that the *conversation_ID* specifies a conversation in **Initialize-Incoming** state.
- CM_OPERATION_NOT_ACCEPTED
  This value indicates that the program has chosen conversation-level non-blocking for the conversation and a previous call operation is still in progress.

- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. This call does not change the *mode_name* for the specified conversation.
2. CPI Communications returns the *mode_name* using the native encoding of the local system.
3. The call is not associated with any conversation queue. When a conversation uses queue-level non-blocking, the call does not return CM_OPERATION_NOT_ACCEPTED on the conversation.

Related Information

"Automatic Conversion of Characteristics" on page 39 provides further information on the automatic conversion of the *mode_name* parameter.

"Set_Mode_Name (CMSMN)" on page 314 and "Side Information" on page 21 provide further information on the *mode_name* characteristic.

Extract_Partner_ID (CMEPID)

LU 6.2	OSI TP

Programs use the Extract_Partner_ID call to determine the *partner_ID* characteristic for a conversation.

Format

```
CALL CMEPID(conversation_ID,
            partner_ID_type,
            partner_ID,
            requested_length,
            partner_ID_length,
            partner_ID_scope,
            directory_syntax,
            directory_encoding,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation ID.

partner_ID_type *(output)*
Specifies the type of the *partner_ID* characteristic. If the call is issued after Allocate completes, the *partner_ID_type* will be of type CM_PROGRAM_BINDING.

partner_ID *(output)*
Specifies the *partner_ID* characteristic for the conversation. This parameter is only set if the *return_code* is CM_OK.

requested_length *(input)*
The input value of this parameter specifies the maximum size of the *partner_ID* variable the program is to receive.

partner_ID_length *(output)*
If *return_code* is CM_OK, the output value of this parameter specifies the size of the *partner_ID* variable in bytes. If *return_code* is CM_BUFFER_TOO_SMALL, this parameter indicates the size of the *partner_ID* to be extracted.

partner_ID_scope *(output)*
Specifies the scope of the search in the use of the *partner_ID*. The *partner_ID_scope* variable only has meaning when the *partner_ID* is of type CM_DISTINGUISHED_NAME.

directory_syntax *(output)*
Specifies the syntax of the distributed directory that CPI Communications accesses with the *partner_ID*. This parameter has no meaning if *partner_ID_type* is CM_PROGRAM_BINDING.

directory_encoding *(output)*
Specifies the encoding rule of the distributed directory that CPI Communications accesses with the *partner_ID*. This parameter has no meaning if *partner_ID_type* is CM_PROGRAM_BINDING.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_STATE_CHECK
  This value indicates that the conversation is in **Initialize-Incoming** state.
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *requested_length* specifies a value less than 0.
- CM_BUFFER_TOO_SMALL
  The *requested_length* specifies a value that is less than the size of the *partner_ID* characteristic to be extracted. The *partner_ID* characteristic is not returned, but the *partner_ID_length* parameter is set to indicate the size required.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. Unless the *return_code* indicates CM_OK or CM_BUFFER_TOO_SMALL, the values of all other parameters on this call have no meaning.
2. If the value specified for the *requested_length* is less than the size of the *partner_ID* characteristic to be extracted, the program receives a return code of CM_BUFFER_TOO_SMALL and the *partner_ID* is not returned. The *partner_ID_length* parameter, however, is updated to show the size *partner_ID* parameter required. A subsequent call to Extract_Partner_ID with sufficient size completes successfully.
3. When used before the Allocate call, this call returns the *partner_ID* value established from side information or by a prior Set_Partner_ID call. After a successful Allocate call, Extract_Partner_ID returns the program binding used to establish the conversation. The program can determine the CRM type on which the conversation is allocated by parsing the program binding. See “Program Binding” on page 429 for details.
4. If the call is issued by the program that accepts the conversation, the program binding returned to the program may not be complete. For example, programs accepting a conversation with a CRM type of LU 6.2 are not able to access the TP name of the partner program. In these cases, Extract_Partner_ID returns with a *partner_ID_type* of CM_PROGRAM_BINDING and the *partner_ID* variable contains as much information on the partner program as is currently available.
5. This call may be issued in **Reset** state to retrieve the program binding. When the call completes successfully, CPI Communications no longer keeps the *partner_ID*. The program should issue this call immediately upon entering **Reset** state, as the duration of the program binding and valid conversation identifier is implementation-specific.

Related Information

"Distributed Directory" on page 22 explains the terms and concepts required for use of a distributed directory.

"Example 14: Using the Distributed Directory to Find the Partner Program" on page 94 provides a sample scenario of a program using the Extract_Partner_ID call.

"Set_Partner_ID (CMSPID)" on page 316 provides details on how to set the *partner_ID* characteristic.

"Program Binding" on page 429 describes the format of a program binding.

Extract_Partner_LU_Name (CMEPLN)

LU 6.2

A program uses the Extract_Partner_LU_Name (CMEPLN) call to extract the *partner_LU_name* characteristic's value for a given conversation. The value is returned in the *partner_LU_name* parameter.

The *partner_lu_name* conversation characteristic contains the SNA LU name that identifies the location of the remote program.

Format

```
CALL CMEPLN(conversation_ID,
            partner_LU_name,
            partner_LU_name_length,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

partner_LU_name *(output)*
Specifies the variable containing the name of the LU where the remote program is located. The variable must be defined with a length of at least 17 bytes.

Note: Unless *return_code* is set to CM_OK, the value of *partner_LU_name* is not meaningful.

partner_LU_name_length *(output)*
Specifies the variable containing the length of the returned *partner_LU_name* parameter.

Note: Unless *return_code* is set to CM_OK, the value of *partner_LU_name_length* is not meaningful.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates that the *conversation_ID* specifies an unassigned conversation identifier.
- CM_PROGRAM_STATE_CHECK
  This value indicates that the *conversation_ID* specifies a conversation in **Initialize-Incoming** state.

- CM_OPERATION_NOT_ACCEPTED
  This value indicates that the program has chosen conversation-level non-blocking for the conversation and a previous call operation is still in progress.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. This call does not change the *partner_LU_name* for the specified conversation.
2. CPI Communications returns the *partner_LU_name* using the native encoding of the local system.
3. The call is not associated with any conversation queue. When a conversation uses queue-level non-blocking, the call does not return CM_OPERATION_NOT_ACCEPTED on the conversation.

Related Information

"Automatic Conversion of Characteristics" on page 39 provides further information on the automatic conversion of the *partner_LU_name* parameter.

"Set_Partner_LU_Name (CMSPLN)" on page 320 and "Side Information" on page 21 provide more information on the *partner_LU_name* characteristic.

Extract_Secondary_Information (CMESI)

LU 6.2	OSI TP

Extract_Secondary_Information (CMESI) is used to extract secondary information associated with the return code for a given call.

Format

```
CALL CMESI(conversation_ID,
           call_ID,
           buffer,
           requested_length,
           data_received,
           received_length,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

call_ID *(input)*
Specifies the call identifier (see Table 19 on page 412).

buffer *(output)*
Specifies the variable in which the program is to receive the secondary information.

Note: *buffer* contains information only if the *return_code* is set to CM_OK.

requested_length *(input)*
Specifies the maximum amount of secondary information the program is to receive. Valid *requested_length* values range from 1 to the maximum buffer size supported by the system. The maximum buffer size is at least 32767 bytes. See Usage Note 12 on page 221 of the Receive call for additional information about determining the maximum buffer size.

data_received *(output)*
Specifies whether or not the program received complete secondary information.

Note: Unless *return_code* is set to CM_OK, the value contained in *data_received* has no meaning.

The *data_received* variable can have one of the following values:

- CM_COMPLETE_DATA_RECEIVED
  This value indicates that complete secondary information is received.
- CM_INCOMPLETE_DATA_RECEIVED
  This value indicates that more secondary information is available to be received.

received_length *(output)*
Specifies the variable containing the amount of secondary information the program received, up to the maximum.

Note: Unless *return_code* is set to CM_OK, the value contained in *received_length* has no meaning.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_NO_SECONDARY_INFORMATION
  This value indicates that no secondary information is available for the specified call on the specified conversation.
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *call_ID* specifies CM_CMESI or an undefined value.
  - The *requested_length* specifies a value that exceeds the range permitted by the implementation.

State Changes

This call does not cause a state change.

Usage Notes

1. The program should issue the call immediately after it receives a return code at the completion of a call. In particular, when a conversation is deallocated and enters **Reset** state, the associated secondary information and conversation identifier are available for a system-dependent time.
2. If an Accept_Conversation, Initialize_Conversation, or Initialize_For_Incoming call fails, a conversation identifier is assigned and returned to the program for use only on the Extract_Secondary_Information call.
3. When the Extract_Secondary_Information call completes successfully, CPI Communications no longer keeps the returned secondary information for the specified call on the specified conversation. The same information is not available for a subsequent Extract_Secondary_Information call.
4. The program cannot use the call to retrieve secondary information for the previous Extract_Secondary_Information call.
5. When the *call_ID* specifies one of the non-conversation calls (that is, Convert_Incoming, Convert_Outgoing, Extract_Maximum_Buffer_Size, Release_Local_TP_Name, Specify_Local_TP_Name, Wait_For_Conversation, and Wait_For_Completion), the *conversation_ID* is ignored.
6. **Note to Implementers:** Because of different non-blocking levels, an implementation should maintain secondary information as follows:
   - For conversations using conversation-level non-blocking, secondary information is kept:
     - On a per-conversation basis for conversation calls
     - On a per-thread basis for non-conversation calls
   - For conversations not using conversation-level non-blocking, secondary information is kept:
     - On a per-queue basis for calls that are associated with a conversation queue
     - On a per-thread basis for calls that are not associated with any conversation queue

Related Information

"Extract_Maximum_Buffer_Size (CMEMBS)" on page 170 further discusses determining the maximum buffer size supported by the system.

"Secondary Information" on page 449 provides a complete discussion of secondary information.

Extract_Security_User_ID (CMESUI)

LU 6.2	OSI TP

A program uses Extract_Security_User_ID (CMESUI) to extract the value of the *security_user_ID* characteristic for a given conversation.

The *security_user_id* conversation characteristic contains the user identification associated with the conversation.

Format

```
CALL CMESUI(conversation_ID,
            security_user_ID,
            security_user_ID_length,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

security_user_ID *(output)*
Specifies the variable containing the user ID. The variable must be defined with a length of at least 10 bytes.

Note: If *return_code* is not set to CM_OK, *security_user_ID* is undefined.

security_user_ID_length *(output)*
Specifies the variable containing the length of the user ID.

Note: If *return_code* is not set to CM_OK, *security_user_ID_length* is undefined.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED

- CM_PROGRAM_PARAMETER_CHECK
  This value indicates that the *conversation_ID* specifies an unassigned conversation identifier.
- CM_PROGRAM_STATE_CHECK
  This value indicates that the program is in **Initialize-Incoming** state.
- CM_OPERATION_NOT_ACCEPTED
  This value indicates that the program has chosen conversation-level non-blocking for the conversation and a previous call operation is still in progress.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause any state changes.

Usage Notes

1. This call does not change the *security_user_ID* for the specified conversation.
2. CPI Communications returns the *security_user_ID* using the native encoding of the local system.
3. The call is not associated with any conversation queue. When a conversation uses queue-level non-blocking, the call does not return CM_OPERATION_NOT_ACCEPTED on the conversation.

Related Information

"Automatic Conversion of Characteristics" on page 39 provides further information on the automatic conversion of the *security_user_ID* parameter.

"Set_Conversation_Security_User_ID (CMSCSU)" on page 292 discusses the setting of the *security_user_ID* characteristic.

Extract_Send_Receive_Mode (CMESRM)

LU 6.2	OSI TP

The Extract_Send_Receive_Mode (CMESRM) call is used by a program to extract the value of the *send_receive_mode* characteristic for a conversation. The value is returned in the *send_receive_mode* parameter.

The *send_receive_mode* conversation characteristic indicates whether the conversation is using half-duplex or full-duplex mode for data transmission.

Format

```
CALL CMESRM(conversation_ID,
            send_receive_mode,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

send_receive_mode *(output)*
Specifies the send-receive mode for the conversation.

The *send_receive_mode* variable can have one of the following values:

- CM_HALF_DUPLEX
  Indicates that the conversation is a half-duplex conversation.
- CM_FULL_DUPLEX
  Indicates that the conversation is a full-duplex conversation.

Note: Unless *return_code* is set to CM_OK, the value of *send_receive_mode* is not meaningful.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates that the *conversation_ID* specifies an unassigned conversation identifier.
- CM_PROGRAM_STATE_CHECK
  This value indicates that the *conversation_ID* specifies a conversation in **Initialize-Incoming** state.

- CM_OPERATION_NOT_ACCEPTED
  This value indicates that the program has chosen conversation-level non-blocking for the conversation and a previous call operation is still in progress.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. This call does not change the *send_receive_mode* for the specified conversation.
2. This call is not associated with any conversation queue. When a conversation uses queue-level non-blocking, the call does not return CM_OPERATION_NOT_ACCEPTED on the conversation.

Related Information

"Send-Receive Modes" on page 15 provides more information on the differences between half-duplex and full-duplex conversations.

"Example 8: Establishing a Full-Duplex Conversation" on page 82 shows an example of how a full-duplex conversation is set up.

"Set_Send_Receive_Mode (CMSSRM)" on page 340 describes how to set the *send_receive_mode* characteristic for a conversation.

Extract_Sync_Level (CMESL)

LU 6.2	OSI TP

A program uses the Extract_Sync_Level (CMESL) call to extract the *sync_level* characteristic's value for a given conversation. The value is returned to the program in the *sync_level* parameter.

The *sync_level* conversation characteristic indicates the level of synchronization services provided on the conversation.

Format

```
CALL CMESL(conversation_ID,
           sync_level,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

sync_level *(output)*
Specifies the variable containing the *sync_level* characteristic of this conversation. The *sync_level* variable can have one of the following values:

- CM_NONE
  Specifies that the programs will not perform confirmation processing on this conversation. The programs will not issue calls or recognize returned parameters relating to synchronization.
- CM_CONFIRM (half-duplex conversations only)
  Specifies that the programs can perform confirmation processing on this conversation. The programs can issue calls and will recognize returned parameters relating to confirmation.
- CM_SYNC_POINT (half-duplex conversations only)
  For systems that support resource recovery processing, this value specifies that this conversation is a protected resource. The programs can issue resource recovery calls and will recognize returned parameters relating to resource recovery operations. The programs can also perform confirmation processing.
- CM_SYNC_POINT_NO_CONFIRM
  For systems that support resource recovery processing, this value specifies that the conversation is a protected resource. The programs can issue resource recovery interface calls and will recognize returned parameters relating to resource recovery processing. The programs cannot perform confirmation processing.

Notes:

1. Unless *return_code* is set to CM_OK, the value of *sync_level* is not meaningful.
2. If the conversation is using an OSI TP CRM, confirmation of the deallocation of the conversation can be performed with any *sync_level* value.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates that the *conversation_ID* specifies an unassigned conversation identifier.
- CM_PROGRAM_STATE_CHECK
  This value indicates that the *conversation_ID* specifies a conversation in **Initialize-Incoming** state.
- CM_OPERATION_NOT_ACCEPTED
  This value indicates that the program has chosen conversation-level non-blocking for the conversation and a previous call operation is still in progress.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. This call does not change the *sync_level* for the specified conversation.
2. The call is not associated with any conversation queue. When a conversation uses queue-level non-blocking, the call does not return CM_OPERATION_NOT_ACCEPTED on the conversation.

Related Information

"Set_Sync_Level (CMSSL)" on page 344 provides more information on the *sync_level* characteristic.

Extract_TP_Name (CMETPN)

LU 6.2	OSI TP

A program uses the Extract_TP_Name (CMETPN) call to extract the *TP_name* characteristic's value for a given conversation. The value is returned to the program in the *TP_name* parameter.

For a conversation established using Initialize_Conversation, *TP_name* is the value set from the side information referenced by *sym_dest_name* or set by the Set_TP_Name call.

For a conversation established by Accept_Conversation or Accept_Incoming, *TP_name* is the value included in the conversation startup request. Since this value comes from the *TP_name* characteristic of the remote program, the values are the same at both ends of a conversation.

Format

```
CALL CMETPN(conversation_ID,
            TP_name,
            TP_name_length,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

TP_name *(output)*
Specifies the variable containing the *TP_name* for the specified conversation. The variable must be defined with a length of at least 64 bytes.

Note: Unless *return_code* is set to CM_OK, the value in *TP_name* is not meaningful.

TP_name_length *(output)*
Specifies the variable containing the length of the returned *TP_name*.

Note: Unless *return_code* is set to CM_OK, the value in *TP_name_length* is not meaningful.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates that the *conversation_ID* specifies an unassigned conversation identifier.
- CM_PROGRAM_STATE_CHECK
  This value indicates that the conversation is in **Initialize-Incoming** state.
- CM_OPERATION_NOT_ACCEPTED

This value indicates that the program has chosen conversation-level non-blocking for the conversation and a previous call operation is still in progress.

- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause any state changes.

Usage Notes

1. This call is used by programs that accept multiple conversations. Extract_TP_Name allows the program to determine which local name was specified in the incoming conversation startup request.
2. The call is not associated with any conversation queue. When a conversation uses queue-level non-blocking, the call does not return CM_OPERATION_NOT_ACCEPTED on the conversation.
3. TP_Name is returned using the local system's native encoding. CPI-C automatically converts TP_Name from the transfer encoding where necessary.
4. Refer to “SNA Service Transaction Programs” on page 499 for special handling of SNA Service Transaction Program names.

Related Information

“Specify_Local_TP_Name (CMSLTP)” on page 351 provides more information on handling multiple names within a single program.

Extract_Transaction_Control (CMETC)

OSI TP

Extract_Transaction_Control (CMETC) is used by a program to extract the *transaction_control* characteristic for a given conversation. The value is returned to the application program in the *transaction_control* parameter.

The *transaction_control* characteristic is used only by an OSI TP CRM and is not significant unless the *sync_level* characteristic is set to either CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM.

The *transaction_control* conversation characteristic indicates whether the conversation supports chained or unchained transactions.

Format

```
CALL CMETC(conversation_ID,
           transaction_control,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

transaction_control *(output)*
Specifies the variable containing the *transaction_control* characteristic for the specified conversation. The *transaction_control* variable can have one of the following values:

- CM_CHAINED_TRANSACTIONS
  Specifies that the conversation uses chained transactions.
- CM_UNCHAINED_TRANSACTIONS
  Specifies that the conversation uses unchained transactions.

Note: Unless *return_code* is set to CM_OK, the value of *transaction_control* is not meaningful.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates that the *conversation_ID* specifies an unassigned identifier.

- CM_PROGRAM_STATE_CHECK
  This value indicates that the *conversation_ID* specifies a conversation in **Initialize-Incoming** state.
- CM_OPERATION_NOT_ACCEPTED
  This value indicates that the program has chosen conversation-level non-blocking for the conversation and a previous call operation is still in progress.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause any state changes.

Usage Notes

1. This call does not change the *transaction_control* for the specified conversation.
2. This call is not associated with any conversation queue. When a conversation uses queue-level non-blocking, the call does not return CM_OPERATION_NOT_ACCEPTED.
3. This call can be used by the recipient to determine the *transaction_control* characteristic for the conversation. If the value is CM_CHAINED_TRANSACTIONS, the conversation is already included in a transaction. If the value is CM_UNCHAINED_TRANSACTIONS, the program will be informed with a CM_JOIN_TRANSACTION *status_received* value if it is to join the transaction.

Related Information

"Set_Transaction_Control (CMSTC)" on page 349 provides more information on the *transaction_control* characteristic.

Flush (CMFLUS)

LU 6.2	OSI TP

A program uses the Flush (CMFLUS) call to empty the local system's send buffer for a given conversation. When notified by CPI Communications that a Flush has been issued, the system sends any information it has buffered to the remote system. The information that can be buffered comes from the Allocate, Send_Data, or Send_Error call. Refer to the descriptions of these calls for more details of when and how buffering occurs.

Format

```
CALL CMFLUS(conversation_ID,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

return_code *(output)*
Specifies the result of the call execution. The *return_code* can be one of the following:

- CM_OK
- CM_OPERATION_INCOMPLETE
- CM_CONVERSATION_CANCELED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates that the *conversation_ID* specifies an unassigned conversation ID.
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - For a half-duplex conversation, the conversation is not in **Send**, **Send-Pending**, or **Defer-Receive** state.
  - For a conversation with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, the conversation's context is in the **Backout-Required** condition. The Flush call is not allowed for this conversation while its context is in this condition.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

The following return codes apply to full-duplex conversations.

If the conversation is not currently included in a transaction, the *return_code* can have one of the following values:

- CM_ALLOCATION_ERROR
- CM_DEALLOCATED_ABEND
- CM_DEALLOCATED_ABEND_SVC
- CM_DEALLOCATED_ABEND_TIMER
- CM_RESOURCE_FAILURE_NO_RETRY

- CM_RESOURCE_FAILURE_RETRY
- CM_DEALLOCATED_NORMAL
- CM_PROGRAM_STATE_CHECK
  This value indicates that the program has received a *status_received* value of CM_JOIN_TRANSACTION and must issue a tx_begin call to the X/Open TX interface to join the transaction.

If the *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM and the conversation is included in a transaction, the *return_code* can have one of the following values:

- CM_TAKE_BACKOUT
- CM_DEALLOCATED_ABEND_BO
- CM_DEALLOCATED_ABEND_SVC_BO
- CM_DEALLOCATED_ABEND_TIMER_BO
- CM_RESOURCE_FAILURE_RETRY_BO
- CM_RESOURCE_FAIL_NO_RETRY_BO
- CM_INCLUDE_PARTNER_REJECT_BO
- CM_CONV_DEALLOC_AFTER_SYNCPT

State Changes

For half-duplex conversations, when *return_code* indicates CM_OK:

- The conversation enters **Send** state if the program issues the Flush call with the conversation in **Send-Pending** state.
- The conversation enters **Receive** state if the program issues the Flush call with the conversation in **Defer-Receive** state.
- No state change occurs if the program issues the Flush call with the conversation in **Send** state.

For full-duplex conversations, this call does not cause any state changes.

Usage Notes

1. This call optimizes processing between the local and remote programs. The local system normally buffers the data from consecutive Send_Data calls until it has a sufficient amount for transmission. Only then does the local system transmit the buffered data.

   The local program can issue a Flush call to cause the system to transmit the data immediately. This helps minimize any delay in the remote program's processing of the data.
2. The Flush call causes the local system to flush its send buffer only when the system has some information to transmit. If the system has no information in its send buffer, nothing is transmitted to the remote system.
3. The use of Send_Data followed by a call to Flush is equivalent to the use of Send_Data after setting *send_type* to CM_SEND_AND_FLUSH.
4. For full-duplex conversations, when CM_ALLOCATION_ERROR, CM_DEALLOCATE_*, CM_RESOURCE_FAILURE_*, or CM_DEALLOCATE_NORMAL is returned and the conversation is in **Send-Receive** state, the program can terminate the conversation by issuing Receive calls until it gets a return code that takes it to **Reset** state, or by issuing a Deallocate call with *deallocate_type* set to CM_DEALLOCATE_ABEND.

Related Information

"Data Buffering and Transmission" on page 42 discusses the conditions for data transmission.

"Example 5: Validation of Data Receipt" on page 76 shows an example of how a program can use the Flush call to establish a conversation immediately.

"Allocate (CMALLC)" on page 121 provides more information on how information is buffered from the Allocate call.

"Send_Data (CMSEND)" on page 244 provides more information on how information is buffered from the Send_Data call.

"Send_Error (CMSERR)" on page 254 provides more information on how information is buffered from the Send_Error call.

"Send_Mapped_Data (CMSNDM)" on page 266 provides more information on a program sends mapped data to its partner.

"Set_Send_Type (CMSST)" on page 342 discusses alternative methods of achieving the Flush function.

Include_Partner_In_Transaction (CMINCL)

OSI TP

A program uses the Include_Partner_In_Transaction (CMINCL) call to explicitly request that the subordinate join the transaction. The caller must be in a transaction, and the subordinate must be on a branch supporting unchained transactions.

Note: The Include_Partner_In_Transaction call has meaning only when an OSI TP CRM is being used for the conversation.

Format

```
CALL CMINCL(conversation_ID,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_OPERATION_INCOMPLETE
- CM_CONVERSATION_CANCELED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The conversation is not using an OSI TP CRM.
  - The *transaction_control* is CM_CHAINED_TRANSACTIONS.
  - The program is not the superior for the conversation.
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - For a half-duplex conversation, the conversation is not in **Send** or **Send-Pending** state.
  - For a full-duplex conversation, the conversation is not in **Send-Receive** state.
  - The conversation is basic and the program started but did not finish sending a logical record.
  - The conversation's context is not in transaction. The program must issue a tx_begin call to the X/Open TX interface to start a transaction.
  - The conversation is already included in the current transaction.
- CM_DEALLOCATED_ABEND
- CM_RESOURCE_FAILURE_NO_RETRY
- CM_RESOURCE_FAILURE_RETRY
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

The following return codes apply to half-duplex conversations.

- CM_SYNC_LVL_NOT_SUPPORTED_SYS
- CM_SEND_RCV_MODE_NOT_SUPPORTED
- CM_TPN_NOT_RECOGNIZED
- CM_TP_NOT_AVAILABLE_NO_RETRY
- CM_TP_NOT_AVAILABLE_RETRY
- CM_PROGRAM_ERROR_PURGING

The following return codes apply to full-duplex conversations.

- CM_ALLOCATION_ERROR
- CM_DEALLOCATED_NORMAL

State Changes

This call does not cause any state changes.

Usage Notes

1. The call is used by a program to request that the subordinate join the transaction when the *begin_transaction* conversation characteristic set to CM_BEGIN_EXPLICIT.
2. The remote program receives the request to join the transaction as a *status_received* indicator of CM_JOIN_TRANSACTION on a Receive call.

Related Information

"Chained and Unchained Transactions" on page 59 discusses chained and unchained transactions.

"Joining a Transaction" on page 59 discusses how a program requests the partner program to join a transaction.

"Set_Begin_Transaction (CMSBT)" on page 283 discusses the *begin_transaction* characteristic.

Initialize_Conversation (CMINIT)

LU 6.2	OSI TP

A program uses the Initialize_Conversation (CMINIT) call to initialize values for various conversation characteristics before the conversation is allocated (with a call to Allocate). The remote partner program uses the Accept_Conversation call or the Initalize_Incoming and Accept_Incoming calls to initialize values for the conversation characteristics on its end of the conversation.

Note: A program can override the values that are initialized by this call using the appropriate Set calls, such as Set_Sync_Level. Once the value is changed, it remains changed until the end of the conversation or until changed again by a Set call.

Format

```
CALL CMINIT(conversation_ID,
            sym_dest_name
            return_code)
```

Parameters

conversation_ID *(output)*
Specifies the variable containing the conversation identifier assigned to the conversation. CPI Communications supplies and maintains the *conversation_ID*. If the Initialize_Conversation call is successful (*return_code* is set to CM_OK), the local program uses the identifier returned in this variable for the rest of the conversation.

sym_dest_name *(input)*
Specifies the symbolic destination name. The symbolic destination name is provided by the program and points to an entry in the side information. The appropriate entry in the side information is retrieved and used to initialize the characteristics for the conversation. Alternatively, a blank *sym_dest_name* (one composed of eight space characters) may be specified. When this is done, the program is responsible for setting up the appropriate destination information, using Set calls, before issuing the Allocate call for that conversation.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates that the *sym_dest_name* specifies an unrecognized value.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

When *return_code* indicates CM_OK, the conversation enters the **Initialize** state.

Usage Notes

1. For a list of the conversation characteristics that are initialized when the Initialize_Conversation call completes successfully, see Table 2 on page 33.
2. For each conversation, CPI Communications assigns a unique identifier, the *conversation_ID*. The program then uses the *conversation_ID* in all future calls intended for that conversation. Initialize_Conversation (or Accept_Conversation or Initialize_For_Incoming, on the opposite side of the conversation) must be issued by the program before any other calls may be made for that conversation.
3. A program can call Initialize_Conversation more than once and establish multiple, concurrently active conversations. When a program with an existing initialized conversation issues an Initialize_Conversation call, CPI Communications initializes a new conversation and assigns a new *conversation_ID*. CPI Communications is designed so that Initialize_Conversation is always issued from the **Reset** state. For more information about managing concurrent conversations, see "Multiple Conversations" on page 27.
4. If the side information supplies invalid allocation information on the Initialize_Conversation (CMINIT) call, or if the program supplies invalid allocation information on any subsequent Set calls, the error is detected when the information is processed by Allocate (CMALLC).
5. A program may obtain information about its partner program (for example, *partner_LU_name*, *TP_name*, and *mode_name*) from a source other than the side information. The local program can, for example, read this information from a file or receive it from another partner over a separate conversation. The information might even be hard-coded in the program. In cases where a program wishes to specify destination information about its partner program without making use of side information, the local program may supply a blank *sym_dest_name* on the Initialize_Conversation call. CPI Communications will initialize the conversation characteristics and return a *conversation_ID* for the new conversation. The program is then responsible for specifying valid destination information (using Set_Partner_LU_Name, Set_TP_Name, and Set_Mode_Name calls) before issuing the Allocate call.

Related Information

"Side Information" on page 21 provides more information on *sym_dest_name*.

"Conversation Characteristics" on page 31 provides a general overview of conversation characteristics and how they are used by the program and CPI Communications.

"Example 1: Data Flow in One Direction" on page 67 shows an example program flow where Initialize_Conversation is used.

The calls beginning with "Set" and "Extract" in this chapter are used to modify or examine conversation characteristics established by the Initialize_Conversation program call; see the individual call descriptions for details.

Initialize_For_Incoming (CMINIC)

LU 6.2	OSI TP

A program uses the Initialize_For_Incoming and Accept_Incoming calls, rather than the Accept call, when various conversation characteristics (for example, processing_mode) must be initialized before the conversation is accepted.

Note: A program can override the values that are initialized by this call using the appropriate Set calls, such as Set_Receive_Type. Once the value is changed, it remains changed until the end of the conversation or until changed again by a Set call.

Format

```
CALL CMINIC(conversation_ID,
            return_code)
```

Parameters

conversation_ID *(output)*
Specifies the variable containing the conversation identifier assigned to the conversation. CPI Communications supplies and maintains the *conversation_ID*. If the Initialize_For_Incoming call is successful (*return_code* is set to CM_OK), the local program uses the identifier returned in this variable for the rest of the conversation.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

When *return_code* indicates CM_OK, the conversation enters the **Initialize-Incoming** state.

Usage Notes

1. For a list of the conversation characteristics initialized when the Initialize_For_Incoming call completes successfully, see Table 2 on page 33.
2. For each conversation, CPI Communications assigns a unique identifier, the *conversation_ID*. The program then uses the *conversation_ID* in all future calls intended for that conversation.
3. The call is designed for use with Accept_Incoming. As shown in Table 2, when Initialize_For_Incoming completes, certain conversation characteristics are initialized. When the Accept_Incoming call completes, the remaining applicable conversation characteristics are initialized.
4. The Initialize_For_Incoming and Accept_Incoming calls can be used by a program to accept multiple conversations.

5. Even though the program may have been initialized as a direct result of an incoming conversation initialization request, the conversation must not be coupled with the *conversation_id* until the *Accept_Incoming* call. This allows the program to issue *Set_TP_Name* calls between the *Initialize_For_Incoming* and *Accept_Incoming* calls to associate specific transaction program names with specific *conversation_ids*.

Related Information

"Conversation Characteristics" on page 31 describes how the conversation characteristics are initialized by the Initialize_For_Incoming and Accept_Incoming calls.

"Example 12: Accepting Multiple Conversations Using Blocking Calls" on page 90 and "Example 13: Accepting Multiple Conversations Using Conversation-Level Non-Blocking Calls" on page 92 show example program flows where Initialize_For_Incoming is used.

The calls beginning with "Set" and "Extract" in this chapter are used to modify or examine conversation characteristics established by the Initialize_For_Incoming program call. See the individual call descriptions for details.

"Accept_Incoming (CMACCI)" on page 118 describes how the *conversation_ID* is used when an incoming conversation is accepted by a program.

Prepare (CMPREP)

OSI TP

A program uses the Prepare (CMPREP) call to explicitly request that a branch of the transaction prepare its resources to commit changes made during the transaction.

When the conversation is using an OSI TP CRM and the caller is not the root of the transaction, the caller must have received a take-commit notification from its superior. The subordinate program on the conversation cannot issue a Prepare (CMPREP) call.

Format

```
CALL CMPREP(conversation_ID,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_OPERATION_INCOMPLETE
- CM_CONVERSATION_CANCELED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *sync_level* is not CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM.
  - The conversation is using an OSI TP CRM, and the program is not the superior for the conversation.
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - For a half-duplex conversation, the conversation is not in **Send**, **Send-Pending**, **Defer-Receive**, or **Defer-Deallocate** state.
  - For a full-duplex conversation, the conversation is not in **Send-Receive** or **Defer-Deallocate** state.
  - The conversation is basic, and the program started but did not finish sending a logical record.
  - The conversation's context is not in transaction. The program must issue a tx_begin call to the X/Open TX interface to start a transaction.
  - The *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and the conversation's context is in the **Backout-Required** condition.

  - The conversation is using an OSI TP CRM, *begin_transaction* is set to CM_BEGIN_EXPLICIT, and the conversation is not currently included in a transaction.
  - The conversation is using an OSI TP CRM, and the program is not the root of the transaction and has not received a take-commit notification from its superior.
- CM_TAKE_BACKOUT
- CM_DEALLOCATED_ABEND_BO
- CM_DEALLOCATED_ABEND_SVC_BO
- CM_DEALLOCATED_ABEND_TIMER_BO
- CM_RESOURCE_FAILURE_RETRY_BO
- CM_RESOURCE_FAIL_NO_RETRY_BO
- CM_INCLUDE_PARTNER_REJECT_BO
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

The following return codes apply to half-duplex conversations.

- CM_CONVERSATION_TYPE_MISMATCH
- CM_PIP_NOT_SPECIFIED_CORRECTLY
- CM_SECURITY_NOT_VALID
- CM_SYNC_LVL_NOT_SUPPORTED_PGM
- CM_SYNC_LVL_NOT_SUPPORTED_SYS
- CM_SEND_RCV_MODE_NOT_SUPPORTED
- CM_TPN_NOT_RECOGNIZED
- CM_TP_NOT_AVAILABLE_NO_RETRY
- CM_TP_NOT_AVAILABLE_RETRY
- CM_PROGRAM_ERROR_PURGING

The following return codes apply to full-duplex conversations.

- CM_ALLOCATION_ERROR
- CM_CONV_DEALLOC_AFTER_SYNCPT

State Changes

When *return_code* indicates CM_OK, the conversation enters the **Prepared** state.

Usage Notes

1. The Prepare (CMPREP) functions without waiting for a response from the remote program. A program can detect that its partner has prepared its transaction resources by issuing a Receive (CMRCV) call and checking the result in *status_received*, or the caller can complete the transaction without waiting for the partner to respond.
2. A program cannot send data to the remote program after issuing a Prepare call.
3. A program that issues the Prepare call may receive data from the remote program if the conversation is using an OSI TP CRM and either

prepare_data_permitted is set to CM_PREPARE_DATA_PERMITTED or the conversation is full-duplex.

4. The partner finds out about the Prepare call by receiving one of the take-commit notifications described in Table 8 on page 54 or Table 9 on page 56.

Related Information

"Receive (CMRCV)" on page 209 discusses the *status_received* parameter.

"Set_Prepare_Data_Permitted (CMSPDP)" on page 322 discusses the *prepare_data_permitted* characteristic.

Prepare_To_Receive (CMPTR)

LU 6.2	OSI TP

Programs use the Prepare_To_Receive call to transfer control of the conversation to the remote program without waiting for the remote program to send data; that is, waiting for a Receive to complete. This allows the local program to continue processing until it actually needs data from the remote program.

A program uses the Prepare_To_Receive (CMPTR) call to change a conversation from **Send** to **Receive** state in preparation to receive data. The change to **Receive** state can be either completed as part of this call or deferred until the program issues a Flush, Confirm, or resource recovery commit call. When the change to **Receive** state is completed as part of this call, it may include the function of the Flush or Confirm call. This call's function is determined by the value of the *prepare_to_receive_type* conversation characteristic.

Before issuing the Prepare_To_Receive call, a program has the option of issuing the following call which affects the function of the Prepare_To_Receive call:

Call CMSPTR – Set_Prepare_To_Receive_Type

Note: The Prepare_To_Receive_Type call can be issued only on a half-duplex conversation.

Format

```
CALL CMPTR(conversation_ID,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

return_code *(output)*
Specifies the result of the call execution. The *prepare_to_receive_type* currently in effect determines which return codes can be returned to the local program.

For any of the following conditions:

- *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_FLUSH
- *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_SYNC_LEVEL and *sync_level* is set to CM_NONE
- *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_SYNC_LEVEL and *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM, but the conversation is not currently included in a transaction

the *return_code* variable can have one of the following values:

- CM_OK
- CM_OPERATION_INCOMPLETE
- 2 CM_CONVERSATION_CANCELED
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - The conversation is not in **Send** or **Send-Pending** state.
  - The conversation is basic and in **Send** state, and the program started but did not finish sending a logical record.
  - The *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and the conversation's context is in the **Backout-Required** condition. The Prepare_To_Receive call is not allowed while the conversation's context is in this condition.
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *send_receive_mode* of the conversation is CM_FULL_DUPLEX.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

For any of the following conditions:

- *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_CONFIRM
- *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_SYNC_LEVEL and *sync_level* is set to CM_CONFIRM
- *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_SYNC_LEVEL and *sync_level* is set to CM_SYNC_POINT, but the conversation is not currently included in a transaction

the *return_code* variable can have one of the following values:

- CM_OK
- CM_OPERATION_INCOMPLETE
- 2 CM_CONVERSATION_CANCELED
- CM_CONVERSATION_TYPE_MISMATCH
- CM_PIP_NOT_SPECIFIED_CORRECTLY
- CM_SECURITY_NOT_VALID
- CM_SYNC_LVL_NOT_SUPPORTED_PGM
- CM_SYNC_LVL_NOT_SUPPORTED_SYS
- CM_SEND_RCV_MODE_NOT_SUPPORTED
- CM_TPN_NOT_RECOGNIZED
- CM_TP_NOT_AVAILABLE_NO_RETRY
- CM_TP_NOT_AVAILABLE_RETRY
- CM_DEALLOCATED_ABEND
- CM_PROGRAM_ERROR_PURGING
- CM_RESOURCE_FAILURE_NO_RETRY
- CM_RESOURCE_FAILURE_RETRY
- CM_DEALLOCATED_ABEND_SVC (basic conversations only)
- CM_DEALLOCATED_ABEND_TIMER (basic conversations only)
- CM_SVC_ERROR_PURGING (basic conversations only)
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - The conversation is not in **Send** or **Send-Pending** state.
  - The conversation is basic and in **Send** state, and the program started but did not finish sending a logical record.

  - For a conversation with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, the conversation's context is in the **Backout-Required** condition.
- CM_PROGRAM_PARAMETER_CHECK
  This return code indicates that the *conversation_ID* specifies an unassigned conversation identifier.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR
- The following values are returned only when *sync_level* is set to CM_SYNC_POINT:
  - CM_TAKE_BACKOUT
  - CM_DEALLOCATED_ABEND_BO
  - CM_DEALLOCATED_ABEND_SVC_BO (basic conversations only)
  - CM_DEALLOCATED_ABEND_TIMER_BO (basic conversations only)
  - CM_RESOURCE_FAIL_NO_RETRY_BO
  - CM_RESOURCE_FAILURE_RETRY_BO
  - CM_INCLUDE_PARTNER_REJECT_BO

If *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_SYNC_LEVEL, *sync_level* is set to is CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and the conversation is included in a transaction, the *return_code* variable can have one of the following values:

- CM_OK
- CM_OPERATION_INCOMPLETE
- CM_CONVERSATION_CANCELED
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - The conversation is not in **Send** or **Send-Pending** state.
  - The conversation is basic and in **Send** state, and the program started but did not finish sending a logical record.
  - The conversation's context is in the **Backout-Required** condition.
  - A prior call to Deferred_Deallocate is still in effect for the conversation.
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The conversation is using an OSI TP CRM, and the program is not the superior for the conversation.
  - The *send_receive_mode* of the conversation is CM_FULL_DUPLEX.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

When *return_code* indicates CM_OK:

- If any of the following conditions is true, the conversation enters the **Receive** state.
  - The *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_FLUSH
  - The *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_CONFIRM
  - The *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_SYNC_LEVEL and *sync_level* is set to CM_NONE or CM_CONFIRM
  - The *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_SYNC_LEVEL, *sync_level* is set to CM_SYNC_POINT

or CM_SYNC_POINT_NO_CONFIRM, but the conversation is not currently included in a transaction.

- The conversation enters the **Defer-Receive** state if *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_SYNC_LEVEL, *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and the conversation is included in a transaction.

Usage Notes

1. If *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_CONFIRM, or if *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_SYNC_LEVEL and *sync_level* is CM_CONFIRM, or if *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_SYNC_LEVEL and *sync_level* is CM_SYNC_POINT but the conversation is not currently included in a transaction, the local program regains control when a Confirmed reply is received.
2. The program uses the *prepare_to_receive_type* characteristic set to CM_PREP_TO_RECEIVE_SYNC_LEVEL to transfer send control to the remote program based on one of the following synchronization levels allocated to the conversation:
   - If *sync_level* is set to CM_NONE, or if *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM but the conversation is not currently included in a transaction, the system's send buffer is flushed if it contains information, and send control is transferred to the remote program without any synchronizing acknowledgment.
   - If *sync_level* is set to CM_CONFIRM, or if *sync_level* is set to CM_SYNC_POINT but the conversation is not currently included in a transaction, the system's send buffer is flushed if it contains information, and send control is transferred to the remote program with confirmation requested.
   - If *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM and the conversation is included in a transaction, transfer of send control is deferred. When the local program subsequently issues a Flush, Confirm, or resource recovery commit call, the system's send buffer is flushed if it contains information, and send control is transferred to the remote program. (A synchronization point is also requested when the call is a commit call.)
3. The program uses the *prepare_to_receive_type* characteristic set to CM_PREP_TO_RECEIVE_FLUSH to transfer send control to the remote program without any synchronizing acknowledgment. The *prepare_to_receive_type* characteristic set to CM_PREP_TO_RECEIVE_FLUSH functions the same as the *prepare_to_receive_type* characteristic set to CM_PREP_TO_RECEIVE_SYNC_LEVEL combined with a *sync_level* set to CM_NONE.
4. The program uses the *prepare_to_receive_type* characteristic set to CM_PREP_TO_RECEIVE_CONFIRM to transfer send control to the remote program with confirmation requested. The *prepare_to_receive_type* characteristic set to CM_PREP_TO_RECEIVE_CONFIRM functions the same as the *prepare_to_receive_type* characteristic set to CM_PREP_TO_RECEIVE_SYNC_LEVEL combined with a *sync_level* set to CM_CONFIRM.

5. The remote program receives send control of the conversation by means of the *status_received* parameter, which can have the following values:

   - CM_SEND_RECEIVED
     The local program issued this call with one of the following:
     - *prepare_to_receive_type* set to CM_PREP_TO_RECEIVE_FLUSH
     - *prepare_to_receive_type* set to CM_PREP_TO_RECEIVE_SYNC_LEVEL and *sync_level* set to CM_NONE
     - *prepare_to_receive_type* set to CM_PREP_TO_RECEIVE_SYNC_LEVEL and *sync_level* set to CM_SYNC_POINT_NO_CONFIRM, but with the conversation not currently included in a transaction.
   - CM_CONFIRM_SEND_RECEIVED
     The local program issued this call with one of the following:
     - *prepare_to_receive_type* set to CM_PREP_TO_RECEIVE_CONFIRM
     - *prepare_to_receive_type* set to CM_PREP_TO_RECEIVE_SYNC_LEVEL and *sync_level* set to CM_CONFIRM
     - *prepare_to_receive_type* set to CM_PREP_TO_RECEIVE_SYNC_LEVEL and *sync_level* set to CM_SYNC_POINT, but with the conversation not currently included in a transaction.
   - CM_TAKE_COMMIT_SEND
     The local program issued a resource recovery commit call after issuing the Prepare_To_Receive call with *prepare_to_receive_type* set to CM_PREP_TO_RECEIVE_SYNC_LEVEL and *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and with the conversation included in a transaction.

6. When the local program's end of the conversation enters **Receive** state, the remote program's end of the conversation enters **Send** or **Send-Pending** state, depending on the *data_received* indicator. The remote program can then send data to the local program.
7. When the conversation is using an OSI TP CRM and the Deferred_Deallocate call has been issued on the conversation, the Prepare_To_Receive call with *prepare_to_receive_type* set to CM_PREP_TO_RECEIVE_SYNC_LEVEL is not allowed. The call gets the CM_PROGRAM_PARAMETER_CHECK return code.

Related Information

"Example 3: The Sending Program Changes the Data Flow Direction" on page 72 and "Example 4: The Receiving Program Changes the Data Flow Direction" on page 74 show example program flows where the Prepare_To_Receive call is used.

"Set_Confirmation_Urgency (CMSCU)" on page 285 tells how to request an immediate response to the Prepare_To_Receive call.
"Set_Prepare_To_Receive_Type (CMSPTR)" on page 324 provides more information on the *prepare_to_receive_type* characteristic.

"Set_Sync_Level (CMSSL)" on page 344 discusses the *sync_level* characteristic and its possible values.

Receive (CMRCV)

LU 6.2	OSI TP

A program uses the Receive (CMRCV) call to receive information from a given conversation. The information received can be a data record (on a mapped conversation), data (on a basic conversation), conversation status, or a request for confirmation or for resource recovery services.

Before issuing the Receive call, a program has the option of issuing one or both of the following calls, which affect the function of the Receive call:

CALL CMSF — Set_Fill
CALL CMSRT — Set_Receive_Type

Format

```
CALL CMRCV(conversation_ID,
           buffer,
           requested_length,
           data_received,
           received_length,
           status_received,
           control_information_received,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

buffer *(output)*
Specifies the variable in which the program is to receive the data.

Note: *Buffer* contains data only if *return_code* is set to CM_OK or CM_DEALLOCATED_NORMAL and *data_received* is not set to CM_NO_DATA_RECEIVED.

requested_length *(input)*
Specifies the maximum amount of data the program is to receive. Valid *requested_length* values range from 0 to the maximum buffer size supported by the system. The maximum buffer size is at least 32767 bytes. See Usage Note 12 on page 221 for additional information about determining the maximum buffer size.

data_received *(output)*
Specifies whether or not the program received data.

Note: Unless *return_code* is set to CM_OK or CM_DEALLOCATED_NORMAL, the value contained in *data_received* has no meaning.

The *data_received* variable can have one of the following values:

- CM_NO_DATA_RECEIVED (basic and mapped conversations)
  No data is received by the program. Status may be received if the *return_code* is set to CM_OK.
- CM_DATA_RECEIVED (basic conversations only)

The *fill* characteristic is set to CM_FILL_BUFFER and data (independent of its logical-record format) is received by the program.

- CM_COMPLETE_DATA_RECEIVED (basic and mapped conversations)
  This value indicates one of the following:
  - For mapped conversations, a complete data record or the last remaining portion of the record is received.
  - For basic conversations, *fill* is set to CM_FILL_LL and a complete logical record, or the last remaining portion of the record, is received.
- CM_INCOMPLETE_DATA_RECEIVED (basic and mapped conversations)
  This value indicates one of the following:
  - For mapped conversations, less than a complete data record is received.
  - For basic conversations, *fill* is set to CM_FILL_LL, and less than a complete logical record is received.

  Note: For either type of conversation, if *data_received* is set to CM_INCOMPLETE_DATA_RECEIVED, the program must issue another Receive (or possibly multiple Receive calls) to receive the remainder of the data.

received_length *(output)*

Specifies the variable containing the amount of data the program received, up to the maximum. If the program does not receive data on this call, the value contained in *received_length* has no meaning.

Note: Data is received only if *return_code* is set to CM_OK or CM_DEALLOCATED_NORMAL, and *data_received* is not set to CM_NO_DATA_RECEIVED.

status_received *(output)*

Specifies the variable containing an indication of the conversation status.

Note: Unless *return_code* is set to CM_OK, the value contained in *status_received* has no meaning.

The *status_received* variable can have one of the following values:

- CM_NO_STATUS_RECEIVED
  No conversation status is received by the program; data may be received.
- CM_SEND_RECEIVED (half-duplex conversations only)
  The remote program's end of the conversation has entered **Receive** state, placing the local program's end of the conversation in **Send-Pending** state (if the program also received data on this call) or **Send** state (if the program did not receive data on this call). The local program (which issued the Receive call) can now send data.
- CM_CONFIRM_RECEIVED (half-duplex conversations only)
  The remote program has sent a confirmation request, requesting the local program to respond by issuing a Confirmed call. The local program must respond by issuing Confirmed, Send_Error, Deallocate with *deallocate_type* set to CM_DEALLOCATE_ABEND, or Cancel_Conversation.

- CM_CONFIRM_SEND_RECEIVED (half-duplex conversations only)
  The remote program's end of the conversation has entered **Receive** state with confirmation requested. The local program must respond by issuing Confirmed, Send_Error, Deallocate with *deallocate_type* set to CM_DEALLOCATE_ABEND, or Cancel_Conversation. Upon issuing a successful Confirmed call, the local program (which issued the Receive call) can now send data.
- CM_CONFIRM_DEALLOC_RECEIVED
  The remote program has deallocated the conversation with confirmation requested. The local program must respond by issuing Confirmed, Send_Error, Deallocate with *deallocate_type* set to CM_DEALLOCATE_ABEND, or Cancel_Conversation. Upon issuing a successful Confirmed call, the local program (which issued the Receive call) is deallocated—that is, placed in **Reset** state.

For a conversation with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and with the conversation included in a transaction, the *status_received* variable can also be set to one of the following values:

- CM_TAKE_COMMIT
  The remote program has issued a resource recovery commit call or a Prepare call. For the exact conditions for receipt of this *status_received* value, refer to Table 8 on page 54 and Table 9 on page 56. The local program should issue a commit call in order to commit all protected resources throughout the transaction. When appropriate, the local program may respond by issuing a call other than commit, such as Send_Error (for half-duplex conversations only) or a resource recovery backout call.
- CM_TAKE_COMMIT_SEND (for half-duplex conversations only)
  The remote program has issued a Prepare_To_Receive call with *prepare_to_receive_type* set to CM_PREP_TO_RECEIVE_SYNC_LEVEL and *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM and then issued a resource recovery commit call or a Prepare call. For the exact conditions for receipt of this *status_received* value, refer to Table 8 on page 54 and Table 9 on page 56. The local program should issue a commit call in order to commit all protected resources throughout the transaction. When appropriate, the local program may respond by issuing a call other than commit, such as Send_Error or a resource recovery backout call. If a successful commit call is issued, the local program can then send data.
- CM_TAKE_COMMIT_DEALLOCATE
  The remote program has deallocated the conversation with *deallocate_type* set to CM_DEALLOCATE_SYNC_LEVEL and *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, or has issued a Deferred_Deallocate call, and then issued a resource recovery commit call or a Prepare call. For the exact conditions for receipt of this *status_received* value, refer to Table 8 on page 54 and Table 9 on page 56. The local program should issue a commit call in order to commit all protected resources throughout the transaction. The local program may respond by issuing a call other than commit when appropriate, such as Send_Error for a half-duplex conversation, or a resource recovery backout call. If a successful commit call is issued, the local program is then deallocated—that is, placed in **Reset** state.

- CM_PREPARE_OK
  By issuing a Prepare (CMPREP) call, the local program requested that the remote program prepare its resources for commitment, and the remote program has done so, by issuing a commit call. The subtree is now ready to commit its resources.

For a conversation with *sync_level* set to either CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM and using an OSI TP CRM, the *status_received* variable can also be set to one of the following values if the conversation is included in a transaction:

- CM_TAKE_COMMIT_DATA_OK
  The remote program issued a Prepare call. For the exact conditions for receipt of this *status_received* value, refer to Table 8 on page 54 and Table 9 on page 56. The local program should issue a commit call in order to commit all protected resources throughout the transaction. The program is allowed to send data before issuing the commit call. When appropriate, the local program may respond by issuing a call other than commit, such as Send_Error (for half-duplex conversations only) or a resource recovery backout call.
- CM_TAKE_COMMIT_SEND_DATA_OK (half-duplex conversations only)
  The remote program issued a Prepare call. For the exact conditions for receipt of this *status_received* value, refer to Table 8 on page 54 and Table 9 on page 56. The local program should issue a commit call in order to commit all protected resources throughout the transaction. The program is allowed to send data before issuing the commit call. When appropriate, the local program may respond by issuing a call other than commit, such as Send_Error or a resource recovery backout call. If a successful commit call is issued, the local program can then send data.
- CM_TAKE_COMMIT_DEALLOC_DATA_OK
  The remote program issued a Prepare call. For the exact conditions for receipt of this *status_received* value, refer to Table 8 on page 54 and Table 9 on page 56. The local program should issue a commit call in order to commit all protected resources throughout the transaction. The program is allowed to send data before issuing the commit call. The local program may respond by issuing a call other than commit when appropriate, such as Send_Error for a half-duplex conversation, or a resource recovery backout call. If a successful commit call is issued, the local program is then deallocated—that is, placed in **Reset** state.
- CM_JOIN_TRANSACTION (unchained transactions only)
  The remote program requested that the local program join into its current transaction. If the local program called Set_Join_Transaction with CM_JOIN_EXPLICIT, the local program should issue a tx_begin() call to the X/Open TX interface to join the superior's transaction as soon as any local work, which is not to be included in the remote program's transaction, has completed. If the local program called Set_Join_Transaction with CM_JOIN_IMPLICIT, the local program already joined the transaction, and tx_begin() must not be called.

control_information_received *(output)*
Specifies the variable containing an indication of whether or not control information has been received. The *control_information_received* variable can have one of the following values:

- CM_NO_CONTROL_INFO_RECEIVED
  Indicates that no control information was received.

- CM_REQ_TO_SEND_RECEIVED (half-duplex conversations only)
  The local program received a request-to-send notification from the remote program. The remote program issued Request_To_Send, requesting the local program's end of the conversation to enter **Receive** state, which would place the remote program's end of the conversation in **Send** state. See "Request_To_Send (CMRTS)" on page 241 for further discussion of the local program's possible responses.
- CM_ALLOCATE_CONFIRMED (OSI TP CRM only)
  The local program received confirmation of the remote program's acceptance of the conversation.
- CM_ALLOCATE_CONFIRMED_WITH_DATA (OSI TP CRM only)
  The local program received confirmation of the remote program's acceptance of the conversation. The local program may now issue an Extract_Initialization_Data (CMEID) call to receive the initialization data.
- CM_ALLOCATE_REJECTED_WITH_DATA (OSI TP CRM only)
  The remote program rejected the conversation. The local program may now issue an Extract_Initialization_Data (CMEID) call to receive the initialization data.

  This value will be returned with a return code of CM_OK. The program will receive a CM_DEALLOCATED_ABEND return code on a later call on the conversation.
- CM_EXPEDITED_DATA_AVAILABLE (LU 6.2 CRM only)
  Expedited data is available to be received.
- CM_RTS_RCVD_AND_EXP_DATA_AVAIL (half-duplex conversations and LU 6.2 CRM only)
  The local program received a request-to-send notification from the remote program and expedited data is available to be received.

Notes:

1. The value contained in *control_information_received* has no meaning only if *return_code* is set to CM_PROGRAM_PARAMETER_CHECK or CM_PROGRAM_STATE_CHECK.
2. When more than one piece of control information is available to be returned to the program, it will be returned in the following order:
   - CM_ALLOCATE_CONFIRMED, CM_ALLOCATE_CONFIRMED_WITH_DATA, or CM_ALLOCATE_REJECTED_WITH_DATA
   - CM_RTS_RCVD_AND_EXP_DATA_AVAIL
   - CM_REQ_TO_SEND_RECEIVED
   - CM_EXPEDITED_DATA_AVAILABLE
   - CM_NO_CONTROL_INFO_RECEIVED

return_code *(output)*
Specifies the result of the call execution. The return codes that can be returned depend on the state and characteristics of the conversation at the time this call is issued.

The following return codes apply to half-duplex conversations.

If *receive_type* is set to CM_RECEIVE_AND_WAIT and this call is issued in **Send** state, *return_code* can have one of the following values:

- CM_OK

- CM_OPERATION_INCOMPLETE
- CM_CONVERSATION_CANCELED
- CM_CONVERSATION_TYPE_MISMATCH
- CM_PIP_NOT_SPECIFIED_CORRECTLY
- CM_SECURITY_NOT_VALID
- CM_SYNC_LVL_NOT_SUPPORTED_PGM
- CM_SYNC_LVL_NOT_SUPPORTED_SYS
- CM_SEND_RCV_MODE_NOT_SUPPORTED
- CM_TPN_NOT_RECOGNIZED
- CM_TP_NOT_AVAILABLE_NO_RETRY
- CM_TP_NOT_AVAILABLE_RETRY
- CM_DEALLOCATED_ABEND
- CM_DEALLOCATED_NORMAL
- CM_PROGRAM_ERROR_NO_TRUNC
- CM_PROGRAM_ERROR_PURGING
- CM_RESOURCE_FAILURE_NO_RETRY
- CM_RESOURCE_FAILURE_RETRY
- CM_DEALLOCATED_ABEND_SVC (basic conversations only)
- CM_DEALLOCATED_ABEND_TIMER (basic conversations only)
- CM_SVC_ERROR_NO_TRUNC (basic conversations only)
- CM_SVC_ERROR_PURGING (basic conversations only)
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR
- The following values are returned only when *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM and the conversation is included in a transaction :
  - CM_TAKE_BACKOUT
  - CM_DEALLOCATED_ABEND_BO
  - CM_DEALLOCATED_ABEND_SVC_BO (basic conversations only)
  - CM_DEALLOCATED_ABEND_TIMER_BO (basic conversations only)
  - CM_RESOURCE_FAIL_NO_RETRY_BO
  - CM_RESOURCE_FAILURE_RETRY_BO
  - CM_INCLUDE_PARTNER_REJECT_BO

If *receive_type* is set to CM_RECEIVE_AND_WAIT and this call is issued in **Send-Pending** state, *return_code* can be one of the following values:

- CM_OK
- CM_OPERATION_INCOMPLETE
- CM_CONVERSATION_CANCELED
- CM_DEALLOCATED_ABEND
- CM_DEALLOCATED_NORMAL
- CM_PROGRAM_ERROR_NO_TRUNC
- CM_PROGRAM_ERROR_PURGING
- CM_RESOURCE_FAILURE_NO_RETRY
- CM_RESOURCE_FAILURE_RETRY
- CM_DEALLOCATED_ABEND_SVC (basic conversations only)
- CM_DEALLOCATED_ABEND_TIMER (basic conversations only)
- CM_SVC_ERROR_NO_TRUNC (basic conversations only)
- CM_SVC_ERROR_PURGING (basic conversations only)
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR
- The following values are returned only when *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM and the conversation is included in a transaction :

  - CM_TAKE_BACKOUT
  - CM_DEALLOCATED_ABEND_BO
  - CM_DEALLOCATED_ABEND_SVC_BO (basic conversations only)
  - CM_DEALLOCATED_ABEND_TIMER_BO (basic conversations only)
  - CM_RESOURCE_FAIL_NO_RETRY_BO
  - CM_RESOURCE_FAILURE_RETRY_BO
  - CM_INCLUDE_PARTNER_REJECT_BO

If *receive_type* is set to CM_RECEIVE_AND_WAIT or CM_RECEIVE_IMMEDIATE and this call is issued in **Receive** or **Prepared** state, *return_code* can be one of the following:

- CM_OK
- CM_OPERATION_INCOMPLETE
  This value is only received when *receive_type* is set to CM_RECEIVE_AND_WAIT.
- CM_CONVERSATION_CANCELED
- CM_CONVERSATION_TYPE_MISMATCH
- CM_PIP_NOT_SPECIFIED_CORRECTLY
- CM_SECURITY_NOT_VALID
- CM_SYNC_LVL_NOT_SUPPORTED_PGM
- CM_SYNC_LVL_NOT_SUPPORTED_SYS
- CM_SEND_RCV_MODE_NOT_SUPPORTED
- CM_TPN_NOT_RECOGNIZED
- CM_TP_NOT_AVAILABLE_NO_RETRY
- CM_TP_NOT_AVAILABLE_RETRY
- CM_DEALLOCATED_ABEND
- CM_DEALLOCATED_NORMAL
- CM_PROGRAM_ERROR_NO_TRUNC
- CM_PROGRAM_ERROR_PURGING
- CM_PROGRAM_ERROR_TRUNC (basic conversations only)
- CM_RESOURCE_FAILURE_NO_RETRY
- CM_RESOURCE_FAILURE_RETRY
- CM_DEALLOCATED_ABEND_SVC (basic conversations only)
- CM_DEALLOCATED_ABEND_TIMER (basic conversations only)
- CM_SVC_ERROR_NO_TRUNC (basic conversations only)
- CM_SVC_ERROR_PURGING (basic conversations only)
- CM_SVC_ERROR_TRUNC (basic conversations only)
- CM_UNSUCCESSFUL
  This value indicates that *receive_type* is set to CM_RECEIVE_IMMEDIATE, but there is no data or status to receive.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR
- The following values are returned only when *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM and the conversation is included in a transaction:
  - CM_TAKE_BACKOUT
  - CM_DEALLOCATED_ABEND_BO
  - CM_DEALLOCATED_ABEND_SVC_BO (basic conversations only)
  - CM_DEALLOCATED_ABEND_TIMER_BO (basic conversations only)
  - CM_RESOURCE_FAIL_NO_RETRY_BO
  - CM_RESOURCE_FAILURE_RETRY_BO
  - CM_INCLUDE_PARTNER_REJECT_BO

If a state or parameter error has occurred, *return_code* can have one of the following values:

- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - The *receive_type* is set to CM_RECEIVE_AND_WAIT and the conversation is not in **Send**, **Send-Pending**, **Receive** or **Prepared** state.
  - The *receive_type* is set to CM_RECEIVE_IMMEDIATE and the conversation is not in **Receive** or **Prepared** state.
  - The *receive_type* is set to CM_RECEIVE_AND_WAIT; the conversation is basic and in **Send** state; and the program started but did not finish sending a logical record.
  - For a conversation with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, the conversation's context is in the **Backout-Required** condition. The Receive call is not allowed for this conversation while its context is in this condition.
  - The program has received a *status_received* value of CM_JOIN_TRANSACTION and must issue a tx_begin call to the X/Open TX interface to join the transaction.
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *requested_length* specifies a value that exceeds the range permitted by the implementation. The maximum value of the length in each implementation is at least 32767. See Usage Note 12 on page 221 for additional information about determining the maximum buffer size.

The following return codes apply to full-duplex conversations.

If the call is issued in **Send-Receive**, **Receive-Only**, or **Prepared** state, *return_code* can be one of the following:

- CM_OK
- CM_PIP_NOT_SPECIFIED_CORRECTLY
- CM_CONVERSATION_TYPE_MISMATCH
- CM_SECURITY_NOT_VALID
- CM_SYNC_LEVEL_NOT_SUPPORTED_PGM
- CM_SYNC_LEVEL_NOT_SUPPORTED_SYS
- CM_SEND_RCV_MODE_NOT_SUPPORTED
- CM_TPN_NOT_RECOGNIZED
- CM_TP_NOT_AVAILABLE_NO_RETRY
- CM_TP_NOT_AVAILABLE_RETRY
- CM_DEALLOCATED_NORMAL
- CM_DEALLOCATED_ABEND
- CM_DEALLOCATED_ABEND_SVC (basic conversations only)
- CM_DEALLOCATED_ABEND_TIMER (basic conversations only)
- CM_PROGRAM_ERROR_NO_TRUNC
- CM_PROGRAM_ERROR_TRUNC (basic conversations only)
- CM_PROGRAM_ERROR_PURGING (OSI TP CRM only)
- CM_RESOURCE_FAILURE_RETRY
- CM_RESOURCE_FAILURE_NO_RETRY

- CM_SVC_ERROR_NO_TRUNC (basic conversations only)
- CM_SVC_ERROR_TRUNC (basic conversations only)
- CM_OPERATION_NOT_ACCEPTED
- CM_OPERATION_INCOMPLETE
- CM_PRODUCT_SPECIFIC_ERROR
- CM_UNSUCCESSFUL
  This value indicates that *receive_type* is set to CM_RECEIVE_IMMEDIATE, but there is nothing to receive.
- The following values are returned only if *sync_level* is CM_SYNC_POINT_NO_CONFIRM and the state is **Send-Receive** or **Prepared** and the conversation is included in a transaction:
  - CM_TAKE_BACKOUT
  - CM_DEALLOCATED_ABEND_BO
  - CM_DEALLOCATED_ABEND_SCV_BO (basic conversations only)
  - CM_DEALLOCATED_ABEND_TIMER_BO (basic conversations only)
  - CM_RESOURCE_FAIL_NO_RETRY_BO
  - CM_RESOURCE_FAILURE_RETRY_BO
  - CM_CONV_DEALLOC_AFTER_SYNCPT
  - CM_INCLUDE_PARTNER_REJECT_BO

If a state or parameter error has occurred, *return_code* can have one of the following values:

- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - The conversation is not in **Send-Receive**, **Prepared**, or **Receive-Only** state.
  - For a conversation with *sync_level* set to CM_SYNC_POINT_NO_CONFIRM, the conversation's context is in the **Backout Required** condition. The Receive call is not allowed for this conversation while its context is in this condition.
  - The local program has received a *status_received* value of CM_JOIN_TRANSACTION and must issue a tx_begin call to the X/Open TX interface to join the transaction.
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *requested_length* specifies a value that exceeds the range permitted by the implementation. The maximum value of the length in each implementation is at least 32,767. See Note 12 on page 221 for additional information about determining the maximum buffer size.

State Changes

For half-duplex conversations, when *return_code* indicates CM_OK:

- The conversation enters **Receive** state if a Receive call is issued and all of the following conditions are true:
  - The *receive_type* is set to CM_RECEIVE_AND_WAIT.
  - The conversation is in **Send-Pending** or **Send** state.
  - The *data_received* indicates CM_DATA_RECEIVED, CM_COMPLETE_DATA_RECEIVED, or CM_INCOMPLETE_DATA_RECEIVED.
  - The *status_received* indicates CM_NO_STATUS_RECEIVED.
- The conversation enters **Send** state when *data_received* is set to CM_NO_DATA_RECEIVED and *status_received* is set to CM_SEND_RECEIVED.

- The conversation enters **Send-Pending** state when *data_received* is set to CM_DATA_RECEIVED, or CM_COMPLETE_DATA_RECEIVED, and *status_received* is set to CM_SEND_RECEIVED.
- The conversation enters **Confirm**, **Confirm-Send**, or **Confirm-Deallocate** state when *status_received* is set to, respectively, CM_CONFIRM_RECEIVED, CM_CONFIRM_SEND_RECEIVED, or CM_CONFIRM_DEALLOC_RECEIVED.
- For a conversation with *sync_level* set to either CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, the conversation enters **Sync-Point**, **Sync-Point-Send**, or **Sync-Point-Deallocate** state when *status_received* is set to CM_TAKE_COMMIT, CM_TAKE_COMMIT_SEND, or CM_TAKE_COMMIT_DEALLOCATE, respectively.
- For a conversation with *sync_level* set to either CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, the conversation enters **Sync-Point**, **Sync-Point-Send**, or **Sync-Point-Deallocate** state when *status_received* is set to CM_TAKE_COMMIT_DATA_OK, CM_TAKE_COMMIT_SEND_DATA_OK, or CM_TAKE_COMMIT_DEALLOC_DATA_OK, respectively.
- No state change occurs when the call is issued in **Receive** state; *data_received* is set to CM_DATA_RECEIVED, CM_COMPLETE_DATA_RECEIVED, or CM_INCOMPLETE_DATA_RECEIVED; and *status_received* indicates CM_NO_STATUS_RECEIVED.
- No state change occurs when the call is issued in **Prepared** state, or if *status_received* indicates CM_JOIN_TRANSACTION.

For full-duplex conversations, when *return_code* indicates CM_OK:

- No state change occurs when the call is issued in **Prepared** or **Receive-Only** state, or if *status_received* indicates CM_JOIN_TRANSACTION.
- The conversation enters **Confirm-Deallocate** state when *status_received* is set to CM_CONFIRM_DEALLOC_RECEIVED.
- For a conversation with *sync_level* set to CM_SYNC_POINT_NO_CONFIRM, the conversation enters **Sync-Point** state when *status_received* is set to CM_TAKE_COMMIT or CM_TAKE_COMMIT_DATA_OK, and it enters **Sync-Point-Deallocate** state when *status_received* is set to CM_TAKE_COMMIT_DEALLOCATE or CM_TAKE_COMMIT_DEALLOC_DATA_OK.

Usage Notes

1. If *receive_type* is set to CM_RECEIVE_AND_WAIT and no information is present when the call is made, CPI Communications waits for information to arrive on the specified conversation before allowing the Receive call to return with the information. If information is already available, the program receives it without waiting.
2. For a half-duplex conversation, if the program issues a Receive call with its end of the conversation in **Send** state with *receive_type* set to CM_RECEIVE_AND_WAIT, the local system will flush its send buffer and send all buffered information to the remote program. The local system will also send a change-of-direction indication. This is a convenient method to change the direction of the conversation, because it leaves the local program's end of the conversation in **Receive** state and tells the remote program that it may now begin sending data. The local system waits for information to arrive.

Note: A Receive call in **Send** or **Send-Pending** state with a *receive_type* set to CM_RECEIVE_AND_WAIT generates an implicit execution of Prepare_To_Receive with *prepare_to_receive_type* set to CM_PREP_TO_RECEIVE_FLUSH, followed by a Receive. Refer to "Prepare_To_Receive (CMPTR)" on page 204 for more information.

3. If *receive_type* is set to CM_RECEIVE_IMMEDIATE, a Receive call receives any available information, but does not wait for information to arrive. If information is available, it is returned to the program with an indication of the exact nature of the information received.

   Since data may not be available when a given Receive call is issued, a program that is using concurrent conversations with multiple partners might use a *receive_type* of CM_RECEIVE_IMMEDIATE and periodically check each conversation for data. For more information about multiple, concurrent conversations, see "Multiple Conversations" on page 27.

4. If the *return_code* indicates CM_PROGRAM_STATE_CHECK or CM_PROGRAM_PARAMETER_CHECK, the values of all other parameters on this call have no meaning.

5. A Receive call issued against a mapped conversation can receive only as much of the data record as specified by the *requested_length* parameter. The *data_received* parameter indicates whether the program has received a complete or incomplete data record, as follows:

   - When the program receives a complete data record or the last remaining portion of a data record, the *data_received* parameter is set to CM_COMPLETE_DATA_RECEIVED. The length of the record or portion of the record is less than or equal to the length specified on the *requested_length* parameter.
   - When the program receives a portion of the data record other than the last remaining portion, the *data_received* parameter is set to CM_INCOMPLETE_DATA_RECEIVED. The data record is incomplete for one of the following reasons:
     - *receive_type* is set to CM_RECEIVE_AND_WAIT, and the length of the record is greater than the length specified on the *requested_length* parameter.
     - *receive_type* is set to CM_RECEIVE_IMMEDIATE, and either the length of the record is greater than the length specified on the *requested_length* parameter or the last portion of the data record has not arrived from the partner program.

     In either case, the amount of data received is equal to the *received_length* specified.

6. When *fill* is set to CM_FILL_LL on a basic conversation, the program intends to receive a logical record, and there are the following possibilities:

   - The program receives a complete logical record or the last remaining portion of a complete record. The length of the record or portion of the record is less than or equal to the length specified on the *requested_length* parameter. The *data_received* parameter is set to CM_COMPLETE_DATA_RECEIVED.
   - The program receives an incomplete logical record for one of the following reasons:

- The length of the logical record is greater than the length specified on the *requested_length* parameter. In this case, the amount received equals the length specified.
- Only a portion of the logical record is available (possibly because it has been truncated). The portion is equal to or less than the length specified on the *requested_length* parameter.

The *data_received* parameter is set to CM_INCOMPLETE_DATA_RECEIVED. The program issues another Receive (or possibly multiple Receive calls) to receive the remainder of the logical record.

Refer to the Send_Data call for a definition of complete and incomplete logical records.

7. When *fill* is set to CM_FILL_BUFFER on a basic conversation, the program is to receive data independently of its logical-record format. The program receives an amount of data equal to or less than the length specified on the *requested_length* parameter.

   The program can receive less data only under one of the following conditions:

   - *receive_type* is set to CM_RECEIVE_AND_WAIT and the end of the data is received. The end of data occurs when it is followed by either:
     - An indication of a change in the state of the conversation
       - For a half-duplex conversation, a change to **Send**, **Send-Pending**, **Confirm**, **Confirm-Send**, **Confirm-Deallocate**, **Sync-Point**, **Sync-Point-Send**, **Sync-Point-Deallocate**, or **Reset** state
       - For a full-duplex conversation, a change to **Send-Only**, **Confirm-Deallocate**, **Sync-Point**, **Sync-Point-Deallocate**, or **Reset** state
     - An error indication, such as a CM_PROGRAM_ERROR_NO_TRUNC return code.
   - *receive_type* is set to CM_RECEIVE_IMMEDIATE and an amount of data equal to the *requested_length* specified has not arrived from the partner program.

   The program is responsible for tracking the logical-record format of the data.

8. The Receive call made with *requested_length* set to zero has no special significance. The type of information available is indicated by the *return_code*, *data_received*, and *status_received* parameters, as usual. If *receive_type* is set to CM_RECEIVE_AND_WAIT and no information is available, this call waits for information to arrive. If *receive_type* is set to CM_RECEIVE_IMMEDIATE, it is possible that no information is available.

   If data is available, the conversation is basic, and *fill* is set to CM_FILL_LL, the *data_received* parameter indicates CM_INCOMPLETE_DATA_RECEIVED. If data is available, the conversation is basic, and *fill* is set to CM_FILL_BUFFER, the *data_received* parameter indicates CM_DATA_RECEIVED. If data is available and the conversation is mapped, the *data_received* parameter is set to CM_INCOMPLETE_DATA_RECEIVED. In all the above cases, the program receives no data.

   If the conversation is mapped and a null data record is available (resulting from a Send_Data call with *send_length* set to 0), the *data_received* parameter is set to CM_COMPLETE_DATA_RECEIVED and the *received_length* parameter is set to 0.

Note: When *requested_length* is set to zero, receipt of either data or status can be indicated, but not both. The only exception to this rule is when a null data record is available for receipt on a mapped conversation. In that case, receipt of the null data record and status can both be indicated.

9. The program can receive both data and conversation status on the same call. However, if the remote program truncates a logical record, the local program receives the indication of the truncation on the Receive call issued by the local program after it receives all of the truncated record. The *return_code*, *data_received*, and *status_received* parameters indicate to the program the kind of information the program receives.
10. The program may receive data and conversation status on the same Receive call or on separate Receive calls. The program should be prepared for either case.
11. For a half-duplex conversation, the request-to-send notification is returned to the program in addition to (not in place of) the information indicated by the *return_code*, *data_received*, and *status_received* parameters.
12. A program must not specify a value in the *requested_length* parameter that is greater than the maximum the implementation can support. The maximum may vary from system to system. The program can use the Extract_Maximum_Buffer_Size call to determine the maximum supported by the local system. The program can achieve portability across different systems by using one of the following methods:

    a. Never using a *requested_length* value greater than 32767.

    b. Using the Extract_Maximum_Buffer_Size call to determine the maximum buffer size supported by the system and never setting *requested_length* greater than that maximum buffer size.

    The program should also be aware that the CM_INCOMPLETE_DATA_RECEIVED value of the *data_received* parameter may be returned when the maximum buffer size differs across the systems.
13. When the Receive call is processed in non-blocking mode and *receive_type* is set to CM_RECEIVE_IMMEDIATE, the call completes immediately. If information is not available, *return_code* is set to CM_UNSUCCESSFUL.
14. When the local program has requested confirmation of the Allocate call and the first call made by the recipient program is Request_To_Send or the recipient program has issued a Send_Expedited_Data call, the CM_ALLOCATE_CONFIRMED value of the *control_information_received* parameter will be returned first, and one of the following values will be returned at the next opportunity:

    - CM_RTS_RCVD_AND_EXP_DATA_AVAIL
    - CM_REQ_TO_SEND_RECEIVED
    - CM_EXPEDITED_DATA_AVAILABLE
15. The Receive call may be issued following a successful Prepare call, without a state transition to **Receive** state in case of a half-duplex conversation, for either of these reasons:

    - To receive data when CM_PREPARE_DATA_PERMITTED is selected and the Prepare Call is issued
    - To receive a new CM_PREPARE_OK value in *status_received*.

16. For a full-duplex conversation, if *receive_type* is set to CM_RECEIVE_AND_WAIT and the conversation startup request has not been sent to the partner, then the Receive call will flush the conversation startup request to the partner.
17. For a full-duplex conversation, if the return code CM_PROGRAM_ERROR_PURGING is received, it indicates that the conversation is allocated using an OSI TP CRM and that data may have been purged. The application has to ensure that the two partners are coordinated.
18. For a full-duplex conversation, when CM_DEALLOCATED_ABEND or CM_DEALLOCATED_ABEND_BO is received, further information on the cause of the deallocation may be obtained by issuing the Extract_Secondary_Information call.
19. When *control_information_received* indicates that expedited data is available to be received, subsequent calls with this parameter will continue to indicate that expedited data is available until the expedited data has been received by the program.

Related Information

"Conversation Types" on page 15 and "Set_Fill (CMSF)" on page 303 further discuss the use of basic conversations.

Most of the example program flows in Chapter 3, "Program-to-Program Communication Example Flows" show programs using the Receive call.

"Extract_Maximum_Buffer_Size (CMEMBS)" on page 170 further discusses determining the maximum buffer size supported by the system.

"Receive_Mapped_Data (CMRCVM)" on page 226 discusses how a program receives partner mapped data.

"Request_To_Send (CMRTS)" on page 241 discusses how a program can place its end of the conversation into **Receive** state.

"Send_Data (CMSEND)" on page 244 provides more information on complete and incomplete logical records and data records.

"Send_Mapped_Data (CMSNDM)" on page 266 dicusses how a program sends mapped partner data.

"Set_Receive_Type (CMSRT)" on page 335 discusses the *receive_type* characteristic and its various values.

Receive_Expedited_Data (CMRCVX)

LU 6.2

A program uses the Receive_Expedited_Data (CMRCVX) call to receive expedited data sent by its partner.

This call has meaning only when an LU 6.2 CRM is used for the conversation.

Format

```
CALL CMRCVX(conversation_ID,
            buffer,
            requested_length,
            received_length,
            control_information_received,
            expedited_receive_type,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

buffer *(output)*
Specifies the variable in which the program is to receive the data.

requested_length *(input)*
Specifies the maximum amount of data the program is to receive. This length can range from 0 to 86 bytes.

received_length *(output)*
When CM_OK is returned to the program, this parameter specifies the amount of data received, which is less than or equal to the buffer size specified in *requested_length*. When CM_BUFFER_TOO_SMALL is returned to the program, this parameter indicates the size of the data that is available to be received but has not been received.

control_information_received *(output)*
Specifies the variable containing an indication of whether or not control information has been received.

The *control_information_received* variable can have one of the following values:

- CM_NO_CONTROL_INFO_RECEIVED
  Indicates that no control information was received.
- CM_REQ_TO_SEND_RECEIVED (half-duplex conversations only)
  The local program received a request-to-send notification from the remote program. The remote program issued Request_To_Send, requesting the local program's end of the conversation to enter **Receive** state, which would place the remote program's end of the conversation in **Send** state. See “Request_To_Send (CMRTS)” on page 241 for further discussion of the local program's possible responses.
- CM_EXPEDITED_DATA_AVAILABLE
  Additional expedited data is available to be received.

- CM_RTS_RCVD_AND_EXP_DATA_AVAIL (half-duplex conversations only)
  The local program received a request-to-send notification from the remote program and expedited data is available to be received.

Notes:

1. If *return_code* is set to CM_PROGRAM_PARAMETER_CHECK or CM_PROGRAM_STATE_CHECK, the value contained in *control_information_received* has no meaning.
2. When more than one piece of control information is available to be returned to the program, it will be returned in the following order:
   - CM_RTS_RCVD_AND_EXP_DATA_AVAIL
   - CM_REQ_TO_SEND_RECEIVED
   - CM_EXPEDITED_DATA_AVAILABLE
   - CM_NO_CONTROL_INFO_RECEIVED

expedited_receive_type *(input)*
Specifies whether control should be returned to the program immediately or after there is expedited data available to receive.

The *expedited_receive_type* variable can have one of the following values:

- CM_RECEIVE_AND_WAIT
  The Receive_Expedited_Data call is to wait for expedited data to arrive on the specified conversation. If expedited data is already available, the program receives it without waiting.
- CM_RECEIVE_IMMEDIATE
  The Receive_Expedited_Data call is to receive any expedited data that is available from the specified conversation, but is not to wait for expedited data to arrive.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_OPERATION_INCOMPLETE
- CM_CONVERSATION_CANCELED
- CM_PROGRAM_PARAMETER_CHECK
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *requested_length* specifies a value less than 0 or greater than 86.
  - The conversation is not using an LU 6.2 CRM.
  - The *expedited_receive_type* specifies an undefined value.
- CM_PROGRAM_STATE_CHECK
  This value indicates that the conversation is in **Initialize** or **Initialize-Incoming** state and is not allowed to send expedited data.
- CM_CONVERSATION_ENDING
  This value indicates that the conversation is ending due to a normal deallocation, an allocation error, a Cancel_Conversation call, a Deallocate call with *deallocate_type* set to CM_DEALLOCATE_ABEND, or a conversation failure. Hence, no expedited data is received.

- CM_EXP_DATA_NOT_SUPPORTED
  This value indicates that the remote system does not support expedited data.
- CM_BUFFER_TOO_SMALL
  This value indicates that the value specified for the *requested_length* parameter is less than the amount of expedited data to be received. Therefore, no expedited data has been received.
- CM_OPERATION_NOT_ACCEPTED
- CM_UNSUCCESSFUL
  This value indicates that the *expedited_receive_type* parameter was set to CM_RECEIVE_IMMEDIATE and there was no expedited data available to receive.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. When expedited data is received by the CRM from the partner program, it is indicated to the local program on the next call it issues that returns the *control_information_received* parameter. When the program uses multiple threads or queue-level non-blocking, more than one call with the *control_information_received* parameter may be executed simultaneously. The availability of expedited data will continue to be indicated until the expedited data is received by the program. However, if a request-to-send or an allocate-confirm notification has been received, this notification is given to the program in only one call that has the *control_information_received* parameter.
2. If the program issues Receive_Expedited_Data with *requested_length* set to 0 and there is data available to be received, CM_BUFFER_TOO_SMALL is returned.
3. If the program issues Receive_Expedited_Data with *requested_length* set to 0 and *expedited_receive_type* set to CM_RECEIVE_AND_WAIT, and there is no data available to be received, the call does not complete until expedited data is available to be received. CM_BUFFER_TOO_SMALL is then returned.

Related Information

"Send_Expedited_Data (CMSNDX)" on page 263 describes the Send_Expedited_Data call.

Receive_Mapped_Data (CMRCVM)

LU 6.2	OSI TP

A program issues the Receive_Mapped_Data (CMRCVM) call to receive mapped data sent by its partner.

Before issuing the Receive_Mapped_Data call, a program has the option of issuing the CALL CMSRT-Set_Receive_Type call.

Format

```
CALL CMRCVM(conversation_ID,
            map_name,
            map_name_length,
            buffer,
            requested_length,
            data_received,
            status_received,
            control_information_received,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the variable containing the conversation identifier assigned to the conversation.

map_name *(output)*
Specifies the variable containing the mapping function used to decode the data record. The length of the variable must be at least 64 bytes.

map_name_length *(output)*
Specifies the variable containing the length of the returned map_name parameter.

buffer *(output)*
Specifies the variable in which the program is to receive the data.

Note: *Buffer* contains data only if *return_code* is set to CM_OK or CM_DEALLOCATE_NORMAL and *data_received* is not set to CM_NO_DATA_RECEIVED. If the *return_code* is set to CM_MAP_ROUTINE_ERROR or CM_UNKNOWN_MAP_RECEIVED the buffer contains the unprocessed user data.

requested_length *(input)*
Specifies the maximum amount of data the program is to receive. Valid *requested_length* values range from 0 to the maximum buffer size supported by the system plustop the map name. See /PGM10/ for additional information about determining the maximum buffer size.

data received_ *(output)*
Specifies whether or not the program received data.

Note: Unless *return_code* is set to CM_OK or

CM_DEALLOCATE_NORMAL, the value contained in *data_received* has no meaning.

The *data_received* variable can have one of the following values:

- CM_NO_DATA_RECEIVED
  No data is received by the program. Status may be received if the *return_code* is set to CM_OK
- CM_COMPLETE_DATA_RECEIVED
  A complete data record or the last remaining portion of the record is received.
- CM_INCOMPLETE_DATA_RECEIVED
  Less than a complete data record was received.

received_length *(output)*
Specifies the variable containing the amount of data the program received, up to the maximum. If the program does not receive data on this call, the value contained in *received_length* has no meaning.

Note: Data is received only if *return_code* is set to CM_OK or CM_DEALLOCATE_NORMAL and *data_received* is not set to CM_NO_DATA_RECEIVED.

status_received *(output)*
Specifies the variable containing an indication of the conversation status.

Note: Unless *return_code* is set to CM_OK, the value contained in *status_received* has no meaning.

The *status_received* variable can have one of the following values:

- CM_NO_STATUS_RECEIVED
  No conversation status is received by the program; data may be received.
- CM_SEND_RECEIVED (half-duplex conversations only)
  The remote program's end of the conversation in **Send-Pending** state (if the program also received data on this call) or **Send** state (if the program did not receive data on this call). The local program which issued the Receive call can now send data.
- CM_CONFIRM_RECEIVED (half-duplex conversations only)
  The remote program has sent a confirmation request, requesting the local program to respond by issuing a Confirmed call. The local program must respond by issuing Confirmed, Send_Error, or Deallocate with *deallocate_type* set to CM_DEALLOCATE_ABEND.
- CM_CONFIRM_SEND_RECEIVED (half-duplex conversations only)
  The remote program's end of the conversation entered **RECEIVE** state with conformation requested. The local program must respond by issuing Confirmed, Send_Error, or Deallocate with *deallocate_type* set to CM_DEALLOCATE_ABEND. Upon issuing a successful Confirmed call, the local program which issued the Receive call can now send data.
- CM_CONFIRM_DEALLOC_RECEIVED
  The remote program has deallocated the conversation with conformation requested. The local program must respond by issuing Confirmed, Send_Error, or Deallocate with *deallocate_type* set to CM_DEALLOCATE_ABEND. Upon issuing a successful Confirmed call, the local program which issued the Receive call is deallocated. This means it is placed in **RESET** state.

For a conversation with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and with the conversation include in a transaction, the *status_received* variable can also be set to one of the following values:

- CM_TAKE_COMMIT
  The remote program has issued a resource recovery commit call. The local program should issue a commit call in order to commit all protected program should issue a commit call in order to commit all protected resources throughout the transaction. When appropriate, the local program may respond by issuing a call other than commit, such as Send_error (for half-duplex conversations only) or a resource recovery backout call.
- CM_TAKE_COMMIT_SEND (half-duplex conversations only)
  The remote program issued a Prepare_to_Receive call with *prepare_to_receive_type* set to CM_PREP_TO_RECEIVE_SYNC_LEVEL and *sync level* set to CM_SYNC_POINT and then issued a resource recovery commit call. The local program should issue a commit call in order to commit all protected resources throughout the transaction. When appropriate, the local program may respond by issuing a call other than commit, such as Send_Error, or a resource recovery backout call. If a successful commit call is issued, the local program can then send data.
- CM_TAKE_COMMIT_DEALLOCATE
  The remote program has deallocated the conversation with *deallocate_type* set to CM_DEALLOCATE_SYNC_LEVEL and *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_COMMIT and then issued a resource recovery commit call. The local program should issue a commit call in order to commit all protected resources throughout the transaction. The local program may respond by issuing a call other than commit, such as Send_Error, or a resource recovery backout call. If a successful commit call is issued, the local program is then deallocated. This means it is placed in **RESET** state.
- CM_PREPARE_OK
  By issuing a Prepare (CMPREP) call, the local program requested that the remote program prepare its resources for commitment, and the remote program has done so by issuing a commit call. The subtree is now ready to commit its resources.

For a conversation with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and allocated using an OSI TP CRM, the *status_received* variable can also be set to one of the values if the conversation is included in a transaction:

- CM_JOIN_TRANSACTION
  The remote program requested that the local program join into its current transaction. The local program should issue an *tx_begin* call to the X/OPEN TX interface to join the superior's transaction as soon as any local work that is not to be included in the remote program's transaction has been completed.
- CM_TAKE_COMMIT_DATA_OK
  The remote program issued a Prepare call. For the exact conditions for receipt of this status_received value, see Table 14 on page 333 and Table 19 on page 412 The local program should issue a commit call in order to commit all protected resources throughout the transaction. The program is allowed to send data before issuing the commit call. When appropriate, the local program may respond by issuing a call other than commit, such as Send_Error for half-duplex conversations only, or a resource recovery backout call.

- CM_TAKE_COMMIT_SEND_DATA_OK(half-duplex conversations only)
  The remote program issued a Prepare call. For the exact conditions for receipt of this status_received value, see Table 14 on page 333 and Table 19 on page 412 The local program should issue a commit call in order to commit all protected resources throughout the transaction. The program is allowed to send data before issuing the commit call. When appropriate, the local program may respond by issuing a call other than commit, such as Send_Error for half-duplex conversations only, or a resource recovery backout call. If a successful commit call is issued, the local program can then send data.
- CM_TAKE_COMMIT_DEALLOC_DATA_OK
  The remote program issued a Prepare call. For the exact conditions for receipt of this status_received value, see Table 14 on page 333 and Table 19 on page 412 The local program should issue a commit call in order to commit all protected resources throughout the transaction. The program is allowed to send data before issuing the commit call. When appropriate, the local program may respond by issuing a call other than commit, such as Send_Error for half-duplex conversations only, or a resource recovery backout call. If a successful commit call is issued, the local program is then deallocated. This means that it is placed in **RESET** state.

control_information_received (output)
Specifies the variable containing an indication of whether or not control information has been received.

The *control_infomration_received* variable can have one of the following values:

- CM_NO_CONTROL_INFO_RECEIVED
  Indicates that no control information was received.
- CM_REQ_TO_SEND_RECEIVED (half-duplex conversations only)
  The local program received a request-to-send notification from the remote program. The remote program issued Request_To_Send, requesting the local program's end of conversation to enter **Receive** state, which would place the remote program's end of conversation in **Send** state. See “Request_To_Send (CMRTS)” on page 241 for further discussion of the local program's possible responses.
- CM_ALLOCATE_CONFIRM (OSI TP CRM only)
  The local program received confirmation of the remote program's acceptance of the conversation.
- CM_ALLOCATE_CONFIRM_WITH_DATA (OSI TP CRM only)
  The local program received confirmation of the remote program's acceptance of the conversation. The local program may now issue an Extract_Mapped_Initialization_Data (CMEMID) call to receive the initialization data.
- CM_ALLOCATE_REJECT_WITH_DATA (OST TP CRM only)
  The remote program rejected the conversation. The local program may now issue an Extract_Mapped_Initialization_call to receive the initialization data.

  This value will be returned with a return code of CM_OK. The program will receive a CM_DEALLOCATE_ABEND return code on a later call on the conversation.
- CM_EXPEDITED_DATA_AVAILABLE (LU 6.2 CRM only)
  Expedited data is available to be received.
- CM_EXPEDITED_MAPPED_DATA_AVAILABLE (LU 6.2 CRM only)

Mapped expedited data is available to be received.

- CM_RTS_RCVD_AND_EXP_MAP_DATA_AVAIL (half-duplex conversations and LU 6.2 CRM only)
  The local program received a request-to-send notification from the remote program and mapped expedited date is available for receiving.

Notes:

1. If *return_code* is set to CM_PROGRAM_PARAMETER_CHECK or CM_PROGRAM_STATE_CHECK, the value contained in *control_information_received* has no meaning.
2. When more than one piece of control information is available to be returned to the program, it will be returned in the following order:
   - CM_ALLOCATE_CONFIRMED, CM_ALLOCATE_CONFIRMED_WITH_DATA or CM_ALLOCATE_REJECTED_WITH_DATA
   - CM_RTS_RCVD_AND_EXP_DATA_AVAIL
   - CM_RTS_RCVD_AND_MAP_EXP_DATA_AVAIL
   - CM_REQ_TO_SEND_RECEIVED
   - CM_EXPEDITED_DATA_AVAILABLE
   - CM_NO_CONTROL_INFO_RECEIVED

return_code (output)
Specifies the result of call execution The return_code that can be returned depends on the state and characteristics of he conversation at the time this call is issued.

The following return codes apply to half-duplex conversations:

If *receive_type* is set to CM_RECEIVE_AND_WAIT and this call is issued in **Send** state, the return_code can have one of the following values:

- CM_OK
- CM_OPERATION_INCOMPLETE
- CM_CONVERSATION_CANCELED
- CM_CONVERSATION_TYPE_MISMATCH
- CM_PIP_NOT_SPECIFIED_CORRECTLY
- CM_SECURITY_NOT_VALID
- CM_SYNC_LVL_NOT_SUPPORTED_PGM
- CM_SYNC_LVL_NOT_SUPPORTED_SYS
- CM_TPN_NOT_RECOGNIZED
- CM_TPN_NOT_AVAILABLE_NO_RETRY
- CM_TPN_NOT_AVAILABLE_RETRY
- CM_DEALLOCATE_ABEND
- CM_DEALLOCATE_NORMAL
- CM_PROGRAM_ERROR_NO_TRUNC
- CM_PROGRAM_ERROR_NO_PURGING
- CM_RESOURCE_FAILURE_NO_RETRY
- CM_RESOURCE_FAILURE_RETRY
- CM_OPERATION_NOT_ACCEPTED
- CM_UNKNOWN_MAP_NAME_RECEIVED

The received data requires a map routine that the local map function does not support. The buffer contains the unprocessed user data.

- CM_MAP_ROUTINE_ERROR
  The map routine encountered a problem with the received data. The buffer contains the unprocessed user data.
- CM_PRODUCT_SPECIFIC_ERROR
- CM_PROGRAM_STATE_CHECK
- CM_PROGRAM_STATE_CHECK
- The following values are returned only when the *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM and the conversation is included in the transaction:
  - CM_TAKE_BACKOUT
  - CM_DEALLOCATED_ABEND_BO
  - CM_RESOURCE_FAIL_NO_RETRY_BO
  - CM_RESOURCE_FAILURE_RETRY_BO

  If *receive_type* is set to CM_RECEIVE_AND_WAIT and this call is issued in **Send-Pending** state, *return_code* can have one of the following values:
- CM_OK
- CM_OPERATION_INCOMPLETE
- CM_CONVERSATION_CANCELED
- CM_SYNC_LVL_NOT_SUPPORTED_SYS
- CM_DEALLOCATED_ABEND
- CM_DEALLOCATED_NORMAL
- CM_PROGRAM_ERROR_NO_TRUNC
- CM_PROGRAM_ERROR_PURGING
- CM_RESOURCE_FAILURE_NO_RETRY
- CM_RESOURCE_FAILURE_RETRY
- CM_UNKNOWN_MAP_NAME_RECEIVED
  The received data requires a map routine that the local map function does not support. The buffer contains the unprocessed user data.
- CM_MAP_ROUTINE_ERROR
  The map routine encountered a problem with the received data. The buffer contains the unprocessed user data.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR
- The following values are returned only whne the *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM and the conversation is included in a transaction:
  - CM_TAKE_BACKOUT
  - CM_DEALLOCATED_ABEND_BO
  - CM_RESOURCE_FAIL_NO_RETRY_BO
  - CM_RESOURCE_FAILURE_RETRY_BO

  If *receive_type* is set to CM_RECEIVE_AND_WAIT or CM_RECEIVE_IMMEDIATE and this call is issued in **Receive** state, the return_code can have one of the following values:
  - CM_OK
  - CM_OPERATION_INCOMPLETE
  - CM_CONVERSATION_CANCELED
    This value is only received when *receive_type* is set to CM_RECEIVE_AND_WAIT.
  - CM_CONVERSATION_TYPE_MISMATCH

- CM_PIP_NOT_SPECIFIED_CORRECTLY
- CM_SECURITY_NOT_VALID
- CM_SYNC_LVL_NOT_SUPPORTED_PGM
- CM_SYNC_LVL_NOT_SUPPORTED_SYS
- CM_TPN_NOT_RECOGNIZED
- CM_TPN_NOT_AVAILABLE_NO_RETRY
- CM_TPN_NOT_AVAILABLE_RETRY
- CM_DEALLOCATE_ABEND
- CM_DEALLOCATE_NORMAL
- CM_PROGRAM_ERROR_NO_TRUNC
- CM_PROGRAM_ERROR_PURGING
- CM_RESOURCE_FAILURE_NO_RETRY
- CM_RESOURCE_FAILURE_RETRY
- CM_UNSUCCESSFUL
- CM_UNKNOWN_MAP_NAME_RECEIVED
  The received data requires a map routine the local map function does not support. The buffer contains the unprocessed user data.
- CM_MAP_ROUTINE_ERROR
  The map routine encountered a problem with the received data. The buffer contains the unprocessed user data.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR
- The following values are returned only when the *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFORM and the conversation is included in a transaction:
  - CM_TAKE_BACKOUT
  - CM_DEALLOCATE_ABEND_BO
  - CM_RESOURCE_FAIL_NO_RETRY
  - CM_RESOURCE_FAILURE_RETRY

  If the state or parameter error has occurred, the *return_code* can have one of the following vlaues:
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - The *receive_type* is set to CM_RECEIVE_AND_WAIT and the conversation is not set to CM_RECEIVE_AND_WAIT and the conversation is not in **Send, Send-Pending, Receive or Prepare** state.
  - The *receive_type* is set to CM_RECEIVE_IMMEDIATE and the conversation is not set to CM_RECEIVE_AND_WAIT and the conversation is not in **Receive or Prepare** state.
  - For a conversation with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, the conversation's context is in the **Backout-Required** condition. The Receive_Mapped_Data call is not allowed for this conversation while its context is in this condition.

- The program has a *status_received* value of CM_JOIN_TRANSACTION and must issue a *tx_begin* call to the X/OPEN TX interface to join the transaction.

– CM_PROGRAM_PARAMETER_CHECK
This value indicates one of the following:

- The *conversation_ID* specifies an unassigned conversation identifier.
- The requested_length specifies a value that exceeds the range permitted by implementation. The maximum value of the length in each implementation is at least 32767. See usage note {UNOT10} for additional information about determining the maximum buffer size.
- The conversation_type characteristic is set to CM_BASIC_CONVERSATION

The following return codes apply to full_duplex conversations:

If the call is issued in **Send-Receive** or **Receive-Only** state and either the *sync_level* is CM_NONE or the *sync_level* is CM_SYNC_POINT_NO_CONFIRM and the conversation is not currently included in a transaction, the return_code can have one of the following values:

- CM_CONVERSATION_TYPE_MISMATCH
- CM_PIP_NOT_SPECIFIED_CORRECTLY
- CM_SECURITY_NOT_VALID
- CM_SYNC_LVL_NOT_SUPPORTED_PGM
- CM_SYNC_LVL_NOT_SUPPORTED_SYS
- CM_SEND_RCV_MODE_NOT_SUPPORTED
- CM_TPN_NOT_RECOGNIZED
- CM_TPN_NOT_AVAILABLE_NO_RETRY
- CM_TPN_NOT_AVAILABLE_RETRY
- CM_DEALLOCATE_ABEND
- CM_DEALLOCATE_NORMAL
- CM_PROGRAM_ERROR_NO_TRUNC (half-duplex conversations only)
- CM_PROGRAM_ERROR_PURGING (OSI TP CRM only)
- CM_RESOURCE_FAILURE_NO_RETRY
- CM_RESOURCE_FAILURE_RETRY
- CM_OPERATION_NOT_ACCEPTED
- CM_UNKNOWN_MAP_NAME_RECEIVED
  The received data requires a map routine the local map function does not support. The buffer contains the unprocessed user data.
- CM_MAP_ROUTINE_ERROR
  The map rountine encountered a problem with the received data. The buffer contains the unprocessed user data.
- CM_OPERATION_INCOMPLETE

- CM_CONVERSATION_CANCELED
- CM_PRODUCT_SPECIFIC_ERROR
- CM_PROGRAM_STATE_CHECK

The following values are returned only when the *sync_level* is set to CM_SYNC_POINT_NO_CONFORM and the state is **Send-Receive** or **Prepared** and the conversation is included in a transaction:

- CM_TAKE_BACKOUT
- CM_DEALLOCATE_ABEND_BO
- CM_RESOURCE_FAILURE_NO_RETRY
- CM_RESOURCE_FAILURE_RETRY
- CM_CONV_DEALLOC_AFTER_SYNCPT
- CM_INCLUDE_PARTNER_REJECT_BO
- CM_PRODUCT_SPECIFIC_ERROR_

If the state or parameter error has occurred, the *return_code* can have one of the following values:

– CM_PROGRAM_STATE_CHECK
This value indicates one of the following:

- The conversation is not in **Send-Receive, Prepared** or **Receive-Only** state.
- For a conversation with *sync_level* set to CM_SYNC_POINT_NO_CONFIRM, the conversation's context is in the **Backout-Required** condition. The Receive_Mapped_Data call is not allowed for this conversation while its context is in this condition.

– CM_PROGRAM_PARAMETER_CHECK
This value indicates one of the following:

- The *conversation_ID* specifies an unassigned conversation identifier.
- The requested_length specifies a value that exceeds the range permitted by implementation. The maximum value of the length in each implementation is at least 32,767. See usage note {UNOT10} for additional information about determining the maximum buffer size.
- The conversation_type characteristic is set to CM_BASIC_CONVERSATION

State Changes

For half-duplex conversations, when *return_code* indicates CM_OK:

The conversation enters Receive state if a Receive call is issued and all of the following conditions are true:

- The receive type is set to CM_RECEIVE_AND_WAIT.
- The conversation is in **Send-Pending** or **Send** state.
- The *data_received* indicates CM_DATA_RECEIVED, CM_COMPLETE_DATA_RECEIVED or CM_INCOMPLETE_DATA_RECEIVED
- The *status_received* indicates CM_NO_STATUS_RECEIVED.

- The conversation enters **Send** state when *data_received* is set to CM_NO_DATA_RECEIVED and *status_received* is set to CM_SEND_RECEIVED.

- The conversation enters **Send-Pending** state when *data_received* is set to CM_DATA_RECEIVED, or CM_COMPLETE_DATA_RECEIVED, and *status_received* is set to CM_SEND_RECEIVED.
- The conversation enters **Confirm**, **Confirm-send**, or **Confirm-Deallocate** state when *status_received* is set to CM_CONFIRM_RECEIVED, CM_CONFIRM_SEND_RECEIVED, or CM_CONFIRM_DEALLOC_RECEIVED, respectively.
- For a conversation with *sync_level* set to either CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, the conversation enters **Sync-Point**, **Sync-Point-Send**, or **Sync-Point-Deallocate** state when *status_received* is set to CM_TAKE_COMMIT, CM_TAKE_COMMIT_SEND, or CM_TAKE_COMMIT_DEALLOCATE, respectively.
- For a conversation with *sync_level* set to either CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, the conversation enters **Sync-Point**, **Sync-Point-Send**, or **Sync-Point-Deallocate** state when *status_received* is set to CM_TAKE_COMMIT_DATA_OK, CM_TAKE_COMMIT_SEND_DATA_OK, or CM_TAKE_COMMIT_DEALLOC_DATA_OK, respectively.
- No state change occurs when the call is issued in **Receive** state. *data_received* is set to CM_DATA_RECEIVED, CM_COMPLETE_DATA_RECEIVED, or CM_INCOMPLETE_DATA_RECEIVED and *status_received* indicates CM_NO_STATUS_RECEIVED
- No state change occurs when the call is issued in **Prepared** state, or if *status_received* indicates CM_JOIN_TRANSACTION.

For full-duplex conversations when *return_code* indicates CM_OK:

- No state change occurs when the call is issued in **Prepared** or **Receive-Only** state, or if *status_received* indicates CM_JOIN_TRANSACTION
- The conversation enters **Confirm-Deallocate** state when *status_rejected* is set to CM_CONFIRM_DEALLOC_RECEIVED.
- For a conversation with *sync_level* set to CM_SYNC_POINT_NO_CONFIRM, the conversation enters **Sync-Point** state when *status_received* is set to CM_TAKE_COMMIT or CM_TAKE_COMMIT_DATA_OK, and it enters **Sync-Point-Deallocate** state when *status_received* is set to CM_TAKE_COMMIT_DEALLOCATE, or CM_TAKE_COMMIT_DEALLOC_DATA_OK.

Usage Notes

1. If *receive_type* is set to CM_RECEIVE_AND_WAIT and no information is present when the call is made, CPI-C waits for information to arrive on the specified conversation before allowing the Receive call to return with the information. If the information is already available, the program receives it without waiting.
2. For a half-duplex conversation, if the program issues a Receive call with its end of the conversation in **Send** state with *receive_type* set to CM_RECEIVE_AND_WAIT, the local system will flush its send buffer and send all buffered information to the remote program. The local system will also send a change-of-direction indication. This is convenient method to change the direction of the conversation because it leaves the local program's end of the

conversation in Receive state and tells the remote program that it may now begin sending data. The local system waits for information to arrive.

Note: A Receive call in **Send** or **Send-Pending** state with a *reeive_type* set to CM_RECEIVE_AND_WAIT generates an implicit execution of Prepare_To_Receive with *prepare_to_receive_type* set to CM_PREP_TO_RECEIVE_FLUSH followed by a Receive. See "Prepare_To_Receive (CMPTR)" on page 204 for more information.

3. If *receive_type* is set to CM_RECEIVE_IMMEDIATE, a Receive call receives any available information, but does not wait for information to arrive. If information is available, it is returned to the program with an indication of the exact nature of the information received.

   Since data may not be available when a given Receive call is issued, a program that is using concurrent conversations with multiple partners might use a *receive_type* of CM_RECEIVE_IMMEDIATE and periodically check each conversation for data. For more information about multiple, concurrent conversations see "Multiple Conversations" on page 27

4. If the *return_code* indicates CM_PROGRAM_STATE_CHECK or CM_PROGRAM_PARAMETER_CHECK, the values of all other parameters on the call have no meaning.

5. A Receive call is issued against a mapped conversation can receive only as much of the data record as specified by the *requested_length* parameter. The *data_received* parameter indicates whether the program has received a complete or incomplete data record as follows:

   - When the program receives a compete data record or the last remaining portion of a data record, the *data_received* is set to CM_COMPLETE_DATA_RECEIVED The length of the record or portion of the record is less than or equal to the length specified on the *requested_length* parameter.
   - When the program receives a portion of the data record other than the last remaining portion, the *data_received* parameter is set to CM_INCOMPLETE_DATA_RECEIVED. The data record is incomplete for one of the following reasons:
     - *receive_type* is set to CM_RECEIVE_AND_WAIT and the length of the record is greater than the length specified on the *requested_length* parameter.
     - *receive_type* is set to CM_RECEIVE_IMMEDIATE and either the length of the record is greater than the length specified on the *requested_length* parameter or the last portion of the data record has not arrived from the partner program.
       In either case, the amount of data received is equal to the *received_length* specified.

6. The Receive call made with *requested_length* set to zero has no special significance. The type of information available is indicated by the *return_code*, *data_received*. and *status_received* parameters as usual. If *receive_type* is set to CM_RECEIVE_AND_WAIT and no information is available, this call waits for information to arrive. If *receive_type* is set to CM_RECEIVE_IMMEDIATE, it is possible that no information is available. If data is available, the *data_received* parameter is set to CM_INCOMPLETE_DATA_RECEIVED and the program receives no data.

If the conversation is mapped and a null data record is available (resulting from a Send_Mapped_Data call with *send_length* set to 0), the *data_received* parameter is set to CM_COMPLETE_DATA_RECEIVED and the *received_length* parameter is set to 0.

Note: When *requested_length* is set to zero, receipt of either data or status can be indicated, but not both. The only exception to this rules is when a null data record is available for receipt on a mapped conversation. In that case, receipt of the null data record and status can both be indicated.

7. The program can receive both data and conversation status on the same call. However, if the remote program truncates a logical record, the local program receives the indication of the truncation on the Receive call issued by the local program after it receives all of the truncated record. The *return_code*, *data_received*, and *status_received* parameters indicate to the program the kind of information the program receives.
8. The program may receive data and conversation status on the same Receive call or on separate Receive calls. The program should be prepared for either case.
9. For a half-duplex conversation, the request-to-send notification is returned to the program in addition to (not in place of) the information indicated by the *return_code_data_received* and *status_received* parameters.
10. A program must not specify a value in the *requested_length* parameter that is greater than the maximum the implementation can support. The maximum may vary from system to system. The maximum also depends on the *map_name* parameter.

    Every CPI-C product must be able to receive data buffers with a length of 32,767 bytes. Users who write map routines should describe the length of the data buffer after decoding, if the encoded buffer has a length of 32,767 bytes.

    The application program should use a *requested_length* value not smaller than this value. The program should also be aware that CM_INCOMPLETE_DATA_RECEIVED value of the *data_received* parameter may be returned when the maximum buffer size differs across systems.
11. When the Receive call is processed in non-blocking mode and *receive_type* is set to CM_RECEIVE_IMMEDIATE, the call completes immediately. If information is not available, *return_code* is set to CM_UNSUCCESSFUL.
12. When the local program has requested confirmation of the Allocate call and the first call made by the recipient program is Request_To_Send or the recipient program has issued a Send_Expedited_Data call, the CM_ALLOCATE_CONFIRMED value of the *control_information_received* parameter will be returned first and one of the following values will be returned at the next opportunity:

    - CM_RTS_RCVD_AND_EXP_DATA_AVAIL
    - CM_REQ_TO_SEND_RECEIVED
    - CM_EXPEDITED_DATA_AVAILABLE
    - CM_EXPEDITED_MAPPED_DATA_AVAILABLE
13. The Receive call may be issued following a successful Prepare call, without a state transition to **Receive** state in case of a half-duplex conversation, for either of these reasons:

- To receive data when CM_PREPARE_DATA_PERMITTED is selected and the Prepare Call is issued
- To receive a new CM_PREPARE_OK value in *status_received*.

14. For a full-duplex conversation, if *receive_type* is set to CM_RECEIVE_AND_WAIT and the conversation startup request has been sent to the partner, then the Receive call will flush the conversation startup request to the partner.
15. for a full-duplex conversation, if the return code CM_PROGRAM_ERROR_PURGING is received, it indicates that the conversation is allocated using an OSI TP CRM and that data may have been purged. The application has to ensure that the two partners are coordinated.
16. For a full-duplex conversation, when CM_DEALLOCATED_ABEND or CM_DEALLOCATED_ABEND_BO is received, further information on the cause of the deallocation may be obtained by issuing the Extract_Secondary_Information call.
17. When *control_information_received* indicated that expedited data is available to be received, subsequent calls with this parameter will continue to indicate that expedited data is available until the expedited data has been received by the program.
18. The *received_length* is local information from the map routine. The *received_length* value is calculated by the map routine after all transformations are completed.
19. If a basic conversation data record is received the map routine treats it as an error.

Related Information

Chapter 3, “Program-to-Program Communication Example Flows” on page 65 show programs using the Receive call.

“Request_To_Send (CMRTS)” on page 241 discusses how a program can place its end of the conversation into **Receive** state.

“Send_Mapped_Data (CMSNDM)” on page 266 provides more information on complete and incomplete logical records and data records.

“Set_Prepare_To_Receive_Type (CMSPTR)” on page 324 discusses the *receive_type* characteristic and its various values.

Release_Local_TP_Name (CMRLTP)

LU 6.2	OSI TP

Release_Local_TP_Name (CMRLTP) is used by a program to release a name. The name is no longer associated with the program.

Format

```
CALL CMRLTP(TP_name,
            TP_name_length,
            return_code)
```

Parameters

TP_name *(input)*
Specifies the name to be released.

Note: Refer to "SNA Service Transaction Programs" on page 499 for special handling of SNA Service Transaction Program names.

TP_name_length *(input)*
Specifies the length of *TP_name*. The length can be from 1 to 64 bytes.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *TP_name* specifies a name that is not associated with this program.
  - The *TP_name_length* specifies a value less than 1 or greater than 64.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause any state changes.

Usage Notes

1. If a *return_code* other than CM_OK is returned on the call, the names associated with the current program remain unchanged.
2. The names used to satisfy an outstanding Accept_Incoming or Accept_Conversation call are not changed by the Release_Local_TP_Name call. The released name will not be used to satisfy future Accept_Incoming or Accept_Conversation calls.
3. A TP can release a name that was taken from the conversation startup request and used to start the program.
4. If a TP has released all names, no incoming conversations can be accepted. Subsequent Accept_Incoming and Accept_Conversation calls will receive the CM_PROGRAM_STATE_CHECK return code.

Related Information

"Specify_Local_TP_Name (CMSLTP)" on page 351 describes how local names are associated with a program.

Request_To_Send (CMRTS)

LU 6.2	OSI TP

The local program uses the Request_To_Send (CMRTS) call to notify the remote program that the local program would like to enter **Send** state for a given conversation.

Note: The Request_To_Send call has meaning only on a half-duplex conversation.

Format

```
CALL CMRTS(conversation_ID,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_OPERATION_INCOMPLETE
- CM_CONVERSATION_CANCELED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *send_receive_mode* is CM_FULL_DUPLEX.
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - The conversation is not in **Receive**, **Send**, **Send-Pending**, **Confirm**, **Confirm-Send**, **Confirm-Deallocate**, **Sync-Point**, **Sync-Point-Send**, **Sync-Point-Deallocate** or **Prepared** state.
  - For a conversation with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, the conversation's context is in the **Backout-Required** condition. The Request_To_Send call is not allowed for this conversation while its context is in this condition.
  - For a conversation using an OSI TP CRM, the Request_To_Send call is not allowed from **Send** or **Prepared** state.
  - The program has received a *status_received* value of CM_JOIN_TRANSACTION and must issue a tx_begin call to the X/Open TX interface to join the transaction.
- CM_CONVERSATION_ENDING
  This return code indicates that the local system is ending the conversation or notification has been received from the remote system that it is ending the conversation.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. The remote program is informed of the arrival of a request-to-send notification by means of the *control_information_received* parameter. The *control_information_received* parameter set to CM_REQ_TO_SEND_RECEIVED or CM_RTS_RCVD_AND_EXP_DATA_AVAIL is a request for the remote program's end of the conversation to enter **Receive** state in order to place the partner program's end of the conversation (the program that issued the Request_To_Send) in **Send** state.

   The remote program's end of the conversation enters **Receive** state when the remote program successfully issues one of the following calls or sequences of calls:

   - The Receive call with *receive_type* set to CM_RECEIVE_AND_WAIT
   - The Prepare_To_Receive call with *prepare_to_receive_type* set to CM_PREP_TO_RECEIVE_FLUSH, CM_PREP_TO_RECEIVE_CONFIRM, or CM_PREP_TO_RECEIVE_SYNC_LEVEL and *sync_level* set to CM_CONFIRM or CM_NONE, or CM_PREP_TO_RECEIVE_SYNC_LEVEL and *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, but with the conversation not currently included in a transaction.
   - The Send_Data call with *send_type* set to CM_SEND_AND_PREP_TO_RECEIVE and *prepare_to_receive_type* set to CM_PREP_TO_RECEIVE_FLUSH, CM_PREP_TO_RECEIVE_CONFIRM, or CM_PREP_TO_RECEIVE_SYNC_LEVEL, and *sync_level* set to CM_CONFIRM or CM_NONE, or CM_PREP_TO_RECEIVE_SYNC_LEVEL and *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, but with the conversation not currently included in a transaction.
   - The Prepare_To_Receive call with *prepare_to_receive_type* set to CM_PREP_TO_RECEIVE_SYNC_LEVEL and *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, followed by a successful commit, Confirm, or Flush call.
   - The Send_Data call with *send_type* set to CM_SEND_AND_PREP_TO_RECEIVE, *prepare_to_receive_type* set to CM_PREP_TO_RECEIVE_SYNC_LEVEL, and *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, followed by a successful commit, Confirm, or Flush call.

   After a remote program issues one of these calls, the local program's end of the conversation is placed into a corresponding **Send**, **Send-Pending**, **Confirm-Send**, or **Sync-Point-Send** state when the local program issues a Receive call. See the *status_received* parameter for the Receive call on page 209 for information about why the state changes from **Receive** to **Send**.

2. The CM_REQ_TO_SEND_RECEIVED value is normally returned to the remote program in the *control_information_received* parameter when the remote program's end of the conversation is in **Send** state (on a Send_Data, Send_Error, Confirm, or Test_Request_To_Send_Received call). However, the value can also be returned on a Receive call.

3. When the remote system receives the request-to-send notification, it retains the notification until the remote program issues a call with the *control_information_received* parameter. The remote system will retain only

one request-to-send notification at a time (per conversation). Additional notifications are discarded until the retained notification is indicated to the remote program. Therefore, a local program may issue the Request_To_Send call more times than are indicated to the remote program.

Related Information

"Example 4: The Receiving Program Changes the Data Flow Direction" on page 74 shows an example program flow using the Request_To_Send call.

"Receive (CMRCV)" on page 209 provides additional information on the *status_received* and *control_information_received* parameters.

"Receive_Mapped_Data (CMRCVM)" on page 226 provides information about receiving mapped partner data.

Send_Data (CMSEND)

LU 6.2	OSI TP

A program uses the Send_Data (CMSEND) call to send data to the remote program. When issued during a mapped conversation, this call sends one data record to the remote program. The data record consists entirely of data and is not examined by the system for possible logical records.

When issued during a basic conversation, this call sends data to the remote program. The data consists of logical records. The amount of data is specified independently of the data format.

Before issuing the Send_Data call, a program has the option of issuing one or more of the following calls, which affect the function of the Send_Data call:

CALL CMSST – Set_Send_Type

If *send_type* = CM_SEND_AND_PREP_TO_RECEIVE, optional setup may include:

CALL CMSPTR – Set_Prepare_To_Receive_Type

If *send_type* = CM_SEND_AND_DEALLOCATE, optional setup may include:

CALL CMSDT – Set_Deallocate_Type

Format

```
CALL CMSEND(conversation_ID,
            buffer,
            send_length,
            control_information_received,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

buffer *(input)*
When a program issues a Send_Data call during a mapped conversation, *buffer* specifies the data record to be sent. The length of the data record is given by the *send_length* parameter.

When a program issues a Send_Data call during a basic conversation, *buffer* specifies the data to be sent. The data consists of logical records, each containing a 2-byte length field (denoted as LL) followed by a data field.

The length of the data field can range from 0 to 32765 bytes. The 2-byte length field contains the following bits:

- A high-order bit that is not examined by the system. It is used, for example, by the system's mapped conversation component in support of the mapped conversation calls.
- A 15-bit binary length of the record.

The length of the record equals the length of the data field plus the 2-byte length field. Therefore, logical record length values of X'0000', X'0001', X'8000', and X'8001' are not valid.

Note: The logical record length values shown above (such as X'0000') are in the hexadecimal (base-16) numbering system.

send_length *(input)*

For both basic and mapped conversations, the *send_length* ranges in value from 0 to the maximum buffer size supported by the system. The maximum buffer size is at least 32767 bytes. See Usage Note 10 on page 252 for additional information about determining the maximum buffer size. The *send_length* parameter specifies the size of the *buffer* parameter and the number of bytes to be sent on the conversation.

When a program issues a Send_Data call during a mapped conversation and *send_length* is zero, a null data record is sent.

When a program issues a Send_Data call during a basic conversation, *send_length* specifies the size of the *buffer* parameter and is **not** related to the length of a logical record. If *send_length* is zero, no data is sent, and the *buffer* parameter is not important. However, the other parameters and setup characteristics are significant and retain their meaning as described.

control_information_received *(output)*

Specifies the variable containing an indication of whether or not control information has been received.

The *control_information_received* variable can have one of the following values:

- CM_NO_CONTROL_INFO_RECEIVED
  Indicates that no control information was received.
- CM_REQ_TO_SEND_RECEIVED (half-duplex conversations only)
  The local program received a request-to-send notification from the remote program. The remote program issued Request_To_Send, requesting the local program's end of the conversation to enter **Receive** state, which would place the remote program's end of the conversation in **Send** state. See "Request_To_Send (CMRTS)" on page 241 for further discussion of the local program's possible responses.
- CM_ALLOCATE_CONFIRMED (OSI TP CRM only)
  The local program received confirmation of the remote program's acceptance of the conversation.
- CM_ALLOCATE_CONFIRMED_WITH_DATA (OSI TP CRM only)
  The local program received confirmation of the remote program's acceptance of the conversation. The local program may now issue an Extract_Initialization_Data (CMEID) call to receive the initialization data.
- CM_ALLOCATE_REJECTED_WITH_DATA (OSI TP CRM only)
  The remote program rejected the conversation. The local program may now issue an Extract_Initialization_Data (CMEID) call to receive the initialization data.

This value will be returned with a return code of CM_OK. The program will receive a CM_DEALLOCATED_ABEND return code on a later call on the conversation.
- CM_EXPEDITED_DATA_AVAILABLE (LU 6.2 CRM only)
  Expedited data is available to be received.
- CM_RTS_RCVD_AND_EXP_DATA_AVAIL (half-duplex conversations and LU 6.2 CRM only)
  The local program received a request-to-send notification from the remote program and expedited data is available to be received.

Notes:

1. If *return_code* is set to CM_PROGRAM_PARAMETER_CHECK or CM_PROGRAM_STATE_CHECK, the value contained in *control_information_received* has no meaning.
2. When more than one piece of control information is available to be returned to the program, it will be returned in the following order:
   - CM_ALLOCATE_CONFIRMED, CM_ALLOCATE_CONFIRMED_WITH_DATA, or CM_ALLOCATE_REJECTED_WITH_DATA
   - CM_RTS_RCVD_AND_EXP_DATA_AVAIL
   - CM_REQ_TO_SEND_RECEIVED
   - CM_EXPEDITED_DATA_AVAILABLE
   - CM_NO_CONTROL_INFO_RECEIVED

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values.

The following return codes apply to half-duplex conversations.

- CM_OK
- CM_OPERATION_INCOMPLETE
- CM_CONVERSATION_CANCELED
- CM_CONVERSATION_TYPE_MISMATCH
- CM_PIP_NOT_SPECIFIED_CORRECTLY
- CM_SECURITY_NOT_VALID
- CM_SYNC_LVL_NOT_SUPPORTED_PGM
- CM_SYNC_LVL_NOT_SUPPORTED_SYS
- CM_SEND_RCV_MODE_NOT_SUPPORTED
- CM_TPN_NOT_RECOGNIZED
- CM_TP_NOT_AVAILABLE_NO_RETRY
- CM_TP_NOT_AVAILABLE_RETRY
- CM_PROGRAM_ERROR_PURGING
- CM_DEALLOCATED_ABEND
- CM_RESOURCE_FAILURE_NO_RETRY
- CM_RESOURCE_FAILURE_RETRY
- CM_DEALLOCATED_ABEND_SVC (basic conversations only)
- CM_DEALLOCATED_ABEND_TIMER (basic conversations only)
- CM_SVC_ERROR_PURGING (basic conversations only)
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - The conversation is not in **Send**, **Send-Pending**, **Sync-Point**, **Sync-Point-Send**, or **Sync-Point-Deallocate** state.

  - The conversation is in **Sync-Point**, **Sync-Point-Send**, or **Sync-Point-Deallocate** state, and the program received a take-commit notification not ending in *_DATA_OK.
  - The conversation is basic and in **Send** state; the *send_type* is set to CM_SEND_AND_CONFIRM, CM_SEND_AND_DEALLOCATE, or CM_SEND_AND_PREP_TO_RECEIVE; the *deallocate_type* is not set to CM_DEALLOCATE_ABEND (if *send_type* is set to CM_SEND_AND_DEALLOCATE); and the data does not end on a logical record boundary.
  - For a conversation with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, the conversation's context is in the **Backout-Required** condition. The Send_Data call is not allowed for this conversation while its context is in this condition.
  - The conversation is in **Sync-Point**, **Sync-Point-Send**, or **Sync-Point-Deallocate** state, and *send_type* is set to CM_SEND_AND_CONFIRM or CM_SEND_AND_PREP_TO_RECEIVE.
  - The conversation is in **Sync-Point**, **Sync-Point-Send**, or **Sync-Point-Deallocate** state, the *send_type* is set to CM_SEND_AND_DEALLOCATE, and the *deallocate_type* is not set to CM_DEALLOCATE_ABEND.
  - The *send_type* is set to CM_SEND_AND_DEALLOCATE and the following conditions are also true:
    - The *deallocate_type* is set to CM_DEALLOCATE_FLUSH or CM_DEALLOCATE_CONFIRM.
    - The *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM.
    - The conversation is included in a transaction.

- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *send_length* exceeds the range permitted by the implementation. The maximum value of the length in each implementation is at least 32767. See Usage Note 10 on page 252 for additional information about determining the maximum buffer size.
  - The *conversation_type* is CM_BASIC_CONVERSATION and *buffer* contains an invalid logical record length (LL) value of X'0000', X'0001', X'8000', or X'8001'.
  - The *send_type* is set to CM_SEND_AND_PREP_TO_RECEIVE and the following conditions are also true:
    - The *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_SYNC_LEVEL.
    - The *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM.
    - The conversation is included in a transaction.
    - The conversation is using an OSI TP CRM, and the program is not the superior for the conversation.
  - The *send_type* is set to CM_SEND_AND_DEALLOCATE and the following conditions are also true:
    - The *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL.
    - The *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM.
    - The conversation is included in a transaction.
    - The conversation is using an OSI TP CRM, and the program is not the superior for the conversation.

- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR
- The following values are returned only when *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM and the conversation is included in a transaction:
  - CM_TAKE_BACKOUT
  - CM_DEALLOCATED_ABEND_BO
  - CM_DEALLOCATED_ABEND_SVC_BO (basic conversations only)
  - CM_DEALLOCATED_ABEND_TIMER_BO (basic conversations only)
  - CM_RESOURCE_FAIL_NO_RETRY_BO
  - CM_RESOURCE_FAILURE_RETRY_BO
  - CM_INCLUDE_PARTNER_REJECT_BO

The following return codes apply to full-duplex conversations.

The *return_code* can have one of the following values:

- CM_OK
- CM_ALLOCATION_ERROR
- CM_DEALLOCATED_ABEND
- CM_DEALLOCATED_ABEND_SVC
- CM_DEALLOCATED_ABEND_TIMER
- CM_DEALLOCATED_CONFIRM_REJECT
- CM_RESOURCE_FAILURE_NO_RETRY
- CM_RESOURCE_FAILURE_RETRY
- CM_DEALLOCATED_NORMAL (OSI TP CRM only)
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - The conversation is not in **Send-Receive**, **Send-Only**, **Sync-Point**, or **Sync-Point-Deallocate** state.
  - The conversation is basic and in **Send-Receive** or **Send-Only** state, the *send_type* is set to CM_SEND_AND_DEALLOCATE, the *deallocate_type* is not set to CM_DEALLOCATE_ABEND, and the data does not end on a logical record boundary.
  - The conversation is in **Sync-Point** or **Sync-Point Deallocate** state and the program received a take-commit notification not ending in *_DATA_OK.
  - The conversation is in **Sync-Point**, or **Sync-Point-Deallocate** state, the *send_type* is set to CM_SEND_AND_DEALLOCATE, and the *deallocate_type* is not set to CM_DEALLOCATE_ABEND.
  - The *send_type* is set to CM_SEND_AND_DEALLOCATE and the following conditions are also true:
    - The *deallocate_type* is set to CM_DEALLOCATE_FLUSH or CM_DEALLOCATE_CONFIRM.
    - The *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM.
    - The conversation is included in a transaction.
  - For a conversation with *sync_level* set to CM_SYNC_POINT_NO_CONFIRM, this return code indicates one of the following:
    - The conversation's context is in the **Backout-Required** condition. The Send_Data call is not allowed for this conversation while its context is in this condition.

      - The local program has received a *status_received* value of CM_JOIN_TRANSACTION and must issue a tx_begin call to the X/Open TX interface to join the transaction.
  - CM_PROGRAM_PARAMETER_CHECK
    This value indicates one of the following:
    - The *conversation_ID* specifies an unassigned conversation identifier.
    - The *send_length* exceeds the range permitted by the implementation. The maximum value of the length in each implementation is at least 32767.
    - The *conversation_type* is CM_BASIC_CONVERSATION and *buffer* contains an invalid logical record length (LL) value of X'0000', X'0001', X'8000', or X'8001'.
    - The *send_type* is set to CM_SEND_AND_DEALLOCATE and the following conditions are also true:
      - The *deallocate_type* is set to CM_DEALLOCATE_FLUSH or CM_DEALLOCATE_CONFIRM.
      - The *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM.
      - The conversation in included in a transaction.
    - The *send_type* is set to CM_SEND_AND_DEALLOCATE and the following conditions are also true:
      - The *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL.
      - The *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM.
      - The conversation is included in a transaction.
      - The program is not the superior for the conversation.
  - CM_OPERATION_NOT_ACCEPTED
  - CM_OPERATION_INCOMPLETE
2 - CM_CONVERSATION_CANCELED
  - CM_PRODUCT_SPECIFIC_ERROR

The following values are returned only if *sync_level* is CM_SYNC_POINT_NO_CONFIRM, the state is **Send-Receive** and the conversation is currently included in a transaction.

- CM_TAKE_BACKOUT
- CM_DEALLOCATED_ABEND_BO
- CM_DEALLOCATED_ABEND_SVC_BO (basic conversations only)
- CM_DEALLOCATED_ABEND_TIMER_BO (basic conversations only)
- CM_RESOURCE_FAIL_NO_RETRY_BO
- CM_RESOURCE_FAILURE_RETRY_BO
- CM_CONV_DEALLOC_AFTER_SYNCPT
- CM_INCLUDE_PARTNER_REJECT_BO

State Changes

For half-duplex conversations, when *return_code* indicates CM_OK:

- The conversation enters **Receive** state when Send_Data is issued with *send_type* set to CM_SEND_AND_PREP_TO_RECEIVE and any of the following conditions are true:
  - *Prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_FLUSH
  - *Prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_CONFIRM
  - *Prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_SYNC_LEVEL and *sync_level* is set to CM_NONE or CM_CONFIRM

  - *Prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_SYNC_LEVEL, *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, but the conversation is not currently included in a transaction.

- The conversation enters **Defer-Receive** state when Send_Data is issued with *send_type* set to CM_SEND_AND_PREP_TO_RECEIVE, *prepare_to_receive_type* set to CM_PREP_TO_RECEIVE_SYNC_LEVEL, *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and the conversation is included in a transaction.
- The conversation enters **Reset** state when Send_Data is issued with *send_type* set to CM_SEND_AND_DEALLOCATE and any of the following conditions is true:
  - *Deallocate_type* is set to CM_DEALLOCATE_ABEND
  - *Deallocate_type* is set to CM_DEALLOCATE_FLUSH
  - *Deallocate_type* is set to CM_DEALLOCATE_CONFIRM
  - *Deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL and *sync_level* is set to CM_NONE or CM_CONFIRM
  - *Deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL, *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, but the conversation is not currently included in a transaction.
- The conversation enters **Defer-Deallocate** state when Send_Data is issued with *send_type* set to CM_SEND_AND_DEALLOCATE, *deallocate_type* set to CM_DEALLOCATE_SYNC_LEVEL, *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and the conversation is included in a transaction.
- The conversation enters **Send** state when Send_Data is issued in **Send-Pending** state with *send_type* set to CM_BUFFER_DATA, CM_SEND_AND_FLUSH, or CM_SEND_AND_CONFIRM.
- No state change occurs when Send_Data is issued in **Send** state with *send_type* set to CM_BUFFER_DATA, CM_SEND_AND_FLUSH, or CM_SEND_AND_CONFIRM.

For full-duplex conversations, when *return_code* indicates CM_OK:

- The conversation enters **Receive-Only** state when the Send_Data call is issued in **Send-Receive** state with *send_type* set to CM_SEND_AND_DEALLOCATE, and one of the following conditions is true:
  - *deallocate_type* is set to CM_DEALLOCATE_FLUSH
  - *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL and *sync_level* is set to CM_NONE
  - *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL, *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM, and the conversation is not currently included in a transaction.
- The conversation enters **Reset** state when the Send_Data call is issued with *send_type* set to CM_SEND_AND_DEALLOCATE and one of the following conditions is true:
  - The call is issued in **Send-Only** state
  - The call is issued in **Send-Receive**, **Send-Only**, **Sync-Point**, or **Sync-Point-Deallocate** state and *deallocate_type* is set to CM_DEALLOCATE_ABEND.
- The conversation enters **Defer-Deallocate** state when the Send_Data call is issued with *send_type* set to CM_SEND_AND_DEALLOCATE, *deallocate_type* set

to CM_DEALLOCATE_SYNC_LEVEL, *sync_level* set to CM_SYNC_POINT_NO_CONFIRM, and the conversation included in a transaction.

- No state change occurs when Send_Data is issued in **Send-Receive** or **Send-Only** state with *send_type* set to CM_BUFFER_DATA or CM_SEND_AND_FLUSH.

Usage Notes

1. The local system buffers the data to be sent to the remote system until it accumulates a sufficient amount of data for transmission (from one or more Send_Data calls), or until the local program issues a call that causes the system to flush its send buffer. The amount of data sufficient for transmission depends on the characteristics of the logical connection allocated for the conversation, and varies from one logical connection to another.
2. For a half-duplex conversation, when *control_information_received* indicates CM_REQ_TO_SEND_RECEIVED, or CM_RTS_RCVD_AND_EXP_DATA_AVAIL, or the remote program is requesting the local program's end of the conversation to enter **Receive** state, which places the remote program's end of the conversation in **Send** state. See “Request_To_Send (CMRTS)” on page 241 for a discussion of how a program can place its end of a conversation in **Receive** state.
3. When issued during a mapped conversation, the Send_Data call sends one complete data record. The data record consists entirely of data, and CPI Communications does not examine the data for logical record length fields. It is this complete data record that is indicated to the remote program by the *data_received* parameter of the Receive call.

   For example, consider a mapped conversation where the local program issues two Send_Data calls with *send_length* set, respectively, to 30 and then 50. (These numbers are simplistic for explanatory purposes.) The local program then issues Flush and the 80 bytes of data are sent to the remote system. The remote program now issues Receive with *requested_length* set to a sufficiently large value, say 1000. The remote program will receive back only 30 bytes of data (indicated by the *received_length* parameter) because this is a complete data record. The completeness of the data record is indicated by the *data_received* variable, which will be set to CM_COMPLETE_DATA_RECEIVED.

   The remote program receives the remaining 50 bytes of data (from the second Send_Data) when it performs a second Receive with *requested_length* set to a value greater than or equal to 50.
4. The data sent by the program during a basic conversation consists of logical records. The logical records are independent of the length of data as specified by the *send_length* parameter. The data can contain one or more complete records, the beginning of a record, the middle of a record, or the end of a record. The following combinations of data are also possible:
   - One or more complete records, followed by the beginning of a record
   - The end of a record, followed by one or more complete records
   - The end of a record, followed by one or more complete records, followed by the beginning of a record
   - The end of a record, followed by the beginning of a record
5. The program using a basic conversation must finish sending a logical record before issuing any of the following calls:

- Confirm
- Deallocate with *deallocate_type* set to CM_DEALLOCATE_FLUSH, CM_DEALLOCATE_CONFIRM, or CM_DEALLOCATE_SYNC_LEVEL
- Include_Partner_In_Transaction
- Prepare
- Prepare_To_Receive
- Receive
- Resource recovery commit

A program finishes sending a logical record when it sends a complete record or when it truncates an incomplete record. The data must end with the end of a logical record (on a logical record boundary) when Send_Data is issued with *send_type* set to CM_SEND_AND_CONFIRM, CM_SEND_AND_DEALLOCATE, or CM_SEND_AND_PREP_TO_RECEIVE.

6. A complete logical record contains the 2-byte LL field and all bytes of the data field, as determined by the logical-record length. If the data field length is zero, the complete logical record contains only the 2-byte length field. An incomplete logical record consists of any amount of data less than a complete record. It can consist of only the first byte of the LL field, the 2-byte LL field plus all of the data field except the last byte, or any amount in between. A logical record is incomplete until the last byte of the data field is sent, or until the second byte of the LL field is sent if the data field is of zero length.
7. During a basic conversation, a program can truncate an incomplete logical record by issuing the Send_Error call. Send_Error causes the system to flush its send buffer, which includes sending the truncated record. The system then treats the first two bytes of data specified in the next Send_Data as the LL field. Issuing Send_Data with *send_type* set to CM_SEND_AND_DEALLOCATE and *deallocate_type* set to CM_DEALLOCATE_ABEND, or Deallocate with *deallocate_type* set to CM_DEALLOCATE_ABEND, during a basic conversation also truncates an incomplete logical record. If the *log_data* characteristic is not null and these conditions occur, log data is sent.
8. Send_Data is often used in combination with other calls, such as Flush, Confirm, and Prepare_To_Receive. Contrast this usage with the equivalent function available from the use of the Set_Send_Type call prior to issuing a call to Send_Data.
9. When a Send_Data call is issued with *send_type* set to CM_SEND_AND_DEALLOCATE, *deallocate_type* set to CM_DEALLOCATE_ABEND, and *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, the conversation's context may be placed in the **Backout-Required** condition.
10. A program must not specify a value in the *send_length* parameter that is greater than the maximum the implementation can support. The maximum may vary from system to system. The program can use the Extract_Maximum_Buffer_Size call to find out the maximum buffer size supported by the local system. The program can achieve portability across different systems by using one of the following methods:
    a. Never using a *send_length* value greater than 32767
    b. Using the Extract_Maximum_Buffer_Size call to determine the maximum buffer size supported by the system and never setting *send_length* greater than that maximum buffer size
11. When *control_information_received* indicates that expedited data is available to be received, subsequent calls with this parameter will continue to indicate that

expedited data is available until the expedited data has been received by the program.

Related Information

"Conversation Types" on page 15 provides more information on mapped and basic conversations.

"Data Buffering and Transmission" on page 42 provides a complete discussion of controls over data transmission.

All of the example program flows in Chapter 3, "Program-to-Program Communication Example Flows" make use of the Send_Data call.

"Extract_Maximum_Buffer_Size (CMEMBS)" on page 170 further discusses determining the maximum buffer size supported by the system.

"Receive (CMRCV)" on page 209 provides more information on the *data_received* parameter.

1 "Receive_Mapped_Data (CMRCVM)" on page 226 provides more information on
1 receiving mapped partner data.

1 "Send_Mapped_Data (CMSNDM)" on page 266 provides more information on
1 sending mapped partner data.

"Set_Send_Type (CMSST)" on page 342 provides more information on the *send_type* conversation characteristic and the use of it in combination with calls to Send_Data.

SNA Transaction Programmer's Reference Manual for LU Type 6.2 provides further discussion of basic conversations.

Send_Error (CMSERR)

LU 6.2	OSI TP

Send_Error (CMSERR) is used by a program to inform the remote program that the local program detected an error during a conversation. If the conversation is in **Send**, **Send-Receive**, or **Send-Only** state, Send_Error forces the system to flush its send buffer.

For a half-duplex conversation, when this call completes successfully, the local program's end of the conversation is in **Send** state and the remote program's end of the conversation is in **Receive** state. Further action is defined by program logic. Typically, this involves sending information about the error to the partner.

For a full-duplex conversation, no state change occurs. The issuance of Send_Error will be reported to the partner on a Receive call.

Before issuing the Send_Error call, a program has the option of issuing one or more of the following calls, which affect the function of the Send_Error call:

CALL CMSED – Set_Error_Direction (for half-duplex conversations only)
CALL CMSLD – Set_Log_Data

Format

```
CALL CMSERR(conversation_ID,
            control_information_received,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

control_information_received *(output)*
Specifies the variable containing an indication of whether or not control information has been received.

The *control_information_received* variable can have one of the following values:

- CM_NO_CONTROL_INFO_RECEIVED
  Indicates that no control information was received.
- CM_REQ_TO_SEND_RECEIVED (half-duplex conversations only)
  The local program received a request-to-send notification from the remote program. The remote program issued Request_To_Send, requesting the local program's end of the conversation to enter **Receive** state, which would place the remote program's end of the conversation in **Send** state. See “Request_To_Send (CMRTS)” on page 241 for further discussion of the local program's possible responses.

- CM_ALLOCATE_CONFIRMED (OSI TP CRM only)
  The local program received confirmation of the remote program's acceptance of the conversation.
- CM_ALLOCATE_CONFIRMED_WITH_DATA (OSI TP CRM only)
  The local program received confirmation of the remote program's acceptance of the conversation. The local program may now issue an Extract_Initialization_Data (CMEID) call to receive the initialization data.
- CM_ALLOCATE_REJECTED_WITH_DATA (OSI TP CRM only)
  The remote program rejected the conversation. The local program may now issue an Extract_Initialization_Data (CMEID) call to receive the initialization data.

  This value will be returned with a return code of CM_OK. The program will receive a CM_DEALLOCATED_ABEND return code on a later call on the conversation.
- CM_EXPEDITED_DATA_AVAILABLE (LU 6.2 CRM only)
  Expedited data is available to be received.
- CM_RTS_RCVD_AND_EXP_DATA_AVAIL (half-duplex conversations and LU 6.2 CRM only)
  The local program received a request-to-send notification from the remote program and expedited data is available to be received.

Notes:

1. If *return_code* is set to CM_PROGRAM_PARAMETER_CHECK or CM_PROGRAM_STATE_CHECK, the value contained in *control_information_received* has no meaning.
2. When more than one piece of control information is available to be returned to the program, it will be returned in the following order:
   - CM_ALLOCATE_CONFIRMED, CM_ALLOCATE_CONFIRMED_WITH_DATA, or CM_ALLOCATE_REJECTED_WITH_DATA
   - CM_RTS_RCVD_AND_EXP_DATA_AVAIL
   - CM_REQ_TO_SEND_RECEIVED
   - CM_EXPEDITED_DATA_AVAILABLE
   - CM_NO_CONTROL_INFO_RECEIVED

return_code *(output)*
Specifies the result of the call execution. The value for *return_code* depends on the state of the conversation at the time this call is issued.

The following return codes apply to half-duplex conversations.

If the Send_Error is issued in **Send** state, *return_code* can have one of the following values:

- CM_OK
- CM_OPERATION_INCOMPLETE
- CM_CONVERSATION_CANCELED
- CM_CONVERSATION_TYPE_MISMATCH
- CM_PIP_NOT_SPECIFIED_CORRECTLY
- CM_SECURITY_NOT_VALID
- CM_SYNC_LVL_NOT_SUPPORTED_PGM
- CM_SYNC_LVL_NOT_SUPPORTED_SYS
- CM_SEND_RCV_MODE_NOT_SUPPORTED

- CM_TPN_NOT_RECOGNIZED
- CM_TP_NOT_AVAILABLE_NO_RETRY
- CM_TP_NOT_AVAILABLE_RETRY
- CM_DEALLOCATED_ABEND
- CM_PROGRAM_ERROR_PURGING
- CM_RESOURCE_FAILURE_NO_RETRY
- CM_RESOURCE_FAILURE_RETRY
- CM_DEALLOCATED_ABEND_SVC (basic conversations only)
- CM_DEALLOCATED_ABEND_TIMER (basic conversations only)
- CM_SVC_ERROR_PURGING (basic conversations only)
- CM_PROGRAM_PARAMETER_CHECK
  The *conversation_ID* specifies an unassigned conversation identifier.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR
- The following values are returned only when *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM and the conversation is included in a transaction:
  - CM_TAKE_BACKOUT
  - CM_DEALLOCATED_ABEND_BO
  - CM_DEALLOCATED_ABEND_SVC_BO (basic conversations only)
  - CM_DEALLOCATED_ABEND_TIMER_BO (basic conversations only)
  - CM_PROGRAM_STATE_CHECK
    This return code indicates that for a conversation with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, the conversation's context is in the **Backout-Required** condition. The Send_Error call is not allowed for this conversation while its context is in this condition.
  - CM_RESOURCE_FAIL_NO_RETRY_BO
  - CM_RESOURCE_FAILURE_RETRY_BO
  - CM_INCLUDE_PARTNER_REJECT_BO

If the Send_Error is issued in **Receive** state, *return_code* can have one of the following values:

- CM_OK
- CM_OPERATION_INCOMPLETE
- CM_CONVERSATION_CANCELED
- CM_SYNC_LVL_NOT_SUPPORTED_SYS
- CM_SEND_RCV_MODE_NOT_SUPPORTED
- CM_TPN_NOT_RECOGNIZED
- CM_TP_NOT_AVAILABLE_NO_RETRY
- CM_TP_NOT_AVAILABLE_RETRY
- CM_DEALLOCATED_ABEND
- CM_PROGRAM_ERROR_PURGING
- CM_DEALLOCATED_NORMAL
- CM_RESOURCE_FAILURE_NO_RETRY
- CM_RESOURCE_FAILURE_RETRY
- CM_PROGRAM_PARAMETER_CHECK
  The *conversation_ID* specifies an unassigned conversation identifier.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR
- The following values are returned only when *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM and the conversation is included in a transaction:
  - CM_TAKE_BACKOUT
  - CM_DEALLOCATED_ABEND_BO

  - CM_DEALLOCATED_NORMAL_BO
  - CM_PROGRAM_STATE_CHECK
    This return code indicates one of the following:
    - For a conversation with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, the conversation's context is in the **Backout-Required** condition. The Send_Error call is not allowed for this conversation while its context is in this condition.
    - The local program has received a *status_received* value of CM_JOIN_TRANSACTION and must issue a tx_begin call to the X/Open TX interface to join the transaction.
  - CM_RESOURCE_FAIL_NO_RETRY_BO
  - CM_RESOURCE_FAILURE_RETRY_BO
  - CM_INCLUDE_PARTNER_REJECT_BO

If the Send_Error is issued in **Send-Pending** state, *return_code* can have one of the following values:

- CM_OK
- CM_OPERATION_INCOMPLETE
- 2 CM_CONVERSATION_CANCELED
- CM_RESOURCE_FAILURE_NO_RETRY
- CM_RESOURCE_FAILURE_RETRY
- CM_PROGRAM_PARAMETER_CHECK
  The *conversation_ID* specifies an unassigned conversation identifier.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR
- The following values are returned only when *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM:
  - CM_TAKE_BACKOUT
  - CM_PROGRAM_STATE_CHECK
    This return code indicates that for a conversation with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, the conversation's context is in the **Backout-Required** condition. The Send_Error call is not allowed for this conversation while its context is in this condition.
  - CM_RESOURCE_FAIL_NO_RETRY_BO
  - CM_RESOURCE_FAILURE_RETRY_BO
  - CM_INCLUDE_PARTNER_REJECT_BO

If the Send_Error call is issued in **Confirm**, **Confirm-Send**, **Confirm-Deallocate**, **Sync-Point**, **Sync-Point-Send**, or **Sync-Point-Deallocate** state, *return_code* can have one of the following values:

- CM_OK
- CM_OPERATION_INCOMPLETE
- 2 CM_CONVERSATION_CANCELED
- CM_PROGRAM_PARAMETER_CHECK
  The *conversation_ID* specifies an unassigned conversation identifier.
- CM_PROGRAM_STATE_CHECK
  This return code indicates that for a conversation with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, the conversation's context is in the **Backout-Required** condition. The Send_Error call is not allowed for this conversation while its context is in this condition.
- CM_TAKE_BACKOUT

This value is returned only when the Send_Error call is issued in **Sync-Point**, **Sync-Point-Send**, or **Sync-Point-Deallocate** state, and only when the conversation is using an OSI TP CRM.

- CM_RESOURCE_FAILURE_NO_RETRY
- CM_RESOURCE_FAILURE_RETRY
- CM_RESOURCE_FAIL_NO_RETRY_BO
  This value is returned only when *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM.
- CM_RESOURCE_FAILURE_RETRY_BO
  This value is returned only when *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM.
- CM_TAKE_BACKOUT
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

Otherwise, the conversation is in **Reset**, **Initialize**, **Defer-Receive**, **Defer-Deallocate**, **Initialize-Incoming**, or **Prepared** state and *return_code* has one of the following values:

- CM_PROGRAM_PARAMETER_CHECK
  The *conversation_ID* specifies an unassigned identifier.
- CM_OPERATION_NOT_ACCEPTED
- CM_PROGRAM_STATE_CHECK

The following return codes apply to full-duplex conversations.

The *return_code* variable can have one of the following values:

- CM_OK
- CM_ALLOCATION_ERROR
- CM_DEALLOCATED_ABEND
- CM_DEALLOCATED_ABEND_SVC
- CM_DEALLOCATED_ABEND_TIMER
- CM_RESOURCE_FAILURE_NO_RETRY
- CM_RESOURCE_FAILURE_RETRY
- CM_DEALLOCATED_NORMAL (OSI TP CRM only)
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - The conversation is not in **Send-Receive**, **Send-Only**, or **Confirm-Deallocate** state.
  - The local program has received a *status_received* value of CM_JOIN_TRANSACTION and must issue a tx_begin call to the X/Open TX interface to join the transaction.
  - For a conversation with *sync_level* set to CM_SYNC_POINT_NO_CONFIRM, the conversation's context is in the **Backout-Required** condition. The Send_Error call is not allowed for this conversation while its context is in this condition.
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates the *conversation_ID* specifies an unassigned conversation identifier.
- CM_OPERATION_NOT_ACCEPTED
- CM_OPERATION_INCOMPLETE
- CM_CONVERSATION_CANCELED
- CM_PRODUCT_SPECIFIC_ERROR

- The following values are returned only if *sync_level* is CM_SYNC_POINT_NO_CONFIRM, the state is **Send-Receive**, and the conversation is included in a transaction.
  - CM_TAKE_BACKOUT
  - CM_DEALLOCATED_ABEND_BO
  - CM_DEALLOCATED_ABEND_SVC_BO (basic conversations only)
  - CM_DEALLOCATED_ABEND_TIMER_BO (basic conversations only)
  - CM_RESOURCE_FAIL_NO_RETRY_BO
  - CM_RESOURCE_FAILURE_RETRY_BO
  - CM_CONV_DEALLOC_AFTER_SYNCPT
  - CM_INCLUDE_PARTNER_REJECT_BO

State Changes

For half-duplex conversations, when *return_code* indicates CM_OK:

- The conversation enters **Send** state when the call is issued in **Receive**, **Confirm**, **Confirm-Send**, **Confirm-Deallocate**, or **Send-Pending** state. For a conversation with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM and which is included in a transaction, the conversation also enters **Send** state when the call is issued in **Sync-Point**, **Sync-Point-Send**, or **Sync-Point-Deallocate** state.
- No state change occurs when the call is issued in **Send** state.

For full-duplex conversations, when *return_code* indicates CM_OK, the conversation enters **Send-Receive** state when this call is issued in **Confirm-Deallocate** state.

Usage Notes

1. The system can send the error notification to the remote system immediately (during the processing of this call), or the system can delay sending the notification until a later time. If the system delays sending the notification, it buffers the notification until it has accumulated a sufficient amount of information for transmission, or until the local program issues a call that causes the system to flush its send buffer.
2. The amount of information sufficient for transmission depends on the characteristics of the logical connection allocated for the conversation, and varies from one logical connection to another. Transmission of the information can begin immediately if the *log_data* characteristic has been specified with sufficient log data, or transmission can be delayed until sufficient data from subsequent Send_Data calls is also buffered.
3. To make sure that the remote program receives the error notification as soon as possible, the local program can issue Flush immediately after Send_Error.
4. For a half-duplex conversation using an LU 6.2 CRM, the issuance of Send_Error is reported to the remote program as one of the following return codes:

   - CM_PROGRAM_ERROR_TRUNC (basic conversation)
     The local program issued Send_Error with its end of the conversation in **Send** state after sending an incomplete logical record (see “Send_Data (CMSEND)” on page 244). The record has been truncated.
   - CM_PROGRAM_ERROR_NO_TRUNC (basic and mapped conversations)
     The local program issued Send_Error with its end of the conversation in **Send** state after sending a complete logical record (basic) or data record

(mapped); or before sending any record; or the local program issued Send_Error with its end of the conversation in **Send-Pending** state with *error_direction* set to CM_SEND_ERROR. No truncation has occurred.

- CM_PROGRAM_ERROR_PURGING (basic and mapped conversations)
  The local program issued Send_Error with its end of the conversation in **Receive** state, and all information sent by the remote program and not yet received by the local program has been purged. Or the local program issued Send_Error with its end of the conversation in **Send-Pending** state and *error_direction* set to CM_RECEIVE_ERROR or in **Confirm**, **Confirm-Send**, or **Confirm-Deallocate** state, and no purging has occurred.

5. If the conversation is using an OSI TP CRM, the remote program receives CM_PROGRAM_ERROR_PURGING, regardless of the conversation state.
6. When a half-duplex conversation is using an LU 6.2 CRM and Send_Error is issued in **Receive** state, incoming information is also purged. Because of this purging, the *return_code* of CM_DEALLOCATED_NORMAL is reported instead of:

   - CM_CONVERSATION_TYPE_MISMATCH
   - CM_PIP_NOT_SPECIFIED_CORRECTLY
   - CM_SECURITY_NOT_VALID
   - CM_SYNC_LVL_NOT_SUPPORTED_PGM
   - CM_TPN_NOT_RECOGNIZED
   - CM_TP_NOT_AVAILABLE_NO_RETRY
   - CM_TP_NOT_AVAILABLE_RETRY
   - CM_DEALLOCATED_ABEND
   - CM_DEALLOCATED_ABEND_SVC (basic conversations only)
   - CM_DEALLOCATED_ABEND_TIMER (basic conversations only)

   Likewise, for conversations with *sync_level* set to CM_SYNC_POINT, a return code of CM_DEALLOCATED_NORMAL_BO is reported instead of:

   - CM_DEALLOCATED_ABEND_BO
   - CM_DEALLOCATED_ABEND_SVC_BO (basic conversations only)
   - CM_DEALLOCATED_ABEND_TIMER_BO (basic conversations only)

   Similarly, a return code of CM_OK is reported instead of:

   - CM_PROGRAM_ERROR_NO_TRUNC
   - CM_PROGRAM_ERROR_PURGING
   - CM_PROGRAM_ERROR_TRUNC (basic conversations only)
   - CM_SVC_ERROR_NO_TRUNC (basic conversations only)
   - CM_SVC_ERROR_PURGING (basic conversations only)
   - CM_SVC_ERROR_TRUNC (basic conversations only)
   - CM_TAKE_BACKOUT

   When the return code CM_TAKE_BACKOUT is purged, the remote system resends the backout indication and the local program receives the CM_TAKE_BACKOUT return code on a subsequent call.

   The following types of incoming information are also purged:

   - Data sent with the Send_Data call.
   - Confirmation request sent with the Send_Data, Confirm, Prepare_To_Receive, or Deallocate call.
     If the confirmation request was sent with *deallocate_type* set to CM_DEALLOCATE_CONFIRM or CM_DEALLOCATE_SYNC_LEVEL, the deallocation request will also be purged.
   - Prepare call or resource recovery commit call.

If the Prepare or commit call was sent in conjunction with a Deallocate call with *deallocate_type* set to CM_DEALLOCATE_SYNC_LEVEL, the deallocation request will also be purged.

The request-to-send notification is not purged. This notification is reported to the program when it issues a call that includes the *control_information_received* parameter.

7. The program can use this call for various application-level functions. For example, the program can issue this call to truncate an incomplete logical record it is sending; to inform the remote program of an error detected in data received; or to reject a confirmation request.
8. If the *log_data_length* characteristic is greater than zero, the system formats the supplied log data into the appropriate format. The data supplied by the program is any data the program wants to have logged. The data is logged on the local system's error log and is also sent to the remote system for logging there.

   The *log_data* is not sent on the Send_Error call when an OSI TP CRM is being used for the conversation. Instead, it is ignored.

   After completion of the Send_Error processing, *log_data* is reset to null, and *log_data_length* is reset to zero.
9. The *error_direction* characteristic is significant only when a half-duplex conversation is using an LU 6.2 CRM and Send_Error is issued in **Send-Pending** state (that is, the Send_Error is issued immediately following a Receive on which both data and a *status_received* parameter set to CM_SEND_RECEIVED is received). In this case, Send_Error could be reporting one of the following types of errors:

   - An error in the received data (in the receive flow)
   - An error having nothing to do with the received data, but instead being the result of processing performed by the program after it had successfully received and processed the data (in the send flow).

   Because the system cannot tell which of the two errors occurred, the program has to supply the *error_direction* information.

   The default for *error_direction* is CM_RECEIVE_ERROR. A program can override the default using the Set_Error_Direction call before issuing Send_Error.

   Once changed, the new *error_direction* value remains in effect until the program changes it again. Therefore, a program should issue Set_Error_Direction before issuing Send_Error for a conversation in **Send-Pending** state.

   If the conversation is not in **Send-Pending** state, the *error_direction* characteristic is ignored.
10. When *control_information_received* indicates that expedited data is available, subsequent calls with this parameter will continue to indicate that expedited data is available until the expedited data has been received by the program.
11. For full-duplex conversations, the issuance of Send_Error is reported on the remote program's Receive call as one of the following return codes:

    - CM_PROGRAM_ERROR_NO_TRUNC (basic and mapped conversations using an LU 6.2 CRM)
    - CM_PROGRAM_ERROR_TRUNC (basic conversations using an LU 6.2 CRM)

- CM_PROGRAM_ERROR_PURGING (conversations using an OSI TP CRM)

No data is purged, unless the conversation is using an OSI TP CRM, in which case, the program should expect purging. The partner program may expect the CM_PROGRAM_ERROR_PURGING return code if the conversation is allocated using an OSI TP CRM. The programs may know whether to expect purging by issuing an Extract_Partner_ID call.

12. Send_Error does not complete successfully if an error that causes the conversation to terminate has occurred or the remote program has issued a Cancel_Conversation call, a Deallocate call with *deallocate_type* set to CM_DEALLOCATE_ABEND, or a Deallocate call with *deallocate_type* set to CM_DEALLOCATE_FLUSH and the conversation has been allocated using an OSI TP CRM.

    For a conversation which is not included in a transaction, a CM_DEALLOCATED_ABEND_*, CM_ALLOCATION_ERROR, CM_RESOURCE_FAILURE_*_RETRY, or CM_DEALLOCATED_NORMAL return code is returned. When one of the above return codes is returned and the conversation is in **Send-Receive** state, the program can terminate the conversation by issuing Receives until it gets one of the above return codes taking it to **Reset** state, or by issuing Cancel_Conversation or Deallocate with *deallocate_type* set to CM_DEALLOCATE_ABEND.

    For a conversation which is included in a transaction, CM_DEALLOCATED_ABEND_*_BO, CM_ALLOCATION_ERROR, CM_RESOURCE_FAILURE_RETRY_BO, or CM_RESOURCE_FAIL_NO_RETRY_BO is returned. If CM_ALLOCATION_ERROR is returned, the program behaves as though it were not in transaction, otherwise it is in **Backout-Required** condition and in **Reset** state.

Related Information

"Example 6: Reporting Errors" on page 78 and "Example 7: Error Direction and Send-Pending State" on page 80 provide example program flows using Send_Error and the **Send-Pending** state; "Set_Error_Direction (CMSED)" on page 300 provides further information on the *error_direction* characteristic.

"Usage Notes" of "Request_To_Send (CMRTS)" on page 242 provides more information on how a conversation enters **Receive** state.

"Send_Data (CMSEND)" on page 244 discusses basic conversations and logical records.

"Set_Log_Data (CMSLD)" on page 309 provides a description of the *log_data* characteristic.

Send_Expedited_Data (CMSNDX)

LU 6.2

A program uses the Send_Expedited_Data (CMSNDX) call to send expedited data to its partner.

This call has meaning only when an LU 6.2 CRM is used for the conversation.

Format

```
CALL CMSNDX(conversation_ID,
            buffer,
            send_length,
            control_information_received,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

buffer *(input)*
Specifies the variable containing the data to be sent.

send_length *(input)*
Specifies the length of the data to be sent. The minimum amount of data that can be sent is 1 byte; the maximum is 86 bytes.

control_information_received *(output)*
Specifies the variable containing an indication of whether or not control information has been received.

The *control_information_received* variable can have one of the following values:

- CM_NO_CONTROL_INFO_RECEIVED
  Indicates that no control information was received.
- CM_REQ_TO_SEND_RECEIVED (half-duplex conversations only)
  The local program received a request-to-send notification from the remote program. The remote program issued Request_To_Send, requesting the local program's end of the conversation to enter **Receive** state, which would place the remote program's end of the conversation in **Send** state. See “Request_To_Send (CMRTS)” on page 241 for further discussion of the local program's possible responses.
- CM_EXPEDITED_DATA_AVAILABLE
  Expedited data is available to be received.
- CM_RTS_RCVD_AND_EXP_DATA_AVAIL (half-duplex conversations only)
  The local program received a request-to-send notification from the remote program and expedited data is available to be received.

Notes:

1. If *return_code* is set to CM_PROGRAM_PARAMETER_CHECK or CM_PROGRAM_STATE_CHECK, the value contained in *control_information_received* has no meaning.
2. When more than one piece of control information is available to be returned to the program, it will be returned in the following order:
   - CM_RTS_RCVD_AND_EXP_DATA_AVAIL
   - CM_REQ_TO_SEND_RECEIVED
   - CM_EXPEDITED_DATA_AVAILABLE
   - CM_NO_CONTROL_INFO_RECEIVED

return_code *(output)*

Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_OPERATION_INCOMPLETE
- 2 CM_CONVERSATION_CANCELED
- CM_PROGRAM_PARAMETER_CHECK
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *send_length* specifies a value less than 1 or greater than 86.
  - The conversation is not using an LU 6.2 CRM.
- CM_PROGRAM_STATE_CHECK
  This value indicates that the conversation is in **Initialize** or **Initialize-Incoming** state and is not allowed to send expedited data.
- CM_CONVERSATION_ENDING
  This value indicates that the conversation is ending due to a normal deallocation, an allocation error, a Cancel_Conversation call, a Deallocate call with *deallocate_type* set to CM_DEALLOCATE_ABEND, or a conversation failure. Hence, no expedited data is sent.
- CM_EXP_DATA_NOT_SUPPORTED
  This value indicates that the remote system does not support expedited data.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. A program uses the Send_Expedited_Data call to send data that flows in an expedited fashion, possibly bypassing data sent using the Send_Data call.
2. The Send_Expedited_Data call should be used sparingly and should not be used for sending normal data.
3. When the remote system receives the expedited data, it retains the expedited data until it is received by the partner program using Receive_Expedited_Data.
4. **Note to Implementers:** A *control_information_received* notification can be reported on this call (associated with the Expedited-Send queue), on the Receive_Expedited_Data call (associated with the Expedited-Receive queue), on the Send_Data call (associated with the Send queue or the Send-Receive

queue), on the Receive call (associated with the Receive queue or the Send-Receive queue), and on the Test_Request_To_Send_Received call (not associated with any queue). When the program uses multiple threads or queue-level non-blocking, more than one of these calls may be executed simultaneously. An implementation should report the CM_EXPEDITED_DATA_AVAILABLE indication to the program through all available calls, until the expedited data is received. All other values of *control_information_received* should be reported only once.

Related Information

"Receive_Expedited_Data (CMRCVX)" on page 223 describes the Receive_Expedited_Data call.

Send_Mapped_Data (CMSNDM)

LU 6.2	OSI TP

A program issues the Send_Mapped_Data (CMSNDM) call to send data that requires some type of transformation, for example, ASN.1 encoding, before it is sent to the remote partner. The *map_name* is used to identify to the local map routine what data is being sent so that it can apply the correct transforms.

When issued during a basis conversation, this call results in an error.

Before issuing the Send_Mapped_Data call, a program has the option of issuing one or more of the following calls which affect the function of the Send_Data call:

CALL CMSST - Set_Send_Type

If*send_type* = CM_SEND_AND_PREP_TO_RECEIVE, optional set may include:

CALL CMSPTR - Set_Prepare_To_Receive_Type

If *send type*=**CM_SEND_AND_DEALLOCATE,** optional set may include:

CALL CMSDT - Set_Deallocate_Type

Format

```
CALL CMSNDM(conversation_ID,
            map_name,
            map_name_length,
            buffer,
            send_length,
            control_information_received,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier of the conversation.

map_name *(input)*
Specifies the mapping function used to encode the data record. This is a 0 to 64 byte identifier.

map_name_length *(input)*
Specifies the length of the map_name. The length can be from 0 to 64 bytes. If the length is 0, the *map_name* is ignored.

buffer *(input)*
Specifies the data record to be sent. The length of the data record is given by the *send_length* parameter.

send_length (input)
The *send_length* ranges in value from 0 to the maximum buffer size supported by the system. The maximum buffer size depends on the map name. See Usage Note 6 on page 252 for additional information about determining the maximum buffer size. The *send_length* parameter specifies the size of the *buffer* parameter and the number of bytes to be sent to the local map routine.

The map routine will calculate the length of the data to be sent on the conversation and handle it in accordance with the underlying CRM.

When a program issues a Send_Mapped_Data call and *send_length* is 0, a null data record is sent. The map routine will determine if a null record will be sent on the conversation. Refer to site documentation for that particular map routine.

control_information_received (output)
Specifies the variable containing an indication of whether or not control information has been received.

The *control_information_received* variable can have one of the following values:

- CM_NO_CONTROL_INFO_RECEIVED
  Indicates that no control information was received.
- CM_REQ_TO_SEND_RECEIVED (half-duplex conversations only)
  The local program received a request-to-send notification from the remote program. The remote program issued Request_To_Send, requesting the local program's end of the conversation to enter **Receive** state, which would place the remote program's end of the conversation in **Send** state. See “Request_To_Send (CMRTS)” on page 241 for further information about the local program's possible responses.
- CM_ALLOCATE_CONFIRMED (OSI TP CRM only) The local program received confirmation of the remote program's acceptance of the conversation.
- CM_ALLOCATE_CONFIRMED_WITH_DATA (OSI TP CRM only) The local received confirmation of the remote program's acceptance of the conversation. The local program received confirmation of the remote program's acceptance of the conversation. The local program may now issue an Extract_Mapped_Initialization_Data (CMEMID) call to receive the initialization data. data received_*(output)*
- CM_ALLOCATE_REJECTED_WITH_DATA (OSI TP CRM only)
  The remote program rejected the conversation. The local program may now issue an Extract_Mapped_Initialization_Data (CMEMID) call to receive the initialization data.
  This value will be returned with a return code of **CM_OK**. The program will receive a CM_DEALLOCATED_ABEND return code on a later call on the conversation.
- CM_EXPEDITED_DATA_AVAILABLE (LU 6.2 CRM only)
  Expedited data is available to be received.
- CM_RTS_RCVD_AND_EXP_DATA_AVAIL (half-duplex conversations and LU 6.2 CRM only)
  The local program received a request-to-send notification form the remote program and expedited data is available to be received.
- CM_EXPEDITED_MAPPED_DATA_AVAILABLE (LU 6.2 CRM only)
  Mapped expedited data is available to be received.
- CM_RTS_RCVD_AND_EXP_MAP_DATA_AVAIL (half-duplex conversations and LU 6.2 CRM only)
  The local program received a request-to-send notification from the remote program and expedited mapped data is available to be received.

Notes:

1. If *return_code* is set to CM_PROGRAM_PARAMETER_CHECK or CM_PROGRAM_STATE_CHECK, the value contained in *control_information_received* has no meaning.
2. When more than one piece of control information is available to be returned to the program, it will be returned in the following order:
   - CM_ALLOCATE_CONFIRMED CM_ALLOCATE_CONFIRMED_WITH_DATA, or CM_ALLOCATE_REJECTED_WITH_DATA
   - CM_RTS_RCVD_AND_EXP_DATA_AVAIL
   - CM_REQ_TO_SEND_RECEIVED
   - CM_EXPEDITED_DATA_AVAILABLE
   - CM_EXPEDITED_MAPPED_DATA_AVAILABLE
   - CM_NO_CONTROL_INFO_RECEIVED

return_code (output)
Specifies the result of the call execution.

The following return codes apply to half-duplex conversations.

CM_OK

- CM_OK
- CM_OPERATION_INCOMPLETE
- CM_CONVERSATION_CANCELED
- CM_CONVERSATION_TYPE_MISMATCH
- CM_CONVERSATION_TYPE_MISMATCH
- CM_PIP_NOT_SPECIFIED_CORRECTLY
- CM_SECURITY_NOT_VALID
- CM_SYNC_LVL_NOT_SUPPORTED_PGM
- CM_SYNC_LVL_NOT_SUPPORTED_SYS
- CM_TPN_NOT_RECOGNIZED
- CM_TPN_NOT_AVAILABLE_NO_RETRY
- CM_TPN_NOT_AVAILABLE_RETRY
- CM_PROGRAM_ERROR_NO_PURGING
- CM_DEALLOCATED_ABEND
- CM_RESOURCE_FAILURE_NO_RETRY
- CM_RESOURCE_FAILURE_RETRY
- CM_UNKNOWN_MAP_NAME_REQUESTED
  The supplied map name is unknown to the map routine. No data was sent.
- CM_MAP_ROUTINE_ERROR
  The map routine encountered a problem with the user data. No data was sent.
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - The conversation is not in **Send**, **Send-Pending**, **Sync-Point**, **Sync-Point-Send**, or **Sync-Point-Deallocate** state.
  - The conversation is in **Sync-Point**, **Sync-Point-Send**, or **Sync-Point-Deallocate** state and the program receives a take-commit notification not ending in DATA_OK.
  - For a conversation with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, the conversation's context is in the

Backout Required condition. The Send_Mapped_Data call is not allowed for this conversation while its context is in this condition.

– The conversation is **Sync-Point**, **Sync-Point-Send**, or **Sync-Point-Deallocate** state, and *send_type* is set to CM_SEND_AND_CONFIRM or CM_SEND_AND_PREP_TO_RECEIVE.

– The conversation is **Sync-Point**, **Sync-Point-Send**, or **Sync-Point-Deallocate** state, the *send_type* is set to CM_SEND_AND_DEALLOCATE, and the *deallocate_type* is not set to CM_DEALLOCATE_ABEND.

– The *send_type* is set to CM_SEND_AND_DEALLOCATE and the following conditions are also true:

- The *deallocate_type* is set to CM_DEALLOCATE_FLUSH or CM_DEALLOCATE_CONFIRM.
- The *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, the conversation is included in a transaction.

• CM_PROGRAM_PARAMETER_CHECK
This value indicates one of the following:

– The *conversation_ID* specifies an unassigned conversation identifier.

– The *send_length* exceeds the range permitted by the implementation.

– The *conversation_type* characteristic is set to:

CM_BASIC_CONVERSATION

– The *send_type* is set to CM_SEND_AND_PREP_TO_RECEIVE and the following conditions are also true:
The *prepare_to_receive_type* is set to:.
CM_PREP_TO_RECEIVE_SYNC_LEVEL

- The *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM
- The conversation is included in a transaction.
- The conversation is using an OSI TP CRM, and the program is not the superior for the conversation.
- The *send_type* is set to CM_SEND_AND_DEALLOCATE and the following conditions are also true:
  - The *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL
  - The *sync_level* is se to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM
  - The conversation is included in a transaction.
  - The conversation using an OSI TP CRM, and the program is not the superior for the conversation.

• CM_OPERATION_NOT_ACCEPTED

• CM_PRODUCT_SPECIFIC_ERROR
The following values are returned only when *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM and the conversation is included in a transaction:

- CM_TAKE_BACKOUT
- CM_DEALLOCATED_ABEND_BO
- CM_RESOURCE_FAIL_NO_RETRY_BO
- CM_RESOURCE_FAILURE_RETRY_BO

The following return codes apply to full-duplex conversations.

- CM_OK
- CM_ALLOCATION_ERROR
- CM_DEALLOCATED_ABEND
- CM_DEALLOCATED_ABEND_SVC
- CM_DEALLOCATED_ABEND_TIMER
- CM_DEALLOCATED_CONFIRM_REJECT
- CM_RESOURCE_FAILURE_NO_RETRY
- CM_RESOURCE_FAILURE_RETRY
- CM_DEALLOCATED_NORMAL_ (OSI TP CRM only)
- CM_UNKNOWN_MAP_NAME_REQUESTED
  The supplied map name is unknown to the map routine, no data was sent.
- CM_MAP_ROUTINE_ERROR
  The map routine encountered a problem with the user data, no data was sent.
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - The conversation is not in **Send-Receive**, **Send-only**, **Sync-Point**, or **Sync-Point-Deallocate** state.
  - The conversation is basic and in Send-Receive or **Send-Only** state, the *send_type* is set to CM_SEND_AND_DEALLOCATE, the *deallocate_type* is not set to CM_DEALLOCATE_ABEND, and the data does not end on a logical record boundary.
  - The conversation is in **Sync-Point** or **Sync-Point Deallocate** state and the program received a take-commit notification not ending in DATA_OK.
  - The conversation is in **Sync-Point** or **Sync-Point Deallocate** state, the *send_type* is set to CM_SEND_AND_DEALLOCATE, and the *deallocate_type* is not set to CM_DEALLOCATE_ABEND.
  - For a conversation with *sync_level* set to CM_SYNC_POINT_NO_CONFIRM, this return code indicates one of the following:
    - The conversation's context is in the **Backout-Required** condition. The Send_Data call is not allowed for this conversation while its context is in this condition.

- The local program has received a *status_received* value of **CM_JOIN_TRANSACTION** and must issue a *tx_begin* call to the X/Open TX interface to join the transaction.

– CM_PROGRAM_PARAMETER_CHECK
This value indicates one of the following:

- The *conversation_ID* specifies an unassigned conversation identifier.
- The *send_length* exceeds the range permitted by the implementation. The maximum value of the length in each implementation is at least 32767.
- The *send_type* is set to CM_SEND_AND_DEALLOCATE and the following conditions are also true:
- The *deallocate_type* is set to CM_DEALLOCATE_FLUSH or CM_DEALLOCATE_CONFIRM.
- The *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM.
- The conversation is included in a transaction.
- The *send_type* is set to CM_SEND_AND_DEALLOCATE and the following conditions are also true:
- The *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL
- The *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM
- The conversation is included in a transaction.
- The program is not the superior for the conversation.
- The *conversation_type* characteristic is set to CM_BASIC_CONVERSATION

– CM_OPERATION_NOT_ACCEPTED

– CM_OPERATION_INCOMPLETE

– CM_CONVERSATION_CANCELED

– CM_PRODUCT_SPECIFIC_ERROR

The following values are returned only when *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM, the state is Send-Receive and the conversation is currently included in a transaction.

- CM_TAKE_BACKOUT
- CM_DEALLOCATED_ABEND_BO
- CM_RESOURCE_FAIL_NO_RETRY_BO
- CM_RESOURCE_FAILURE_RETRY_BO
- CM_CONV_DEALLOC_AFTER_SYNCPT
- CM_INCLUDE_PARTNER_REJECT_BO

State Changes

For half-duplex conversations, when *return_code* indicates CM_OK:

- The conversation enters Receive state when Send_data is issued with *send type* set to CM_SEND_AND_PREP_TO_RECEIVE and any of the following conditions are true.
  - *Prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_FLUSH
  - *Prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_CONFIRM
  - *Prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_SYNC_LEVEL and *sync_level* is set to CM_NONE or CM_CONFIRM
  - *Prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_SYNC_LEVEL, *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, but the conversation is not currently included in a transaction.
- The conversation enters **Defer-Receive** state when Send_Data is issued with *send_type* set to CM_SEND_AND_PREP_TO_RECEIVE, *prepare_to_receive_type* set to CM_PREP_TO_RECEIVE_SYNC_LEVEL, *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and the conversation is included in a transaction.
- The conversation enters **Reset** state when Send_Data is issued with *send_type* set to CM_SEND_AND_DEALLOCATE and any of the following conditions is true:
  - *Deallocate_type* is set to CM_DEALLOCATE_ABEND
  - *Deallocate_type* is set to CM_DEALLOCATE_FLUSH
  - *Deallocate_type* is set to CM_DEALLOCATE_CONFIRM
  - *Deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL and *sync_level* is set to CM_NONE or CM_CONFIRM
  - *Deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL, *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, but the conversation is not currently included in a transaction.
- The conversation entes **Defer-Deallocate** state when Send_Data is issued with *send type* set to CM_SEND_AND_DEALLOCATE, *deallocate_type* set to CM_DEALLOCATE_SYNC_LEVEL, *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and
- The conversation enters **Send** state when Send_Data is issued in Send-Pending state with *send_type* set to CM_BUFFER_DATA CM_SEND_AND_FLUSH, or CM_SEND_AND_CONFIRM.
- No state change occurs when Send_Data is issued in Send state with *send_type* set to CM_BUFFER_DATA_CM_SEND_AND_FLUSH, or CM_SEND_AND_CONFIRM.

For full-duplex conversations when *return_code* indicates **CM_OK:**

- The conversation enters **Receive-Only** state when the Send_Data call is issued in **Send-Receive** state with *send_type* set to CM_SEND_AND_DEALLOCATE, and one of the following conditions is true:
  - *Deallocate_type* is set to CM_DEALLOCATE_FLUSH
  - *Deallocate_type is set to CM_DEALLOCATE_SYNC_LEVEL and sync_level is set to CM NONE*

  - *Deallocate_type is set to CM_DEALLOCATE_SYNC_LEVEL and sync_level is set to CM_SYNC_POINT_NO_CONFIRM, and the conversation is not currently included in a transaction.*

    The conversation enters **Reset** *state when the* **Send_Data** *call is issued with send_type set to CM_SEND_AND_DEALLOCATE and one of the following conditions is true:*

  - *The call is issued in* **Send-Only** *state.*
  - *The call is issued in* **Send-Receive**, **Send-Only**, **Sync-Point**, *or* **Sync-Point-Deallocate** *state and deallocate_type is set to CM_DEALLOCATE_ABEND*

- The conversation enters **Defer-Deallocate** state when the Send_Data call is issued with *send_type* set to CM_SEND_DEALLOCATE, *sync_level* set to CM_SYNC_POINT_NO_CONFIRM, and the conversation included in a transaction.
- No state change occurs when Send_Data is issued in **Send-Receive** or **Send-Only** state with *send_type* set to CM_BUFFER_DATA or CM_SEND_AND_FLUSH.

Usage Notes

1. The local system may buffer data to be sent to the remote system unit until it accumulates a sufficient amount of data for transmission (from one or more Send_Mapped_Data calls), or until the local program issues a call that causes the system to flush its send buffer. The map routine is responsible for any buffering and determines when data should be sent. Therefore, a flush call may or may not have an effect.
2. For a half-duplex conversation, when *control_information_received* indicates CM_REQ_TO_SEND_RECEIVED, CM_RTS_RCVD_AND_EXP_DATA_AVAIL, or CM_RTS_RCVD_AND_EXP_MAP_DATA_AVAIL or the remote program is requesting the local program's end of conversation to enter Receive state, which places the remote program's end of the conversation in **Send** state. See “Request_To_Send (CMRTS)” on page 241 for a discussion of how a program can place its end of a conversation in Receive state.
3. When issued during a mapped conversation, the Send_Mapped_Data call sends one complete data record. The data record consists entirely of data. CPI-C does not examine the data for logical record length fields. It is this specification of a complete data record, at send time by the local program and what it sends, that is indicated to the remote program by the *data_received* parameter of the Receive_Mapped_Data call.

   For example, consider a mapped conversation where the local program issues tow Send_Data calls with *send_length* set to 30 and 50 respectively. (These numbers are simple for explanatory purposes.) The local program then issues Flush and the 80 bytes of data are sent to the remote system. The remote program now issues Receive_Mapped_Data with *requested length* set to a sufficiently large value of 1000. The remote program will receive back only 30 bytes of data, indicated by the *received_length* parameter, because this is a complete data record. The completeness of the data record is indicated by the *data_received* variable, which will be set to CM_COMPLETE_DATA_RECEIVED.

   The remote program receives the remaining 50 bytes of data (from the second Send_Mapped_Data) when it performs a second Receive_Mapped_Data with *requested_length* set to a value greater than or equal to 50.

Note: The *received_length* may be different from the *send_length* because of the differences in how data is represented locally in each partner system.

4. If the map routine is unable to process the user data because an incorrect map_name was identified or the map routine encountered an error during processing, the *return_code* is set appropriately. Nothing is sent and the conversation is not aborted. Control is given back to the program for appropriate action.
5. The *send_length* is local information for the map routine. The *send_length* value that is used by the CRM is calculated by the map routine after all transformations are completed.
6. Send_Data is often used in conjunction with other call, such as Flush, Confirm, and Prepare_To_Receive. Contrast this usage with the equivalent function available from the use of the Set_Send_Type call prior to issuing a call to Send_Data.
7. A program must not specify a value in the *send_length* parameter that is greater than the maximum the implementation can support. The maximum may vary from system-to-system. The maximum also depends on the *map_name* parameter.

   Every CPI-C product must be able to send buffers with a length of 32767 bytes. Map routines written should describe the length of the data buffer before encoding, if the encoded buffer has a length of 32767 bytes.

   The application program should not use a *send_length* larger than this.
8. When *control_information_received* indicates that expedited data is available to be received, subsequent calls with this parameter will continue to indicate that expedited data is available until the expedited data has been received by the program.

Related Information

"Conversation Types" on page 15 provides more information on mapped and basic conversations.

"Data Buffering and Transmission" on page 42 provides information about data transmission control.

Chapter 3, "Program-to-Program Communication Example Flows" on page 65 show programs using the Send_Data call.

For a mapped conversation with a non-null map name, the largest amount of data a program can send in a Send_Mapped_Data call and the largest amount of data that can be received by the program in a Receive_Mapped_Data call depends on the map name.

"Receive_Mapped_Data (CMRCVM)" on page 226 provides more information about the *data_received* parameter.

"Set_Send_Type (CMSST)" on page 342 provides more information about the *send_type* conversation characteristic and the use of it in combination with calls to Send_Data.

The *SNA Transaction Programmers Reference Manual for LU Type 6.2* provides more information about mapped conversations.

Set_AE_Qualifier (CMSAEQ)

OSI TP

Set_AE_Qualifier (CMSAEQ) is used by a program to set the *AE_qualifier*, *AE_qualifier_length*, and *AE_qualifier_format* characteristics for a conversation. Set_AE_Qualifier overrides the current values that were originally acquired from the side information using *sym_dest_name*.

Issuing this call does not change the information in the side information. It only changes the *AE_qualifier*, the *AE_qualifier_length*, and the *AE_qualifier_format* characteristics for this conversation.

The *AE_qualifier* conversation characteristic identifies the OSI application-entity qualifier associated with the remote program. It may be set by the conversation initiator to identify the location of the remote program.

Notes:

1. A program cannot issue Set_AE_Qualifier after an Allocate call is issued. Only the program that initiated the conversation (issued the Initialize_Conversation call) can issue Set_AE_Qualifier.
2. The *AE_qualifier* characteristic is used only by an OSI TP CRM.

Format

```
CALL CMSAEQ(conversation_ID,
            AE_qualifier,
            AE_qualifier_length,
            AE_qualifier_format,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

AE_qualifier *(input)*
Specifies the application-entity-qualifier that distinguishes the application-entity at the application-process where the remote program is located.

AE_qualifier_length *(input)*
Specifies the length of *AE_qualifier*. The length can be from 1 to 1024 bytes.

AE_qualifier_format *(input)*
Specifies the format of *AE_qualifier*. The *AE_qualifier_format* variable can have one of the following values:

- CM_DN
  Specifies that the *AE_qualifier* is a distinguished name.
- CM_INT_DIGITS
  Specifies that the *AE_qualifier* is an integer represented as a sequence of decimal digits.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *AE_qualifier_length* is set to a value less than 1 or greater than 1024.
  - The *AE_qualifier_format* specifies an undefined value.
  - The *partner_ID* characteristic is set to a non-null value.
- CM_PROGRAM_STATE_CHECK
  This value indicates that the conversation is not in **Initialize** state.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause any state changes.

Usage Notes

1. Specify *AE_qualifier* using the local system's native encoding. CPI Communications automatically converts the *AE_qualifier* from the native encoding where necessary.
2. If a *return_code* other than CM_OK is returned on the call, the *AE_qualifier*, the *AE_qualifier_length*, and the *AE_qualifier_format* conversation characteristics remain unchanged.
3. The *AE_qualifier* may be either a distinguished name or an integer represented as a sequence of decimal digits. Distinguished names can have any format and syntax that can be recognized by the local system.

Related Information

"Side Information" on page 21 and note 4 of Table 21 on page 422 provide further discussion of the *AE_qualifier* conversation characteristic.

"Automatic Conversion of Characteristics" on page 39 provides further information on the automatic conversion of the *AE_qualifier* parameter.

Set_Allocate_Confirm (CMSAC)

OSI TP

Set_Allocate_Confirm (CMSAC) is used by a program to set the *allocate_confirm* characteristic for a given conversation. Set_Allocate_Confirm overrides the value that was assigned when the Initialize_Conversation call was issued.

The conversation initiator uses the Set_Allocate_Confirm call to indicate whether or not a positive confirmation is required when the remote program has accepted the conversation.

Notes:

1. A program cannot issue Set_Allocate_Confirm after an Allocate call is issued. Only the program that initiates the conversation (issues the Initialize_Conversation call) can issue Set_Allocate_Confirm.
2. The *allocate_confirm* characteristic is used only by an OSI TP CRM.

Format

```
CALL CMSAC(conversation_ID,
           allocate_confirm,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

allocate_confirm *(input)*
Specifies whether the program is to receive notification when the remote program confirms its acceptance of the conversation. The *allocate_confirm* variable can have one of the following values:

- CM_ALLOCATE_NO_CONFIRM
  Specifies that the program is not to receive notification when the remote program confirms its acceptance of the conversation.
- CM_ALLOCATE_CONFIRM
  Specifies that the program is to receive notification when the remote program confirms its acceptance of the conversation.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED

- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned identifier.
  - The *allocate_confirm* specifies an undefined value.
  - The *allocate_confirm* specifies CM_ALLOCATE_CONFIRM, and the conversation is using an LU 6.2 CRM.
- CM_PROGRAM_STATE_CHECK
  This value indicates that the conversation is not in **Initialize** state.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause any state changes.

Usage Notes

1. If a *return_code* other than CM_OK is returned on the call, the *allocate_confirm* conversation characteristic remains unchanged.
2. When the remote program confirms its acceptance of the conversation, the initiating program is notified by receiving a *control_information_received* value of CM_ALLOCATE_CONFIRMED or CM_ALLOCATE_CONFIRMED_WITH_DATA on a subsequent call.
3. After the remote program has accepted the conversation by issuing an Accept_Conversation or Accept_Incoming call, it confirms the acceptance by issuing any call other than a Cancel_Conversation, Deallocate with *deallocate_type* of CM_DEALLOCATE_ABEND, or Set_* or Extract_* call. The remote program rejects the conversation by issuing a Cancel_Conversation call or a Deallocate call with *deallocate_type* of CM_DEALLOCATE_ABEND as its first operation on the conversation (other than a Set_* or Extract_* call).
4. The program that initiates the conversation (issues Initialize_Conversation) must set *allocate_confirm* to CM_ALLOCATE_CONFIRM if it is expecting *initialization_data* to be returned from the remote program after the remote program confirms its acceptance of the conversation.

Set_AP_Title (CMSAPT)

OSI TP

Set_AP_Title (CMSAPT) is used by a program to set the *AP_title*, *AP_title_length*, and *AP_title_format* characteristics for a conversation. Set_AP_Title overrides the current values that were originally acquired from the side information using *sym_dest_name*.

Issuing this call does not change the values in the side information. It only changes the *AP_title*, the *AP_title_length*, and the *AP_title_format* characteristics for this conversation.

The *AP_title* conversation characteristic identifies the OSI application-process title associated with the remote program. It may be set by the conversation initiator to identify the location of the remote program.

Notes:

1. A program cannot issue Set_AP_Title after an Allocate call is issued. Only the program that initiated the conversation (issued the Initialize_Conversation call) can issue Set_AP_Title.
2. The *AP_title* characteristic is used only by an OSI TP CRM.

Format

```
CALL CMSAPT(conversation_ID,
            AP_title,
            AP_title_length,
            AP_title_format,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

AP_title *(input)*
Specifies the title of the application-process where the remote program is located.

AP_title_length *(input)*
Specifies the length of *AP_title*. The length can be from 1 to 1024 bytes.

AP_title_format *(input)*
Specifies the format of *AP_title*. The *AP_title_format* variable can have one of the following values:

- CM_DN
  Specifies that the *AP_title* is a distinguished name.
- CM_OID
  Specifies that the *AP_title* is an object identifier.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned identifier.
  - The *AP_title_length* is set to a value less than 1 or greater than 1024.
  - The *AP_title_format* specifies an undefined value.
  - The *partner_ID* characteristic is set to a non-null value.
- CM_PROGRAM_STATE_CHECK
  This value indicates that the conversation is not in **Initialize** state.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause any state changes.

Usage Notes

1. Specify *AP_title* using the local system's native encoding. CPI Communications automatically converts the *AP_title* from the native encoding where necessary.
2. If a *return_code* other than CM_OK is returned on the call, the *AP_title*, the *AP_title_length*, and the *AP_title_format* conversation characteristics remain unchanged.
3. The *AP_title* may be either a distinguished name or an object identifier. Distinguished names can have any format and syntax that can be recognized by the local system. Object identifiers are represented as a series of digits separated by periods (for example, *n.nn.n.nnn*).

Related Information

"Side Information" on page 21 and note 4 of Table 21 on page 422 provide further discussion of the *AP_title* conversation characteristic.

"Automatic Conversion of Characteristics" on page 39 provides more information on the automatic conversion of the *AP_title* parameter.

Set_Application_Context_Name (CMSACN)

OSI TP

Set_Application_Context_Name (CMSACN) is used by a program to set the *application_context_name* and *application_context_name_length* characteristics for a conversation. Set_Application_Context_Name overrides the current values that were originally acquired from the side information using *sym_dest_name*.

The *application_context_name* conversation characteristic identifies the OSI application-context used on the conversation. It may be set by the conversation initiator.

Issuing this call does not change the values in the side information. It only changes the *application_context_name* and *application_context_name_length* characteristics for this conversation.

Note: The *application_context_name* characteristic is used only by an OSI TP CRM.

Format

```
CALL CMSACN(conversation_ID,
            application_context_name,
            application_context_name_length,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

application_context_name *(input)*
Specifies the name of the application context to be used on the conversation. The length can be 1-256 bytes.

application_context_name_length *(input)*
Specifies the length of the application context name to be used on the conversation startup request.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_STATE_CHECK
  This value indicates that the conversation is not in the **Initialize** state.

- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned identifier.
  - The *application_context_name_length* is set to a value less than 1 or greater than 256.
  - The *partner_ID* characteristic is set to a non-null value.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause any state changes.

Usage Notes

1. Specify *application_context_name* using the local system's native encoding. CPI Communications automatically converts the *application_context_name* from the native encoding where necessary.
2. If a *return_code* other than CM_OK is returned on the call, the *application_context_name* and the *application_context_name_length* conversation characteristics remain unchanged.
3. The application context name is an object identifier and is represented as a series of digits separated by periods. For example, the application context defined by the Open System Environment Implementers' Workshop (OIW) for UDT with Commit Profiles is represented as "1.3.14.15.5.1.0" and the application context for Application Supported Transactions using UDT is represented as "1.3.14.15.5.2.0".

Related Information

"Side Information" on page 21 provides more information on the *application_context_name* conversation characteristic.

"Automatic Conversion of Characteristics" on page 39 provides further information on the automatic conversion of the *application_context_name* parameter.

Set_Begin_Transaction (CMSBT)

OSI TP

Set_Begin_Transaction (CMSBT) is used by a program to set the *begin_transaction* characteristic for a given conversation. Set_Begin_Transaction overrides the value that was assigned when the Initialize_Conversation call was issued.

The superior program uses the Set_Begin_Transaction call to indicate whether the subordinate is to be explicitly included in the current transaction or implicitly included, if and when any conversation activity occurs.

Note: The *begin_transaction* characteristic is used only by an OSI TP CRM.

Format

```
CALL CMSBT(conversation_ID,
           begin_transaction,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

begin_transaction *(input)*
Specifies whether the superior, when a new transaction is started, will explicitly or implicitly ask that the subordinate program join the transaction. The *begin_transaction* variable can have one of the following values:

- CM_BEGIN_IMPLICIT
  Specifies that the superior implicitly asks that the subordinate join the transaction by issuing one of the following calls from **Initialize**, **Send**, **Send-Pending**, or **Send-Receive** states.
  CMALLC — Allocate
  CMCFM — Confirm
  CMINCL — Include_Partner_In_Transaction
  CMPREP — Prepare
  CMPTR — Prepare_To_Receive
  CMRCV — Receive
  CMSEND — Send_Data
  CMSERR — Send_Error
- CM_BEGIN_EXPLICIT
  Specifies that the superior explicitly asks that the subordinate join the transaction by use of the Include_Partner_In_Transaction (CMINCL) call.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_STATE_CHECK
  This value indicates that the conversation is in **Initialize-Incoming** state.
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned identifier.
  - The *begin_transaction* specifies an undefined value.
  - The *transaction_control* is set to CM_CHAINED_TRANSACTIONS.
  - The program is not the superior for the conversation.
- CM_OPERATION_NOT_ACCEPTED
  This value indicates that the program has chosen conversation-level non-blocking for the conversation and a previous call operation is still in progress.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause any state changes.

Usage Notes

1. If a *return_code* other than CM_OK is returned on the call, the *begin_transaction* conversation characteristic remains unchanged.
2. This call does not apply to any previous call operation still in progress.
3. The remote program receives the request to join the transaction as a *status_received* indicator of CM_JOIN_TRANSACTION on a Receive call it issues.
4. If the superior is not in transaction when it issues an Allocate, Confirm, Include_Partner_In_Transaction, Prepare, Prepare_To_Receive, Receive, Send_Data, or Send_Error call, the *begin_transaction* characteristic is ignored, and the subordinate is not asked to join a transaction.
5. If *begin_transaction* is set to CM_BEGIN_IMPLICIT, the subordinate is asked to join the transaction only when the Allocate, Confirm, Include_Partner_In_Transaction, Prepare, Prepare_To_Receive, Receive, Send_Data or Send_Error call is returned with a *return_code* of CM_OK.
6. The call is not associated with any conversation queue. When a conversation uses queue-level non-blocking, the call does not return CM_OPERATION_NOT_ACCEPTED on the conversation.

Related Information

"Chained and Unchained Transactions" on page 59 discusses chained and unchained transactions.

"Joining a Transaction" on page 59 discusses how a program requests the partner program to join a transaction.

Set_Confirmation_Urgency (CMSCU)

LU 6.2	OSI TP

Set_Confirmation_Urgency (CMSCU) is used by a program to set the *confirm_urgency* characteristic for a given conversation. Set_Confirmation_Urgency overrides the value that was assigned when the Initialize_Conversation, Accept_Conversation, or Initialize_For_Incoming call was issued.

Programs would use the Set_Confirmation_Urgency call to indicate whether to optimize the Prepare_to_Receive flows for reduced link traffic or immediate response.

Note: The *confirmation_urgency* characteristic is used only for a half-duplex conversation.

Format

```
CALL CMSCU(conversation_ID,
           confirmation_urgency,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

confirmation_urgency *(input)*
Specifies whether the response to a Prepare_To_Receive call that requests confirmation will be sent immediately. The *confirmation_urgency* variable can have one of the following values:

- CM_CONFIRMATION_NOT_URGENT
  Specifies that the remote program's response to the confirmation request may not be sent immediately.
- CM_CONFIRMATION_URGENT
  Specifies that the remote program's response to the confirmation request will be sent immediately.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED

- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned identifier.
  - The *confirmation_urgency* variable specifies an undefined value.
  - The *send_receive_mode* of the conversation is CM_FULL_DUPLEX.
  - The *sync_level* is set to CM_NONE or CM_SYNC_POINT_NO_CONFIRM.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause any state changes.

Usage Notes

1. If a *return_code* other than CM_OK is returned on the call, the *confirmation_urgency* conversation characteristic remains unchanged.
2. When the local program issues a Prepare_To_Receive call with *prepare_to_receive_type* set to CM_PREPARE_TO_RECEIVE_CONFIRM or CM_PREPARE_TO_RECEIVE_SYNC_LEVEL with *sync_level* set to CM_CONFIRM, the remote CRM may optimize link usage by buffering the response generated by the Confirmed call until the remote program issues another call. This may increase the time the local program must wait for control to be returned to it.

   By issuing a Set_Confirmation_Urgency call with the *confirmation_urgency* parameter set to CM_CONFIRMATION_URGENT before issuing the Prepare_To_Receive call, the local program can request that the response from the Confirmed call be sent to the local program as soon as it is issued by the remote program.

Related Information

See “Prepare_To_Receive (CMPTR)” on page 204 for information on requesting confirmation.

Set_Conversation_Security_Password (CMSCSP)

LU 6.2	OSI TP

Set_Conversation_Security_Password (CMSCSP) is used by a program to set the *security_password* and *security_password_length* characteristics for a conversation. Set_Conversation_Security_Password overrides the current values, which were originally acquired from the side information using *sym_dest_name*.

This call does not change the values in the side information. It only changes the *security_password* and *security_password_length* characteristics for this conversation.

The *security_password* conversation characteristic contains the password associated with the user identification to be used on the conversation. It may be set by the conversation initiator.

Note: A program cannot issue the Set_Conversation_Security_Password call after an Allocate call is issued. Only the program that initiates the conversation (issues the Initialize_Conversation call) can issue Set_Conversation_Security_Password. A program can only specify a password when *conversation_security_type* is set to CM_SECURITY_PROGRAM or CM_SECURITY_PROGRAM_STRONG.

Format

```
CALL CMSCSP(conversation_ID,
            security_password,
            security_password_length,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

security_password *(input)*
Specifies the password to be included in the conversation startup request. The partner system uses this value and the user ID to validate the user's access to the remote program. The password is stored temporarily by node services, and is erased at the successful completion of an Allocate call.

security_password_length *(input)*
Specifies the length of the password. The length can be from 0 to 10 bytes. If zero, the *security_password_length* characteristic is set to zero (effectively setting the *security_password* characteristic to the null string), and the *security_password* parameter on this call is ignored.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:

  - The conversation is not in **Initialize** state.
  - *conversation_security_type* is not set to CM_SECURITY_PROGRAM or CM_SECURITY_PROGRAM_STRONG.
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *security_password_length* is less than 0 or greater than 10.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause any state changes.

Usage Notes

1. When a program issues Set_Conversation_Security_Password, a user ID must also be supplied. The user ID comes from side information or is set by the program issuing Set_Conversation_Security_User_ID.
2. Specify *security_password* using the local system's native encoding. CPI Communications automatically converts the *security_password* from the native encoding where necessary.
3. Specification of a password that is not valid is not detected on this call. It is detected by the partner system when it receives the conversation startup request. The partner system returns an error indication to the local system, which reports the error to the program by means of the CM_SECURITY_NOT_VALID return code on a call subsequent to the Allocate call.
4. If a *return_code* other than CM_OK is returned on the call, the *security_password* and *security_password_length* characteristics are unchanged.

Related Information

"Automatic Conversion of Characteristics" on page 39 provides further information on the automatic conversion of the *security_password* parameter.

"Conversation Security" on page 49 provides further information on security.

"Set_Conversation_Security_Type (CMSCST)" on page 289 provides more information on the *conversation_security_type* characteristic.

"Set_Conversation_Security_User_ID (CMSCSU)" on page 292 provides more information on the *security_user_ID* characteristic.

Set_Conversation_Security_Type (CMSCST)

LU 6.2	OSI TP

Set_Conversation_Security_Type (CMSCST) is used by a program to set the *conversation_security_type* characteristic for a conversation. Set_Conversation_Security_Type overrides the current value, which was originally acquired from the side information using *sym_dest_name*.

This call does not change the value in the side information. It only changes the *conversation_security_type* characteristic for this conversation.

The conversation initiator uses the Set_Conversation_Security_Type call to indicate the type of authorization to be used during conversation initialization.

Note: A program cannot issue the Set_Conversation_Security_Type call after an Allocate call is issued. Only the program that initiates the conversation (issues the Initialize_Conversation call) can issue Set_Conversation_Security_Type.

Format

```
CALL CMSCST(conversation_ID,
            conversation_security_type,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

conversation_security_type *(input)*
Specifies the type of access security information to be sent in the conversation startup request to the partner system. The access security information, if present, consists of either a user ID, or a user ID and a password. It is used by the partner system to validate the user's access to the remote program.

The *conversation_security_type* variable can have one of the following values:

- CM_SECURITY_NONE
  No access security information is included in the conversation startup request.

- CM_SECURITY_SAME
  The security parameters maintained by node services for the program's current context when the program issues the Allocate call are used to set the access security information included in the conversation startup request.
- CM_SECURITY_PROGRAM
  The values of the *security_user_ID* and *security_password* characteristics are used to set the access security information included in the conversation startup request.
- CM_SECURITY_PROGRAM_STRONG
  The values of the *security_user_ID* and *security_password* characteristics are used to set the access security information included in the conversation startup request. The local CRM ensures that the *security_password* is not exposed in clear-text form on the physical network. If the local CRM cannot ensure this, then the subsequent Allocate request will fail with a *return_code* of CM_SECURITY_NOT_SUPPORTED.
- CM_SECURITY_DISTRIBUTED
  The security parameters for the program's current context are used to generate authentication tokens using a distributed security service. The tokens are used as the access security information included in the conversation startup request. If the remote system does not accept the type of tokens generated by the local system, then the request fails locally. A locally failed request does not send any data to the remote system.
- CM_SECURITY_MUTUAL
  The security parameters for the program's current context are used to generate authentication tokens using a distributed security service. The tokens are used as the access security information included in the conversation startup request. Furthermore, the local CRM is requested to authenticate the partner principal before any user information is transmitted to the remote CRM.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_STATE_CHECK
  This value indicates that the conversation is not in **Initialize** state.
- CM_PARM_VALUE_NOT_SUPPORTED
  This value indicates that the *conversation_security_type* specifies CM_SECURITY_PROGRAM, CM_SECURITY_PROGRAM_STRONG, CM_SECURITY_DISTRIBUTED, or CM_SECURITY_MUTUAL and the value is not supported by the local system.

- CM_PROGRAM_PARAMETER_CHECK
  This return code indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *conversation_security_type* specifies an undefined value.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause any state changes.

Usage Notes

1. A *conversation_security_type* of CM_SECURITY_SAME is intended for use between nodes which have the same set of user IDs and which accept user validation performed on one node as verifying the user for all nodes. A password is not used in this case.
2. A *conversation_security_type* of CM_SECURITY_PROGRAM or CM_SECURITY_PROGRAM_STRONG requires that a user ID and password be supplied for inclusion in the conversation startup request. These may come from side information or be set by the program using the Set_Conversation_Security_User_ID and Set_Conversation_Security_Password calls.
3. If a *return_code* other than CM_OK is returned on the call, the *conversation_security_type* is unchanged.
4. A *conversation_security_type* of CM_SECURITY_MUTUAL is intended for usage when the local program wants the local CRM to authenticate that the remote program or CRM is actually the partner principal specified in the program binding.
5. Certain combinations of *conversation_security_type* value and required_user_name_type value (from the program binding) causes the local CRM to reject an Allocate request with a *return_code* value of CM_SECURITY_NOT_SUPPORTED. The incompatible combinations are shown in Table 7 on page 50.
6. For an OSI TP CRM, the type of access security information sent for CM_SECURITY_SAME is implementation defined.

Related Information

"Conversation Security" on page 49 provides further information on security.

"Set_Conversation_Security_Password (CMSCSP)" on page 287 discusses setting the *security_password* characteristic.

"Set_Conversation_Security_User_ID (CMSCSU)" on page 292 discusses setting the *security_user_ID* characteristic.

"Set_Partner_ID (CMSPID)" on page 316 discusses setting the *partner_ID* characteristic.

"Program Binding" on page 429 provides further information on the program binding.

Set_Conversation_Security_User_ID (CMSCSU)

LU 6.2	OSI TP

Set_Conversation_Security_User_ID (CMSCSU) is used by a program to set the *security_user_ID* and *security_user_ID_length* characteristics for a conversation. Set_Conversation_Security_User_ID overrides the current values, which were originally acquired from the side information using *sym_dest_name*.

The *security_user_id* conversation characteristic contains the user identification associated with the conversation. It may be set by the conversation initiator.

This call does not change the values in the side information. It only changes the *security_user_ID* and *security_user_ID_length* characteristics for this conversation.

Note: A program cannot issue the Set_Conversation_Security_User_ID call after an Allocate call is issued. Only the program that initiates the conversation (issues the Initialize_Conversation call) can issue Set_Conversation_Security_User_ID. A program can only specify an access security user ID when *conversation_security_type* is set to CM_SECURITY_PROGRAM or CM_SECURITY_PROGRAM_STRONG.

Format

```
CALL CMSCSU(conversation_ID,
            security_user_ID,
            security_user_ID_length,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

security_user_ID *(input)*
Specifies the user ID to be included in the conversation startup request. The partner system uses this value and the password to validate the user's access to the remote program. In addition, the partner system may use the user ID for auditing or accounting purposes.

security_user_ID_length *(input)*
Specifies the length of the user ID. The length can be from 0 to 10 bytes. If zero, the *security_password_length* characteristic is set to zero (effectively setting the *security_password* characteristic to the null string), and the *security_password* parameter on this call is ignored.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - The conversation is not in **Initialize** state.

  - The *conversation_security_type* is not set to CM_SECURITY_PROGRAM or CM_SECURITY_PROGRAM_STRONG.
- CM_PROGRAM_PARAMETER_CHECK
  This return code indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *security_user_ID_length* is less than 0 or greater than 10.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause any state changes.

Usage Notes

1. When a program issues Set_Conversation_Security_User_ID, a password must also be supplied. The password comes from side information or is set by the program using Set_Conversation_Security_Password.
2. Specify *security_user_ID* using the local system's native encoding. CPI Communications automatically converts the *security_user_ID* from the native encoding where necessary.
3. Specification of a security user ID that is not valid is not detected on this call. It is detected by the partner system when it receives the conversation startup request. The partner system returns an error indication to the local system, which reports the error to the program by means of the CM_SECURITY_NOT_VALID return code on a call subsequent to the Allocate call.
4. If a *return_code* other than CM_OK is returned on the call, the *security_user_ID* and *security_user_ID_length* characteristics are unchanged.

Related Information

"Automatic Conversion of Characteristics" on page 39 provides further information on the automatic conversion of the *security_user_ID* parameter.

"Conversation Security" on page 49 provides further information on security.

"Set_Conversation_Security_Password (CMSCSP)" on page 287 provides more information on the *security_password* characteristic.

"Set_Conversation_Security_Type (CMSCST)" on page 289 provides more information on the *conversation_security_type* characteristic.

Set_Conversation_Type (CMSCT)

LU 6.2	OSI TP

Set_Conversation_Type (CMSCT) is used by a program to set the *conversation_type* characteristic for a given conversation. It overrides the value that was assigned when the Initialize_Conversation or Initialize_For_Incoming call was issued.

The *conversation_type* conversation characteristic indicates whether the data exchange on the conversation will follow basic or mapped rules.

Notes:

1. A program cannot use Set_Conversation_Type after an Allocate has been issued. Only the program that initiates the conversation (using the Initialize_Conversation call) can issue the Set_Conversation_Type call.
2. When using an LU 6.2 CRM, only the program that initiates the conversation (using the Initialize_Conversation call) can issue the Set_Conversation_Type call, and it must be issued before the Allocate is issued. When using an OSI TP CRM, because the mapped/basic indication is not carried by the protocol, the recipient of the conversation request must use Initialize_For_Incoming and Set_Conversation_Type to override the *conversation_type* default of CM_MAPPED_CONVERSATION. The recipient must issue these calls before the Accept_Incoming call is issued.

Format

```
CALL CMSCT(conversation_ID,
           conversation_type,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

conversation_type *(input)*
Specifies the type of conversation to be allocated when Allocate is issued. The *conversation_type* variable can have one of the following values:

- CM_BASIC_CONVERSATION
  Specifies the allocation of a basic conversation.
- CM_MAPPED_CONVERSATION
  Specifies the allocation of a mapped conversation.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_PROGRAM_STATE_CHECK
  This value indicates that the conversation is not in **Initialize** or **Initialize-Incoming** state.
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *conversation_type* specifies an undefined value.
  - The *conversation_type* is set to CM_MAPPED_CONVERSATION, but *fill* is set to CM_FILL_BUFFER.
  - The *conversation_type* is set to CM_MAPPED_CONVERSATION, but a prior call to Set_Log_Data is still in effect.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. Because of the detailed manipulation of the data and resulting complexity of error conditions, the use of basic conversations should be regarded as an advanced programming technique.
2. If a *return_code* other than CM_OK is returned on the call, the *conversation_type* conversation characteristic is unchanged.

Related Information

"Conversation Types" on page 15 and the "Usage Notes" section of "Send_Data (CMSEND)" on page 244 provide more information on the differences between mapped and basic conversations.

Set_Deallocate_Type (CMSDT)

LU 6.2	OSI TP

Set_Deallocate_Type (CMSDT) is used by a program to set the *deallocate_type* characteristic for a given conversation. Set_Deallocate_Type overrides the value that was assigned when the Initialize_Conversation, Accept_Conversation, or Initialize_For_Incoming call was issued.

The Set_Deallocate_Type call is used by programs to identify the processing option to be used when the local program issues a Deallocate call.

Format

```
CALL CMSDT(conversation_ID,
           deallocate_type,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

deallocate_type *(input)*
Specifies the type of deallocation to be performed. The *deallocate_type* variable can have one of the following values:

- CM_DEALLOCATE_SYNC_LEVEL
  Perform deallocation based on the *sync_level* characteristic in effect for this conversation:
  - If *sync_level* is set to CM_NONE, or if *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM but the conversation is not currently included in a transaction, execute the function of the Flush call and deallocate the conversation normally.
  - For half-duplex conversations, if *sync_level* is set to CM_CONFIRM, or if *sync_level* is set to CM_SYNC_POINT but the conversation is not currently included in a transaction, execute the function of the Confirm call. If the Confirm call is successful (as indicated by a return code of CM_OK on the Deallocate call or a return code of CM_OK on the Send_Data call with *send_type* set to CM_SEND_AND_DEALLOCATE), deallocate the conversation normally. If the Confirm call is not successful, the state of the conversation is determined by the return code.
  - If *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM and the conversation is included in a transaction, defer the deallocation until the program issues a resource recovery commit call. If the commit call is successful, the conversation is deallocated normally. If the commit is not successful or if the program issues a resource recovery backout call instead of a commit, the conversation is not deallocated. See “Deallocate (CMDEAL)” on page 140 for more information about deallocating conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM.
- CM_DEALLOCATE_FLUSH

Execute the function of the Flush call and deallocate the conversation normally.

- CM_DEALLOCATE_CONFIRM
  Execute the function of the Confirm call. If the Confirm call is successful (as indicated by a return code of CM_OK on the Deallocate call or a return code of CM_OK on the Send_Data call with *send_type* set to CM_SEND_AND_DEALLOCATE), deallocate the conversation normally. If the Confirm call is not successful, the state of the conversation is determined by the return code.
- CM_DEALLOCATE_ABEND
  For half-duplex conversations, execute the function of the Flush call when the conversation is in **Send** state and deallocate the conversation abnormally. Data purging can occur when the conversation is in **Receive** state. If the conversation is a basic conversation, logical-record truncation can occur when the conversation is in **Send** state.

  For full-duplex conversations, execute the function of the Flush call when the conversation is in **Send-Receive** or **Send-Only** state and deallocate the conversation abnormally. Data purging can occur when the conversation is in **Send-Receive** or **Receive-Only** state. If the conversation is basic, logical-record truncation can occur when the conversation is in **Send-Receive** or **Send-Only** state.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *deallocate_type* specifies an undefined value.
  - The *deallocate_type* is set to CM_DEALLOCATE_FLUSH, *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and *transaction_control* is set to CM_CHAINED_TRANSACTIONS.
  - The conversation is using an LU 6.2 CRM, *deallocate_type* is set to CM_DEALLOCATE_CONFIRM, and *sync_level* is set to CM_NONE, CM_SYNC_POINT, or CM_SYNC_POINT_NO_CONFIRM.
  - The converation is using an OSI TP CRM, *deallocate_type* is set to CM_DEALLOCATE_CONFIRM, *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and *transaction_control* is set to CM_CHAINED_TRANSACTIONS.
- CM_PROGRAM_STATE_CHECK
  The conversation is in **Initialize-Incoming** state.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. A *deallocate_type* set to CM_DEALLOCATE_SYNC_LEVEL is used by a program to deallocate a conversation based on the conversation's synchronization level.
   - For half-duplex conversations:
     - If *sync_level* is set to CM_NONE, or if *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM but the conversation is not currently included in a transaction, the conversation is unconditionally deallocated.
     - If *sync_level* is set to CM_CONFIRM, or if *sync_level* is set to CM_SYNC_POINT but the conversation is not currently included in a transaction, the conversation is deallocated when the remote program responds to the confirmation request by issuing the Confirmed call. The conversation remains allocated when the remote program responds to the confirmation request by issuing the Send_Error call.
     - If *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM and the conversation is included in a transaction, the deallocation is deferred until the program issues a resource recovery commit call. If the commit call is successful, the conversation is deallocated normally. If the commit is not successful or if the program issues a resource recovery backout call instead of a commit, the conversation is not deallocated.
   - For full-duplex conversations:
     - If *sync_level* is set to CM_NONE, or if *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM but the conversation is not currently included in a transaction, and the Deallocate call is issued in **Send-Receive** state, the program can no longer issue calls associated with the Send queue, but it can continue to issue calls associated with the other conversation queues. If the Deallocate call is issued in **Send-Only** state, the conversation is deallocated.
     - If *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM and the conversation is included in a transaction, the deallocation is deferred until the program issues a resource recovery commit call. If the commit call is successful, the conversation is deallocated normally. If the commit is not successful or if the program issues a backout call instead of a commit, the conversation is not deallocated.
2. A *deallocate_type* set to CM_DEALLOCATE_FLUSH is used by a program to unconditionally deallocate the conversation. This *deallocate_type* value can be used for conversations with *sync_level* set to CM_NONE or CM_CONFIRM. If the conversation is using an OSI TP CRM, it can also be used for conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM if the conversation is not currently included in a transaction. The *deallocate_type* set to CM_DEALLOCATE_FLUSH is functionally equivalent to *deallocate_type* set to CM_DEALLOCATE_SYNC_LEVEL combined with a *sync_level* set to CM_NONE.

   For a half-duplex conversation, the conversation is deallocated. For a full-duplex conversation, the program can no longer issue calls associated with the Send queue, and the conversation is deallocated if the Deallocate call is issued in **Send-Only** state. This *deallocate_type* value can be used for conversations with *sync_level* set to CM_NONE.

3. A *deallocate_type* set to CM_DEALLOCATE_CONFIRM is used by a program to conditionally deallocate the conversation, depending on the remote program's response, when the *sync_level* is set to CM_CONFIRM. The *deallocate_type* set to CM_DEALLOCATE_CONFIRM is functionally equivalent to *deallocate_type* set to CM_DEALLOCATE_SYNC_LEVEL combined with a *sync_level* set to CM_CONFIRM.

   The conversation is deallocated when the remote program responds to the confirmation request by issuing Confirmed. The conversation remains allocated when the remote program responds to the confirmation request by issuing Send_Error.

4. A *deallocate_type* set to CM_DEALLOCATE_ABEND is used by a program to unconditionally deallocate a conversation regardless of its synchronization level and its current state. Specifically, this *deallocate_type* value is used when the program detects an error condition that prevents further useful communications (communications that would lead to successful completion of the transaction).

5. If a *return_code* other than CM_OK is returned on the call, the *deallocate_type* conversation characteristic is unchanged.

Related Information

"Deallocate (CMDEAL)" on page 140 provides further discussion on the use of the *deallocate_type* characteristic in the deallocation of a conversation.

"Set_Sync_Level (CMSSL)" on page 344 provides information on how the *sync_level* characteristic is used in combination with the *deallocate_type* characteristic in the deallocation of a conversation.

Set_Error_Direction (CMSED)

LU 6.2

Set_Error_Direction (CMSED) is used by a program to set the *error_direction* characteristic for a given conversation. Set_Error_Direction overrides the value that was assigned when the Initialize_Conversation, the Accept_Conversation, or the Initialize_For_Incoming call was issued.

A program uses the Set_Error_Direction call, when using an LU 6.2 CRM, to indicate whether the error was detected while receiving the data or after receiving the data.

Note: The *error_direction* characteristic is used by an LU 6.2 CRM and only for a half-duplex conversation.

Format

```
CALL CMSED(conversation_ID,
           error_direction,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

error_direction *(input)*
Specifies the direction of the data flow in which the program detected an error. This parameter is significant only if Send_Error is issued in **Send-Pending** state (that is, immediately after a Receive on which both data and a conversation status of CM_SEND_RECEIVED are received). Otherwise, the *error_direction* value is ignored when the program issues Send_Error.

The *error_direction* variable can have one of the following values:

- CM_RECEIVE_ERROR
  Specifies that the program detected an error in the data it received from the remote program.
- CM_SEND_ERROR
  Specifies that the program detected an error while preparing to send data to the remote program.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED

- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *error_direction* specifies CM_SEND_ERROR and the conversation is using an OSI TP CRM.
  - The *error_direction* specifies an undefined value.
  - The *send_receive_mode* of the conversation is CM_FULL_DUPLEX.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. The *error_direction* conversation characteristic is significant only if Send_Error is issued immediately after a Receive on which both data and a conversation status of CM_SEND_RECEIVED are received (when the conversation is in **Send-Pending** state). In this situation, the Send_Error may result from one of the following errors:

   - An error in the received data (in the receive flow)
   - An error having nothing to do with the received data, but instead being the result of processing performed by the program after it had successfully received and processed the data (in the send flow).

   Because the system in this situation cannot tell which error occurred, the program has to supply the *error_direction* information.

   The *error_direction* defaults to a value of CM_RECEIVE_ERROR. To override the default, a program can issue the Set_Error_Direction call prior to issuing Send_Error.

   Once changed, the new *error_direction* value remains in effect until the program changes it again. Therefore, a program should issue Set_Error_Direction before issuing Send_Error for a conversation in **Send-Pending** state.

   If the conversation is not in **Send-Pending** state, the *error_direction* characteristic is ignored.

2. If the conversation is in **Send-Pending** state and the program issues a Send_Error call, CPI Communications examines the *error_direction* characteristic and notifies the partner program accordingly:

   - If *error_direction* is set to CM_RECEIVE_ERROR, the partner program receives a *return_code* of CM_PROGRAM_ERROR_PURGING. This indicates that an error at the remote program occurred in the data before the remote program received send control.
   - If *error_direction* is set to CM_SEND_ERROR, the partner program receives a *return_code* of CM_PROGRAM_ERROR_NO_TRUNC. This indicates that an error at the remote program occurred in the send processing after the remote program received send control.

3. If a *return_code* other than CM_OK is returned on the call, the *error_direction* conversation characteristic is unchanged.

Related Information

"Example 7: Error Direction and Send-Pending State" on page 80 provides an example program using Set_Error_Direction.

"Send_Error (CMSERR)" on page 254 provides more information on reporting errors.

"Send-Pending State and the error_direction Characteristic" on page 498 provides more information on the *error_direction* characteristic.

Set_Fill (CMSF)

LU 6.2	OSI TP

Set_Fill (CMSF) is used by a program to set the *fill* characteristic for a given conversation. Set_Fill overrides the value that was assigned when the Initialize_Conversation, Accept_Conversation, or Initialize_For_Incoming call was issued.

Programs use the Set_Fill call to indicate to the local system the condition that will be used to determine when sufficient data is available to complete a Receive call.

Note: This call applies only to basic conversations. The *fill* characteristic is ignored for mapped conversations.

Format

```
CALL CMSF(conversation_ID,
          fill,
          return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

fill *(input)*
Specifies whether the program is to receive data in terms of the logical-record format of the data. The *fill* variable can have one of the following values:

- CM_FILL_LL
  Specifies that the program is to receive one complete or truncated logical record, or a portion of the logical record that is equal to the length specified by the *requested_length* parameter of the Receive call.
- CM_FILL_BUFFER
  Specifies that the program is to receive data independent of its logical-record format. The amount of data received will be equal to or less than the length specified by the *requested_length* parameter of the Receive call. The amount is less than the requested length when the program receives the end of the data.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *conversation_type* specifies CM_MAPPED_CONVERSATION.
  - The *fill* specifies an undefined value.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. The *fill* value provided (for a basic conversation) is used on all subsequent Receive calls for the specified conversation until changed by the program with another Set_Fill call.
2. If a *return_code* other than CM_OK is returned on the call, the *fill* conversation characteristic is unchanged.

Related Information

"Receive (CMRCV)" on page 209 provides more information on how the *fill* characteristic is used for basic conversations.

Set_Initialization_Data (CMSID)

LU 6.2	OSI TP

Set_Initialization_Data (CMSID) is used by a program to set the *initialization_data* and *initialization_data_length* conversation characteristics to be sent to the remote program for a given conversation. Set_Initialization_Data overrides the values that were assigned when the Initialize_Conversation, Accept_Conversation, Initialize_For_Incoming, or Accept_Incoming call was issued.

The *initialization_data* conversation characteristic contains program-supplied data that is sent to, or received from, the remote program during conversation initialization. It may be specified prior to Allocate by the conversation initiator. When the conversation is using an OSI TP CRM it may also be specified by the recipient of the conversation immediately following Accept_Conversation or Accept_Incoming.

Format

```
CALL CMSID(conversation_ID,
           initialization_data,
           initialization_data_length,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

initialization_data *(input)*
Specifies the initialization data that is to be passed to the remote program during conversation startup.

initialization_data_length *(input)*
Specifies the length of the initialization data. The length can be from 0 to 10000 bytes. If zero, the *initialization_data* parameter is ignored.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - The conversation is not in **Initialize** state, **Receive** state (for a half-duplex conversation), or **Send-Receive** state (for a full-duplex conversation).

- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned identifier.
  - The *initialization_data_length* specifies a value greater than 10000 or less than zero.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause any state changes.

Usage Notes

1. Initialization data is data that the program initiating a conversation (using the Initialize_Conversation call) can choose to send to the remote program. The initiator issues a Set_Initialization_Data call between the Initialize_Conversation and Allocate calls to specify the initialization data to be sent by the Allocate call. Following the successful completion of either an Accept_Conversation or Accept_Incoming call, the remote program issues an Extract_Initialization_Data call to extract the initialization data.
2. When the conversation is allocated using an OSI TP CRM, the remote program may issue a Set_Initialization_Data call to identify data that is to be sent to the initiating program on its next call following its acceptance of the conversation. To avoid overwriting initialization data from the initiating program, the recipient must issue the Extract_Initialization_Data call to extract the incoming initialization data before issuing the Set_Initialization_Data call. The Set_Initialization_Data must be issued before any other call on the conversation, except Set_* or Extract_* calls. To extract the data from the remote program, the initiating program issues the Extract_Initialization_Data call after receiving a *control_information_received* value of CM_ALLOCATE_CONFIRMED_WITH_DATA or CM_ALLOCATE_REJECTED_WITH_DATA.
3. If a *return_code* other than CM_OK is returned on the call, the *initialization_data* and *initialization_data_length* conversation characteristics remain unchanged.

Related Information

"Extract_Initialization_Data (CMEID)" on page 165 describes the Extract_Initialization_Data call.

"Extract_Mapped_Initialization_Data (CMEMID)" on page 167 describes information about the Extract_Mapped_Initialization_Data call.

"Set_Mapped_Initialization_Data (CMSMID)" on page 311 describes information about the Set_Mapped_Initialization_Data call.

Set_Join_Transaction (CMSJT)

LU 6.2	OSI TP

Programs use the Set_Join_Transaction call to set the *join_transaction* characteristic for a conversation. Set_Join_Transaction overrides the value assigned when the Accept_Conversation or Accept_Incoming call was issued.

Note: The *join_transaction* characteristic is only meaningful in conjunction with the X/Open TX resource recovery interface.

Format

```
CALL CMSJT(conversation_ID,
           join_transaction,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation ID.

join_transaction *(input)*
Specifies if the subordinate implicitly joins the transaction after receiving a join transaction request from the superior. The *join_transaction* characteristic can have one of the following values:

- CM_JOIN_IMPLICIT
  Specifies that the subordinate automatically joins the transaction when receiving a join transaction request from the superior.
- CM_JOIN_EXPLICIT
  Specifies that the subordinate must join the transaction explicitly when receiving a join transaction request from the superior.

return_code *(output)*
Specifies the results of the call execution. The *return_code* can be one of the following:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned identifier.
  - The *join_transaction* specifies an undefined value.
  - The program is not the subordinate for the conversation.
  - The *transaction_control* characteristic is set to CM_CHAINED_TRANSACTIONS.

- CM_OPERATION_NOT_ACCEPTED
  This value indicates that the program has chosen conversation-level non-blocking for the conversation and a previous call operation is still in progress.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. If a *return_code* other than CM_OK is returned on the call, the *join_transaction* conversation characteristic remains unchanged.
2. This call can be issued only by the subordinate program of a conversation.
3. This call can be issued in all states except **Reset** and **Initialize**. It should be issued in the **Initialize_Incoming** state, so that it has an effect at the following Accept_Incoming call. In all other states, it is allowed only if the *transaction_control* characteristic has the value CM_UNCHAINED_TRANSACTION.
4. If a program wants to use CM_JOIN_EXPLICIT, it should extract the *transaction_control* characteristic after a successful Accept_Incoming call. If the value is CM_CHAINED_TRANSACTIONS, the program should join the transaction by issuing a tx_begin() call. If the value is CM_UNCHAINED_TRANSACTIONS, the program is informed with a CM_JOIN_TRANSACTION *status_received* value if it is to join the transaction. In any case, the program may first do any local work that is not to be included in the remote program's transaction before joining the transaction.
5. This call does not apply to any previous call operation still in progress.
6. This call is not associated with any conversation queue. When a conversation uses queue-level non-blocking, the call does not return CM_OPERATION_NOT_ACCEPTED on the conversation.

Related Information

"Joining a Transaction" on page 59 discusses how a program can join a transaction.

"TX Extensions for CPI Communications" on page 64 discusses the TX extensions for CPI Communications.

Set_Log_Data (CMSLD)

LU 6.2	OSI TP

Set_Log_Data (CMSLD) is used by a program to set the *log_data* and *log_data_length* characteristics for a given conversation. Set_Log_Data overrides the values that were assigned when the Initialize_Conversation, Accept_Conversation, or Initialize_For_Incoming call was issued.

The *log_data* conversation characteristic contains program-supplied information that will be sent to the remote system when an error occurs. It may be helpful in determining what caused the error condition.

Note: When an LU 6.2 CRM is being used, the *log_data* characteristic is used only on basic conversations.

Format

```
CALL CMSLD(conversation_ID,
           log_data,
           log_data_length,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

log_data *(input)*
Specifies the program-unique error information that is to be logged. The data supplied by the program is any data the program wants to have logged.

log_data_length *(input)*
Specifies the length of the program-unique error information. The length can be from 0 to 512 bytes. If zero, the *log_data_length* characteristic is set to zero (effectively setting the *log_data* characteristic to the null string), and the *log_data* parameter on this call is ignored.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_PROGRAM_PARAMETER_CHECK
  This value can be one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *conversation_type* is set to CM_MAPPED_CONVERSATION and the conversation is using an LU 6.2 CRM.
  - The *log_data_length* specifies a value less than 0 or greater than 512.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. If the *log_data* characteristic contains data (as a result of a Set_Log_Data call), log data will be sent to the remote system under any of the following conditions:
   - When the local program issues a Send_Error call and the conversation is using an LU 6.2 CRM
   - When the local program issues a Deallocate call with *deallocate_type* set to CM_DEALLOCATE_ABEND
   - When the local program issues a Send_Data call with *send_type* set to CM_SEND_AND_DEALLOCATE and *deallocate_type* set to CM_DEALLOCATE_ABEND
2. The system resets the *log_data* and *log_data_length* characteristics to their initial (null) values after sending the log data. Therefore, the *log_data* is sent to the remote system only once even though an error indication may be issued several times. See usage note 1 for conditions when log data is sent.
3. Specify *log_data* using the local system's native encoding. When the log data is displayed on the partner system, it will be displayed in that system's native encoding.
4. If a *return_code* other than CM_OK is returned on the call, the *log_data* and *log_data_length* conversation characteristics are unchanged.

Related Information

"Automatic Conversion of Characteristics" on page 39 provides further information on the automatic conversion of the *log_data* parameter.

"Send_Error (CMSERR)" on page 254 and "Deallocate (CMDEAL)" on page 140 provide further discussion on how the *log_data* characteristic is used.

Set_Mapped_Initialization_Data (CMSMID)

OSI TP

A program uses the Set_Mapped_Initialization_Data (CMSMID) call to set the *initialization_data* and *initialization_data_length* conversation characteristics to be sent to the remote program for a given conversation. The *map_name* identifies the data so the underlying map routine can properly transform it for transmission to the remote partner. Set_Mapped_Initialization_Data overrides the values that were assigned when the Initialize_Conversation, Accept_Conversation, Initialize_For_Incoming, or Accept_Incoming call was issued.

Format

```
CALL CMSMID(conversation_ID,
            map_name,
            map_name_length, initialization_data,
            initialization_data_length,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

map_name (input)
Specifies the mapping function used to encode the data record. The length of the identifier is 0 to 64 bytes.

map_name_length (input)
Specifies the length of the map_name. The length can range from 0 to 64 bytes. If the length is zero, the map_name parameter is ignored.

initialization_data *(input)*
Specifies the initialization data that is to be passed to the remote program during conversation start up.

initialization_data_length *(input)*
Specifies the length of the initialization data. If zero, the *initialization_data* parameter is ignored.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_UNKNOWN_MAP_NAME_REQUESTED
  The supplied map name is unknown to the map routine. No data was sent.
- CM_MAP_ROUTINE_ERROR
  The map routine encountered a problem with the user data. No data was sent.
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:

The conversation is not in initialize state, Receive state (for a half-duplex conversation), or **Send-Receive** state (for a full-duplex conversation).

– CM_PROGRAM_PARAMETER_CHECK
Value indicates one of the following:

- The *conversation_ID* specifies an unassigned identifier.
- The *initialization_data_length* specifies a value greater than 10000 or less than 0.
- The *conversation_type* characteristic is set to CM_BASIC_CONVERSATION.

– CM_OPERATION_NOT_ACCEPTED

– CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause any state changes.

Usage Notes

1. Initialization data is data that the program initiating a conversation, using the Initialize_Conversation call, can choose to send to the remote program. The initiator issues a Set_Mapped_Initialization Data call between the Initialize_Conversation and Allocate calls to specify the initialization to be sent by the Allocate call. The *map_name* parameter is set to identify the data so that the underlying map routine can properly handle it. Following the successful completion of either an Accept_Conversation or Accept_Incoming call, the remote program issues an Extract_Mapped_Initialization_Data call to extract the initialization data.

2. The remote program may issue a Set_Mapped_Initialization_Data call to identify data that is to be sent to the initiating program on its next call following its acceptance of the conversation. To avoid overwriting initialization data from the initiating program, the recipient must issue the Extract_Mapped_Initialization_Data call to extract the incoming initialization data before issuing the Set_Mapped_Initialization_Data call. The Set_Mapped_Initialization Data must be issued before any other call on the conversation, except Set or Extract calls. To extract the data from the remote program, the initiating program issues the Extract_Mapped_Initialization_Data call after receiving a *control_information_received* value of CM_ALLOCATE_CONFIRMED_WITH_DATA or CM_ALLOCATE_REJECTED_WITH_DATA.

3. If a *return_code* other than CM_OK is returned on the call, the *initialization_data* and *initialization_data_length* conversation characteristics remain unchanged.

4. If the map routine is unable to process the user data either because the user identified an incorrect *map_name* or the map routine encountered an error during processing the *return_code* is set appropriately. Nothing is sent nor is the conversation aborted. Control is given back to the program for appropriate action.

5. Because of the work the local map routine performs, the real amount of data sent by the CRM may be larger than 10000 bytes, even if the initialization_data_length is less than 10000. In this case the remote system may not be able to process the data. Therefore, the maximum value of

initialization_data_length depends on the map routine and the abilities of the remote system.

6. When the conversation is allocated using the LU 6.2 CRM, initialization data is sent as PIP data.

Related Information

"Extract_Initialization_Data (CMEID)" on page 165 describes the Extract_Initialization_Data call.

"Set_Initialization_Data (CMSID)" on page 305 describes the Set_Initialization_Data call.

"Extract_Mapped_Initialization_Data (CMEMID)" on page 167 describes the Extract_Mapped_Initialization_Data call.

Set_Mode_Name (CMSMN)

LU 6.2	OSI TP

Set_Mode_Name (CMSMN) is used by a program to set the *mode_name* and *mode_name_length* characteristics for a conversation. Set_Mode_Name overrides the current values that were originally acquired from the side information using the *sym_dest_name*.

Issuing this call does not change the values in the side information. It only changes the *mode_name* and *mode_name_length* characteristics for this conversation.

Note: A program cannot issue the Set_Mode_Name call after an Allocate is issued. Only the program that initiates the conversation (using the Initialize_Conversation call) can issue this call.

The *mode_name* conversation characteristic is used during conversation initialization to select a session with the appropriate attributes; such as, cost, bandwidth, and so on.

Format

```
CALL CMSMN(conversation_ID,
           mode_name,
           mode_name_length,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

mode_name *(input)*
Specifies the mode name designating the network properties for the logical connection to be allocated for the conversation. The network properties include, for example, the class of service to be used, and whether data is to be enciphered.

Note: A program may require special authority to specify some mode names. For example, SNASVCMG requires special authority with LU 6.2.

mode_name_length *(input)*
Specifies the length of the mode name. The length can be from zero to eight bytes. If zero, the mode name for this conversation is set to null and the *mode_name* parameter included with this call is not significant.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_PROGRAM_STATE_CHECK
  This value indicates that the conversation is not in **Initialize** state.
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:

  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *mode_name_length* specifies a value less than zero or greater than eight.
  - The *partner_ID* characteristic is set to a non-null value.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. Specification of a mode name that is not recognized by the system is not detected on this call. It is detected on the subsequent Allocate call.
2. Specify *mode_name* using the local system's native encoding. CPI Communications automatically converts the *mode_name* from the native encoding where necessary.
3. If a *return_code* other than CM_OK is returned on the call, the *mode_name* and *mode_name_length* conversation characteristics are unchanged.

Related Information

"Side Information" on page 21 further discusses the *mode_name* conversation characteristic.

"Automatic Conversion of Characteristics" on page 39 provides further information on the automatic conversion of the *mode_name* parameter.

"SNA Service Transaction Programs" on page 499 discusses SNA service transaction programs.

Set_Partner_ID (CMSPID)

LU 6.2	OSI TP

Programs use the Set_Partner_ID call to specify a *partner_ID* characteristic that will be used to allocate the conversation. Set_Partner_ID overrides the current values for the *partner_ID*, *partner_ID_length*, *partner_ID_type*, and *partner_ID_scope* characteristics that were originally acquired from the side information using the *sym_dest_name*.

Issuing this call does not change the information in the side information. It only changes the *partner_ID*, *partner_ID_length*, *partner_ID_type*, and *partner_ID_scope* characteristics for this conversation.

Format

```
CALL CMSPID(conversation_ID,
            partner_ID_type,
            partner_ID,
            partner_ID_length,
            partner_ID_scope,
            directory_syntax,
            directory_encoding,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation ID.

partner_ID_type *(input)*
Specifies the type of the *partner_ID* that will be used on this conversation.

The *partner_ID_type* variable can have one of the following values:

- CM_DISTINGUISHED_NAME
  The *partner_ID* variable contains a complete distinguished name CPI Communications can use to retrieve destination information from a distributed directory.
- CM_LOCAL_DISTINGUISHED_NAME
  The *partner_ID* variable contains a local distinguished name. When combined with a system-specific prefix, the local DN creates a complete DN for access of destination information from a distributed directory.
- CM_PROGRAM_FUNCTION_ID
  The *partner_ID* variable contains a program function identifier that CPI Communications can use to search the distributed directory and obtain the partner binding.

- CM_OSI_TPSU_TITLE_OID
  The *partner_ID* variable contains an object identifier for an OSI TPSU title. On systems supporting attribute_type searches, CPI Communications will search the directory for objects containing attributes with an attribute_type of TPSU_ENTRY and an attribute_value equal to the specified partner_ID.
- CM_PROGRAM_BINDING
  The *partner_ID* variable contains a program binding for the partner program. For more information on the format of a program binding, see "Program Binding" on page 429.

partner_ID *(input)*
Specifies the *partner_ID* to be used in allocating the conversation.

partner_ID_length *(input)*
Specifies the length of the *partner_ID*. The length can be from 0 to 32767 bytes. If the *partner_ID_length* is zero (effectively setting the *partner_ID* characteristic to the null string), the *partner_ID* parameter on this call is ignored.

partner_ID_scope *(input)*
Specifies the scope of the search in the use of the *partner_ID*. The *partner_ID_scope* variable only has meaning when the *partner_ID* is of type CM_DISTINGUISHED_NAME. It can have one of the following values:

- CM_EXPLICIT
  CPI Communications should only use the destination information contained in the program installation object identified by the distinguished name.
- CM_REFERENCE
  CPI Communications should access the program binding contained in the program installation object identified by the distinguished name. If CPI Communications is unable to establish a logical connection with the partner CRM using this binding, CPI Communications should use the PFID contained in the program installation object (if available) to search for and attempt to use other program installation objects.

directory_syntax *(input)*
Specifies the syntax of the distributed directory that CPI Communications will access with the *partner_ID*. This parameter is ignored if the *partner_ID_type* is CM_PROGRAM_BINDING. *directory_syntax* can have one of the following values:

- CM_DEFAULT_SYNTAX
  The DN or PFID specified can be used with a directory conforming to the default directory syntax for the implementation.
- CM_DCE_SYNTAX
  The DN or PFID specified can be used with a directory conforming to DCE directory syntax guidelines.
- CM_XDS_SYNTAX
  The DN or PFID specified can be used with a directory conforming to XDS directory syntax guidelines.
- CM_NDS_SYNTAX
  The DN or PFID specified can be used with a directory conforming to Novell's NDS directory syntax guidelines.

directory_encoding *(input)*
Specifies the encoding rule of the distributed directory that CPI Communications will access with the *partner_ID*. This parameter is ignored if the

partner_ID_type is CM_PROGRAM_BINDING. *directory_encoding* can have one of the following values:

- CM_DEFAULT_ENCODING
  The DN or PFID specified is encoded in 8-bit locally-defined format.
- CM_UNICODE_ENCODING
  The DN or PFID specified is encoded in 16-bit unicode format.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_STATE_CHECK
  This value indicates that the conversation is not in **Initialize** state.
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *partner_ID_type* parameter specifies an undefined value.
  - The *partner_ID_scope* parameter specifies an undefined value.
  - The *partner_ID_type* parameter specifies CM_PROGRAM_BINDING and the *partner_ID_length* parameter specifies a value less than 0 or greater than 32767.
  - The *partner_ID_type* parameter specifies CM_DISTINGUISHED_NAME or CM_PROGRAM_FUNCTION_ID and the *partner_ID_length* parameter specifies a value less than 0 or greater than 1024.
  - The *directory_syntax* parameter specifies an undefined value.
  - The *directory_encoding* parameter specifies an undefined value.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This program does not cause a state change.

Usage Notes

1. If the *partner_ID* variable is not null, it is used by CPI Communications to allocate the conversation. Any other destination information (specified in side information or using Set calls) is ignored.
2. If the *partner_ID* characteristic is null, the *partner_ID* characteristic will not be used to allocate the conversation. Instead, CPI Communications will use any destination information provided by side information or Set calls.
3. If a *return_code* other than CM_OK is returned on the call, the characteristics for the conversation are unchanged.
4. If the program sets *partner_ID_type* to CM_PROGRAM_FUNCTION_ID, the *partner_ID* parameter will be used as a PFID to search the distributed directory. CPI Communications uses the PFID in conjunction with a default DN. The specification of a default DN is system-specific and its use depends on the contents of the directory object pointed to:
   - If the default DN points to one of the directory objects defined in Appendix F, “CPI Communications Extensions for Use with DCE Directory,”

CPI Communications will use the contents of the object to direct its search. See “Scenarios for Use of CNSI” on page 550 for examples.

- If the default DN does not point to a directory object recognized by CPI Communications, the default DN will be used as a starting point for a search of the directory tree for objects containing a PFID with a value equal to the value specified in *partner_ID*.

5. **Note to Implementers:** As a performance aid, implementations may begin concurrent access of the directory after the program provides a *partner_ID* (either via side information or the Set_Partner_ID call) but before the program issues an Allocate call. This optimization does not affect the Set_Partner_ID call (it does not block) and the program will be unable to extract any retrieved directory information until after the Allocate. An Extract_Partner_ID call issued before the Allocate will only return the *partner_ID* information set by the program.

Related Information

“Distributed Directory” on page 22 explains the terms and concepts required for use of a distributed directory.

“Example 14: Using the Distributed Directory to Find the Partner Program” on page 94 provides a sample scenario of a program using the Set_Partner_ID call.

“Extract_Partner_ID (CMEPID)” on page 174 can be used to extract the *partner_ID* characteristic.

“Program Binding” on page 429 describes the format of a program binding.

Set_Partner_LU_Name (CMSPLN)

LU 6.2

Set_Partner_LU_Name (CMSPLN) is used by a program to set the *partner_LU_name* and *partner_LU_name_length* characteristics for a conversation. Set_Partner_LU_Name overrides the current values that were originally acquired from the side information using the *sym_dest_name*.

Issuing this call does not change the information in the side information. It only changes the *partner_LU_name* and *partner_LU_name_length* characteristics for this conversation.

The *partner_lu_name* conversation characteristic contains the SNA LU name that identifies the location of the remote program. It may be set by the conversation initiator to identify the location of the remote program.

Notes:

1. A program cannot issue Set_Partner_LU_Name after an Allocate call is issued. Only the program that initiated the conversation (issued the Initialize_Conversation call) can issue Set_Partner_LU_Name.
2. The *partner_LU_name* characteristic is used only by an LU 6.2 CRM.

Format

```
CALL CMSPLN(conversation_ID,
            partner_LU_name,
            partner_LU_name_length,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

partner_LU_name *(input)*
Specifies the name of the remote LU at which the remote program is located. This LU name is any name by which the local system knows the remote LU for purposes of allocating a conversation.

partner_LU_name_length *(input)*
Specifies the length of the partner LU name. The length can be from 1 to 17 bytes.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.

  - The *partner_LU_name_length* is set to a value less than 1 or greater than 17.
  - The *partner_ID* characteristic is set to a non-null value.
- CM_PROGRAM_STATE_CHECK
  This value indicates that the conversation is not in **Initialize** state.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. Specify *partner_LU_name* using the local system's native encoding. CPI Communications automatically converts the *partner_LU_name* from the native encoding where necessary.
2. If a *return_code* other than CM_OK is returned on the call, the *partner_LU_name* and *partner_LU_name_length* conversation characteristics are unchanged.

Related Information

"Side Information" on page 21 and notes 4 and 5 of Table 21 on page 422 provide further discussion of the *partner_LU_name* conversation characteristic.

"Automatic Conversion of Characteristics" on page 39 provides further information on the automatic conversion of the *partner_LU_name* parameter.

Set_Prepare_Data_Permitted (CMSPDP)

OSI TP

Set_Prepare_Data_Permitted (CMSPDP) is used by a program to set the *prepare_data_permitted* characteristic for a given conversation. Set_Prepare_Data_Permitted overrides the value that was assigned when the Initialize_Conversation call was issued. The subordinate program on the conversation cannot issue the Set_Prepare_Data_Permitted call.

The superior program uses the Set_Prepare_Data Permitted call to indicate whether the subordinate may send data following receipt of a *take_commit* notification.

Note: The *prepare_data_permitted* characteristic is used only by an OSI TP CRM and only for a half-duplex conversation.

Format

```
CALL CMSPDP(conversation_ID,
            prepare_data_permitted,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

prepare_data_permitted *(input)*
Specifies whether the superior program wants to allow the subordinate to send data following the receipt of a take-commit notification. The *prepare_data_permitted* variable can have one of the following values:

- CM_PREPARE_DATA_NOT_PERMITTED
  Specifies the subordinate will not be permitted to send data following the receipt of a take-commit notification.
- CM_PREPARE_DATA_PERMITTED
  Specifies the subordinate will be permitted to send data following the receipt of a take-commit notification.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned identifier.
  - The *prepare_data_permitted* specifies CM_PREPARE_DATA_PERMITTED and the conversation is using an LU 6.2 CRM.
  - The *prepare_data_permitted* specifies an undefined value.
  - The *sync_level* is set to CM_NONE or CM_CONFIRM.
  - The program is not the superior for the conversation.
- CM_PROGRAM_STATE_CHECK

This value indicates that the conversation is in **Initialize-Incoming** state.

- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause any state changes.

Usage Notes

1. If a *return_code* other than CM_OK is returned on the call, the *prepare_data_permitted* conversation characteristic remains unchanged.
2. When the Prepare call is issued with the *prepare_data_permitted* characteristic set to CM_PREPARE_DATA_PERMITTED, the subordinate program is notified that it is permitted to send data through a take-commit notification that ends in a *status_received* value of CM_TAKE_COMMIT_DATA_OK, CM_TAKE_COMMIT_SEND_DATA_OK, or CM_TAKE_COMMIT_DEALLOC_DATA_OK.

Related Information

See “Prepare (CMPREP)” on page 201 for a description of the Prepare call.

Set_Prepare_To_Receive_Type (CMSPTR)

LU 6.2	OSI TP

Set_Prepare_To_Receive_Type (CMSPTR) is used by a program to set the *prepare_to_receive_type* characteristic for a conversation. This call overrides the value that was assigned when the Initialize_Conversation, Accept_Conversation, or Initialize_For_Incoming call was issued.

Programs use the Set_Prepare_To_Receive_Type call to identify any additional CPI-C functions (such as, Flush and Confirm) that are to be done in conjunction with the Prepare_To_Receive call.

Note: The *prepare_to_receive_type* characteristic is used only for a half-duplex conversation.

Format

```
CALL CMSPTR(conversation_ID,
            prepare_to_receive_type,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

prepare_to_receive_type *(input)*
Specifies the type of prepare-to-receive processing to be performed for this conversation. The *prepare_to_receive_type* variable can have one of the following values:

- CM_PREP_TO_RECEIVE_SYNC_LEVEL
  Perform the prepare-to-receive based on one of the following *sync_level* settings:
  - If *sync_level* is set to CM_NONE, or if *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM but the conversation is not currently included in a transaction, execute the function of the Flush call and enter **Receive** state.
  - If *sync_level* is set to CM_CONFIRM, or if *sync_level* is set to CM_SYNC_POINT but the conversation is not currently included in a transaction, execute the function of the Confirm call and if successful (as indicated by a return code of CM_OK on the Prepare_To_Receive call, or a return code of CM_OK on the Send_Data call with *send_type* set to CM_SEND_AND_PREP_TO_RECEIVE), enter **Receive** state. If Confirm is not successful, the state of the conversation is determined by the return code.
  - If *sync_level* is set to CM_SYNC_POINT and the conversation is included in a transaction, enter **Defer-Receive** state until the program issues a resource recovery commit or backout call, or until the program issues a Confirm or Flush call for this conversation. If the commit or Confirm call is successful or if a Flush call is issued, the conversation then enters **Receive** state. If the backout call is successful, the conversation

returns to its state at the previous sync point. Otherwise, the state of the conversation is determined by the return code.
  - If *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM, and the conversation is included in a transaction, enter **Defer-Receive** state until the program issues a resource recovery commit or backout call, or until the program issues a Flush call for this conversation. If the commit call is successful or if a Flush call is issued, the conversation then enters **Receive** state. If the backout call is successful, the conversation returns to its state at the previous sync point. Otherwise, the state of the conversation is determined by the return code.
- CM_PREP_TO_RECEIVE_FLUSH
  Execute the function of the Flush call and enter **Receive** state.
- CM_PREP_TO_RECEIVE_CONFIRM
  Execute the function of the Confirm call and if successful (as indicated by a return code of CM_OK on the Prepare_To_Receive call, or a return code of CM_OK on the Send_Data call with *send_type* set to CM_SEND_AND_PREP_TO_RECEIVE), enter **Receive** state. If it is not successful, the state of the conversation is determined by the return code.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *prepare_to_receive_type* is set to an undefined value.
  - The *prepare_to_receive_type* is CM_PREP_TO_RECEIVE_CONFIRM, but the conversation is assigned with *sync_level* set to CM_NONE or CM_SYNC_POINT_NO_CONFIRM.
  - The *send_receive_mode* of the conversation is CM_FULL_DUPLEX.
- CM_PROGRAM_STATE_CHECK
  This value indicates that the conversation is in **Initialize-Incoming** state.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

If a *return_code* other than CM_OK is returned on the call, the *prepare_to_receive_type* conversation characteristic is unchanged.

Related Information

"Example 4: The Receiving Program Changes the Data Flow Direction" on page 74 shows an example program using the Prepare_To_Receive call.

"Prepare_To_Receive (CMPTR)" on page 204 discusses how the *prepare_to_receive_type* is used.

Set_Processing_Mode (CMSPM)

LU 6.2	OSI TP

A program uses the Set_Processing_Mode (CMSPM) call to set the *processing_mode* characteristic of a conversation. The *processing_mode* characteristic indicates whether CPI Communications calls on the specified conversation are to be processed in blocking or conversation-level non-blocking mode. Set_Processing_Mode overrides the default value of CM_BLOCKING that was assigned when the Initialize_Conversation, Initialize_For_Incoming, or Accept_Conversation call was issued. The processing mode of a conversation cannot be changed prior to the completion of all previous call operations on that conversation.

Note: The *processing_mode* characteristic is used only for a half-duplex conversation.

Format

```
CALL CMSPM(conversation_ID,
           processing_mode,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

processing_mode *(input)*
Specifies the processing mode to be used for this conversation. *processing_mode* can have one of the following values:

- CM_BLOCKING
  Specifies that calls will be processed in blocking mode. Calls complete before control is returned to the program. The CM_OPERATION_INCOMPLETE return code will not be returned on this conversation.
- CM_NON_BLOCKING
  Specifies that calls will be processed in conversation-level non-blocking mode. If possible, the calls complete immediately. When a call operation cannot complete immediately, CPI Communications returns control to the program with the CM_OPERATION_INCOMPLETE return code. The operation proceeds without blocking the program.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *processing_mode* specifies an undefined value.
  - The *send_receive_mode* of the conversation is CM_FULL_DUPLEX.

  - The program has chosen queue-level non-blocking for the conversation.
- CM_OPERATION_NOT_ACCEPTED
  This value indicates that a previous call operation on the conversation is still in progress.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause any state changes.

Usage Notes

1. A program can choose to use conversation-level non-blocking by issuing the Set_Processing_Mode call to set the *processing_mode* characteristic to CM_NON_BLOCKING for a conversation. The processing mode applies to all the subsequent calls on that conversation until it is set otherwise or the conversation ends.
2. If a *return_code* other than CM_OK is returned on the call, the *processing_mode* conversation characteristic is unchanged.
3. When CM_OPERATION_INCOMPLETE is returned from any of the calls listed in Table 6 on page 46, the call operation has not completed. The operation proceeds without blocking the program. The data and buffer areas used in the call are in an indeterminate state and should not be referenced until the operation is completed. For conversations using conversation-level non-blocking, the Wait_For_Conversation call is used to determine when an operation is completed. Each call to Wait_For_Conversation will return the conversation identifier and return code (the *conversation_return_code* value) of a completed operation. It is the responsibility of the program to keep track of the operation being performed by each conversation in order to be able to properly interpret the *conversation_return_code* value.

   If programs place the Wait_For_Conversation call in a procedure other than the accompanying CPI-C call that returned CM_OPERATION_INCOMPLETE, all parameters of that CPI-C call must be in global storage and not in automatic storage. This is important even for parameters the program does not use. For example, if the partner program will never use any call that results in a control_information_received value, other than CM_NO_CONTROL_INFO_RECEIVED, the local program still has to place the *control_information_received* parameter of the Receive call in global storage.
4. Not all language processors support the use of non-blocking operations. See "Programming Language Considerations" on page 108 for language processor restrictions on the use of non-blocking operations.

Related Information

"Concurrent Operations" on page 42 discusses the use of concurrent operations and conversation queues.

"Non-Blocking Operations" on page 45 discusses the use of non-blocking operations.

"Example 13: Accepting Multiple Conversations Using Conversation-Level Non-Blocking Calls" on page 92 shows an example of a program that uses conversation-level non-blocking calls to accept multiple incoming half-duplex conversations.

"Set_Queue_Callback_Function (CMSQCF)" on page 329 describes how to set a callback function and related information for a conversation queue.

"Set_Queue_Processing_Mode (CMSQPM)" on page 332 describes how to set the processing mode for a conversation queue.

"Wait_For_Conversation (CMWAIT)" on page 359 describes the use of Wait_For_Conversation to wait for completion of a conversation-level outstanding operation.

Set_Queue_Callback_Function (CMSQCF)

LU 6.2	OSI TP

Set_Queue_Callback_Function (CMSQCF) is used to set a callback function and a user field for a given conversation queue and to set the queue's processing mode to CM_NON_BLOCKING.

Format

```
CALL CMSQCF(conversation_ID,
            conversation_queue,
            callback_function,
            user_field,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

conversation_queue *(input)*
Specifies the conversation queue on which completion of a call operation will invoke the callback function. The *conversation_queue* can have one of the following values:

- CM_INITIALIZATION_QUEUE
- CM_SEND_QUEUE
- CM_RECEIVE_QUEUE
- CM_SEND_RECEIVE_QUEUE
- CM_EXPEDITED_SEND_QUEUE
- CM_EXPEDITED_RECEIVE_QUEUE

callback_function *(input)*
Specifies a callback function to be set for the identified queue.

user_field *(input)*
Specifies a user field to be associated with the identified queue.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* contains an unassigned conversation identifier.
  - The *conversation_queue* specifies a value that is not defined for the *send_receive_mode* conversation characteristic.
  - The program has chosen conversation-level non-blocking for the conversation.
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:

  - The *conversation_queue* parameter is set to CM_INITIALIZATION_QUEUE, and the conversation is not in **Initialize** or **Initialize-Incoming** state.
  - The *conversation_queue* parameter is set to CM_SEND_QUEUE, CM_RECEIVE_QUEUE, CM_SEND_RECEIVE_QUEUE, CM_EXPEDITED_SEND_QUEUE, or CM_EXPEDITED_RECEIVE_QUEUE, and the conversation is in **Initialize-Incoming** state.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. Because of requiring support of passing a callback function as a parameter, the call is supported by the C programming language only.
2. A program can choose to use queue-level non-blocking by issuing the Set_Queue_Callback_Function call (or the Set_Queue_Processing_Mode call) for a conversation queue. When the call completes successfully, the *processing_mode* characteristic becomes meaningless to the conversation.
3. The call is associated with the queue specified in the *conversation_queue* parameter.
4. The program can issue the call for a conversation queue that is defined for the current send-receive mode. The defined queues for each send-receive mode are listed in Table 14 on page 333 under the "Usage Notes" for the Set_Queue_Processing_Mode call.

   In the special case when the conversation is in **Initialize-Incoming** state, the *send_receive_mode* characteristic has no defined value. The program can issue the call only for the Initialization queue.
5. Until the program sets the processing mode for a conversation queue (or chooses conversation-level non-blocking), all the calls associated with that queue are processed in blocking mode.
6. The call sets the processing mode of the identified queue to CM_NON_BLOCKING. The processing mode applies to all subsequent calls to the queue until the processing mode is set to CM_BLOCKING using a Set_Queue_Processing_Mode (CMSQPM) call or the conversation ends.
7. Once set for the identified queue, the callback function and user field will be associated with all subsequent outstanding operations on the queue until they are set differently, a Set_Queue_Processing_Mode (CMSQPM) call is issued, or the conversation ends.
8. When CM_OPERATION_INCOMPLETE is returned from any of the calls listed in Table 6 on page 46, the call operation has not completed. The operation proceeds without blocking the program. The data and buffer areas used in the call are in an indeterminate state and should not be referenced until the operation is completed.
9. A callback function is a user-defined routine and has two input parameters, *user_field* and *call_ID*. It is used to handle completion of an outstanding operation.

If a callback function is set for a conversation queue, the function is invoked when an outstanding operation on the queue completes. The user field, as specified by the program, and call ID for the completed operation can then be passed to the callback function.

Note: An exception is the Microsoft Windows** environment. The *callback_function* parameter is ignored in Windows, and the *user_field* parameter contains a pointer to a structure of type `MSG`, as defined by Windows. The structure contains at least a window handle, message number, word value, and doubleword value. When an outstanding operation completes, CPI Communications will use these fields as parameters to call the Windows `PostMessage` function. Upon catching the message, the program can then invoke a routine (taking the word value and doubleword value as input) to handle the completion of the outstanding operation.

Related Information

"Concurrent Operations" on page 42 discusses the use of concurrent operations and conversation queues.

"Non-Blocking Operations" on page 45 discusses the use of non-blocking operations.

"Set_Queue_Processing_Mode (CMSQPM)" on page 332 describes how to set the processing mode for a conversation queue.

"Wait_For_Completion (CMWCMP)" on page 356 describes the use of Wait_For_Completion to wait for completion of an outstanding operation on a conversation queue.

Set_Queue_Processing_Mode (CMSQPM)

LU 6.2	OSI TP

Set_Queue_Processing_Mode (CMSQPM) is used to set the processing mode for a given conversation queue. When the *queue_processing_mode* is set to CM_NON_BLOCKING, this call also associates an outstanding-operation identifier (OOID) and a user field with the queue.

Format

```
CALL CMSQPM(conversation_ID,
            conversation_queue,
            queue_processing_mode,
            user_field,
            OOID,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

conversation_queue *(input)*
Specifies the conversation queue for which the processing mode is to be set by this call. *conversation_queue* can have one of the following values:

- CM_INITIALIZATION_QUEUE
- CM_SEND_QUEUE
- CM_RECEIVE_QUEUE
- CM_SEND_RECEIVE_QUEUE
- CM_EXPEDITED_SEND_QUEUE
- CM_EXPEDITED_RECEIVE_QUEUE

queue_processing_mode *(input)*
Specifies the processing mode to be used for the identified queue. *queue_processing_mode* can have one of the following values:

- CM_BLOCKING
- CM_NON_BLOCKING

user_field *(input)*
Specifies a user field to be associated with the identified queue, when *queue_processing_mode* is set to CM_NON_BLOCKING.

OOID *(output)*
Specifies an outstanding operation identifier assigned to the identified queue, when *queue_processing_mode* is set to CM_NON_BLOCKING.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_PARAMETER_CHECK

This value indicates one of the following:
  - The *conversation_ID* contains an unassigned conversation identifier.
  - The *conversation_queue* specifies a value that is not defined for the *send_receive_mode* conversation characteristic.
  - The *queue_processing_mode* specifies an undefined value.
  - The program has chosen conversation-level non-blocking for the conversation.
- CM_PROGRAM_STATE_CHECK
  This value indicates one of the following:
  - The *conversation_queue* parameter is set to CM_INITIALIZATION_QUEUE, and the conversation is not in **Initialize** or **Initialize-Incoming** state.
  - The *conversation_queue* parameter is set to CM_SEND_QUEUE, CM_RECEIVE_QUEUE, CM_SEND_RECEIVE_QUEUE, CM_EXPEDITED_SEND_QUEUE, or CM_EXPEDITED_RECEIVE_QUEUE, and the conversation is in **Initialize-Incoming** state.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. A program can choose to use queue-level non-blocking by issuing the Set_Queue_Processing_Mode call (or the Set_Queue_Callback_Function call) for a conversation queue. When the call completes successfully, the *processing_mode* characteristic becomes meaningless to the conversation.
2. The call is associated with the queue specified in the *conversation_queue* parameter.
3. The program can issue the call for a conversation queue that is defined for the current send-receive mode. The defined queues for each send-receive mode are listed in Table 14.

   In the special case when the conversation is in **Initialize-Incoming** state, the *send_receive_mode* characteristic has no defined value. The program can issue the call only for the Initialization queue.

   Table 14. Full-Duplex and Half-Duplex Conversation Queues

Send-Receive Mode	Conversation Queues
Full-Duplex	Initialization Send Receive Expedited-Send Expedited-Receive
Half-Duplex	Initialization Send-Receive Expedited-Send Expedited-Receive

4. Until the program sets the processing mode for a conversation queue (or chooses conversation-level non-blocking), all the calls associated with that queue are processed in blocking mode.

5. If a return code other than CM_OK is returned on the call, the processing mode of the specified queue is unchanged.
6. Once a processing mode is set for a conversation queue, the processing mode applies to all the subsequent calls associated with the queue until it is set differently using the call or until the conversation ends.
7. If the queue processing mode is CM_BLOCKING, no OOID is returned on the call. Therefore, the program should ignore the *OOID* parameter.
8. If the queue processing mode is CM_NON_BLOCKING, an OOID is returned on the call. The OOID will be associated with all subsequent outstanding operations on the queue until the processing mode is set to CM_BLOCKING, a Set_Queue_Callback_Function (CMSQCF) call is issued, or the conversation ends.
9. When the program issues the call for a conversation queue and sets the queue processing mode to CM_NON_BLOCKING for the first time, an OOID is created and set for the queue. The OOID remains with the queue until the conversation ends. Even if the queue processing mode changes several times or a Set_Queue_Callback_Function (CMSQCF) call is issued during the conversation, each Set_Queue_Processing_Mode call to return to CM_NON_BLOCKING reactivates the same OOID for that queue.
10. When CM_OPERATION_INCOMPLETE is returned from any of the calls listed in Table 6 on page 46, the call operation has not completed. The operation proceeds without blocking the program. The data and buffer areas used in the call are in an indeterminate state and should not be referenced until the operation is completed. For conversations using the Set_Queue_Processing_Mode call, the Wait_For_Completion call or a callback function is used to determine when an outstanding operation is completed.
11. The program may specify a user field on the call when the queue processing mode is CM_NON_BLOCKING. If the program chooses to do so, the user field will be associated with the identified queue along with an OOID. The user field specified by the program will be returned on the *user_field_list* parameter of the Wait_For_Completion (CMWCMP) call when an outstanding operation with the OOID has completed.

Related Information

"Concurrent Operations" on page 42 discusses the use of concurrent operations and conversation queues.

"Non-Blocking Operations" on page 45 discusses the use of non-blocking operations.

"Example 11: Queue-Level Non-Blocking" on page 88 shows an example of a program that uses queue-level non-blocking.

"Set_Queue_Callback_Function (CMSQCF)" on page 329 describes how to set a callback function and related information for a conversation queue.

"Wait_For_Completion (CMWCMP)" on page 356 describes the use of Wait_For_Completion to wait for completion of an outstanding operation on a conversation queue.

Set_Receive_Type (CMSRT)

LU 6.2	OSI TP

Set_Receive_Type (CMSRT) is used by a program to set the *receive_type* characteristic for a conversation. Set_Receive_Type overrides the value that was assigned when the Initialize_Conversation, Accept_Conversation, or Initialize_For_Incoming call was issued.

Programs use the Set_Receive_Type call to indicate whether the Receive call will return immediately when no data is available, or wait for data to be received.

Format

```
CALL CMSRT(conversation_ID,
           receive_type,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

receive_type *(input)*
Specifies the type of receive to be performed. The *receive_type* variable can have one of the following values:

- CM_RECEIVE_AND_WAIT
  The Receive call is to wait for information to arrive on the specified conversation. If information is already available, the program receives it without waiting.
- CM_RECEIVE_IMMEDIATE
  The Receive call is to receive any information that is available from the specified conversation, but is not to wait for information to arrive.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *receive_type* specifies an undefined value.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

If a *return_code* other than CM_OK is returned on the call, the *receive_type* conversation characteristic is unchanged.

Related Information

"Example 3: The Sending Program Changes the Data Flow Direction" on page 72 discusses how a program can use Set_Receive_Type with a value of CM_RECEIVE_IMMEDIATE.

"Receive (CMRCV)" on page 209 discusses how the *receive_type* characteristic is used.

"Receive_Mapped_Data (CMRCVM)" on page 226 discusses how a program is used to receive mapped partner data.

Set_Return_Control (CMSRC)

LU 6.2	OSI TP

Set_Return_Control (CMSRC) is used to set the *return_control* characteristic for a given conversation. Set_Return_Control overrides the value that was assigned when the Initialize_Conversation call was issued.

Note: A program cannot issue the Set_Return_Control call after an Allocate has been issued for a conversation. Only the program that initiates the conversation (with the Initialize_Conversation call) can issue this call.

The conversation initiator uses the Set_Return_Control call to indicate whether the Allocate call will return before the conversation is assigned to a session, or wait until a session is available.

Format

```
CALL CMSRC(conversation_ID,
           return_control,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

return_control *(input)*
Specifies when a program receives control back after issuing a call to Allocate. The *return_control* can have one of the following values:

- CM_WHEN_SESSION_ALLOCATED
  Allocate a logical connection for the conversation before returning control to the program.
- CM_IMMEDIATE

  Allocate a logical connection for the conversation if a logical connection is immediately available and return control to the program with one of the following return codes indicating whether or not a logical connection is allocated.
  - A return code of CM_OK indicates a logical connection was immediately available and has been allocated for the conversation. A logical connection is immediately available when it is active; the logical connection is not allocated to another conversation; and, for an LU 6.2 CRM, the local system is the contention winner for the logical connection.
  - A return code of CM_UNSUCCESSFUL indicates a logical connection is not immediately available. Allocation is not performed.
- CM_WHEN_CONWINNER_ALLOCATED
  Allocate a contention winner session for the conversation before returning control to the program.
- CM_WHEN_SESSION_FREE
  Allocate a session for the conversation if a session is available. If no session is available, the local program is willing to wait for session

activation. If a session cannot be activated and there are no outstanding session activation requests to satisfy this Allocate, control returns to the program with a return code of CM_ALLOCATE_FAILURE_RETRY.

Table 15. Return Control Options

Return_control value	Con-winner acceptable	Con-loser acceptable	Wait expected
CM_WHEN_SESSION_ALLOCATED	Yes	Yes	Yes, indefinitely
CM_WHEN_CONWINNER_ALLOCATED	Yes	No	Yes, indefinitely
CM_WHEN_SESSION_FREE	Yes	Yes	Yes, while there are outstanding session activation requests
CM_IMMEDIATE	Yes	No	No

return_code *(output)*

Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_PROGRAM_STATE_CHECK
  This value indicates that the conversation is not in **Initialize** state.
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *return_control* specifies an undefined value.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. An allocation error resulting from the local system's failure to obtain a logical connection for the conversation is reported on the Allocate call. An allocation error resulting from the remote system's rejection of the conversation startup request is reported on a subsequent conversation call.
2. For an LU 6.2 CRM, two systems connected by a logical connection may both attempt to allocate a conversation on the logical connection at the same time. This is called contention. Contention is resolved by making one system the contention winner of the session and the other system the contention loser of the session. The contention-winner system allocates a conversation on a session without asking permission from the contention-loser system. Conversely, the contention-loser system requests permission from the contention-winner system to allocate a conversation on the session, and the contention-winner system either grants or rejects the request. For more information, see *SNA Transaction Programmer's Reference Manual for LU Type 6.2*.

   Contention may result in a CM_UNSUCCESSFUL return code for programs specifying CM_IMMEDIATE.

3. The program can modify the function of the Allocate call by specifying a *return_control* characteristic of CM_IMMEDIATE. The result is that control is returned to the program immediately if no session is available. Use of the distributed directory for destination information makes it impossible to guarantee a similar level of function because the CPI Communications implementation's call to the distributed directory might itself make use of a resource that is not immediately available.

   Programs requiring immediate return of control on the Allocate call should consider using non-blocking function, or accessing the directory directly and providing the information as a program binding to CPI Communications using the Set_Partner_ID call.

4. If a *return_code* other than CM_OK is returned on the call, the *return_control* conversation characteristic is unchanged.

Related Information

"Allocate (CMALLC)" on page 121 provides more discussion on the use of the *return_control* characteristic in allocating a conversation.

Set_Send_Receive_Mode (CMSSRM)

LU 6.2	OSI TP

The Set_Send_Receive_Mode (CMSSRM) call is used by a program to set the *send_receive_mode* characteristic for a conversation. Set_Send_Receive_Mode overrides the value that was assigned when the Initialize_Conversation call was issued.

The *send_receive_mode* conversation characteristic indicates whether the conversation is using half-duplex or full-duplex mode for data transmission. It may be set by the conversation initiator.

Note: A program cannot issue Set_Send_Receive_Mode after an Allocate call is issued. Only the program that initiated the conversation (issued the Initialize_Conversation call) can issue Set_Send_Receive_Mode.

Format

```
CALL CMSSRM(conversation_ID,
            send_receive_mode,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

send_receive_mode *(input)*
Specifies the send-receive mode of the conversation.

The *send_receive_mode* variable can have one of the following values:

- CM_HALF_DUPLEX
  Specifies the allocation of a half-duplex conversation.
- CM_FULL_DUPLEX
  Specifies the allocation of a full-duplex conversation.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_STATE_CHECK
  This value indicates that the program is not in **Initialize** state.

- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *send_receive_mode* specifies an undefined value.
  - The *sync_level* is set to CM_CONFIRM or CM_SYNC_POINT, and *send_receive_mode* is set to CM_FULL_DUPLEX.
  - The *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM, the conversation is using a LU 6.2 CRM, and the *send_receive_mode* specifies CM_HALF_DUPLEX.
  - The *send_type* is set to CM_SEND_AND_CONFIRM or CM_SEND_AND_PREP_TO_RECEIVE, and *send_receive_mode* is set to CM_FULL_DUPLEX.
  - The *deallocate_type* is set to CM_DEALLOCATE_CONFIRM, the conversation is using a LU 6.2 CRM, and the *send_receive_mode* specifies CM_FULL_DUPLEX.
  - The program has selected conversation-level non-blocking by issuing Set_Processing_Mode successfully, and *send_receive_mode* is set to CM_FULL_DUPLEX.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. If a *return_code* other than CM_OK is returned on the call, the *send_receive_mode* characteristic is unchanged.
2. Set_Send_Receive_Mode overrides the value assigned with the Initialize_Conversation call and can only be issued when the program is in **Initialize** state.

Related Information

"Send-Receive Modes" on page 15 provides more information on the differences between half-duplex and full-duplex conversations.

"Example 8: Establishing a Full-Duplex Conversation" on page 82 shows an example of how a full-duplex conversation is set up.

"Extract_Send_Receive_Mode (CMESRM)" on page 184 tells how to determine the send-receive mode used for a conversation.

Set_Send_Type (CMSST)

LU 6.2	OSI TP

Set_Send_Type (CMSST) is used by a program to set the *send_type* characteristic for a conversation. Set_Send_Type overrides the value that was assigned when the Initialize_Conversation, Accept_Conversation, or Initialize_For_Incoming call was issued.

Programs use the Set_Send_Type call to identify any additional CPI-C functions (such as, Flush and Confirm) to be done following the transferring of the data to the buffer.

Format

```
CALL CMSST(conversation_ID,
           send_type,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

send_type *(input)*
Specifies what, if any, information is to be sent to the remote program in addition to the data supplied on the Send_Data call, and whether the data is to be sent immediately or buffered.

The *send_type* variable can have one of the following values:

- CM_BUFFER_DATA
  No additional information is to be sent to the remote program. Further, the supplied data might not be sent immediately but, instead, might be buffered until a sufficient quantity is accumulated.
- CM_SEND_AND_FLUSH
  No additional information is to be sent to the remote program. However, the supplied data is sent immediately rather than buffered. Send_Data with *send_type* set to CM_SEND_AND_FLUSH is functionally equivalent to a Send_Data with *send_type* set to CM_BUFFER_DATA followed by a Flush call.
- CM_SEND_AND_CONFIRM (half-duplex conversations only)
  The supplied data is to be sent to the remote program immediately, along with a request for confirmation. Send_Data with *send_type* set to CM_SEND_AND_CONFIRM is functionally equivalent to Send_Data with *send_type* set to CM_BUFFER_DATA followed by a Confirm call.
- CM_SEND_AND_PREP_TO_RECEIVE (half-duplex conversations only)
  The supplied data is to be sent to the remote program immediately, along with send control of the conversation. Send_Data with *send_type* set to CM_SEND_AND_PREP_TO_RECEIVE is functionally equivalent to Send_Data with *send_type* set to CM_BUFFER_DATA followed by a Prepare_To_Receive call. The action depends on the value of the *prepare_to_receive_type* characteristic for the conversation.
- CM_SEND_AND_DEALLOCATE

The supplied data is to be sent to the remote program immediately, along with a deallocation notification. Send_Data with *send_type* set to CM_SEND_AND_DEALLOCATE is functionally equivalent to Send_Data with *send_type* set to CM_BUFFER_DATA followed by a call to Deallocate. The action depends on the value of the *deallocate_type* characteristic for the conversation.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *send_type* is set to CM_SEND_AND_CONFIRM and the conversation is assigned with *sync_level* set to CM_NONE or CM_SYNC_POINT_NO_CONFIRM.
  - The *send_type* specifies an undefined value.
  - The *send_type* is set to CM_SEND_AND_CONFIRM or CM_SEND_AND_PREP_TO_RECEIVE and the *send_receive_mode* is set to CM_FULL_DUPLEX.
- CM_PROGRAM_STATE_CHECK
  This value indicates the conversation is in **Initialize-Incoming** state.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

If a *return_code* other than CM_OK is returned on the call, the *send_type* conversation characteristic is unchanged.

Related Information

"Example 4: The Receiving Program Changes the Data Flow Direction" on page 74 shows an example program flow using the Set_Send_Type call.

"Send_Data (CMSEND)" on page 244 discusses how the *send_type* characteristic is used by Send_Data.

"Send_Mapped_Data (CMSNDM)" on page 266 discusses how a program sends mapped data to its partner.

The same function of a call to Send_Data with different values of the *send_type* conversation characteristic in effect can be achieved by combining Send_Data with other calls:

- "Confirm (CMCFM)" on page 130
- "Deallocate (CMDEAL)" on page 140
- "Flush (CMFLUS)" on page 192
- "Prepare_To_Receive (CMPTR)" on page 204

Set_Sync_Level (CMSSL)

LU 6.2	OSI TP

Set_Sync_Level (CMSSL) is used by a program to set the *sync_level* characteristic for a given conversation. The *sync_level* characteristic is used to specify the level of synchronization processing between the two programs. It determines whether the programs support no synchronization, confirmation-level synchronization (using the Confirm and Confirmed CPI Communications calls), or sync-point-level synchronization (using the calls of a resource recovery interface). Set_Sync_Level overrides the value that was assigned when the Initialize_Conversation call was issued.

The *sync_level* conversation characteristic indicates the level of synchronization services provided on the conversation. It may be set by the conversation initiator.

Note: A program cannot use the Set_Sync_Level call after an Allocate has been issued. Only the program that initiates a conversation (using the Initialize_Conversation call) can issue this call.

Format

```
CALL CMSSL(conversation_ID,
           sync_level,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

sync_level *(input)*
Specifies the synchronization level that the local and remote programs can use on this conversation. The *sync_level* can have one of the following values:

- CM_NONE
  The programs will not perform confirmation or sync point processing on this conversation. The programs will not issue any calls or recognize any returned parameters relating to synchronization.
- CM_CONFIRM (half-duplex conversations only)
  The programs can perform confirmation processing on this conversation. The programs can issue calls and recognize returned parameters relating to confirmation.
- CM_SYNC_POINT (half-duplex conversations only)

  The programs can perform sync point processing on this conversation. The programs can issue resource recovery interface calls and will recognize returned parameters relating to resource recovery processing. The programs can also perform confirmation processing.
- CM_SYNC_POINT_NO_CONFIRM

  The programs can perform sync point processing on this conversation. The programs can issue resource recovery interface calls and will recognize returned parameters relating to resource recovery processing. The programs cannot perform confirmation processing.

Note: If the conversation is using an OSI TP CRM, confirmation of the deallocation of the conversation can be performed with any *sync_level* value.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_PARM_VALUE_NOT_SUPPORTED
  This value indicates that the *sync_level* specifies CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM and the value is not supported by the local system.
- CM_PROGRAM_STATE_CHECK
  This value indicates that the conversation is not in **Initialize** state.
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *sync_level* specifies CM_NONE, the *deallocate_type* is set to CM_DEALLOCATE_CONFIRM, and the conversation is using an LU 6.2 CRM.
  - The *sync_level* specifies CM_NONE, the *send_receive_mode* is set to CM_HALF_DUPLEX, and the *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_CONFIRM.
  - The *sync_level* specifies CM_NONE or CM_SYNC_POINT_NO_CONFIRM, the *send_receive_mode* is set to CM_HALF_DUPLEX, and the *send_type* is set to CM_SEND_AND_CONFIRM.
  - The *sync_level* specifies CM_CONFIRM or CM_SYNC_POINT and the *send_receive_mode* is set to CM_FULL_DUPLEX.
  - The *sync_level* specifies CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, the *deallocate_type* is set to CM_DEALLOCATE_FLUSH or CM_DEALLOCATE_CONFIRM, and the conversation is using an LU 6.2 CRM.
  - The *sync_level* specifies CM_SYNC_POINT_NO_CONFIRM, the *send_receive_mode* is set to CM_HALF_DUPLEX, and the conversation is using an LU 6.2 CRM.
  - The *sync_level* specifies an undefined value.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

If a *return_code* other than CM_OK is returned on the call, the *sync_level* conversation characteristic is unchanged.

Related Information

"Confirm (CMCFM)" on page 130 and "Confirmed (CMCFMD)" on page 134 provide further information on confirmation processing.

"Example 5: Validation of Data Receipt" on page 76 and "Example 15: Sending Program Issues a Commit" on page 96 show how to use the Set_Sync_Level call and how to perform confirm and sync point processing.

“Support for Resource Recovery Interfaces” on page 52 contains additional related information on the Set_Sync_Level call.

Set_TP_Name (CMSTPN)

LU 6.2	OSI TP

Set_TP_Name (CMSTPN) is used by a program that initiates a conversation, using the Initialize_Conversation call, to set the *TP_name* and *TP_name_length* characteristics for a given conversation. Set_TP_Name overrides the current values that were originally acquired from the side information using the *sym_dest_name*. See "Side Information" on page 21 for more information.

This call does not change the values in the side information. Set_TP_Name only changes the*TP_name* and *TP_name_length* characteristics for this conversation. The Set_TP_Name call may also be used by the program that did not initiate the conversation to identify a specific *TP_name* to be accepted on a given conversation.

The *tp_name* conversation characteristic identifies the recipient of the conversation initialization request. It may be set by the conversation initiator.

Note: A program cannot issue Set_TP_Name after an Allocate, Accept_Conversation, or Accept_Incoming is issued.

Format

```
CALL CMSTPN(conversation_ID,
            TP_name,
            TP_name_length,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

TP_name *(input)*
Specifies the name of the remote program.

Note: A program may require special syntax for the name and special authority to specify some TP names. For example, SNA service transaction programs require special authority with LU 6.2. (For more information, see "SNA Service Transaction Programs" on page 499.)

TP_name_length *(input)*
Specifies the length of *TP_name*. The length can be from 1 to 64 bytes.

return_code *(output)*
Specifies the result of the call execution. The *return_code* can have one of the following values:

- CM_OK
- CM_PROGRAM_STATE_CHECK
  This value indicates that the conversation is not in **Initialize** or **Initialize_Incoming** state.

- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *TP_name_length* specifies a value less than 1 or greater than 64.
  - The *partner_ID* characteristic is set to a non-null value.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. Specify *TP_name* using the local system's native encoding. CPI Communications automatically converts the *TP_name* from the native encoding where necessary.
2. If a *return_code* other than CM_OK is returned on the call, the *TP_name* and *TP_name_length* conversation characteristics are unchanged.
3. The *TP_name* specified on this call must be formatted according to the naming conventions of the partner system.
4. Refer to “SNA Service Transaction Programs” on page 499 for special handling of SNA Service Transaction Program names.

Related Information

“Side Information” on page 21 and notes 3 on page 424 and 6 on page 425 of Table 21 on page 422 provide further discussion of the *TP_name* conversation characteristic.

“Automatic Conversion of Characteristics” on page 39 provides further information on the automatic conversion of the *TP_name* parameter.

“SNA Service Transaction Programs” on page 499 provides more information on privilege and service transaction programs.

Set_Transaction_Control (CMSTC)

OSI TP

Set_Transaction_Control (CMSTC) is used by a program to set the *transaction_control* characteristic for a given conversation. Set_Transaction_Control overrides the value that was assigned when the Initialize_Conversation call was issued.

The *transaction_control* conversation characteristic indicates whether the conversation supports chained or unchained transactions. It may be set by the conversation initiator.

Notes:

1. Only the program that initiates the conversation can issue this call.
2. The *transaction_control* characteristic is used only by an OSI TP CRM.

Format

```
CALL CMSTC(conversation_ID,
           transaction_control,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

transaction_control *(input)*
Specifies whether the superior program wants to use chained or unchained transactions on the conversation with the subordinate. The *transaction_control* variable can have one of the following values:

- CM_CHAINED_TRANSACTIONS
  Specifies that the conversation will use chained transactions.
- CM_UNCHAINED_TRANSACTIONS
  Specifies that the conversation will use unchained transactions.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_STATE_CHECK
  This value indicates that the conversation is not in the **Initialize** state.

- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned identifier.
  - The *transaction_control* specifies an undefined value.
  - The *sync_level* is set to either CM_NONE or CM_CONFIRM.
  - The *transaction_control* specifies CM_UNCHAINED_TRANSACTIONS, and the conversation is using an LU 6.2 CRM.
- CM_OPERATION_NOT_ACCEPTED
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause any state changes.

Usage Notes

If a *return_code* other than CM_OK is returned on the call, the *transaction_control* conversation characteristic remains unchanged.

Related Information

"Chained and Unchained Transactions" on page 59 provides more information about using chained and unchained transactions with CPI Communications.

Specify_Local_TP_Name (CMSLTP)

LU 6.2	OSI TP

A program uses the Specify_Local_TP_Name (CMSLTP) call to associate a name with itself, thus notifying CPI Communications that it can accept conversations destined for the name. A program may have many local names simultaneously. It can extract the *TP_name* for a particular conversation using the Extract_TP_Name call.

Format

```
CALL CMSLTP(TP_name,
            TP_name_length,
            return_code)
```

Parameters

TP_name *(input)*
Specifies a name to be associated with this program.

Note: Refer to "SNA Service Transaction Programs" on page 499 for special handling of SNA Service Transaction Program names.

TP_name_length *(input)*
Specifies the length of *TP_name*. The length can be from 1 to 64 bytes.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *TP_name* specifies a name that is restricted in some way by node services.
  - The *TP_name* has incorrect internal syntax as defined by node services.
  - The *TP_name_length* specifies a value less than 1 or greater than 64.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause any state changes.

Usage Notes

1. If a *return_code* other than CM_OK is returned on the call, the names associated with the current program remain unchanged.
2. Any of the names associated with the program at the time an Accept_Conversation or Accept_Incoming call is issued can be used to satisfy the call.

3. If the program has an outstanding Accept_Incoming or Accept_Conversation call when it issues Specify_Local_TP_Name, the names used to satisfy the outstanding Accept_Incoming or Accept_Conversation are not affected. The newly specified name will be added to the names used to satisfy subsequent Accept_Incoming or Accept_Conversation calls.

Related Information

"Accept_Conversation (CMACCP)" on page 116 and "Accept_Incoming (CMACCI)" on page 118 describe how an incoming conversation is accepted by a program.

"Release_Local_TP_Name (CMRLTP)" on page 239 explains additional timing considerations for names associated with the program.

Test_Request_To_Send_Received (CMTRTS)

LU 6.2	OSI TP

Test_Request_To_Send_Received (CMTRTS) is used by a program to determine whether a request-to-send or allocate-confirmed notification has been received from the remote program for the specified conversation.

Note: The Test_Request_To_Send_Received call has meaning only when a half-duplex conversation is being used.

Format

```
CALL CMTRTS(conversation_ID,
            control_information_received,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

control_information_received *(output)*
Specifies the variable containing an indication of whether or not control information has been received.

The *control_information_received* variable can have one of the following values:

- CM_NO_CONTROL_INFO_RECEIVED
  Indicates that no control information was received.
- CM_REQ_TO_SEND_RECEIVED
  The local program received a request-to-send notification from the remote program. The remote program issued Request_To_Send, requesting the local program's end of the conversation to enter **Receive** state, which would place the remote program's end of the conversation in **Send** state. See “Request_To_Send (CMRTS)” on page 241 for further discussion of the local program's possible responses.
- CM_ALLOCATE_CONFIRMED (OSI TP CRM only)
  The local program received confirmation of the remote program's acceptance of the conversation.
- CM_ALLOCATE_CONFIRMED_WITH_DATA (OSI TP CRM only)
  The local program received confirmation of the remote program's acceptance of the conversation. The local program may now issue an Extract_Initialization_Data (CMEID) call to receive the initialization data.
- CM_ALLOCATE_REJECTED_WITH_DATA (OSI TP CRM only)
  The remote program rejected the conversation. The local program may now issue an Extract_Initialization_Data (CMEID) call to receive the initialization data.

  This value will be returned with a return code of CM_OK. The program will receive a CM_DEALLOCATED_ABEND return code on a later call on the conversation.
- CM_EXPEDITED_DATA_AVAILABLE (LU 6.2 CRM only)
  Expedited data is available to be received.
- CM_RTS_RCVD_AND_EXP_DATA_AVAIL (LU 6.2 CRM only)

The local program received a request-to-send notification from the remote program and expedited data is available to be received.

Notes:

1. If *return_code* is set to CM_PROGRAM_PARAMETER_CHECK or CM_PROGRAM_STATE_CHECK, the value contained in *control_information_received* has no meaning.
2. When more than one piece of control information is available to be returned to the program, it will be returned in the following order:
   - CM_ALLOCATE_CONFIRMED, CM_ALLOCATE_CONFIRMED_WITH_DATA, or CM_ALLOCATE_REJECTED_WITH_DATA
   - CM_RTS_RCVD_AND_EXP_DATA_AVAIL
   - CM_REQ_TO_SEND_RECEIVED
   - CM_EXPEDITED_DATA_AVAILABLE
   - CM_NO_CONTROL_INFO_RECEIVED

return_code *(output)*

Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_PROGRAM_STATE_CHECK
  - This value indicates that the conversation is not in **Send**, **Receive**, **Send-Pending**, **Defer-Receive**, or **Defer-Deallocate** state.
  - For a conversation with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, the conversation's context is in the **Backout-Required** condition. The Test_Request_To_Send_Received call is not allowed for this conversation while its context is in this condition.
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *send_receive_mode* of the conversation is CM_FULL_DUPLEX.
- CM_OPERATION_NOT_ACCEPTED
  This value indicates that the program has chosen conversation-level non-blocking for the conversation and a previous call operation is still in progress.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. When the local system receives a request-to-send or allocate-confirmed notification, it retains the notification until the local program issues a call (such as Test_Request_To_Send_Received) with the *control_information_received* parameter. It will retain only one request-to-send or allocate-confirmed notification at a time (per conversation). Additional notifications are discarded until the retained notification is indicated to the local program. Therefore, a remote program may issue the Request_To_Send call more times than are indicated to the local program.

When the local system receives expedited data from the partner system, it is indicated on the calls that have the *control_information_received* parameter until the expedited data is actually received by the program.

2. After the retained notification, other than the expedited data notification, is indicated to the local program through the *control_information_received* parameter, the local system discards the notification.
3. **Note to Implementers:** A request-to-send or allocate-confirmed notification can be reported on this call (not associated with any queue), on the Send_Expedited_Data call (associated with the Expedited-Send queue), and on the Receive_Expedited_Data call (associated with the Expedited-Receive queue). When the program uses queue-level non-blocking, more than one of these calls may be executed simultaneously. An implementation should report the notification to the program only once, through one of these calls.
4. A program should not rely solely on this call to test whether expedited data is available. Expedited data may be available in the CRM, but the implementation of the CPIC layer may not always be able to indicate this to the program on this call. To test for the availability of expedited data, the program should issue Receive_Expedited_Data with the *expedited_receive_type* set to CM_RECEIVE_IMMEDIATE.

Related Information

"Request_To_Send (CMRTS)" on page 241 provides further discussion of the request-to-send function, and "Set_Allocate_Confirm (CMSAC)" on page 277 provides more information about the allocate-confirmed function.

Wait_For_Completion (CMWCMP)

LU 6.2	OSI TP

Wait_For_Completion (CMWCMP) is used to wait for completion of one or more outstanding operations represented in a specified outstanding-operation-ID (OOID) list.

Format

```
CALL CMWCMP(OOID_list,
            OOID_list_count,
            timeout,
            completed_op_index_list,
            completed_op_count,
            user_field_list,
            return_code)
```

Parameters

OOID_list *(input)*
Specifies a list of OOIDs representing the outstanding operations for which completion is expected.

OOID_list_count *(input)*
Specifies the number of OOIDs contained in *OOID_list*.

timeout *(input)*
Specifies the amount of time in milliseconds that the program is willing to wait for completion of an operation. Valid *timeout* values are zero or any greater integer number.

completed_op_index_list *(output)*
Specifies a list of indexes corresponding to the OOIDs in *OOID_list* for which the associated operations have completed. The index is the position of an OOID in *OOID_list*, beginning with 1.

completed_op_count *(output)*
Specifies the number of indexes contained in *completed_op_index_list*, or the number of user fields contained in *user_field_list*, or both.

user_field_list *(output)*
Specifies a list of user fields corresponding to the completed operations.

return_code *(output)*
Specifies the result of the call execution. The *return_code* variable can have one of the following values:

- CM_OK
- CM_CALL_NOT_SUPPORTED
- CM_PROGRAM_PARAMETER_CHECK
  This value indicates one of the following:
  - The *OOID_list_count* specifies a value less than 1.
  - The number of OOIDs in *OOID_list* is less than the value specified in *OOID_list_count*.
  - The *OOID_list* contains an unassigned OOID.
  - The *timeout* specifies a value less than zero.
- CM_PROGRAM_STATE_CHECK
  This value indicates that there is no outstanding operation associated with any of the OOIDs specified in *OOID_list*.
- CM_UNSUCCESSFUL
  This value indicates that the specified timeout value has elapsed and none of the operations specified in *OOID_list* has completed.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

This call does not cause a state change.

Usage Notes

1. Unless the *return_code* indicates CM_OK, the values of all other parameters on this call have no meaning.
2. The call returns the OOID corresponding to a completed operation only once. At that time, all information about the completed operation is purged from the associated queue. If the program issues the call to check the status of the same operation again, the OOID will not be returned.
3. When the call returns a completion operation to the program, the return code of the completion operation can be found in the *return_code* parameter on the completed call.
4. A special timeout value of zero can be used to check the status of all the operations whose OOIDs are specified in the *OOID_list* parameter. The call specified in this way incurs no blocking.
5. The program can replace a previously returned OOID in the *OOID_list* parameter with a null OOID (integer zero) and continue to use the same list for the following Wait_For_Completion call. The null OOID is not associated with any outstanding operation.
6. There is a one-to-one correspondence between elements of the completed-operation-index list and those of the user-field list. Hence, the size of the user-field list equals that of the completed-operation-index list.
7. The program should allocate the same amount of storage for the completed-operation-index list and user-field list as it does for the outstanding-operation-ID list. If there is not enough storage allocated, the program may lose some OOIDs and user fields that correspond to the completed operations.

8. In a multi-threaded environment, concurrent Wait_For_Completion operations can occur. If an OOID is specified on more than one Wait_For_Completion call, the OOID is returned on only one of the Wait_For_Completion calls when the corresponding outstanding operation completes.
9. **Note to Implementers:** After returning CM_OPERATION_INCOMPLETE to the program, an implementation should not fill the return code for the outstanding operation before the program checks the return-code value. It is recommended that implementations fill the return code only when the program issues a Wait_For_Completion call for the outstanding operation.

Related Information

"Non-Blocking Operations" on page 45 discusses the use of non-blocking operations.

"Example 13: Accepting Multiple Conversations Using Conversation-Level Non-Blocking Calls" on page 92 shows an example of a program that uses conversation-level non-blocking calls to accept multiple incoming half-duplex conversations.

"Set_Queue_Processing_Mode (CMSQPM)" on page 332 describes how to set the processing mode for a conversation queue.

Wait_For_Conversation (CMWAIT)

LU 6.2	OSI TP

A program must use the Wait_For_Conversation (CMWAIT) call to wait for the completion of an outstanding operation on a conversation using conversation-level non-blocking. An outstanding operation is indicated when the CM_OPERATION_INCOMPLETE *return_code* value is returned on an Accept_Incoming, Allocate, Confirm, Confirmed, Deallocate, Flush, Prepare_To_Receive, Receive, Receive_Expedited_Data, Request_To_Send, Send_Data, Send_Error, or Send_Expedited_Data call. This can occur when the *processing_mode* conversation characteristic is set to CM_NON_BLOCKING and the requested operation cannot complete immediately.

Format

```
CALL CMWAIT(conversation_ID,
            conversation_return_code,
            return_code)
```

Parameters

conversation_ID *(output)*
Specifies the variable containing the conversation identifier for the completed operation.

Note: Unless *return_code* is set to CM_OK, the value contained in *conversation_ID* is not meaningful.

conversation_return_code *(output)*
Specifies the variable containing the return code for the completed operation. The meaning of this return code depends upon the operation that was started. *conversation_return_code* can have one of the following values:

- CM_OK
- CM_ALLOCATE_FAILURE_NO_RETRY
- CM_ALLOCATE_FAILURE_RETRY
- CM_BUFFER_TOO_SMALL
- CM_CALL_NOT_SUPPORTED
- CM_CONV_DEALLOC_AFTER_SYNCPT
- CM_CONVERSATION_CANCELED
- CM_CONVERSATION_ENDING
- CM_CONVERSATION_TYPE_MISMATCH
- CM_DEALLOC_CONFIRM_REJECT
- CM_DEALLOCATED_ABEND
- CM_DEALLOCATED_ABEND_BO
- CM_DEALLOCATED_ABEND_SVC
- CM_DEALLOCATED_ABEND_SVC_BO
- CM_DEALLOCATED_ABEND_TIMER
- CM_DEALLOCATED_ABEND_TIMER_BO
- CM_DEALLOCATED_NORMAL
- CM_DEALLOCATED_NORMAL_BO
- CM_EXP_DATA_NOT_SUPPORTED
- CM_INCLUDE_PARTNER_REJECT_BO

- CM_PIP_NOT_SPECIFIED_CORRECTLY
- CM_PRODUCT_SPECIFIC_ERROR
- CM_PROGRAM_ERROR_NO_TRUNC
- CM_PROGRAM_ERROR_PURGING
- CM_PROGRAM_ERROR_TRUNC
- CM_RESOURCE_FAIL_NO_RETRY_BO
- CM_RESOURCE_FAILURE_NO_RETRY
- CM_RESOURCE_FAILURE_RETRY
- CM_RESOURCE_FAILURE_RETRY_BO
- CM_RETRY_LIMIT_EXCEEDED
- CM_SECURITY_MUTUAL_FAILED
- CM_SECURITY_NOT_SUPPORTED
- CM_SECURITY_NOT_VALID
- CM_SEND_RCV_MODE_NOT_SUPPORTED
- CM_SVC_ERROR_NO_TRUNC
- CM_SVC_ERROR_PURGING
- CM_SVC_ERROR_TRUNC
- CM_SYNC_LVL_NOT_SUPPORTED_PGM
- CM_SYNC_LVL_NOT_SUPPORTED_SYS
- CM_TAKE_BACKOUT
- CM_TP_NOT_AVAILABLE_NO_RETRY
- CM_TP_NOT_AVAILABLE_RETRY
- CM_TPN_NOT_RECOGNIZED

Note: Unless *return_code* is set to CM_OK, the value contained in *conversation_return_code* is not meaningful.

return_code *(output)*
Specifies the result of the Wait_For_Conversation call execution. The *return_code* variable can have one of the following values:

- CM_OK
  This value indicates that an outstanding operation has completed and that the *conversation_ID* and *conversation_return_code* have been returned.
- CM_SYSTEM_EVENT
  This value indicates that, rather than an outstanding operation on a conversation, an event (such as a signal) recognized by the program has occurred. The Wait_For_Conversation call returns this return code value to allow the program to decide whether to reissue the Wait_For_Conversation or to perform other processing.
- CM_PROGRAM_STATE_CHECK
  This value indicates that there were no conversation-level outstanding operations for the program.
- CM_PRODUCT_SPECIFIC_ERROR

State Changes

When *return_code* is set to CM_OK, the conversation identified by *conversation_ID* may change state. The new state is determined by the operation that completed, the return code for that operation (the *conversation_return_code* value), and the other factors that affect state transitions.

Usage Notes

1. Wait_For_Conversation waits for the completion of any outstanding operation on any conversation using conversation-level non-blocking. It is the responsibility of the program to keep track of the operation in progress on each conversation in order to be able to interpret properly the *conversation_return_code* value.
2. In a multi-threaded environment, concurrent operations may occur. A Wait_For_Conversation call waits for any operation, on any conversation using conversation-level non-blocking, that either is already outstanding or becomes outstanding during execution of the Wait_For_Conversation call. In case of concurrent Wait_For_Conversation operations, completion of an outstanding operation is indicated on one Wait_For_Conversation call only.

   Note to implementers: An implementation should serialize execution of the concurrent Wait_For_Conversation operations to prevent any Wait_For_Conversation call from hanging forever.
3. It is the responsibility of the event-handling portion of the program to record sufficient information for the program to decide how to proceed on receipt of the CM_SYSTEM_EVENT return code.
4. The program's current context is not changed as a result of the completion of a Wait_For_Conversation call.
5. This call applies only to conversations using conversation-level non-blocking support.

Related Information

"Non-Blocking Operations" on page 45 discusses the use of non-blocking operations.

"Example 13: Accepting Multiple Conversations Using Conversation-Level Non-Blocking Calls" on page 92 shows an example of a program that uses conversation-level non-blocking calls to accept multiple incoming half-duplex conversations.

"Cancel_Conversation (CMCANC)" on page 128 describes the means for terminating an operation before it is completed.

"Set_Processing_Mode (CMSPM)" on page 326 describes setting the *processing_mode* conversation characteristic.

Extract_Conversation_LUWID (XCECL)

A program uses the Extract_Conversation_LUWID (XCECL) call to extract the SNA LU 6.2 architected logical unit of work ID (LUWID) for a given protected conversation. The LUWID can be used to identify the most recent sync point.

This routine can be called after issuing an Allocate (CMALLC) or Accept_Conversation (CMACCP) call to establish a protected conversation.

Note: The Extract_Conversation_LUWID call is valid only for protected (*sync_level*=CM_SYNC_POINT) conversations.

Format

```
CALL XCECL(conversation_ID,
           luwid,
           luwid_length,
           return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

luwid *(output)*
Is a 26-byte character variable used to return the SNA LU 6.2 architected LUWID associated with the specified conversation ID when the *return_code* is CM_OK. See the usage note for a description of the LUWID.

luwid_length *(output)*
Is a variable used to return the length of the SNA LU 6.2 architected LUWID when the *return_code* is CM_OK.

return_code *(output)*
Is a variable used to hold the return code passed back from the communications routine to the calling program. The *return_code* variable can have one of the following values:

- CM_OK
  Successful completion.
- CM_PRODUCT_SPECIFIC_ERROR
  This return code can result in the CPICOMM LOGDATA A file being appended with one of the following entries:

  ```
  XCECL_PRODUCT_SPECIFIC_ERROR:  Call to DMSLUWID failed

  XCECL_PRODUCT_SPECIFIC_ERROR:  Call to CMSIUCV QCMSWID failed
  ```

- CM_PROGRAM_PARAMETER_CHECK
  This can result from one of the following conditions:
  – The *conversation_ID* specifies an unassigned conversation identifier.
  – The *conversation_ID* was not for a protected (*sync_level*=CM_SYNC_POINT) conversation.
- CM_PROGRAM_STATE_CHECK
  This value indicates that the conversation is in **Initialize** state.
- CM_OPERATION_NOT_ACCEPTED
  This value indicates that a previous operation on this conversation is incomplete.

State Changes

This call does not cause a state change.

Usage Notes

1. The LUWID can be up to 26 bytes long, containing the following fields:

Length	Description
1	Length of the fully-qualified LU name
1-17	The fully-qualified LU name. If its length is less than 17 bytes, it is left-justified and padded on the right with blanks (X'40'). It is composed of the following fields:

Length	Description
0-8	The network ID
0-1	A delimiter (a period)
1-8	LU name

   If both the network ID and the LU name are present, they are separated by a period.

6	Instance number in binary
2	Sequence number in binary

   Refer to the *SNA Format and Protocol Reference Manual for LU Type 6.2* for more information about the LUWID.

2. This call does not change the *luwid* for the specified conversation.

Extract_Conversation_Security_User_ID (XCECSU)

A program uses the Extract_Conversation_Security_User_ID (XCECSU) routine to extract the access security user ID associated with a given conversation.

A security user ID is only returned if *conversation_security_type* is XC_SECURITY_SAME or XC_SECURITY_PROGRAM. If the *conversation_security_type* is XC_SECURITY_NONE, the *security_user_ID* parameter returns nulls (X'00'), and the length is set to zero.

The returned *security_user_ID* can be used as input to the DMSREG (Resource Adapter Registration) CSL routine, which is described in the *VM/ESA: CMS Application Development Reference*. The *security_user_ID* returned is not valid for this use if Extract_Conversation_Security_User_ID is called while the conversation is in **Initialize** state.

Format

```
CALL XCECSU(conversation_ID,
            security_user_ID,
            security_user_ID_length,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

security_user_ID *(output)*
Is a variable used to return the access security user ID obtained by this routine when the *return_code* is CM_OK.

security_user_ID_length *(output)*
Is a variable used to return the length, in bytes, of the *security_user_ID* when the *return_code* is CM_OK.

return_code *(output)*
Is a variable used to hold the return code passed back from the communications routine to the calling program. The *return_code* variable can have one of the following values:

- CM_OK
  Successful completion.
- CM_PROGRAM_PARAMETER_CHECK
  The *conversation_ID* specifies an unassigned conversation identifier.
- CM_OPERATION_NOT_ACCEPTED
  This value indicates that a previous operation on this conversation is incomplete.

State Changes

This call does not cause a state change.

Usage Notes

1. Generally, when in **Initialize** state the *security_user_ID_length* is zero and the *security_user_ID* is meaningless. If the conversation was initialized with the `:security.` tag set to PGM in side information (a CMS communications directory file) and a security user ID was specified on the `:userid.` tag, then that specified value is returned. Also, if Set_Conversation_Security_User_ID (XCSCSU) was called to set a security user ID, that value is returned.

   When Extract_Conversation_Security_User_ID is called after a successful Allocate (CMALLC) or Accept_Conversation (CMACCP) call, the access security user ID for the specified conversation ID is returned.

2. This call does not change the *security_user_ID* for the specified conversation.

Extract_Conversation_Workunitid (XCECWU)

A program uses the Extract_Conversation_Workunitid (XCECWU) call to extract the CMS work unit ID for a given conversation. This routine can be used after issuing an Allocate (CMALLC) or Accept_Conversation (CMACCP) call. This routine is especially useful for resource managers that handle multiple requests for multiple resources.

The output from this routine can be used as input to specify the work unit ID on such CSL routines as DMSPUSWU (Push Workunitid) for changing the default CMS work unit, and DMSCOMM (Commit) and DMSROLLB (Rollback) when using Coordinated Resource Recovery. These callable services library (CSL) routines are described in the *VM/ESA: CMS Application Development Reference*.

For information on CMS work units, refer to the *VM/ESA: CMS Application Development Guide*.

Format

```
CALL XCECWU(conversation_ID,
            workunitid,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

workunitid *(output)*
Is a signed 4-byte integer variable used to return the CMS work unit ID associated with the specified conversation ID when the *return_code* is CM_OK.

return_code *(output)*
Is a variable used to hold the return code passed back from the communications routine to the calling program. The *return_code* variable can have one of the following values:

- CM_OK
  Successful completion.
- CM_PRODUCT_SPECIFIC_ERROR
  When this code is returned, a file named CPICOMM LOGDATA A is appended with the following line:

  ```
  XCECWU_PRODUCT_SPECIFIC_ERROR:  Call to CMSIUCV QCMSWID failed
  ```

- CM_PROGRAM_PARAMETER_CHECK
  The *conversation_ID* specifies an unassigned conversation identifier.
- CM_PROGRAM_STATE_CHECK
  This value indicates that the conversation is in **Initialize** state.
- CM_OPERATION_NOT_ACCEPTED
  This value indicates that a previous operation on this conversation is incomplete.

State Changes

This call does not cause a state change.

Usage Notes

This call does not change the *workunitid* for the specified conversation.

Extract_Local_Fully_Qualified_LU_Name (XCELFQ)

A program uses the Extract_Local_Fully_Qualified_LU_Name (XCELFQ) call to extract the local fully-qualified LU name for a given conversation. This routine can be used after issuing an Allocate (CMALLC) or Accept_Conversation (CMACCP) call.

The output from this routine can be used as input on the DMSREG (Resource Adapter Registration) CSL routine, which is described in the *VM/ESA: CMS Application Development Reference*.

Format

```
CALL XCELFQ(conversation_ID,
            local_FQ_LU_name,
            local_FQ_LU_name_length,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

local_FQ_LU_name *(output)*
Specifies the variable used to return the local fully-qualified LU name obtained by this routine when the *return_code* is CM_OK. Allow 17 bytes for this variable: 0 to 8 bytes for a network ID, 1 to 8 bytes for the LU name, and 1 byte for a delimiter if both a network ID and LU name are specified (the delimiter is a period). If the fully-qualified LU name is less than 17 bytes long, it is left-justified and padded on the right with blanks (X'40').

local_FQ_LU_name_length *(output)*
Specifies the variable used to return the length of the local fully-qualified LU name obtained by this routine when the *return_code* is CM_OK. This length is zero if the partner program is on the same LU as the program issuing this routine (communication is not routed through AVS).

return_code *(output)*
Is a variable used to hold the return code passed back from the communications routine to the calling program. The *return_code* variable can have one of the following values:

- CM_OK
  Successful completion.
- CM_PROGRAM_PARAMETER_CHECK
  The *conversation_ID* specifies an unassigned conversation identifier.
- CM_PROGRAM_STATE_CHECK
  This value indicates that the conversation is in **Initialize** state.
- CM_OPERATION_NOT_ACCEPTED
  This value indicates that a previous operation on this conversation is incomplete.

State Changes

This call does not cause a state change.

Usage Notes

This call does not change the *local_FQ_LU_name* for the specified conversation.

Extract_Remote_Fully_Qualified_LU_Name (XCERFQ)

A program uses the Extract_Remote_Fully_Qualified_LU_Name (XCERFQ) call to extract the remote fully-qualified LU name for a given conversation. This routine can be used after issuing an Allocate (CMALLC) or Accept_Conversation (CMACCP) call.

The output from this routine can be used as input on the DMSREG (Resource Adapter Registration) CSL routine, which is described in the *VM/ESA: CMS Application Development Reference*.

Format

```
CALL XCERFQ(conversation_ID,
            remote_FQ_LU_name,
            remote_FQ_LU_name_length,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

remote_FQ_LU_name *(output)*
Specifies the variable to contain the remote fully-qualified LU name obtained by this routine and returned to the local program when the *return_code* is CM_OK. Allow 17 bytes for this variable: 0 to 8 bytes for a network ID, 1 to 8 bytes for the LU name, and 1 byte for a delimiter if both a network ID and LU name are specified (the delimiter is a period). If the fully-qualified LU name is less than 17 bytes long, it is left-justified and padded on the right with blanks (X'40').

remote_FQ_LU_name_length *(output)*
Specifies the variable to contain the length of the remote fully-qualified LU name obtained by this routine and returned to the local program when the *return_code* is CM_OK. This length is zero if the remote program is on the same system as the local program.

return_code *(output)*
Is a variable used to hold the return code passed back from the communications routine to the calling program. The *return_code* variable can have one of the following values:

- CM_OK
  Successful completion.
- CM_PROGRAM_PARAMETER_CHECK
  The *conversation_ID* specifies an unassigned conversation identifier.
- CM_PROGRAM_STATE_CHECK
  This value indicates that the conversation is in **Initialize** state.
- CM_OPERATION_NOT_ACCEPTED
  This value indicates that a previous operation on this conversation is incomplete.

State Changes

This call does not cause a state change.

Usage Notes

This call does not change the *remote_FQ_LU_name* for the specified conversation.

Extract_TP_Name (XCETPN)

A program uses the Extract_TP_Name (XCETPN) call to extract the *TP_name* characteristic for a given conversation.

Format

```
CALL XCETPN(conversation_ID,
            TP_name,
            TP_name_length,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

TP_name *(output)*
Specifies the variable to contain the transaction program name obtained by this routine and returned to the local program when the *return_code* is CM_OK. Allow 64 bytes for this variable.

TP_name_length *(output)*
Specifies the variable to contain the length of the transaction program name obtained by this routine and returned to the local program when the *return_code* is CM_OK.

return_code *(output)*
Specifies the return code that is passed back from the communications routine to the calling program. The *return_code* variable can have one of the following values:

- CM_OK
  Successful completion.
- CM_PROGRAM_PARAMETER_CHECK
  The *conversation_ID* specifies an unassigned conversation identifier.
- CM_OPERATION_NOT_ACCEPTED
  This value indicates that a previous operation on this conversation is incomplete.

State Changes

This call does not cause a state change.

Usage Notes

1. This call does not change the *TP_name* for the specified conversation.
2. When the non-blank symbolic destination name is specified on the Initialize_Conversation (CMINIT) call, the *TP_name* characteristic is set to an initial value from side information if an entry exists for it (on the `:tpn.` tag). If there is no entry in side information or a different value is required, the TP name can be set using the Set_TP_Name (CMSTPN) call.

Identify_Resource_Manager (XCIDRM)

An application uses the Identify_Resource_Manager (XCIDRM) routine to declare to CMS the name of a resource that it wants to manage.

Format

```
CALL XCIDRM(resource_ID,
            resource_manager_type,
            service_mode,
            security_level_flag,
            return_code)
```

Parameters

resource_ID *(input)*

Specifies the name of a resource managed by this resource manager application. This variable must be an 8-byte character string, padded on the right with blanks if necessary. The first character of the resource name must be alphanumeric.

The value of the *resource_ID* parameter corresponds to the *TP_name* characteristic that requesting applications supply when allocating a conversation to this resource. This *resource_ID* name must be unique within the scope (private, local, global, or system) for which it is identified.

Other programs' allocation requests are then routed to the application that called this Identify_Resource_Manager routine.

resource_manager_type *(input)*

Identifies whether the specified *resource_ID* is a private, local, global, or system resource. The *resource_manager_type* variable can have one of the following values:

- XC_PRIVATE
  Private resource names are identified only to the virtual machine in which they are active, but they can be accessed by authorized users on the same VM/ESA system, in the same TSAF or CS collection, or on another system in an SNA network.
- XC_LOCAL
  Local resource names are identified only to the system in which they reside and cannot be accessed from outside this system.
- XC_GLOBAL
  Global resource names are identified to an entire TSAF or CS collection. They may be accessed by other users in the collection or in an SNA network.
- XC_SYSTEM
  System resource names are identified only to the VM/ESA system in which they reside, but are remotely accessible from other systems.

service_mode *(input)*

Indicates how this resource manager application handles conversations associated with the specified *resource_ID*. The *service_mode* can have one of the following values:

- XC_SINGLE
  This resource manager program can accept only a single conversation for the specified *resource_ID*.

  If the resource manager program already has accepted a conversation for the resource and another program requests that same resource, the identification of the resource manager type as private, local, global, or system determines what happens to the new allocation request:

  – For a private resource, CMS queues the new allocation request. Then, when the private resource manager program that is running ends, CMS automatically restarts the private resource manager program and takes the first pending allocation request off the queue.

  – For a local, global, or system resource, CMS deallocates the allocation request. The application issuing the allocation request receives a *return_code* value of CM_TPN_NOT_RECOGNIZED upon completion of a subsequent call that allows this return code.

- XC_SEQUENTIAL
  This resource manager program can accept only one conversation at a time for the specified *resource_ID*. When one conversation is completed and deallocated, the resource manager program can issue Wait_on_Event (XCWOE) to wait for the next allocation request, or issue Accept_Conversation (CMACCP). (If a program issues Accept_Conversation and there is not a pending allocation request, however, a CM_PROGRAM_STATE_CHECK return code is returned.)

  If the resource manager program has an active conversation for the resource and another program requests that same resource, the identification of the resource manager type as private, local, global, or system determines what happens to the new allocation request:

  – For a private resource, CMS queues the new allocation request. Then after the active conversation is deallocated, the resource manager program should issue Wait_on_Event or Accept_Conversation as described in the preceding paragraph.

  – For a local, global, or system resource, CMS deallocates the allocation request. The application issuing the allocation request receives a *return_code* value of CM_TPN_NOT_RECOGNIZED upon completion of a subsequent call that allows this return code.

- XC_MULTIPLE
  This resource manager program can accept multiple conversations for the specified *resource_ID*.

  If another program requests the resource for which there is already an active conversation, the pending allocation request will be reported to the resource manager on a future call to Wait_on_Event.

security_level_flag *(input)*
Indicates whether this resource manager will accept inbound connections for the specified *resource_ID* that have *conversation_security_type* equal to XC_SECURITY_NONE. The *security_level_flag* variable must have one of the following values:

- XC_REJECT_SECURITY_NONE
  The resource manager will not accept connections that have a *conversation_security_type* of XC_SECURITY_NONE. A requester program that allocates a conversation with XC_SECURITY_NONE will get a return code of CM_SECURITY_NOT_VALID upon completion of a subsequent call that allows this return code.
- XC_ACCEPT_SECURITY_NONE
  The resource manager will accept connections that have *conversation_security_type* equal to XC_SECURITY_NONE.

return_code *(output)*
Is a variable used to hold the return code passed back from the communications routine to the calling program. The *return_code* variable can have one of the following values:

- CM_OK
  Successful completion.
- CM_PRODUCT_SPECIFIC_ERROR
  This return code can result from one of the following conditions:
  - A storage failure prevented the specified *resource_ID* from being identified. When this code is returned, a file named CPICOMM LOGDATA A is appended with the following line:

    ```
    XCIDRM_PRODUCT_SPECIFIC_ERROR:  Unable to get storage
    ```

  - An error was encountered trying to load the VMMTLIB callable services library which is required by CPI Communications. When this code is returned, a file named CPICOMM LOGDATA A is appended with the following line:

    ```
    XCIDRM_PRODUCT_SPECIFIC_ERROR:  Unable to RTNLOAD VMMTLIB
    ```

- CM_PROGRAM_PARAMETER_CHECK
  This can result from one of the following conditions:
  - The *resource_ID* has already been defined within the virtual machine.
  - The *resource_manager_type* contains an invalid value.
  - The *service_mode* contains an invalid value.
  - The *security_level_flag* contains an invalid value.
- CM_PROGRAM_STATE_CHECK
  This is a *TP-model application*, so this routine cannot be called.
- CM_UNSUCCESSFUL
  Identify_Resource_Manager was unable to obtain ownership of the resource. The following are possible reasons:
  - The resource is already owned by another virtual machine.
  - The virtual machine in which the application is running does not have authority to connect to *IDENT.
  - The virtual machine in which the application is running does not have authority to declare the resource.

  This return code applies only when *resource_manager_type* is XC_LOCAL, XC_GLOBAL, or XC_SYSTEM.

State Changes

This call is not specific to a conversation, so it does not cause a state change.

Usage Notes

1. An application can call Identify_Resource_Manager multiple times to identify different resources that it wants to manage.
2. The application does not need to call Identify_Resource_Manager if:
   - The application initiates all its conversations and is never the target of an allocation request.
   - The application is a private resource manager invoked by CMS as the target of a single conversation.
3. An application calling Identify_Resource_Manager should also call the Terminate_Resource_Manager (XCTRRM) routine before exiting. See "End-of-Command Processing" on page 396 for information regarding system cleanup of resource identifiers after program termination.

Set_Client_Security_User_ID (XCSCUI)

A program acting as an intermediate server uses the Set_Client_Security_User_ID (XCSCUI) routine to set the access security user ID for a given conversation based on an incoming conversation's access security user ID. This user ID is then presented to the target when the intermediate server allocates a conversation on behalf of the client application.

An intermediate server can call Set_Client_Security_User_ID only when the following conditions are true:

- The program is not a TP-model application.
- The specified conversation (to be allocated to the target resource manager) has a *conversation_security_type* equal to XC_SECURITY_SAME.
- An access security user ID is available for the incoming conversation with the client. The access security user ID for that conversation should be retrieved by calling the Extract_Conversation_Security_User_ID (XCECSU) routine.
- The intermediate server virtual machine is authorized to issue a DIAGNOSE code X'D4' (for defining an alternate user ID). This authorization is privilege class B (unless default privilege classes have been changed). If not authorized, the Allocate (CMALLC) call will complete with a CM_PRODUCT_SPECIFIC_ERROR return code.
- There is no alternate user ID in effect for an incoming conversation. If an alternate user ID is in effect, the Allocate will complete with a CM_PRODUCT_SPECIFIC_ERROR return code.

Note: Set_Client_Security_User_ID can be issued only for a conversation that is in **Initialize** state. It cannot be issued after an Allocate.

Format

```
CALL XCSCUI(conversation_ID,
            client_user_ID,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

client_user_ID *(input)*
Specifies the client's user ID. This variable must be an 8-byte character string, padded on the right with blanks as necessary.

return_code *(output)*
Is a variable used to hold the return code passed back from the communications routine to the calling program. The *return_code* variable can return one of the following values:

- CM_OK
  Successful completion.
- CM_PROGRAM_PARAMETER_CHECK
  This can result from one of the following conditions:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *conversation_security_type* for the specified conversation is not equal to XC_SECURITY_SAME.
- CM_PROGRAM_STATE_CHECK
  This can result from one of the following conditions:
  - The conversation is not in **Initialize** state.
  - This is a *TP-model application*, so this routine cannot be called.
- CM_OPERATION_NOT_ACCEPTED
  This value indicates that a previous operation on this conversation is incomplete.

State Changes

This call does not cause a state change.

Usage Notes

1. A program that acts as an intermediate server might have incoming conversations from various clients. With Set_Client_Security_User_ID, such a server can specify a particular user ID that will be presented to a target resource manager. In this way, the target resource manager can determine whether to grant access to its resources based on the client's access security user ID rather than the intermediate server's.
2. Here is a typical sequence of events that include an intermediate server calling the Set_Client_Security_User_ID:
   a. The server application issues Identify_Resource_Manager (XCIDRM) to declare the resource it is managing, and then issues Wait_on_Event (XCWOE) to wait for a request.
   b. A client application issues an Allocate for a conversation to the server application.
   c. The server application accepts the conversation using the Accept_Conversation (CMACCP) routine.
   d. The server application calls the Extract_Conversation_Security_User_ID routine for the conversation with the client application to get the client's access security user ID.
   e. The server calls Initialize_Conversation (CMINIT) to get a conversation ready to allocate on behalf of the client. The *conversation_security_type* characteristic should be set to XC_SECURITY_SAME, which is the default value.
   f. The server application calls Set_Client_Security_User_ID using the extracted access security user ID to set the security information of the new conversation.

g. The intermediate server application calls Allocate for the outgoing conversation on behalf of the client application.

h. The target program is presented with the client program's access security user ID.

3. When a TP-model intermediate server allocates a conversation to a target with *conversation_security_type* set to XC_SECURITY_SAME, the access security user ID forwarded on the allocation is always the client's user ID; TP-model intermediate servers cannot use Set_Client_Security_User_ID.
4. When an intermediate server that has called Identify_Resource_Manager allocates a conversation with *conversation_security_type* set to XC_SECURITY_SAME to the target resource manager without first calling Set_Client_Security_User_ID, the access security user ID forwarded on the allocation is its own user ID, not that of the client.
5. If a *return_code* other than CM_OK is returned on the call, the *client_user_ID* conversation characteristic is unchanged.

Set_Conversation_Security_Password (XCSCSP)

A program uses the Set_Conversation_Security_Password (XCSCSP) routine to set the access security password for a given conversation when the *conversation_security_type* is XC_SECURITY_PROGRAM. Both an access security user ID and password are required to establish a conversation with a security type of PGM.

This call does not change the value of the `:password.` tag in side information. Set_Conversation_Security_Password changes the *security_password* and *security_password_length* only for this conversation.

Note: Set_Conversation_Security_Password can be issued only for a conversation that is in **Initialize** state. It cannot be issued after an Allocate (CMALLC).

Format

```
CALL XCSCSP(conversation_ID,
            security_password,
            security_password_length,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

security_password *(input)*
Specifies the access security password. The target LU verifies the access security user ID and password pair during the allocation process. CPI Communications maintains this password while the conversation is in **Initialize** state.

security_password_length *(input)*
Specifies the length of the security password. The length must be specified as a value from 0 to 8. If 0 is specified, the password is set to null and the *security_password* parameter is ignored.

return_code *(output)*
Is a variable used to hold the return code passed back from the communications routine to the calling program. The *return_code* variable can return one of the following values:

- CM_OK
  Successful completion.
- CM_PROGRAM_PARAMETER_CHECK
  This can result from one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *security_password_length* variable specifies a value of less than 0 or greater than 8.
- CM_PROGRAM_STATE_CHECK
  This can result from one of the following:
  - The conversation is not in **Initialize** state.
  - The *conversation_security_type* is not XC_SECURITY_PROGRAM.
- CM_OPERATION_NOT_ACCEPTED
  This value indicates that a previous operation on this conversation is incomplete.

State Changes

This call does not cause a state change.

Usage Notes

1. A program does not need to call this routine if a security password is specified in either of the following:
   - Side information (communications directory file)
   - An APPCPASS statement in the virtual machine's CP directory.

   The access security password specified on this routine overrides a password in the communications directory file and takes precedence over a password specified on a corresponding APPCPASS directory statement. If the *security_password_length* parameter is specified as zero, however, the CP directory will still be checked during conversation allocation for an APPCPASS statement to supply the missing password. The Set_Conversation_Security_User_ID routine works the same way.
2. If a *return_code* other than CM_OK is returned on the call, the *security_password* and *security_password_length* conversation characteristics are unchanged.

Set_Conversation_Security_Type (XCSCST)

A program uses the Set_Conversation_Security_Type (XCSCST) routine to set the security type for a given conversation. This routine overrides the value that was assigned when the conversation was initialized.

This call does not change the value of the `:security.` tag in side information. Set_Conversation_Security_Type changes the *conversation_security_type* only for this conversation.

Note: Set_Conversation_Security_Type can be issued only for a conversation that is in **Initialize** state. It cannot be issued after an Allocate (CMALLC).

Format

```
CALL XCSCST(conversation_ID,
            conversation_security_type,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

conversation_security_type *(input)*
Specifies the kind of access security information to be sent to the target. The target LU uses this security information to verify the identity of the source. The access security information, if present, consists of either a user ID or a user ID and password. This parameter must be set to one of the following values:

- XC_SECURITY_NONE
  No access security information is to be included on the allocation request to the target resource manager.
- XC_SECURITY_SAME
  An access security user ID is sent on the allocation request to the target resource manager.
- XC_SECURITY_PROGRAM
  An access security user ID and password must be supplied. These values can be set by calls to Set_Conversation_Security_User_ID (XCSCSU) and Set_Conversation_Security_Password (XCSCSP) or from information contained in an APPCPASS statement in the virtual machine's CP directory.

return_code *(output)*
Is a variable used to hold the return code passed back from the communications routine to the calling program. The *return_code* variable can return one of the following values:

- CM_OK
  Successful completion.
- CM_PROGRAM_PARAMETER_CHECK
  This can result from one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *conversation_security_type* specifies an undefined value.
- CM_PROGRAM_STATE_CHECK
  The conversation is not in **Initialize** state.

- CM_OPERATION_NOT_ACCEPTED
  This value indicates that a previous operation on this conversation is incomplete.

State Changes

This call does not cause a state change.

Usage Notes

1. A program does not need to use this routine if the default security type of XC_SECURITY_SAME is desired, or if a security type is specified in the virtual machine's side information.
2. If the current security type for the conversation is PGM, a security user ID previously set by a `:userid.` entry in side information associated with this conversation or by a call to Set_Conversation_Security_User_ID (XCSCSU) is reset to a null value if Set_Conversation_Security_Type is called to change the *conversation_security_type* to either XC_SECURITY_NONE or XC_SECURITY_SAME. Similarly, a security password previously set from a `:password.` tag in side information or by a Set_Conversation_Security_Password (XCSCSP) call is reset to a null value if the *conversation_security_type* is changed to either XC_SECURITY_NONE or XC_SECURITY_SAME.

   If the current security type for the conversation is SAME, a client security user ID previously set by a Set_Client_Security_User_ID (XCSCUI) call is reset to a null value if Set_Conversation_Security_Type is called to change the *conversation_security_type* to either XC_SECURITY_NONE or XC_SECURITY_PROGRAM.
3. If a *return_code* other than CM_OK is returned on the call, the *conversation_security_type* conversation characteristic is unchanged.

Set_Conversation_Security_User_ID (XCSCSU)

A program uses the Set_Conversation_Security_User_ID (XCSCSU) routine to set the access security user ID for a given conversation when the *conversation_security_type* is XC_SECURITY_PROGRAM. Both an access security user ID and password are required to establish a conversation when the *conversation_security_type* is XC_SECURITY_PROGRAM.

This call does not change the value of the `:userid.` tag in the side information. Set_Conversation_Security_User_ID changes the *security_user_ID* and *security_user_ID_length* only for this conversation.

Note: Set_Conversation_Security_User_ID can be issued only for a conversation that is in **Initialize** state. It cannot be issued after an Allocate (CMALLC).

Format

```
CALL XCSCSU(conversation_ID,
            security_user_ID,
            security_user_ID_length,
            return_code)
```

Parameters

conversation_ID *(input)*
Specifies the conversation identifier.

security_user_ID *(input)*
Specifies the user ID. The target LU verifies the access security user ID and password, which can be specified on the Set_Conversation_Security_Password (XCSCSP) routine, during the allocation process. In addition, the target LU can use the user ID for auditing or accounting purposes.

security_user_ID_length *(input)*
Specifies the length, in bytes, of the security user ID. This variable must be given a value from 0 to 8. If 0 is specified, the user ID is set to null and the *security_user_ID* parameter is ignored.

return_code *(output)*
Is a variable used to hold the return code passed back from the communications routine to the calling program. The *return_code* variable can return one of the following values:

- CM_OK
  Successful completion.
- CM_PROGRAM_PARAMETER_CHECK
  This can result from one of the following:
  - The *conversation_ID* specifies an unassigned conversation identifier.
  - The *security_user_ID_length* variable specifies a value less than 0 or greater than 8.
- CM_PROGRAM_STATE_CHECK
  This can result from one of the following:
  - The conversation is not in **Initialize** state.
  - The *conversation_security_type* is not XC_SECURITY_PROGRAM.

- CM_OPERATION_NOT_ACCEPTED
  This value indicates that a previous operation on this conversation is incomplete.

State Changes

This call does not cause a state change.

Usage Notes

1. A program does not need to call this routine if a security user ID is specified in either of the following:
   - Side information (a communications directory file)
   - An APPCPASS statement in the virtual machine's CP directory.

   The access security user ID specified on this routine overrides a user ID in the communications directory file and takes precedence over a user ID specified on a corresponding APPCPASS directory statement. If the *security_user_ID_length* parameter is specified as zero, however, the CP directory will still be checked during conversation allocation for an APPCPASS statement to supply the missing user ID. The Set_Conversation_Security_Password routine works the same way.
2. If a *return_code* other than CM_OK is returned on the call, the *security_user_ID* and *security_user_ID_length* conversation characteristics are unchanged.

Signal_User_Event (XCSUE)

A program, such as an interrupt handler, uses the Signal_User_Event (XCSUE) routine to inform VM/ESA CPI Communications that a user event has occurred.

Signal_User_Event would typically be called from an interrupt handler to let a CPI Communications program running in the same virtual machine know about some event such as the receipt of a message or the lapsing of a time interval. Information on writing interrupt handlers can be found in the *VM/ESA: CMS Application Development Guide for Assembler*. An example program using the Signal_User_Event call can be found in the *VM/ESA: CMS Application Development Guide*. The CPI Communications program must issue Wait_on_Event (XCWOE) to get the user-event notification.

Format

```
CALL XCSUE(event_ID,
           user_data,
           user_data_length,
           return_code)
```

Parameters

event_ID *(input)*
Specifies a variable to identify the event. This identifier will be returned by Wait_on_Event (XCWOE) in the *resource_ID* parameter when the event is reported.

user_data *(input)*
Specifies information about the event. The data supplied for this parameter is any information the program wants to supply to describe the event. This information will be returned by Wait_on_Event in the *event_buffer* parameter when the event is reported.

user_data_length *(input)*
Specifies the length of the information specified for the *user_data* parameter. If zero is specified, the *user_data* parameter is ignored. The length can be from 0 to 130 bytes.

return_code *(output)*
Is a variable used to hold the return code passed back from the communications call to the calling program. The *return_code* variable can have one of the following values:

- CM_OK
  Successful completion.
- CM_PROGRAM_PARAMETER_CHECK
  The *user_data_length* parameter specifies a value of less than 0 or greater than 130.
- CM_PRODUCT_SPECIFIC_ERROR
  A storage failure prevented the user event from being queued. A file named CPICOMM LOGDATA A is appended with the following line:

  ```
  XCSUE_PRODUCT_SPECIFIC_ERROR: Unable to get storage
  ```

- CM_PROGRAM_STATE_CHECK
  This value indicates that a successful call has not been made to Accept_Conversation (CMACCP), Initialize_Conversation (CMINIT), or Identify_Resource_Manager (XCIDRM).

State Changes

This call does not cause a state change.

Usage Notes

1. When Signal_User_Event is issued, VM/ESA CPI Communications queues the event so it can be reported by a subsequent Wait_on_Event call. Any number of events can be queued, limited only by the amount of storage in the virtual machine. If there is an outstanding Wait_on_Event call when Signal_User_Event is issued, Wait_on_Event reports the user event as soon as the interrupt handler completes.
2. Pending (unreported) user events are purged at end-of-command.
3. By using CMS event management services, events can be created and signalled without issuing the Signal_User_Event call.

Terminate_Resource_Manager (XCTRRM)

A resource manager application uses the Terminate_Resource_Manager (XCTRRM) routine to end management of a resource. CPI Communications automatically deallocates all conversations and pending allocation requests for the specified resource ID. All CPI Communications calls issued on these conversations following the Terminate_Resource_Manager call will result in a CM_PROGRAM_PARAMETER_CHECK return code.

Format

```
CALL XCTRRM(resource_ID,
            return_code)
```

Parameters

resource_ID *(input)*
Specifies the name of a resource, managed by this resource manager application, for which service is being terminated. This is a name that was specified by this application on a previous call to the Identify_Resource_Manager (XCIDRM) routine.

return_code *(output)*
Is a variable used to hold the return code passed back from the communications routine to the calling program. The *return_code* variable can return one of the following values:

- CM_OK
  Successful completion.
- CM_PROGRAM_PARAMETER_CHECK
  This virtual machine does not control the specified resource.
- CM_PROGRAM_STATE_CHECK
  This is a *TP-model application*, so this routine cannot be called.
- CM_OPERATION_NOT_ACCEPTED
  This value indicates that the *resource_ID* cannot be terminated at this time because an operation on a conversation associated with this *resource_ID* is incomplete.

State Changes

When the return code is CM_OK, **Reset** state is entered on all conversations associated with the specified *resource_ID*.

Usage Notes

1. Any resource manager application that calls the Identify_Resource_Manager routine should be sure to call Terminate_Resource_Manager before exiting. Failure to call Terminate_Resource_Manager will result in the name of the resource remaining active until CMS end-of-command processing.
2. Generally, an application should deallocate all conversations associated with the specified resource ID before calling Terminate_Resource_Manager.
3. Upon successful completion of this call, the specified resource ID is no longer identified.

Wait_on_Event (XCWOE)

An application uses the Wait_on_Event (XCWOE) routine to wait for communications from one or more partners. This routine is basically a way to handle “interrupts” from partner programs and system functions; a program can issue Wait_on_Event, then take action according to the type of interrupt it receives.

Format

```
CALL XCWOE(resource_ID,
           conversation_ID,
           event_type,
           event_info_length,
           event_buffer,
           return_code)
```

Parameters

resource_ID *(output)*
Is a variable used to return one of the following, depending on the value returned in the *event_type* parameter:

- If the *event_type* is XC_ALLOCATION_REQUEST or XC_RESOURCE_REVOKED, the *resource_ID* returns the name of a resource managed by this resource manager application for which an event has completed. The value returned is a name that was specified by this application for the *resource_ID* parameter on a previous call to Identify_Resource_Manager (XCIDRM).
- If the *event_type* is XC_USER_EVENT, the *resource_ID* returns an event identifier, specified as the *event_ID* parameter on the Signal_User_Event (XCSUE) call corresponding to this event.
- If the *event_type* is XC_INFORMATION_INPUT, XC_CONSOLE_INPUT, or XC_REQUEST_ID, the *resource_ID* parameter should not be examined.

conversation_ID *(output)*
Is a variable used to identify the conversation on which data or status information is available to be received.

This parameter is valid only when the *event_type* is XC_INFORMATION_INPUT. The contents of this variable should not be examined if *event_type* contains any other value.

event_type *(output)*
Is a variable used to indicate the type of event. The *event_type* variable can return one of the following values:

- XC_ALLOCATION_REQUEST
  A program is attempting to allocate a conversation with the application that called Wait_on_Event. The application should call Accept_Conversation (CMACCP) to process this event.
- XC_INFORMATION_INPUT
  A partner program is attempting to communicate information to the application that called Wait_on_Event. For instance, it might be sending data or deallocating the conversation. The application should call Receive (CMRCV) to process this event.

- XC_RESOURCE_REVOKED
  Another program has revoked the resource being managed by the application that called Wait_on_Event.
- XC_CONSOLE_INPUT
  Information is available from the console attached to this virtual machine. This information is placed in the *event_buffer* parameter.
- XC_REQUEST_ID
  A Shared File System (SFS) asynchronous event has completed. The request ID is placed in the *event_info_length* parameter.
- XC_USER_EVENT
  An interrupt handler or other program in the local program's virtual machine called Signal_User_Event. The values specified for the Signal_User_Event input parameters are returned by the following Wait_on_Event output parameters:

XCSUE (input)	XCWOE (output)
event_ID	*resource_ID*
user_data	*event_buffer*
user_data_length	*event_info_length*

event_info_length *(output)*
Is a variable whose contents depend on the *event_type* parameter as follows:

- If the *event_type* is XC_INFORMATION_INPUT, this variable indicates the number of data bytes that are available to be received. See Usage Note 2 on page 393 for details of how to use this value on a Receive call.
- If the *event_type* is XC_CONSOLE_INPUT or XC_USER_EVENT, this variable indicates how many bytes of data are available in the *event_buffer* parameter.
- If the *event_type* is XC_REQUEST_ID, this variable contains the actual request ID.
- If the *event_type* is XC_ALLOCATION_REQUEST or XC_RESOURCE_REVOKED, the contents of this variable should not be examined.

event_buffer *(output)*
Is the name of a 130-byte character string buffer. If more than 130 bytes are supplied, CPI Communications uses only the first 130 bytes.

The contents of this buffer depend on the value returned in the *event_type* parameter:

- If *event_type* is XC_CONSOLE_INPUT, this buffer contains the contents of the console input buffer.
- If the *event_type* is XC_USER_EVENT, this buffer contains the user event data as specified in the *user_data* parameter on the Signal_User_Event call corresponding to this event.
- If the *event_type* is XC_ALLOCATION_REQUEST, XC_INFORMATION_INPUT, XC_RESOURCE_REVOKED, or XC_REQUEST_ID, this variable should not be examined.

The *event_info_length* parameter returns the number of bytes stored in this buffer.

return_code *(output)*
Is a variable used to hold the return code passed back from the communications routine to the calling program. The *return_code* variable can return one of the following values:

- CM_OK
  Successful completion.
- CM_PRODUCT_SPECIFIC_ERROR
  This return code can result from one of the following conditions:
  - There was a problem attempting to obtain or to release storage. A file named CPICOMM LOGDATA A is appended with one of the following lines:

    ```
    XCWOE_PRODUCT_SPECIFIC_ERROR:  Unable to get storage
    ```

    ```
    XCWOE_PRODUCT_SPECIFIC_ERROR:  Unable to free storage
    ```

  - There was a problem on a call to the callable services library (CSL) routine DMSCHECK. If the problem was encountered while calling DMSCHECK, a file named CPICOMM LOGDATA A is appended with the following line:

    `XCWOE_PRODUCT_SPECIFIC_ERROR: Call to DMSCHECK failed with CSL return code` *dd*

    where *dd* is a negative value. If the DMSCHECK CSL routine encountered the problem, CPICOMM LOGDATA A is appended with the following line:

    `XCWOE_PRODUCT_SPECIFIC_ERROR: Call to DMSCHECK returned reason code` *reascode*

    where *reascode* is the reason code returned.

    Possible return codes and reason codes are described in the *VM/ESA: CMS Application Development Reference*.
- CM_PROGRAM_STATE_CHECK
  This value indicates that a successful call has not been made to Accept_Conversation (CMACCP), Initialize_Conversation (CMINIT), or Identify_Resource_Manager (XCIDRM) prior to calling Wait_on_Event (XCWOE).

State Changes

This call does not cause a state change.

Usage Notes

1. Events are reported in this order of priority:
   a. User event
   b. Allocation request
   c. Information input
   d. Resource revoked notification
   e. Request ID
   f. Console input

   For example, as long as there are user events pending, they will be reported first. Within an event type, however, events may not be reported in the order in which they occurred.

- **User event**:

  The application determines how to interpret the user event and what further action to take. User events are reported first in, first out (FIFO). This information will not be available after it has been presented to the program.

- **Allocation request**:

  After receiving the allocation event indication, the application can call the Accept_Conversation routine, which will establish the conversation and assign a *conversation_ID*. If necessary, the resource manager application can get information about the conversation by calling the appropriate Extract routines after accepting the conversation.

  This event will be reported by Wait_on_Event calls until an Accept_Conversation (CMACCP) call is issued to process this event or until Terminate_Resource_Manager (XCTRRM) is called to end management of the subject resource.

- **Information input**:

  After getting this event, the application should call the Receive routine. Usage Note 2 on page 393 describes how to use the value returned in the *event_info_length* parameter for the *requested_length* on the Receive call. Note that for protected conversations (*sync_level* of CM_SYNC_POINT), if the application initiates a backout sync point instead of issuing a Receive, the data or information associated with the event is purged unless the information is deallocation notification. This event will be reported by Wait_on_Event calls until a Receive (CMRCV) call is issued to process this event, until a Send_Error (CMSERR) or Deallocate (CMDEAL) call is issued, or until Terminate_Resource_Manager is called to end management of the subject resource. If there are multiple conversations with the information input event, this event will not necessarily be reported on every Wait_on_Event call.

- **Resource revoked notification**:

  The application will no longer receive allocation requests for this resource. No new connections may be made to the specified *resource_ID*. This resource ID is no longer known to the rest of the system or TSAF or CS collection. Existing conversations for this resource ID are not affected. The actions taken for this event are application-specific. The resource manager still must issue Terminate_Resource_Manager after all associated conversations have been deallocated. This information will not be available after it has been presented to the program.

- **Request ID**:

  After receiving the request ID event indication, the application should examine the *event_info_length* field to get the request ID for a Shared File System asynchronous event. This information will not be available after it has been presented to the program. For information on SFS asynchronous events, see the *VM/ESA: CMS Application Development Guide*.

- **Console input**:

  The application determines how to interpret what is input from the console and what further action to take. The console input will not be available after it has been presented to the program.

2. The *event_info_length* parameter indicates how much data is available when the *event_type* is XC_INFORMATION_INPUT, XC_CONSOLE_INPUT, or XC_USER_EVENT.

   When the *event_type* is XC_INFORMATION_INPUT, the value returned by *event_info_length* can be used for the *requested_length* parameter on a subsequent call to the Receive routine to receive the data. An application using this value as the requested length may need to verify that it does not exceed the maximum length for a single Receive call.

   For mapped conversations, the value returned by *event_info_length* may be greater than the number of bytes sent by the remote program. Using this length on the call to Receive will not guarantee that the Receive call will complete immediately; the only way to guarantee that a call to Receive will complete immediately is to set *receive_type* to CM_RECEIVE_IMMEDIATE prior to calling Receive.

3. This call causes the entire application to wait. Multitasking applications should use the CMS event management services to allow a single thread to wait for an event while the others continue processing.

VM/ESA Variables and Characteristics

The following tables are provided for the variables and characteristics used with the VM/ESA extension calls shown in this appendix:

- A chart showing the possible values for variables and characteristics associated with VM/ESA extension calls. The valid pseudonyms and corresponding integer values are provided for each variable or characteristic.
- The data definitions for types and lengths of all VM/ESA extension characteristics and variables.

Pseudonyms and Integer Values

Values for VM/ESA variables and conversation characteristics are shown as pseudonym character strings rather than integer values. For example, instead of stating that the variable *conversation_security_type* is set to an integer value of 0, this appendix shows *conversation_security_type* being set to a pseudonym value of XC_SECURITY_NONE. Table 16 provides a mapping from valid VM/ESA pseudonyms to integer values for each variable and characteristic.

Pseudonyms can also be used for integer values in program code by making use of equate or define statements. See -- Heading 'VMPSEUD' unknown -- for more information on the sample pseudonym files VM/ESA provides.

For further discussion of variables, characteristics, pseudonyms, and the various naming conventions used throughout this book, see Chapter 2, “CPI Communications Terms and Concepts” on page 13.

Table 16. VM/ESA Variables/Characteristics and Their Possible Values

Variable or Characteristic Name	Pseudonym Values	Integer Values
conversation_security_type	XC_SECURITY_NONE	0
	XC_SECURITY_SAME	1
	XC_SECURITY_PROGRAM	2
event_type	XC_ALLOCATION_REQUEST	1
	XC_INFORMATION_INPUT	2
	XC_RESOURCE_REVOKED	3
	XC_CONSOLE_INPUT	4
	XC_REQUEST_ID	5
	XC_USER_EVENT	6
resource_manager_type	XC_PRIVATE	0
	XC_LOCAL	1
	XC_GLOBAL	2
	XC_SYSTEM	3
security_level_flag	XC_REJECT_SECURITY_NONE	0
	XC_ACCEPT_SECURITY_NONE	1
service_mode	XC_SINGLE	0
	XC_SEQUENTIAL	1
	XC_MULTIPLE	2

Variable Types and Lengths

Table 17 defines the type and length of variables used specifically for VM/ESA extension calls.

Table 17. VM/ESA Variable Types and Lengths

Variable	Variable Type	Character Set	Length (in bytes)
client_user_ID	Character string	00640	8
conversation_security_type	Integer	Not applicable	4
event_buffer	Character string	No restriction	130
event_ID	Character string	No restriction	8
event_info_length	Integer	Not applicable	4
event_type	Integer	Not applicable	4
local_FQ_LU_name	Character string	00640	17
local_FQ_LU_name_length	Integer	Not applicable	4
luwid	Character string	00640	26
luwid_length	Integer	Not applicable	4
remote_FQ_LU_name	Character string	00640	17
remote_FQ_LU_name_length	Integer	Not applicable	4
resource_ID	Character string	00640	8
resource_manager_type	Integer	Not applicable	4
security_level_flag	Integer	Not applicable	4
security_password	Character string	00640	0-8
security_password_length	Integer	Not applicable	4
security_user_ID [1]	Character string	00640	0-8
security_user_ID_length	Integer	Not applicable	4
service_mode	Integer	Not applicable	4
user_data	Character string	No restriction	0-130
user_data_length	Integer	Not applicable	4
workunitid	Integer	Not applicable	4

Note:

1. Because the *security_user_ID* characteristic is an output parameter on the Extract_Conversation_Security_User_ID (XCECSU) call, the variable used to contain the output character string should be defined with a length equal to the maximum specification length.

VM/ESA Special Notes

The topics in this section cover a variety of important issues relating to the VM/ESA implementation of CPI Communications.

Program-Startup Processing

In VM/ESA, when the resource being requested is a private resource, node services retrieves the name of the program to be started from a special CMS NAMES file called $SERVER$ NAMES. VM/ESA also uses this file to enable a user to control access to private resources in the virtual machine. The file contains the names of private resources and users that are allowed to connect to them. See *VM/ESA: Connectivity Planning, Administration, and Operation* for detailed information on setting up a $SERVER$ NAMES file.

In addition, the private resource program's virtual machine requires certain statements in its CP directory and PROFILE EXEC to enable it to start CMS and act as a server virtual machine. At a minimum, the CP directory needs the following entries:

- IUCV ALLOW
- IPL CMS

The IUCV ALLOW directory control statement lets programs in other virtual machines communicate with the resource program in the server virtual machine. The IPL CMS statement causes CP to start CMS in the server virtual machine. *VM/ESA: Connectivity Planning, Administration, and Operation* describes these directory control statements in more detail.

The private server virtual machine needs the following statements in its PROFILE EXEC so it can process private resource connections after it has been autologged:

- SET SERVER ON
- SET FULLSCREEN OFF or SET FULLSCREEN SUSPEND
- SET AUTOREAD OFF

The SET SERVER command enables CMS private resource processing. The SET FULLSCREEN command ensures that session services are deactivated. The SET AUTOREAD command prevents CMS from issuing a console read immediately after command execution. This means that CMS will return to `Ready;` state following end-of-command processing and thus will be able to invoke the private resource program. For more information on these CMS commands, see the *VM/ESA: CMS Command Reference*.

End-of-Command Processing

Any unterminated resources declared using Identify_Resource_Manager (XCIDRM) are terminated at CMS end of command.

Work Units

All CPI Communications conversations are associated with CMS work units in VM/ESA. This means that any events that affect CMS work units also affect associated conversations. For example, during end-of-work unit processing, all CPI Communications conversations associated with that work unit are deallocated. Work units are discussed in detail in the *VM/ESA: CMS Application Development Guide*.

External Interrupts

For CPI Communications to work properly in VM/ESA, external interrupts must be enabled for a user's virtual machine. Except for the VM/ESA extension routine Signal_User_Event (XCSUE), CPI Communications routines should not be called from an interrupt handler.

Coordination with the SAA Resource Recovery Interface

VM/ESA supports the SAA resource recovery interface for protected conversations and product-specific protected resources, such as the CMS Shared File System (SFS). See "Support for Resource Recovery Interfaces" on page 52 for an overview of CPI Communications support for the SAA resource recovery interface. The CMS Coordinated Resource Recovery (CRR) facility implements the SAA resource recovery interface in VM/ESA. CRR is available only in CMS environments. For more information on using the SAA resource recovery interface in VM/ESA, see the VM/ESA appendix to the *SAA CPI Resource Recovery Reference*. For more information on CRR, see the *VM/ESA: CMS Application Development Guide* and *VM/ESA: SFS and CRR Planning, Administration, and Operation*.

Additional Conversation Characteristics

In VM/ESA, CPI Communications maintains an additional set of characteristics for each conversation used by a program. These characteristics provide security parameters, which the program can modify.

Table 18 provides a comparison of the security conversation characteristics and initial values as set by the Initialize_Conversation call and the Accept_Conversation call.

Table 18 (Page 1 of 2). VM/ESA Security Characteristics and Their Default Values

Name of Characteristic	Initialize_Conversation sets it to:	Accept_Conversation sets it to:
conversation_security_type	The security type from side information referenced by *sym_dest_name*; if the security type is not listed in side information or if a blank *sym_dest_name* is specified on the call, *conversation_security_type* is set to XC_SECURITY_SAME.	Not applicable
security_password	The password from side information referenced by *sym_dest_name* when the *conversation_security_type* is XC_SECURITY_PROGRAM and a user ID is listed; otherwise a null string. If a blank *sym_dest_name* is specified, *security_password* is set to a null string.	Not applicable
security_password_length	The length of *security_password*, if that characteristic is assigned a value; otherwise, zero. If a blank *sym_dest_name* is specified, *security_password_length* is set to zero.	Not applicable

Table 18 (Page 2 of 2). VM/ESA Security Characteristics and Their Default Values

Name of Characteristic	Initialize_Conversation sets it to:	Accept_Conversation sets it to:
security_user_ID	The user ID from side information referenced by *sym_dest_name* when the *conversation_security_type* is XC_SECURITY_PROGRAM; otherwise a null string. If a blank *sym_dest_name* is specified, *security_user_ID* is set to a null string.	The access security user ID for the session on which the conversation startup request arrived
security_user_ID_length	The length of *security_user_ID*, if that characteristic is assigned a value; otherwise, zero. If a blank *sym_dest_name* is specified, *security_user_ID_length* is set to zero.	The length of *security_user_ID*, if that characteristic is assigned a value; otherwise zero

TP-Model Applications in VM/ESA

Recall from Chapter 2 that SAA CPI Communications provides a programming interface to IBM's SNA LU 6.2. The set of calls defined by SAA, however, does not implement every aspect of the LU 6.2 protocol. VM/ESA provides extensions to SAA CPI Communications to support several additional LU 6.2 features, such as support for security types. VM/ESA also provides routines that are considered extensions to the LU 6.2 architecture. Resource manager support for accepting multiple incoming conversations, for example, is not part of the LU 6.2 protocol.

This section describes how CPI Communications programs in the VM/ESA environment can establish conversations that closely conform to the LU 6.2 model for communications. Such programs are referred to here as LU 6.2 transaction program model applications, or *TP-model applications*. While a TP-model application can be created using only SAA CPI Communications routines, such an application program is also allowed to call most of the VM/ESA extension routines.

LU 6.2 Communications Model

In LU 6.2, LUs initiate and run transaction programs. A transaction program (TP) initiates a conversation with its TP partner using the services of the LUs. In Figure 27, TP A in LU x allocates a conversation to TP B in LU y. LU x formats and presents a conversation startup request in the form of an LU 6.2 Attach to LU y. LU y validates the Attach and starts a new instance of TP B.

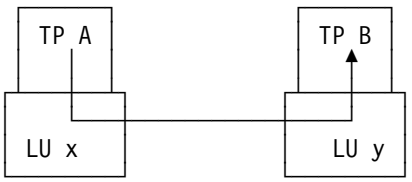


Figure 27. LU 6.2 Communications Model

In this example, both TP A and TP B are TP-model applications:

- TP A is the initial program of a distributed application. It is invoked by some process other than an Attach, typically by an end-user command. TP A has no incoming conversations.

- TP B is invoked as a result of the Attach presented to LU y. There is one and only one incoming conversation.

TP A and TP B can allocate any number of conversations with other partner programs.

VM/ESA TP-Model Applications

In Figure 28, assume that the allocation of a conversation by program A in virtual machine VMUSR1 in LU x causes program B to be automatically started by CMS in virtual machine VMUSR2 in LU y.

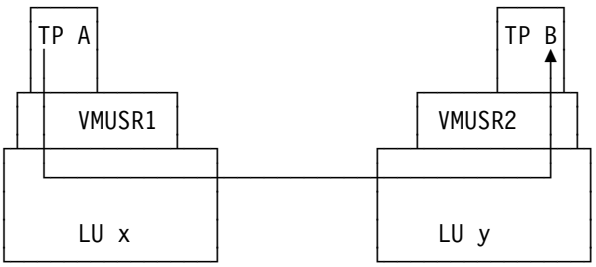


Figure 28. Creating a TP-Model Application in VM/ESA

The CPI-C calls issued by each program determine if it is a TP-model application. Program A is considered a TP-model application until it issues Identify_Resource_Manager (XCIDRM) VM/ESA extension call. Program B's classification, though, is determined by how it is started and by the first successful CPI Communications call that it issues. Calling Accept_Conversation (CMACCP) or Initialize_Conversation (CMINIT) results in program B being a TP-model application. If it is not desirable for program B to be a TP-model application, then it should issue Identify_Resource_Manager as its first CPI Communications call.

VM/ESA considers an application program like program A in Figure 28 to be a TP-model application if it has the following characteristics:

- The program is started by CMS as a result of local (end-user) action.
- There are no incoming conversations. However, the application program can allocate any number of conversations with other partner programs.
- The Identify_Resource_Manager call has not been issued successfully.

VM/ESA considers an application program like program B in Figure 28 to be a TP-model application if it has the following characteristics:

- The program is started automatically by CMS as a result of a private resource conversation startup request.
- There is only one incoming conversation - the one that caused CMS to start the program. The program can allocate any number of conversations with other partner programs, though.
- The first successful CPI Communications call is either Accept_Conversation or Initialize_Conversation.

VM/ESA considers an application program to be a non TP-model application if it has the following characteristics:

- The program has successfully called Identify_Resource_Manager at least once to identify a resource ID it wishes to manage.
- The program can accept multiple conversations and can also allocate any number of conversations with other partner programs.
- The program can call the VM/ESA extensions Terminate_Resource_Manager (XCTRRM) and Set_Client_Security_User_ID (XCSCUI).

Implications

Certain behavior is enforced and certain services are provided by VM/ESA for TP-model applications:

- For TP-model applications, there are three VM/ESA extension calls intended for non TP-model applications that the application programs are not allowed to issue. These functions are: Identify_Resource_Manager (XCIDRM), Terminate_Resource_Manager (XCTRRM), and Set_Client_Security_User_ID (XCSCUI).
- The virtual machine in which a TP-model application is running may require authorization to issue DIAGNOSE code X'D4'. This authorization is necessary if the TP-model application is an intermediate server allocating a conversation with a *conversation_security_type* characteristic of XC_SECURITY_SAME, which is the default value. In this case, the access security user ID provided by the incoming conversation that caused CMS to start the program is automatically propagated on the allocated conversation.

  See the *VM/ESA: CMS Application Development Guide* for more information on intermediate servers and the propagation of access security user IDs.
- For CPI Communications protected conversations (those with the *sync_level* characteristic set to CM_SYNC_POINT), screening is performed for TP-model applications to prevent allocation wrapback. Allocation wrapback occurs when a program tries to allocate a protected conversation whose logical unit of work identifier (LUWID) is already associated with another protected conversation to which the remote program is a partner. Screening is necessary because allocation wrapback can result in deadlock during sync-point processing.

  For example, assume that protected conversations between program A and program B and between program B and program C have been established, as illustrated by the solid lines in Figure 29 on page 401. Three cases of allocation wrapback are illustrated by the dotted lines in that figure. In all of these cases, allocations are being attempted for protected conversations with the same LUWID. Note that the work unit in effect when Allocate (CMALLC) is called determines the LUWID for a protected conversation. The *VM/ESA: CMS Application Development Guide* describes the relationship between LUWIDs and CMS work units.

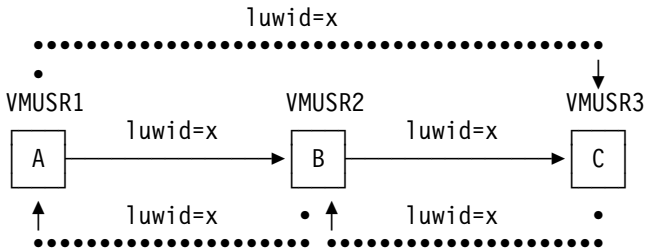


Figure 29. Three Potential Conversation Wrap-Back Scenarios

A conversation startup request that would result in allocation wrapback is automatically rejected for TP-model applications by CMS in the target virtual machine. If an application program allocates a protected conversation that would result in allocation wrapback, it receives a *return_code* value of CM_TP_NOT_AVAILABLE_NO_RETRY on a CPI Communications call following the allocate.

Certain behavior is enforced by VM/ESA for non TP-model applications:

- In order to accept any incoming conversations, the program must call the Identify_Resource_Manager function for all of the resource IDs it wishes to manage (for example, program B in Figure 28 on page 399 must call the Identify_Resource_Manager function for the resource ID of the conversation startup request from program A; otherwise, program B will not be able to accept the conversation startup request from program A).

VM/ESA-Specific Notes for CPI Communications Routines

This section contains VM/ESA-specific notes for certain CPI Communications routines.

Notes for Accept_Conversation (CMACCP):

- In VM/ESA, CPI Communications maintains additional conversation characteristics that provide security information. Table 18 on page 397 lists these additional conversation characteristics and describes how they are initialized by VM/ESA when the Accept_Conversation (CMACCP) call completes successfully.
- When accepting a conversation, the program can become a TP-model application. Refer to “TP-Model Applications in VM/ESA” on page 398 for information on how Accept_Conversation can determine whether a program is a TP-model application.

Notes for Allocate (CMALLC):

- If the remote program is within the same TSAF or CS collection, the operation of the Allocate (CMALLC) call differs from that described in Chapter 4 of this book in the following ways:
  - The Allocate (CMALLC) call does not establish an LU 6.2 session.
  - Because sessions are not used, the *return_control* conversation characteristic has no effect.
  - There is no session buffering; the Allocate (CMALLC) call can be considered to include the function of the Flush (CMFLUS) call. Therefore, the conversation startup request is flowed to the partner immediately.

  - The Allocate (CMALLC) call does not complete immediately. Instead, it completes when the remote program or VM/ESA system either accepts or deallocates the conversation startup request.

- The virtual machine in which the program is running may require authorization to issue DIAGNOSE code X'D4' to allow CPI Communications to set an alternate user ID. This authorization is usually privilege class B, unless the default privilege classes assigned to your installation have been changed.

  DIAGNOSE code X'D4' authorization is typically required when a program either is a TP-model intermediate server or issues the Set_Client_Security_User_ID (XCSCUI) call.

  If not authorized, the Allocate call will complete with a CM_PRODUCT_SPECIFIC_ERROR return code.

Note for Flush (CMFLUS):

- A Flush (CMFLUS) call has no effect when issued on a conversation that is allocated to a target program within the same TSAF or CS collection because information is not buffered for this environment. However, inclusion of Flush (CMFLUS) calls should be considered to make an application program portable.

Notes for Initialize_Conversation (CMINIT):

- If the value specified for *sym_dest_name* does not match an entry in side information, VM/ESA does not return CM_PROGRAM_PARAMETER_CHECK. Rather, the specified value is used to set the *TP_name* characteristic for the conversation. Likewise, if a matching entry is found in the side information, but no *TP_name* characteristic (`:tpn.` field) is associated with the entry, the specified *sym_dest_name* is used. This means that VM/ESA handles both of these cases as initializations for a conversation to a local, global, or system resource that has been identified with a name matching the specified *sym_dest_name*. Conversation characteristics are initialized to the values listed in the section entitled “Conversation Characteristics” on page 31 except as listed here.

Conversation Characteristic	**Initialized Value**
mode_name	set to a null string
mode_name_length	set to zero
partner_LU_name	set to a null value, which indicates *IDENT
partner_LU_name_length	set to zero
TP_name	set to the name specified in the *sym_dest_name* parameter
TP_name_length	set to the length of the name passed in the *sym_dest_name* parameter.

- In VM/ESA, CPI Communications maintains additional conversation characteristics that provide security information. Table 18 on page 397 lists these additional conversation characteristics and describes how they are initialized by VM/ESA when the Initialize_Conversation (CMINIT) call completes successfully.

- When initializing a conversation, the program can become a TP-model application. Refer to “TP-Model Applications in VM/ESA” on page 398 for

information on how Initialize_Conversation may determine whether a program is a TP-model application.

Notes for Send_Data (CMSEND):

- If Send_Data (CMSEND) is called from a REXX program, the buffer parameter specified on the call cannot contain more than 32767 bytes of data. A data field exceeding this size must be partitioned into units of 32767 bytes or less. This restriction applies only to REXX.
- Setting the *send_type* conversation characteristic to CM_SEND_AND_FLUSH or CM_BUFFER_DATA does not affect a Send_Data (CMSEND) call issued on a conversation that is allocated to a target program within the same TSAF or CS collection because information is not buffered for this environment. However, setting the *send_type* characteristic should be considered in case the application is ported to another environment.
- If the conversation partner is located on the same VM/ESA system and the conversation is not allocated through the SNA network, completion of the Send_Data call depends on the partner to receive the data, to send an error notification, or to deallocate its side of the conversation abnormally. In this situation, if the conversation partner does not respond, the Send_Data call will not complete.

  Single-threaded applications that use two conversations to simulate full-duplex behavior can experience a deadlock if both partners are waiting for the other partner to respond to a Send_Data call. To avoid this problem, these applications should use multiple threads and CMS multitasking services.

Note for Set_Log_Data (CMSLD):

- The error information supplied in the *log_data* parameter is formatted by the sending LU into an Error Log general data stream (GDS) variable. The data is placed in the message text portion of the Error Log GDS variable created by the LU. The LU formats the GDS variable, filling in the appropriate length fields and the Product Set ID portion of the GDS variable. See *VM/ESA: CP Programming Services* for the format of the Log Data GDS variable in VM/ESA.

VM/ESA Communications Events

The occurrences of communications events are represented by a system event called VMCPIC. By reporting information through this event, CPI Communications allows an application to use all the facilities of CMS event management services to monitor and respond to these conditions, with the additional benefit of avoiding undue serialization in multitasking applications.

The following types of events are reported by VMCPIC:

- Allocation requests
- Information input from partner
- Resource revoked notification.

The other two events supported by Signal_User_Event (XCSUE) and Wait_on_Event (XCWOE), namely console input and user events, also can be handled through the use of event management services. CMS provides a system event, called VMCONINPUT, that allows an application to wait on console input events. Additionally, an application can use the event management functions to generate and process its own user events.

See *VM/ESA: CMS Application Multitasking* for a full description of event management services.

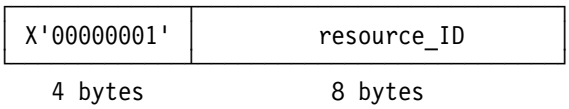
The VMCPIC Event

When VMCPIC is signalled, event data is associated with the signal, and a portion of this event data forms the event key. The following sections describe the VMCPIC event data and event keys in more detail and provide some information on creating match keys.

Event Data and Keys: The following list contains a description of the event data available when VMCPIC is signalled and the event keys that are carried by the VMCPIC signals.

- Allocation request

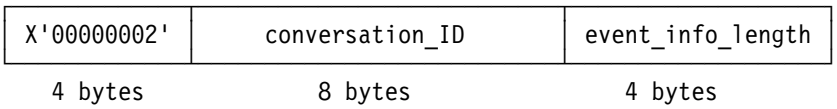
  The event data associated with a signal for an allocation request consists of X'00000001' concatenated with the *resource_ID*:

  The event key is composed of both fields. However, note that since allocation requests are presented in first in, first out (FIFO) order, an application should not create a key to handle allocation requests selectively based on the *resource_ID*. An application that attempts to use selective allocation request monitors may not perform as desired. The application instead should specify the match-all wildcard '*' (X'5C') for the resource ID portion of the key.

- Information input

  The event data associated with a signal for information input consists of X'00000002' concatenated with the *conversation_ID* concatenated with the *event_info_length*:

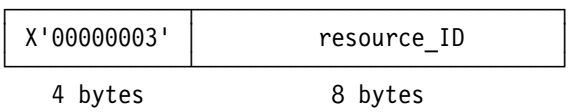
  

  Note: The value returned by *event_info_length* may be greater than the amount of data sent by the remote partner. An application that uses this value to set the *requested_length* parameter on a Receive call may need to verify that it does not exceed the maximum length allowed for a single Receive call.

  The event key consists of the first two fields.

- Resource revoked notification

  The event data associated with a signal for a resource revoked notification consists of X'00000003' concatenated with the *resource_ID*:

  The event key contains both fields.

Creating Match Keys: An application may specify either a key that exactly matches the signal key of interest, or a partial key, possibly including wildcard characters, which matches a broader range of occurrences.

The *event_type* values provided in the VM/ESA pseudonym files may be used to build keys or to determine which event was signalled by a VMCPIC event; however, some conversion of the pseudonym value or event data by the application may be required.

For example, to build the key to specify when creating a monitor for information input events associated with an established conversation represented by the identifier contained in the *conversation_ID* variable, a REXX application may use a line of code like this:

```
match_key = d2c(XC_INFORMATION_INPUT,4)||conversation_ID
```

Notes on the VMCPIC Event

Here is some information that a programmer should understand before writing an application that uses the VMCPIC event.

- Event services and the VMCPIC event are supported for the Assembler, C, and REXX programming languages.
- VMCPIC is not signalled for an allocation request event unless an Identify_Resource_Manager (XCIDRM) call was previously issued for the corresponding *resource_ID*.
- VMCPIC is not signalled for an information input event if a Receive (CMRCV) call with a *receive_type* of CM_RECEIVE_AND_WAIT is outstanding for the corresponding conversation at the time the event occurs. Thus, if both a Receive call and an EventWait for a VMCPIC monitor were waiting when an information input event occurred, only the Receive call would complete.
- VMCPIC is not signaled if Request_To_Send arrives without any accompanying data.
- The occurrence of an allocation request event or an information input event is signalled only once by VMCPIC, rather than continuously until the event has been processed as is done by the Wait_on_Event call.
- An application using the VMCPIC event should be written such that all communications-related actions are performed in response to the signalling of VMCPIC. In other words, the application using VMCPIC should not anticipate that certain communications events will happen and handle those events before VMCPIC has signalled their occurrence.

Using the Online HELP Facility

You can receive online information about the CPI Communications calls and the VM/ESA extensions described in this book using the VM/ESA HELP Facility. For example, to display a menu of callable routines, enter:

```
help routine menu
```

To display a list of general tasks for which callable routines exist, enter

```
help routine task
```

To display information about a specific call (CMINIT in this example), enter:

```
help routine cminit
```

For more information about using the HELP Facility, see the *VM/ESA: CMS User's Guide*. To display the main HELP Task Menu, enter:

```
help
```

For more information about the HELP command, see the *VM/ESA: CMS Command Reference* or enter:

```
help cms help
```

Part 3. Appendixes

Appendix A. Variables and Characteristics 411
Pseudonyms and Integer Values 411
Character Sets 418
Variable Types 421
Integers 421
Character Strings 421
Distinguished Name 426
Program Function Identifier (PFID) 427
PFID Assignment Algorithms 427
Program Binding 429

Appendix B. Return Codes and Secondary Information 431
Return Codes 431
Secondary Information 449
Application-Oriented Information 450
CPI Communications-Defined Information 451
CRM-Specific Secondary Information 460
Implementation-Related Information 461

Appendix C. State Tables 463
How to Use the State Tables 463
Example 464
Explanation of Half-Duplex State Table Abbreviations 466
Conversation Characteristics ( ) 466
Conversation Queues () 467
Return Code Values [ ] 468
data_received and status_received { , } 470
Table Symbols for the Half-Duplex State Table 471
Effects of Calls to the SAA Resource Recovery Interface on Half-Duplex Conversations 479
Effects of Calls on Half-Duplex Conversations to the X/Open TX Interface . 480
Explanation of Full-Duplex State Table Abbreviations 481
Conversation Characteristics ( ) 481
Conversation Queues () 482
Return Code Values [ ] 483
data_received and status_received { , } 486
Table Symbols for the Full-Duplex State Table 487
Effects of Calls to the SAA Resource Recovery Interface on Full-Duplex Conversations 495
Effects of Calls on Full-Duplex Conversations to the X/Open TX Interface . . 496

Appendix D. Mapping CPI Communications to LU 6.2 and OSI TP CRMs 497
CPI Communications and LU 6.2 CRMs 497
Send-Pending State and the error_direction Characteristic 498
CPI Communications Programs Communicating with APPC Programs . . 499
SNA Service Transaction Programs 499
3 Implementation Considerations 500
Relationship between LU 6.2 Verbs and CPI Communications Calls . . . 500
CPI Communications and OSI TP CRMs for Half-Duplex Conversations . . . 507
Summary of CPI-C ASE Services 507

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Mapping CPI-C to OSI TP Services . . . 507
Mapping OSI TP Services to CPI-C for Half-Duplex Conversations . . . 522
Sequencing Rules and State Tables . . . 527
CPI-C ASE Protocol Definition . . . 527
CPI-C ASE Structure and Encoding of APDUs . . . 527
CPI Communications and OSI TP CRMs for Full-Duplex Conversations . . . 527
Mapping OSI TP Services to CPI-C for Full-Duplex Conversations . . . 536
Sequencing Rules and State Tables . . . 541
CPI-C ASE Protocol Definition . . . 541
CPI-C ASE Structure and Encoding of APDUs . . . 541

Appendix E. Application Migration from X/Open CPI-C . . . 543

Appendix F. CPI Communications Extensions for Use with DCE Directory . . . 545
Profile Object . . . 545
Server Object . . . 545
Server Group Object . . . 546
Interaction of Directory Objects . . . 546
CPI-C Name Service Interface . . . 547
CNSI Calls . . . 548
Definition of New Objects . . . 548
Terminology . . . 548
Profile Object . . . 549
Server Object . . . 549
Server Group Object . . . 549
Program Installation Object . . . 550
Encoding Method for Complex Attribute Values . . . 550
Scenarios for Use of CNSI . . . 550
(PFID, *, *) . . . 551
(PFID, SDN, *) . . . 551
(PFID, SGDN, *) . . . 551
(PFID, SDN, resID) . . . 552
(PFID, SGDN, resID) . . . 552
(PFID, PDN, *) . . . 552
(PFID, PDN, resID) . . . 552

Appendix G. CPI Communications 2.1 Conformance Classes . . . 553
Definitions . . . 553
Conformance Requirements . . . 553
Multi-Threading Support . . . 553
CPI-C 2.1 Conformance Classes . . . 553
Functional Conformance Class Descriptions . . . 554
Conversations . . . 554
LU 6.2 . . . 556
OSI TP . . . 556
Recoverable Transactions . . . 557
Unchained Transactions . . . 557
Conversation-Level Non-Blocking . . . 558
Queue-Level Non-Blocking . . . 558
Callback Function . . . 558
Server . . . 559
Data Conversion Routines . . . 559
Security . . . 559

Distributed Security 560
Full-Duplex 560
Expedited Data 560
Directory 560
Secondary Information 561
Initialization Data 561
Automatic Data Conversation 561
Configuration Conformance Class Description 562
OSI TP Addressing Disable 562
Relationship to OSI TP Functional Units and OSI TP Profiles 563
Conformance Class Details 564

Appendix A. Variables and Characteristics

For the variables and characteristics used throughout this book, this appendix provides the following items:

- A chart showing the values that variables and characteristics can take. The valid pseudonyms and corresponding integer values are provided for each variable and characteristic.
- The character sets used by CPI Communications.
- The data definitions for types and lengths of all CPI Communications characteristics and variables.

Pseudonyms and Integer Values

As explained in "Naming Conventions—Calls, Characteristics, Variables, and Values" on page 11, the values for variables and conversation characteristics are shown as pseudonyms rather than integer values. For example, instead of stating that the variable *return_code* is set to an integer value of 0, the book shows the *return_code* being set to a pseudonym value of CM_OK. Table 19 on page 412 provides a mapping from valid pseudonyms to integer values for each variable and characteristic.

Pseudonyms can also be used for integer values in program code by making use of equate or define statements. The diskette that came with this manual provides sample pseudonym files for several programming languages. The diskette also contains an example of how a pseudonym file is used by a COBOL program.

Note: Because the *return_code* variable is used for all CPI Communications calls, Appendix B, "Return Codes and Secondary Information" provides a more detailed description of its values, in addition to the list of values provided here.

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Variable Definitions

Table 19 (Page 1 of 6). Variables/Characteristics and Their Possible Values		
Variable or Characteristic Names	**Pseudonym Values**	**Integer Values**
AE_qualifier_format	CM_DN CM_INT_DIGITS	0 2
allocate_confirm	CM_ALLOCATE_NO_CONFIRM CM_ALLOCATE_CONFIRM	0 1
AP_title_format	CM_DN CM_OID	0 1
begin_transaction	CM_BEGIN_IMPLICIT CM_BEGIN_EXPLICIT	0 1
call_id [1]	CM_CMACCI CM_CMACCP CM_CMALLC CM_CMCANC CM_CMCFM CM_CMCFMD CM_CMCNVI CM_CMCNVO CM_CMDEAL CM_CMDFDE CM_CMEACN CM_CMEAEQ CM_CMEAPT CM_CMECS CM_CMECT CM_CMECTX CM_CMEID CM_CMEMBS CM_CMEMN CM_CMEPID CM_CMEPLN CM_CMESI CM_CMESL CM_CMESRM CM_CMESUI CM_CMETC CM_CMETPN CM_CMFLUS CM_CMINCL CM_CMINIC CM_CMINIT CM_CMPREP CM_CMPTR CM_CMRCV CM_CMRCVX CM_CMRLTP CM_CMRTS CM_CMSAC CM_CMSACN CM_CMSAEQ CM_CMSAPT CM_CMSBT	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42

Table 19 (Page 2 of 6). Variables/Characteristics and Their Possible Values

Variable or Characteristic Names	Pseudonym Values	Integer Values
	CM_CMSCSP	43
	CM_CMSCST	44
	CM_CMSCSU	45
	CM_CMSCT	46
	CM_CMSCU	47
	CM_CMSDT	48
	CM_CMSED	49
	CM_CMSEND	50
	CM_CMSERR	51
	CM_CMSF	52
	CM_CMSID	53
	CM_CMSLD	54
	CM_CMSLTP	55
	CM_CMSMN	56
	CM_CMSNDX	57
	CM_CMSPDP	58
	CM_CMSPID	59
	CM_CMSPLN	60
	CM_CMSPM	61
	CM_CMSPTR	62
	CM_CMSQCF	63
	CM_CMSQPM	64
	CM_CMSRC	65
	CM_CMSRT	66
	CM_CMSSL	67
	CM_CMSSRM	68
	CM_CMSST	69
	CM_CMSTC	70
	CM_CMSTPN	71
	CM_CMTRTS	72
	CM_CMWAIT	73
	CM_CMWCMP	74
	CM_CMSJT	75
	CM_CMEMID	76
	CM_CMSMID	77
	CM_CMSNDM	78
	CM_CMRCVM	79
confirmation_urgency	CM_CONFIRMATION_NOT_URGENT	0
	CM_CONFIRMATION_URGENT	1
control_information_received	CM_NO_CONTROL_INFO_RECEIVED	0
	CM_REQ_TO_SEND_RECEIVED	1
	CM_ALLOCATE_CONFIRMED	2
	CM_ALLOCATE_CONFIRMED_WITH_DATA	3
	CM_ALLOCATE_REJECTED_WITH_DATA	4
	CM_EXPEDITED_DATA_AVAILABLE	5
	CM_RTS_RCVD_AND_EXP_DATA_AVAIL	6
conversation_queue	CM_INITIALIZATION_QUEUE	0
	CM_SEND_QUEUE	1
	CM_RECEIVE_QUEUE	2
	CM_SEND_RECEIVE_QUEUE	3
	CM_EXPEDITED_SEND_QUEUE	4
	CM_EXPEDITED_RECEIVE_QUEUE	5

Variable Definitions

Table 19 (Page 3 of 6). Variables/Characteristics and Their Possible Values

Variable or Characteristic Names	Pseudonym Values	Integer Values
conversation_return_code	See *return_code*.	
conversation_security_type	CM_SECURITY_NONE	0
	CM_SECURITY_SAME	1
	CM_SECURITY_PROGRAM	2
	CM_SECURITY_DISTRIBUTED	3
	CM_SECURITY_MUTUAL	4
	CM_SECURITY_PROGRAM_STRONG	5
conversation_state	CM_INITIALIZE_STATE	2
	CM_SEND_STATE	3
	CM_RECEIVE_STATE	4
	CM_SEND_PENDING_STATE	5
	CM_CONFIRM_STATE	6
	CM_CONFIRM_SEND_STATE	7
	CM_CONFIRM_DEALLOCATE_STATE	8
	CM_DEFER_RECEIVE_STATE	9
	CM_DEFER_DEALLOCATE_STATE	10
	CM_SYNC_POINT_STATE	11
	CM_SYNC_POINT_SEND_STATE	12
	CM_SYNC_POINT_DEALLOCATE_STATE	13
	CM_INITIALIZE_INCOMING_STATE	14
	CM_SEND_ONLY_STATE	15
	CM_RECEIVE_ONLY_STATE	16
	CM_SEND_RECEIVE_STATE	17
	CM_PREPARED_STATE	18
conversation_type	CM_BASIC_CONVERSATION	0
	CM_MAPPED_CONVERSATION	1
data_received	CM_NO_DATA_RECEIVED	0
	CM_DATA_RECEIVED	1
	CM_COMPLETE_DATA_RECEIVED	2
	CM_INCOMPLETE_DATA_RECEIVED	3
deallocate_type	CM_DEALLOCATE_SYNC_LEVEL	0
	CM_DEALLOCATE_FLUSH	1
	CM_DEALLOCATE_CONFIRM	2
	CM_DEALLOCATE_ABEND	3
directory_encoding	CM_DEFAULT_ENCODING	0
	CM_UNICODE_ENCODING	1
directory_syntax	CM_DEFAULT_SYNTAX	0
	CM_DCE_SYNTAX	1
	CM_XDS_SYNTAX	2
	CM_NDS_SYNTAX	3
error_direction	CM_RECEIVE_ERROR	0
	CM_SEND_ERROR	1
expedited_receive_type	CM_RECEIVE_AND_WAIT	0
	CM_RECEIVE_IMMEDIATE	1

Table 19 (Page 4 of 6). Variables/Characteristics and Their Possible Values

Variable or Characteristic Names	Pseudonym Values	Integer Values
fill	CM_FILL_LL	0
	CM_FILL_BUFFER	1
join_transaction	CM_JOIN_IMPLICIT	0
	CM_JOIN_EXPLICIT	1
partner_ID_scope	CM_EXPLICIT	0
	CM_REFERENCE	1
partner_ID_type	CM_DISTINGUISHED_NAME	0
	CM_LOCAL_DISTINGUISHED_NAME	1
	CM_PROGRAM_FUNCTION_ID	2
	CM_OSI_TPSU_TITLE_OID	3
	CM_PROGRAM_BINDING	4
prepare_data_permitted	CM_PREPARE_DATA_NOT_PERMITTED	0
	CM_PREPARE_DATA_PERMITTED	1
prepare_to_receive_type	CM_PREP_TO_RECEIVE_SYNC_LEVEL	0
	CM_PREP_TO_RECEIVE_FLUSH	1
	CM_PREP_TO_RECEIVE_CONFIRM	2
processing_mode	CM_BLOCKING	0
	CM_NON_BLOCKING	1
queue_processing_mode	CM_BLOCKING	0
	CM_NON_BLOCKING	1
receive_type	CM_RECEIVE_AND_WAIT	0
	CM_RECEIVE_IMMEDIATE	1
request_to_send_received [2]	CM_REQ_TO_SEND_NOT_RECEIVED	0
	CM_REQ_TO_SEND_RECEIVED	1
return_code and *conversation_return_code*	CM_OK	0
	CM_ALLOCATE_FAILURE_NO_RETRY	1
	CM_ALLOCATE_FAILURE_RETRY	2
	CM_CONVERSATION_TYPE_MISMATCH	3
	CM_PIP_NOT_SPECIFIED_CORRECTLY	5
	CM_SECURITY_NOT_VALID	6
	CM_SYNC_LVL_NOT_SUPPORTED_SYS	7
	CM_SYNC_LVL_NOT_SUPPORTED_PGM	8
	CM_TPN_NOT_RECOGNIZED	9
	CM_TP_NOT_AVAILABLE_NO_RETRY	10
	CM_TP_NOT_AVAILABLE_RETRY	11
	CM_DEALLOCATED_ABEND	17
	CM_DEALLOCATED_NORMAL	18
	CM_PARAMETER_ERROR	19
	CM_PRODUCT_SPECIFIC_ERROR	20
	CM_PROGRAM_ERROR_NO_TRUNC	21
	CM_PROGRAM_ERROR_PURGING	22
	CM_PROGRAM_ERROR_TRUNC	23
	CM_PROGRAM_PARAMETER_CHECK	24
	CM_PROGRAM_STATE_CHECK	25
	CM_RESOURCE_FAILURE_NO_RETRY	26

Variable Definitions

Table 19 (Page 5 of 6). Variables/Characteristics and Their Possible Values

Variable or Characteristic Names	Pseudonym Values	Integer Values
	CM_RESOURCE_FAILURE_RETRY	27
	CM_UNSUCCESSFUL	28
	CM_DEALLOCATED_ABEND_SVC	30
	CM_DEALLOCATED_ABEND_TIMER	31
	CM_SVC_ERROR_NO_TRUNC	32
	CM_SVC_ERROR_PURGING	33
	CM_SVC_ERROR_TRUNC	34
	CM_OPERATION_INCOMPLETE	35
	CM_SYSTEM_EVENT	36
	CM_OPERATION_NOT_ACCEPTED	37
	CM_CONVERSATION_ENDING	38
	CM_SEND_RCV_MODE_NOT_SUPPORTED	39
	CM_BUFFER_TOO_SMALL	40
	CM_EXP_DATA_NOT_SUPPORTED	41
	CM_DEALLOC_CONFIRM_REJECT	42
	CM_ALLOCATION_ERROR	43
	CM_RETRY_LIMIT_EXCEEDED	44
	CM_NO_SECONDARY_INFORMATION	45
	CM_SECURITY_NOT_SUPPORTED	46
	CM_SECURITY_MUTUAL_FAILED	47
	CM_CALL_NOT_SUPPORTED	48
	CM_PARM_VALUE_NOT_SUPPORTED	49
	CM_UNKNOWN_MAP_NAME_REQUESTED	50
	CM_UNKNOWN_MAP_NAME_RECEIVED	51
	CM_MAP_ROUTINE_ERROR	52
	CM_CONVERSATION_CANCELED	53
	CM_TAKE_BACKOUT	100
	CM_DEALLOCATED_ABEND_BO	130
	CM_DEALLOCATED_ABEND_SVC_BO	131
	CM_DEALLOCATED_ABEND_TIMER_BO	132
	CM_RESOURCE_FAIL_NO_RETRY_BO	133
	CM_RESOURCE_FAILURE_RETRY_BO	134
	CM_DEALLOCATED_NORMAL_BO	135
	CM_CONV_DEALLOC_AFTER_SYNCPT	136
	CM_INCLUDE_PARTNER_REJECT_BO	137
return_control	CM_WHEN_SESSION_ALLOCATED	0
	CM_IMMEDIATE	1
	CM_WHEN_CONWINNER_ALLOCATED	2
	CM_WHEN_SESSION_FREE	3
send_receive_mode	CM_HALF_DUPLEX	0
	CM_FULL_DUPLEX	1
send_type	CM_BUFFER_DATA	0
	CM_SEND_AND_FLUSH	1
	CM_SEND_AND_CONFIRM	2
	CM_SEND_AND_PREP_TO_RECEIVE	3
	CM_SEND_AND_DEALLOCATE	4

Table 19 (Page 6 of 6). Variables/Characteristics and Their Possible Values

Variable or Characteristic Names	Pseudonym Values	Integer Values
status_received	CM_NO_STATUS_RECEIVED	0
	CM_SEND_RECEIVED	1
	CM_CONFIRM_RECEIVED	2
	CM_CONFIRM_SEND_RECEIVED	3
	CM_CONFIRM_DEALLOC_RECEIVED	4
	CM_TAKE_COMMIT	5
	CM_TAKE_COMMIT_SEND	6
	CM_TAKE_COMMIT_DEALLOCATE	7
	CM_TAKE_COMMIT_DATA_OK	8
	CM_TAKE_COMMIT_SEND_DATA_OK	9
	CM_TAKE_COMMIT_DEALLOC_DATA_OK	10
	CM_PREPARE_OK	11
	CM_JOIN_TRANSACTION	12
sync_level	CM_NONE	0
	CM_CONFIRM	1
	CM_SYNC_POINT	2
	CM_SYNC_POINT_NO_CONFIRM	3
transaction_control	CM_CHAINED_TRANSACTIONS	0
	CM_UNCHAINED_TRANSACTIONS	1

Notes:

1. The *call_ID* values greater than 10000 are reserved for the product extension calls.
2. Early versions of CPI-C used the *request_to_send_received* variable. CPI-C 2.0 programs use *control_information_received*, which is an enhanced version of the *request_to_send_received* variable.

Character Sets

CPI Communications makes use of character strings composed of characters from one of the following character sets:

- Character set 01134, which is composed of the uppercase letters A through Z and numerals 0-9.
- Character set 00640, which is composed of the uppercase and lowercase letters A through Z, numerals 0-9, and 20 special characters.
- Character set T61String, which is composed of the uppercase and lowercase letters A through Z, numerals 0-9, and many additional special characters. The most commonly used special characters are provided in Table 20. See CCITT Recommendation T.61 for other defined special characters.

These character sets, along with EBCDIC hexadecimal and graphic representations, are provided in Table 20. See the *SNA Formats* manual (GA27-3136) for more information on character sets.

Table 20 (Page 1 of 3). Character Sets T61String, 01134, and 00640

EBCDIC Hex Code	Graphic	Description	Character Set		
			T61-String	01134	00640
40		Blank	X		X
4A	[	Left square bracket	X		
4B	.	Period	X		X
4C	<	Less than sign	X		X
4D	(	Left parenthesis	X		X
4E	+	Plus sign	X		X
4F	!	Exclamation mark	X		
50	&	Ampersand	X		X
5A	]	Right square bracket	X		
5C	*	Asterisk	X		X
5D	)	Right parenthesis	X		X
5E	;	Semicolon	X		X
60	-	Dash	X		X
61	/	Slash	X		X
6B	,	Comma	X		X
6C	%	Percent sign	X		X
6D	_	Underscore	X		X
6E	>	Greater than sign	X		X
6F	?	Question mark	X		X
7A	:	Colon	X		X
7C	@	Commercial a (at sign)	X		
7D	'	Single quote	X		X
7E	=	Equal sign	X		X
7F	"	Double quote	X		X
81	a	Lowercase a	X		X
82	b	Lowercase b	X		X
83	c	Lowercase c	X		X
84	d	Lowercase d	X		X
85	e	Lowercase e	X		X
86	f	Lowercase f	X		X
87	g	Lowercase g	X		X

Table 20 (Page 2 of 3). Character Sets T61String, 01134, and 00640

EBCDIC Hex Code	Graphic	Description	Character Set		
			T61-String	01134	00640
88	h	Lowercase h	X		X
89	i	Lowercase i	X		X
91	j	Lowercase j	X		X
92	k	Lowercase k	X		X
93	l	Lowercase l	X		X
94	m	Lowercase m	X		X
95	n	Lowercase n	X		X
96	o	Lowercase o	X		X
97	p	Lowercase p	X		X
98	q	Lowercase q	X		X
99	r	Lowercase r	X		X
A2	s	Lowercase s	X		X
A3	t	Lowercase t	X		X
A4	u	Lowercase u	X		X
A5	v	Lowercase v	X		X
A6	w	Lowercase w	X		X
A7	x	Lowercase x	X		X
A8	y	Lowercase y	X		X
A9	z	Lowercase z	X		X
BB	|	Vertical line	X		
C1	A	Uppercase A	X	X	X
C2	B	Uppercase B	X	X	X
C3	C	Uppercase C	X	X	X
C4	D	Uppercase D	X	X	X
C5	E	Uppercase E	X	X	X
C6	F	Uppercase F	X	X	X
C7	G	Uppercase G	X	X	X
C8	H	Uppercase H	X	X	X
C9	I	Uppercase I	X	X	X
D1	J	Uppercase J	X	X	X
D2	K	Uppercase K	X	X	X
D3	L	Uppercase L	X	X	X
D4	M	Uppercase M	X	X	X
D5	N	Uppercase N	X	X	X
D6	O	Uppercase O	X	X	X
D7	P	Uppercase P	X	X	X
D8	Q	Uppercase Q	X	X	X
D9	R	Uppercase R	X	X	X
E2	S	Uppercase S	X	X	X
E3	T	Uppercase T	X	X	X
E4	U	Uppercase U	X	X	X
E5	V	Uppercase V	X	X	X
E6	W	Uppercase W	X	X	X
E7	X	Uppercase X	X	X	X
E8	Y	Uppercase Y	X	X	X
E9	Z	Uppercase Z	X	X	X
F0	0	Zero	X	X	X
F1	1	One	X	X	X
F2	2	Two	X	X	X
F3	3	Three	X	X	X
F4	4	Four	X	X	X
F5	5	Five	X	X	X
F6	6	Six	X	X	X

Table 20 (Page 3 of 3). Character Sets T61String, 01134, and 00640

EBCDIC Hex Code	Graphic	Description	Character Set		
			T61-String	01134	00640
F7	7	Seven	X	X	X
F8	8	Eight	X	X	X
F9	9	Nine	X	X	X

Variable Types

CPI Communications makes use of two variable types, integer and character string. Table 21 on page 422 defines the type and length of variables used in this document. Variable types are described below.

Integers

The integers are signed, non-negative integers. Their length is provided in bits.

Character Strings

Character strings are composed of characters taken from one of the character sets discussed in "Character Sets" on page 418, or, in the case of *buffer*, are bytes with no restrictions (that is, a string composed of characters from X'00' to X'FF').

Note: The name "character string" as used in this manual should not be confused with "character string" as used in the C programming language. No further restrictions beyond those described above are intended.

The character-string length represents the number of characters a character string can contain. CPI Communications defines two lengths for some character-string variables:

- **Minimum specification length:** The minimum number of characters that a program can use to specify the character string. For some character strings, the minimum specification length is zero. A zero-length character string on a call means the character string is omitted, regardless of the length of the variable that contains the character string (see the notes for Table 21 on page 422).
- **Maximum specification length:** The maximum number of characters that a transaction program can use to specify a character string. All products can send or receive the maximum specification length for the character string.

For example, the character-string length for *log_data* is listed as 0-512 bytes, where 0 is the minimum specification length and 512 is the maximum specification length.

If the variable to which a character string is assigned is longer than the character string, the character string is left-justified within the variable and the variable is filled out to the right with space characters (also referred to as blank characters). Space characters, if present, are not part of the character string.

If the character string is formed from the concatenation of two or more individual character strings, as is discussed in note 5 on page 424 for the *partner_LU_name*, the concatenated character string as a whole is left-justified within the variable and the variable is filled out to the right with space characters. Space characters, if present, are not part of the concatenated character string.

Variable Definitions

Table 21 (Page 1 of 3). Variable Types and Lengths

Variable	Variable Type	Character Set	Length
AE_qualifier [3, 4]	Character string	T61String	0-1024 bytes
AE_qualifier_format	Integer	N/A	32 bits
AE_qualifier_length	Integer	N/A	32 bits
allocate_confirm	Integer	N/A	32 bits
AP_title [3, 4]	Character string	T61String	0-1024 bytes
AP_title_format	Integer	N/A	32 bits
AP_title_length	Integer	N/A	32 bits
application_context_name [3, 4]	Character string	00640	0-256 bytes
application_context_name_length	Integer	N/A	32 bits
begin_transaction	Integer	N/A	32 bits
buffer [1, 2]	Character string	no restriction	0-max supported by system
buffer_length [1]	Integer	N/A	32 bits
call_ID	Integer	N/A	32 bits
callback_function	Pointer [11]	N/A	system-dependent [11]
completed_op_index_list	Array of integers	N/A	n X 32 bits
completed_op_count	Integer	N/A	32 bits
confirmation_urgency	Integer	N/A	32 bits
context_ID	Character string	no restriction	1-32 bytes
context_ID_length	Integer	N/A	32 bits
control_information_received	Integer	N/A	32 bits
conversation_ID	Character string	no restriction	8 bytes
conversation_queue	Integer	N/A	32 bits
conversation_return_code	Integer	N/A	32 bits
conversation_security_type	Integer	N/A	32 bits
conversation_state	Integer	N/A	32 bits
conversation_type	Integer	N/A	32 bits
data_received	Integer	N/A	32 bits
deallocate_type	Integer	N/A	32 bits
directory_encoding	Integer	N/A	32 bits
directory_syntax	Integer	N/A	32 bits
error_direction	Integer	N/A	32 bits
expedited_receive_type	Integer	N/A	32 bits
fill	Integer	N/A	32 bits
initialization_data [3, 4]	Character string	no restriction	0-10000 bytes

Table 21 (Page 2 of 3). Variable Types and Lengths

Variable	Variable Type	Character Set	Length
initialization_data_length	Integer	N/A	32 bits
join_transaction	Integer	N/A	32 bits
log_data [3]	Character string	no restriction	0-512 bytes
log_data_length	Integer	N/A	32 bits
map_name	Character string	T61String	0-64 bytes
map_name_length	Integer	N/A	32 bits
maximum_buffer_size [2]	Integer	N/A	32 bits
mode_name [3, 4, 8]	Character string	01134	0-8 bytes
mode_name_length	Integer	N/A	32 bits
OOID	Integer	N/A	32 bits
OOID_list	Array of integers	N/A	n X 32 bits
OOID_list_count	Integer	N/A	32 bits
partner_ID	Character string	no restriction	0-32767 bytes
partner_ID_length	Integer	N/A	32 bits
partner_ID_scope	Integer	N/A	32 bits
partner_ID_type	Integer	N/A	32 bits
partner_LU_name [3, 4, 5]	Character string	01134	1-17 bytes
partner_LU_name_length	Integer	N/A	32 bits
prepare_data_permitted	Integer	N/A	32 bits
prepare_to_receive_type	Integer	N/A	32 bits
processing_mode	Integer	N/A	32 bits
queue_processing_mode	Integer	N/A	32 bits
receive_type	Integer	N/A	32 bits
received_length [2]	Integer	N/A	32 bits
request_to_send_received [10]	Integer	N/A	32 bits
requested_length [2]	Integer	N/A	32 bits
return_code	Integer	N/A	32 bits
return_control	Integer	N/A	32 bits
security_password [3]	Character string	00640	0-10 bytes
security_password_length	Integer	N/A	32 bits
security_user_ID [3, 4]	Character string	00640	0-10 bytes
security_user_ID_length	Integer	N/A	32 bits
send_length [2]	Integer	N/A	32 bits
send_receive_mode	Integer	N/A	32 bits
send_type	Integer	N/A	32 bits
status_received	Integer	N/A	32 bits
sym_dest_name [3, 7]	Character string	01134	8 bytes
sync_level	Integer	N/A	32 bits

Table 21 (Page 3 of 3). Variable Types and Lengths

Variable	Variable Type	Character Set	Length
timeout	Integer	N/A	32 bits
TP_name [3, 4, 6]	Character string	T61String	1-64 bytes
TP_name_length	Integer	N/A	32 bits
transaction_control	Integer	N/A	32 bits
user_field	Character string	no restriction	8 bytes
user_field_list	Array of character strings	no restriction	n X 8 bytes

Notes:

1. When a transaction program is in conversation with another transaction program executing in an unlike environment (for example, an EBCDIC-environment program in conversation with an ASCII-environment program), *buffer* may require conversion from one encoding to the other. For character data in character data set 00640, this conversion can be accomplished by Convert_Outgoing in the sending program and by Convert_Incoming in the receiving program. The maximum allowed value of the *buffer_length* parameter on the Convert_Incoming and Convert_Outgoing calls is implementation-specific.
2. The maximum buffer size for sending and receiving data may vary from system to system. The maximum buffer size is at least 32767. For more information, refer to “Extract_Maximum_Buffer_Size (CMEMBS)” on page 170.
3. Specify these fields using the native encoding of the local system. When appropriate, CPI Communications automatically converts these fields to the correct format (EBCDIC on LU 6.2 and the negotiated transfer syntax on OSI TP) when they are used as input parameters on CPI Communications calls. When CPI Communications returns these fields to the program (for instance, as output parameters on one of the Extract calls), they are returned in the native encoding of the local system. See “Automatic Conversion of Characteristics” on page 39 for more information on automatic conversion of these fields.

   Note: An LU 6.2 CRM converts log data in character set 00640 only. To enhance program portability, it is recommended that character set 00640 be used for the *log_data* characteristic.
4. Because the *mode_name*, *partner_LU_name*, *security_user_ID*, *AE_qualifier*, *AP_title*, *application_context_name*, *context_ID*, *TP_name*, and *initialization_data* characteristics are output parameters on their respective Extract calls, the variables used to contain the output character strings should be defined with a length equal to the maximum specification length.

   Note: An LU 6.2 CRM uses character set 00640 for the *partner_LU_name* and *TP_name*. An OSI TP CRM uses character set T61 String for the *AE_qualifier*, *AP_title*, *application_context_name*, and *TP_name*. Both CRM types use character set 01134 for the *mode_name*. To enhance program portability, it is recommended that character set 01134, a subset of character sets 00640 and T61 String, be used for these characteristics.
5. The *partner_LU_name* can be of two varieties:

- A character string composed solely of characters drawn from character set 01134
- A character string consisting of two character strings composed of characters drawn from character set 01134. The two character strings are concatenated together by a period (the period is not part of character set 01134). The left-hand character string represents the network ID, and the right-hand character string represents the network LU name. The period is not part of the network ID or the network LU name. Neither network ID nor network LU name may be longer than eight bytes.

The use of the period defines which variety of *partner_LU_name* is being used.

6. The following usage notes apply when specifying the *TP_name*:
   - The space character is not allowed in *TP_name*.
   - When communicating with non-CPI Communications programs, the *TP_name* can use characters other than those in character set 00640. See "CPI Communications and LU 6.2 CRMs" on page 497 and "SNA Service Transaction Programs" on page 499 for details.
7. The field containing the *sym_dest_name* parameter on the CMINIT call must be eight bytes long. The symbolic destination name within that field may be from 0 to 8 characters long, with its characters taken from character set 01134. If the symbolic destination name is shorter than eight characters, it should be left-justified in the variable field, and padded on the right with spaces. A *sym_dest_name* parameter composed of eight spaces has special significance. See "Initialize_Conversation (CMINIT)" on page 197 for more information.
8. The four names in the following list are mode names defined by the LU 6.2 architecture for user sessions and may be specified for CPI Communications conversations on systems where they are defined, even though they contain the character **#**, which is not found in character set 01134:
   - #BATCH
   - #BATCHSC
   - #INTER
   - #INTERSC
9. The maximum size of the the *partner_ID* characteristic is determined by the *partner_ID_type*.
   - If the *partner_ID_type* is CM_PROGRAM_BINDING, the maximum size is 32767 bytes.
   - If the *partner_ID_type* is CM_DISTINGUISHED_NAME, CM_LOCAL_DISTINGUISHED_NAME, CM_PROGRAM_FUNCTION_ID, or CM_OSI_TPSU_TITLE_OID, the maximum size is 1024 bytes.
10. The *request_to_send_received* variable is used by CPI-C 1.2 programs. CPI-C 2.0 programs use *control_information_received*, which is an enhanced version of this variable.
11. The *callback_function* specifies a pointer to a routine and is supported by the C programming language only. Its length depends on the C compiler.

Distinguished Name

In general, directory objects are identified by a name. Different directories specify different syntax conventions for directory object names. Regardless of syntactic differences though, two naming convention commonalities can be identified:

- The program specifies a fully-qualified name that is valid for the entire distributed directory and namespace. A fully-qualified name may also be referred to as a global name.
- The program specifies an incomplete name that is only a part of a global name. An incomplete name is also referred to as a partial name. The global name can be created from a partial name by appending a prefix.

Here are some examples of global names using two different naming conventions. The first is an XDS-compliant distinguished name. The second is a name for the same object that would be recognized by DCE:

```
XDS:
     /C=us/O=UNC/OU=ChapelHill/CN=ThomasWolfe
DCE:
     /.../C=us/O=UNC/OU=ChapelHill/CN=ThomasWolfe
```

The distinguished name consists of a sequence of **relative distinguished names** (RDNs) separated by slashes. Each RDN is composed of an identifier that is set equal to a value. In the example, well-known abbreviations for identifiers are used—C for country, O for organization, OU for organization unit, CN for common name. Thus, the example name identifies an object for someone with a common name of ThomasWolfe at the Chapel Hill campus of the University of North Carolina (UNC). The "/.../" prefix at the front of the DCE name explicitly identifies the name as global.

The partial name of ThomasWolfe might be used to identify the object, but a prefix of /C=us/O=UNC/OU=ChapelHill/ would be required to make sure that it didn't locate a Tom Wolfe at the Greensboro campus of UNC. The specific DCE syntax for such a partial name would be:

```
/.:/ThomasWolfe
```

In DCE, the "/.:" prefix explicitly identifies the name as a partial distinguished name. The default prefix used by the local system to create a complete DN is the DCE "cell" name.

In CPI Communications, a distinguished name is always a global name. Programs establish a distinguished name by issuing the Set_Partner_ID call with a *partner_ID_type* set to CM_DISTINGUISHED_NAME. Programs establish a partial distinguished name by issuing the Set_Partner_ID call with a *partner_ID_type* set to CM_LOCAL_DISTINGUISHED_NAME. Format and syntax of the *partner_ID* characteristic are determined by the *directory_syntax* and *directory_encoding* characteristics.

Program Function Identifier (PFID)

The program function identifier (PFID) identifies the function provided by the program, thus allowing multiple installations of a given program to be recognized as providing the same function. This relationship is illustrated in Figure 30. In this example, Program A, B, and C all provide the same function. For example, they might be mail servers located on three different nodes. Conversations are allocated to each program using different destination information, and each would be identified with a different sym_dest_name or DN. The PFID allows all three programs to be identified as providing the same function.

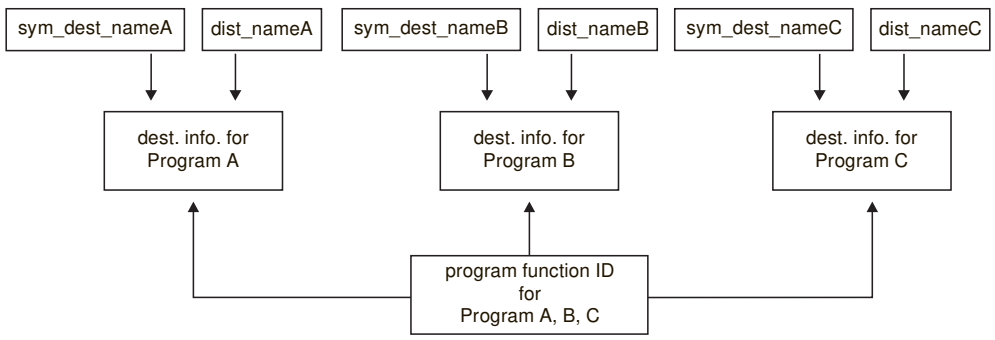

Figure 30. Relationship of PFID to Program Installation DNs

PFIDs must be administered to ensure they are unambiguous and no PFID value is assigned to more than one function. Unambiguous PFIDs allow use (and publication) of the PFID prior to creation of directory objects, and remove the requirement for installation questions about specific DNs. For example, code making use of PFIDs allows distribution of shrink-wrapped applications.

PFID Assignment Algorithms

CPI Communications does not establish any assignment algorithms or syntax rules for the PFID. It treats the PFID as a string and will retrieve program bindings by finding program installation objects that contain a matching PFID string. Assignment of PFIDs is implementation- and application- dependent.

Here are three sample assignment algorithms that ensure PFID uniqueness:

1. PFID values are Universal Unique Identifiers (UUIDs).
2. PFID values are ISO-registered object identifiers (OIDs).
3. A general-purpose naming method is created using existing naming registeries. Here is such a method:
   - The value consists of up to 1024 printable characters in GCSGID 640 (the set of invariant graphics in most character sets and also found in the invariant part of ISO 646).
   - The value is organized as set of three or more tokens separated by slashes(/).

- The first token identifies the existing naming authority. To accommodate the spectrum of developers, three values are proposed to begin with: “SNA,” “INTERNET,” and “OSI.”
- The second token is a unique value assigned by the naming authority identified in the first token. The token values vary based on the naming authority:
  - For SNA, the second token is a registered SNA NETID. For those network owners with more than one registered NETID, any one of them may be selected for this purpose. The third and last token is administered by the “owner” of the NETID.
  - For INTERNET, the second token is a printable form of a class A, B, or C NETID in decimal octet format (such as "9.0.0.0" for IBM). Alternatively, a domain name suffix such as “AUSTIN.IBM.COM” could be used. The third and last token is administered by the “owner” of the NETID.
  - For OSI the second token is a two character country code as described in ISO 3166 (such as US). The country code identifies the country under which the third token is registered. The third token is an organization code as registered by the registration authority in the country identified by the second token. (In the US, American National Standards Institute (ANSI) operates a registry for organizations.). The fourth token is administered by the organization. For example, if fictitious organization MYCOMPANY registered with ANSI, and identified a program function as ACCOUNTS_PAYABLE, the PFID would be:

    ```
    /OSI/US/MYCOMPANY/ACCOUNTS_PAYABLE
    ```

Program Binding

A **program binding** contains the destination information required to allocate a conversation. The data in the binding is of the general pattern "field_type=field_value; field_type=field_value" where field_type is a four-byte identifier for the field and field_value is a variable-length field. The end of a field_value is determined by the semicolon character. If the field_value itself contains a semicolon, the textual semicolon is repeated.

Table 22 shows the 4-byte code for each field_type, along with a maximum length for each field_value. Note that the field_type of "BIND" has a maximum length of 0; this is because the BIND field_type is used to begin a binding and is immediately followed by another field_type. The binding is complete when either the end of the string is reached or another BIND field_type is reached.

Table 22. Fields in the Program Binding

Description of Field Contents	4-Byte field_type Code	Order	Maximum Length of Field
binding	BIND	1	0
CRM type	CRMT	2	5
TP name	TPNM	3	64
mode name	MODE	4	8
partner LU name	PLUN	5	17
partner principal name	PPNM	6	1024
required user name type	RUNM	7	9
AE qualifier	AEQL	8	1024
AP title	APTI	9	1024
application context name	APCN	10	256

A valid binding must contain both a CRM_type and TP_name field. The possible values of the CRM_type field_value are "LU6.2" and "OSITP." If the CRM_type is "LU6.2," the AE qualifier, AP title, and application context name fields should not be present. Similiarly, if the CRM_type is "OSITP," the partner LU name field should not be included in the program binding. Possible values for required user name type are: "NONE," "LOCAL," and "PRINCIPAL." The valid ordering of field_types for a single binding is as shown in Table 22.

Errors in the binding format will result in failure of the Allocate call with a return code of CM_PARAMETER_ERROR.

Note:

- Programs extracting a program binding after accepting a conversation may not receive a valid program binding because some fields may not be available to CPI Communications. Missing fields will have an field_type, but no field_value. For example, "TPNM=;" would be returned in a program binding for a program accepting a conversation with a CRM_type of "LU6.2." See "Extract_Partner_ID (CMEPID)" for further information.
- On systems using distributed directories that support multiple values for an attribute, the program_binding should be stored as a single attribute value.

Figure 31 shows a sample program binding for a program with the following destination information fields:

- CRM type of “LU6.2”
- TP name of “PAYROLL”
- Mode name of “BATCH”
- Partner LU name of “ibmnet07.accntlu0”

```
BIND=;CRMT=LU6.2;TPNM=PAYROLL;MODE=BATCH;PLUN=IBMNET07.ACCNTLU0;
```

Figure 31. Sample Program Binding Format

If the program can also be accessed by a second LU, that information can be included in the example by adding a “BIND=;” tag after the last semicolon and providing the next set of binding information.

Appendix B. Return Codes and Secondary Information

This chapter discusses the parameter called *return_code* that is passed back to the program at the completion of a call. It also discusses associated secondary information that may be available for the program to extract using the Extract_Secondary_Information call.

Return Codes

All calls have a parameter called *return_code* that is passed back to the program at the completion of a call. The return code can be used to determine call-execution results and any state change that may have occurred on the specified conversation. On some calls, the return code is not the only source of call-execution information. For example, on the Receive call, the *status_received* and *data_received* parameters should also be checked.

Some of the return codes indicate the results of the local processing of a call. These return codes are returned on the call that invoked the local processing. Other return codes indicate results of processing invoked at the remote end of the conversation. Depending on the call, these return codes can be returned on the call that invoked the remote processing or on a subsequent call. Still other return codes report events that originate at the remote end of the conversation. In all cases, only one code is returned at a time.

Some of the return codes associated with the allocation of a conversation have the suffix RETRY or NO_RETRY in their name.

- RETRY means that the condition indicated by the return code may not be permanent, and the program can try to allocate the conversation again. Whether or not the retry attempt succeeds depends on the duration of the condition. In general, the program should limit the number of times it attempts to retry without success.
- NO_RETRY means that the condition is probably permanent. In general, a program should not attempt to allocate the conversation again until the condition is corrected.

For programs using conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, all return codes indicating a required backout have numeric values equal to or greater than CM_TAKE_BACKOUT. This allows the CPI Communications programmer to test for a range of return code values to determine if backout processing is required. An example is:

return_code >= CM_TAKE_BACKOUT

The return codes shown below are listed alphabetically, and each description includes the following:

- Meaning of the return code
- Origin of the condition indicated by the return code
- When the return code is reported to the program
- The state of the conversation when control is returned to the program

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Notes:

1. The individual call descriptions in Chapter 4, “Call Reference” list the return code values that are valid for each call.
2. The integer values that correspond to the pseudonyms listed below are provided in Table 19 on page 412 of Appendix A, “Variables and Characteristics.”

The valid *return_code* values are described below:

CM_ALLOCATE_FAILURE_NO_RETRY
: The conversation cannot be allocated on a logical connection because of a condition that is not temporary. When this *return_code* value is returned to the program, the conversation is in **Reset** state. For example, if the conversation is using an LU 6.2 CRM, the logical connection (session) to be used for the conversation cannot be activated because the current session limit for the specified LU-name and mode-name pair is 0, or because of a system definition error or a session-activation protocol error. This return code is also returned when the session is deactivated because of a session protocol error before the conversation can be allocated. The program should not retry the allocation request until the condition is corrected. This return code is returned on the Allocate call.

CM_ALLOCATE_FAILURE_RETRY
: The conversation cannot be allocated on a logical connection because of a condition that may be temporary. When this *return_code* value is returned to the program, the conversation is in **Reset** state. For example, the logical connection to be used for the conversation cannot be activated because of a temporary lack of resources at the local system or remote system. This return code is also returned if the logical connection is deactivated because of logical connection outage before the conversation can be allocated. The program can retry the allocation request. This return code is returned on the Allocate call.

CM_ALLOCATION_ERROR
: This may be returned on calls associated with the Send queue (except the Deallocate call with *deallocate_type* set to CM_DEALLOCATE_ABEND) while the conversation is in **Send-Receive** state. The function requested on the call is not performed.

  The return code indicates that the partner system rejected the conversation startup request. At the time this return code information is returned, the cause of allocation rejection is not returned to the program. The cause of the allocation rejection, which can be one of the following, can be obtained through the return code on the first Receive call.

  - CM_SEND_RCV_MODE_NOT_SUPPORTED (OSI TP CRM only)
  - CM_CONVERSATION_TYPE_MISMATCH (LU 6.2 CRM only)
  - CM_PIP_NOT_SPECIFIED_CORRECTLY (LU 6.2 CRM only)
  - CM_SECURITY_NOT_VALID (LU 6.2 CRM only)
  - CM_SYNC_LEVEL_NOT_SUPPORTED_SYS (OSI TP CRM only)
  - CM_SYNC_LEVEL_NOT_SUPPORTED_PGM (LU 6.2 CRM only)
  - CM_TPN_NOT_RECOGNIZED
  - CM_TP_NOT_AVAILABLE_NO_RETRY
  - CM_TP_NOT_AVAILABLE_RETRY

  The conversation is in **Receive-Only** state.

CM_BUFFER_TOO_SMALL
The local program issued a CPI Communications call specifying a buffer size that is insufficient for the amount of data available for the program to receive. The state of the conversation remains unchanged.

CM_CALL_NOT_SUPPORTED
The call is not supported by the local system. This return code is returned on any call in an optional conformance class when the implementation provides an entry point for the call but does not support the function requested by the call. The state of the conversation remains unchanged.

CM_CONV_DEALLOC_AFTER_SYNCPT (LU 6.2 CRM ONLY)
The conversation was deallocated as a part of the last sync-point operation. The local program was not given prior notification of the imminent deallocation because of a commit operation race that arose as follows: This program issued the resource recovery commit call. At the same time, the partner program issued a Deallocate call with *deallocate_type* set to CM_DEALLOCATE_SYNC_LEVEL and *sync_level* set to CM_SYNC_POINT_NO_CONFIRM, followed by the commit call.

2 CM_CONVERSATION_CANCELED
2 This return code is returned for outstanding operations when the conversation
2 was terminated locally by a CANCEL_CONVERSATION call.

CM_CONVERSATION_ENDING (LU 6.2 CRM ONLY)
This return code is returned on the Send_Expedited_Data and Receive_Expedited_Data calls and indicates one of the following:

- The local CRM is ending the conversation normally.
- A notification indicating that the remote program is ending the conversation (normally or abnormally) has been received by the local CRM.
- A notification of an error that causes the conversation to terminate has been received from the remote CRM or occurred locally.

The error that causes the conversation to terminate may be an allocation error, a conversation failure, or a deallocation of the conversation. The return code indicating that the cause of termination is returned on the calls associated with Send-Receive queue (half-duplex conversations only) or with the Send and Receive queues (full-duplex conversations only). The state of the conversation remains unchanged. Subsequent calls associated with the expedited queues will be rejected with this return code until the conversation enters **Reset** state.

CM_CONVERSATION_TYPE_MISMATCH (LU 6.2 CRM ONLY)
The remote system rejected the conversation startup request because of one of the following:

- The local program issued an Allocate call with *conversation_type* set to either CM_MAPPED_CONVERSATION or CM_BASIC_CONVERSATION, and the remote program does not support the respective conversation type.
- The local program issued an Allocate call with *send_receive_mode* set to either CM_HALF_DUPLEX or CM_FULL_DUPLEX, and the remote program does not support the respective send-receive mode.

For a half-duplex conversation, this return code is returned on a subsequent call to the Allocate. For a full-duplex conversation, this return code is returned on the Receive call. Calls associated with the Send queue that complete before this return code is returned on the Receive call are notified of the conversation type mismatch by a CM_ALLOCATION_ERROR return code.

When this *return_code* value is returned to the program, the conversation is in **Reset** state.

If *conversation_security_type* is set to CM_SECURITY_MUTUAL, then this return code may be returned on the Allocate call.

CM_DEALLOCATE_CONFIRM_REJECT (OSI TP CRM ONLY)
This return code is returned on a full-duplex conversation under one of the following two conditions:

- The program issued a Deallocate call with *deallocate_type* set to CM_DEALLOCATE_CONFIRM and the partner program responded negatively to the Deallocate by issuing a Send_Error call in **Confirm-Deallocate** state.
- The program issued a Send_Data call with *send_type* set to CM_SEND_AND_DEALLOCATE and *deallocate_type* set to CM_DEALLOCATE_CONFIRM, and the partner program responded negatively to the Send-Data by issuing a Send_Error call in **Confirm-Deallocate** state.

A Receive call issued by the local program will receive a CM_PROGRAM_ERROR_PURGING return code after all available data is received. The state of the conversation remains unchanged.

CM_DEALLOCATED_ABEND
This return code may be returned under one of the following conditions:

- The remote program issued a Deallocate call with *deallocate_type* set to CM_DEALLOCATE_ABEND, or a Cancel_Conversation call, or the remote system has done so because of a remote program abnormal-ending condition. If the remote program was in **Receive** state (half-duplex conversations only) or in **Send-Receive** or **Receive-Only** state (full-duplex conversations only) when the call was issued, information sent by the local program and not yet received by the remote program is purged.
- The remote program terminated normally but did not deallocate the conversation before terminating. Node services at the remote system deallocated the conversation on behalf of the remote program.
- On a half-duplex conversation using an OSI TP CRM, the local program issued a Send_Error call, and the error notification was delivered to the remote CRM. Subsequently, the remote program issued a Deallocate call with *deallocate_type* set to CM_DEALLOCATE_FLUSH, or with *deallocate_type* set to CM_DEALLOCATE_SYNC_LEVEL and *sync_level* set to CM_NONE, or with *deallocate_type* set to CM_DEALLOCATE_SYNC_LEVEL, *sync_level* set to CM_SYNC_POINT_NO_CONFIRM, and the conversation currently not included in a transaction.
- begin_transaction_collision (OSI TP CRM only)
  On a full-duplex conversation, there was a collision between a Deallocate call with *deallocate_type* set to CM_DEALLOCATE_CONFIRM issued by the local program and an Include_Partner_In_Transaction call issued by the partner program. No log data is available.
- dealloc_confirm_collision (OSI TP CRM only)
  On a full-duplex conversation, there was a collision between a Deallocate call with *deallocate_type* set to CM_DEALLOCATE_CONFIRM issued by the local program and a Deallocate call with *deallocate_type* set to CM_DEALLOCATE_CONFIRM call issued by the partner program. No log data is available.

- On a full-duplex conversation in **Send-Receive** state or **Receive-Only** state, the local program has issued a Deallocate call with *deallocate_type* set to CM_DEALLOCATE_ABEND.
- CPI Communications deallocated the conversation because an implicit call of tx_set_transaction_control or tx_begin failed.

For a half-duplex conversation, this return code is reported to the local program on a call issued in **Send** or **Receive** state. For a full-duplex conversation, this return code is returned on a Receive call issued in **Send-Receive** or **Receive-Only** state. It is also returned on calls associated with the Send queue (except the Deallocate call with *deallocate_type* set to CM_DEALLOCATE_ABEND) under one of the following conditions:

- They are issued in **Send-Only** state.
- They are issued in **Send-Receive** state and complete before this return code is returned on the Receive call.

The conversation is now in **Reset** state unless the return code was returned on one of the calls associated with the Send queue, issued in **Send-Receive** state. In that case, the conversation is in **Receive-Only** state.

CM_DEALLOCATED_ABEND_BO

This return code is returned only for conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and with the conversation included in a transaction.

This return code may be returned under one of the following conditions:

- The remote program issued a Deallocate call with *deallocate_type* set to CM_DEALLOCATE_ABEND or a Cancel_Conversation call, or the remote system has done so because of a remote program abnormal-ending condition.
- dealloc_cfm_collision_bo (OSI TP CRM only)
  On a full-duplex conversation, there was a collision between a Include_Partner_In_Transaction call issued by this program and a Deallocate call with *deallocate_type* set to CM_DEALLOCATE_CONFIRM issued by the partner program. The Include_Partner_In_Transaction call got a return code of CM_OK. However, when the collision is detected, a CM_DEALLOCATED_ABEND_BO return code is returned on a subsequent call. No log data is available.

If the remote program was in **Receive** state (half-duplex conversations only) or in **Send-Receive**, **Prepared** or **Deferred-Deallocate** states (full-duplex conversations only) when it issued the Deallocate call, information sent by the local program and not yet received by the remote program is purged.

For a half-duplex conversation, this return code is reported to the local program on a call issued in **Send** or **Receive** state. For a full-duplex conversation, this return code is reported to the local program on calls issued in **Send-Receive**, **Sync-Point**, **Deferred-Deallocate**, **Sync-Point-Deallocate** and **Prepared** states. The conversation is now in **Reset** state. For a full-duplex conversation, incoming information may not be received if this return code is returned on a call associated with the Send queue.

The local conversation's context is in the **Backout-Required** condition, and the program must issue a resource recovery backout call in order to restore all of the context's protected resources to their status as of the last synchronization point.

CM_DEALLOCATED_ABEND_SVC (LU 6.2 CRM ONLY)
This return code is returned for basic conversations only. It may be returned under one of the following conditions:

- The remote program, using an LU 6.2 application programming interface and not using CPI Communications, issued a DEALLOCATE verb specifying a TYPE parameter of ABEND_SVC. If the remote program was in **Receive** state (half-duplex conversations only) or in **Send-Receive** or **Receive-Only** state (full-duplex conversations only) when the verb was issued, information sent by the local program and not yet received by the remote program is purged.
- The remote program either terminated abnormally or terminated normally but did not deallocate the conversation before terminating. Node services at the remote system deallocated the conversation on behalf of the remote program.

For a half-duplex conversation, this return code is reported to the local program on a call issued in **Send** or **Receive** state. For a full-duplex conversation, this return code is returned on a Receive call issued in **Send-Receive** or **Receive-Only** state. It is also returned on calls associated with the Send queue (except the Deallocate call with *deallocate_type* set to CM_DEALLOCATE_ABEND) under one of the following conditions:

- They are issued in **Send-Only** state.
- They are issued in **Send-Receive** state and complete before this return code is returned on the Receive call.

The conversation is now in **Reset** state unless the return code was returned on one of the calls associated with the Send queue issued in **Send-Receive** state. In that case, the conversation is in **Receive-Only** state.

CM_DEALLOCATED_ABEND_SVC_BO (LU 6.2 CRM ONLY)
This return code is returned only for basic conversations with *sync_level* set to CM_SYNC_POINT. It is returned under the same conditions described under CM_DEALLOCATED_ABEND_SVC above.

For a half-duplex conversation, this return code is reported to the local program on a call issued in **Send** or **Receive** state. For a full-duplex conversation, this return code is reported to the local program on calls issued in **Send-Receive**, **Sync-Point**, **Deferred-Deallocate**, **Sync-Point-Deallocate**, and **Prepared** states. The conversation is now in **Reset** state.

The local conversation's context is in the **Backout-Required** condition and the program must issue a resource recovery backout call in order to restore all of the context's protected resources to their status as of the last synchronization point.

CM_DEALLOCATED_ABEND_TIMER (LU 6.2 CRM ONLY)
This return code is returned only for basic conversations.

In addition, it is returned only when the remote program is using an LU 6.2 application programming interface and is not using CPI Communications.

The remote LU 6.2 transaction program issued a DEALLOCATE verb specifying a TYPE parameter of ABEND_TIMER. For a half-duplex conversation, this return code is reported to the local program on a call issued in **Send** or **Receive** state. For a full-duplex conversation, this return code is returned on a Receive call issued in **Send-Receive** or **Receive-Only** state.

It is also returned on calls associated with the Send queue (except the Deallocate call with *deallocate_type* set to CM_DEALLOCATE_ABEND) under one of the following conditions:

- They are issued in **Send-Only** state.
- They are issued in **Send-Receive** state and complete before this return code is returned on the Receive call.

The conversation is now in **Reset** state unless the return code was returned on one of the calls associated with the Send queue issued in **Send-Receive** state. In that case, the conversation is in **Receive-Only** state.

CM_DEALLOCATED_ABEND_TIMER_BO (LU 6.2 CRM ONLY)

This return code is returned only for basic conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and only when the remote program is using an LU 6.2 application programming interface and is not using CPI Communications.

The remote LU 6.2 transaction program issued a DEALLOCATE verb specifying a TYPE parameter of ABEND_TIMER. If the conversation for the remote program was in **Receive** state (half-duplex conversations only) or in **Send-Receive**, **Prepared**, or **Deferred-Deallocate** state (full-duplex conversations only) when the verb was issued, information sent by the local program and not yet received by the remote program is purged. If the return code is returned on a call associated with the Send queue for a full-duplex conversation, incoming data may be purged. For a half-duplex conversation, this return code is reported to the local program on a call issued in **Send** or **Receive** state. For a full-duplex conversation, this return code is reported to the local program on calls issued in **Send-Receive**, **Sync-Point**, **Deferred-Deallocate**, **Sync-Point-Deallocate**, and **Prepared** states. The conversation is now in **Reset** state.

The local conversation's context is in the **Backout-Required** condition and the program must issue a resource recovery backout call in order to restore all of the context's protected resources to their status as of the last synchronization point.

CM_DEALLOCATED_NORMAL

This return code may be returned under one of the following conditions:

- The remote program issued a Deallocate call or a Send_Data call with *send_type* set to CM_SEND_AND_DEALLOCATE on a basic or mapped conversation with one of the following:
  - *deallocate_type* set to CM_DEALLOCATE_FLUSH
  - *deallocate_type* set to CM_DEALLOCATE_SYNC_LEVEL and *sync_level* set to CM_NONE
  - *deallocate_type* set to CM_DEALLOCATE_SYNC_LEVEL, *sync_level* set to CM_SYNC_POINT_NO_CONFIRM, and the conversation is not currently included in a transaction

  For a half-duplex conversation, this return code is reported to the local program on a call issued in **Receive** state. For a full-duplex conversation, this return code is reported to the local program on the Receive call issued in **Send-Receive** or **Receive-Only** state. If the conversation is a full-duplex conversation using an OSI TP CRM, this return code is also returned on calls associated with the Send queue (except the Deallocate call with *deallocate_type* set to CM_DEALLOCATE_ABEND).

- The local program issued a Deallocate call or a Send_Data call with *send_type* set to CM_SEND_AND_DEALLOCATE and with one of the following:
  - *deallocate_type* set to CM_DEALLOCATE_FLUSH
  - *deallocate_type* set to CM_DEALLOCATE_SYNC_LEVEL, *sync_level* set to CM_NONE, and the conversation is a full-duplex conversation using an OSI TP CRM
  - *deallocate_type* set to CM_DEALLOCATE_SYNC_LEVEL, *sync_level* set to CM_SYNC_POINT_NO_CONFIRM, and the conversation is not currently included in a transaction

  This return code is returned to the local program on a Receive call that was outstanding when the Deallocate call was issued.

For a half-duplex conversation, the conversation is now in **Reset** state. For a full-duplex conversation, the conversation can now be in one of the following states:

- **Reset** state if this return code was returned on calls issued in **Receive-Only** or **Send-Only** state.
- **Send-Only** state if this return code was returned on a Receive call issued in **Send-Receive** state.
- **Receive-Only** state if this return code was returned on calls associated with the Send queue (except the Deallocate call with *deallocate_type* set to CM_DEALLOCATE_ABEND) issued in **Send-Receive** state.

CM_DEALLOCATED_NORMAL_BO
: This return code is returned only for half-duplex conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and with the conversation included in a transaction.

  When the conversation is using an LU 6.2 CRM and the Send_Error call is issued in **Receive** state, incoming information is purged by the system. This purged information may include an abend deallocation notification from the remote program or system. When such a notification is purged, CPI Communications returns CM_DEALLOCATED_NORMAL_BO instead of one of the following return codes:

  - CM_DEALLOCATED_ABEND_BO
  - CM_DEALLOCATED_ABEND_SVC_BO
  - CM_DEALLOCATED_ABEND_TIMER_BO

  The conversation is now in **Reset** state.

  The local conversation's context is in the **Backout-Required** condition and the program must issue a resource recovery backout call in order to restore all of the context's protected resources to their status as of the last synchronization point.

CM_EXP_DATA_NOT_SUPPORTED (LU 6.2 CRM ONLY)
: An expedited data call was locally rejected because the remote CRM does not support expedited data. The state of the conversation remains unchanged.

CM_INCLUDE_PARTNER_REJECT_BO (OSI TP CRM ONLY)
: A prior Include_Partner_In_Transaction call issued by the program completed locally with CM_OK but was rejected by the partner system. The partner system rejected the request to join the transaction because the partner program is already a part of another transaction and cannot be a part of two transactions at the same time. The conversation is now in **Reset** state.

The local conversation's context is in the **Backout-Required** condition and the program must issue a resource recovery backout call in order to restore all of the context's protected resources to their status as of the last synchronization point.

CM_MAP_ROUTINE_ERROR
This return code is returned on Send_Mapped_Data, Receive_Mapped_Data, Extract_Mapped_Initialization_Data, and Set_Mapped_Initialization_Data, indicating that the underlying map routine aborted. If the error occurred during a receive function, the incoming data is placed in the buffer un-decoded so the application program can take appropriate action.

CM_NO_SECONDARY_INFORMATION
The Extract_Secondary_Information call did not complete successfully because no secondary information was available for the specified call on the specified conversation. The state of the conversation remains unchanged.

CM_OK
The call issued by the local program executed successfully (that is, the function defined for the call, up to the point at which control is returned to the program, was performed as specified). The state of the conversation is as defined for the call.

CM_OPERATION_INCOMPLETE
A non-blocking operation has been started either on the conversation (when conversation-level non-blocking is used) or on the queue with which the call is associated (when queue-level non-blocking is used), but the operation has not completed. This return code is returned when the call is suspended waiting for incoming data, buffers, or other resources. A program must do one of the following:

- For conversation-level non-blocking, use the Wait_For_Conversation call to wait for the operation to complete and to retrieve the return code for the completed operation.
- For queue-level non-blocking,
  - If an OOID is associated with the outstanding operation, use the Wait_For_Completion call to wait for the operation to complete and to obtain the OOID and user field corresponding to the completed operation.
  - If a callback function is associated with the outstanding operation, use the callback function and user field to properly handle the completed operation.

The state of the conversation remains unchanged.

CM_OPERATION_NOT_ACCEPTED
A previous operation either on this conversation (when conversation-level non-blocking is chosen) or on the same queue (when conversation-level non-blocking is not chosen) is incomplete. This return code is returned when there is an outstanding operation on the conversation or queue, as indicated by the CM_OPERATION_INCOMPLETE return code to a previous call. On a system that supports multiple program threads, when one thread has started an operation that has not completed, this return code is returned on a call made by another thread on the same conversation or associated with the same queue. The state of the conversation remains unchanged.

CM_PARM_VALUE_NOT_SUPPORTED
The specified value of a call parameter is not supported by the local system. This return code is returned on a call with defined parameter values that are optional for support of the call. It is returned when the implementation supports the call but does not support the specified optional parameter value. The state of the conversation remains unchanged.

CM_PARAMETER_ERROR
The local program issued a call specifying a parameter containing an invalid argument. ("Parameters" include not only the parameters described as part of the call syntax, but also characteristics associated with the *conversation_ID*.) The source of the argument is considered to be outside the program definition, such as an LU name supplied by a system administrator in the side information and referenced by the Initialize_Conversation call.

The CM_PARAMETER_ERROR return code is returned on the call specifying the invalid argument. The state of the conversation remains unchanged.

Note: Contrast this definition with the definition of the CM_PROGRAM_PARAMETER_CHECK return code.

CM_PIP_NOT_SPECIFIED_CORRECTLY (LU 6.2 CRM ONLY)
This return code is returned only when the remote program is using an LU 6.2 application programming interface and is not using CPI Communications.

The remote CRM rejected the conversation startup request because the remote program has one or more program initialization parameter (PIP) variables defined and the initialization data specified by the local program is incorrect. This return code is returned on a call issued after the Allocate for a half-duplex conversation. For a full-duplex conversation, this return code is returned on the Receive call. Calls associated with the Send queue that complete before this return code is returned are notified of the error by an CM_ALLOCATION_ERROR return code. When this return code is returned to the program, the conversation is in **Reset** state.

If *conversation_security_type* is set to CM_SECURITY_MUTUAL, then this return code may be returned on the Allocate call.

CM_PRODUCT_SPECIFIC_ERROR
A product-specific error has been detected and a description of the error has been entered into the product's system error log. See product documentation for an indication of conditions and state changes caused by this return code.

CM_PROGRAM_ERROR_NO_TRUNC (LU 6.2 CRM ONLY)
One of the following occurred:

- The remote program issued a Send_Error call on a mapped conversation and the conversation for the remote program was in **Send** state (half-duplex conversations only) or in **Send-Receive** or **Send-Only** state (full-duplex conversations only). No truncation occurs at the mapped conversation protocol boundary. This return code is reported to the local program on a Receive call the program issues before receiving any data records or after receiving one or more data records.
- The remote program issued a Send_Error call on a basic conversation, the conversation for the remote program was in **Send** state (half-duplex conversations only) or in **Send-Receive** or **Send-Only** state (full-duplex conversations only), and the call did not truncate a logical record. No truncation occurs at the basic conversation protocol boundary when a program issues Send_Error before sending any logical records or after

sending a complete logical record. This return code is reported to the local program on a Receive call the program issues before receiving any logical records or after receiving one or more complete logical records.

- The remote program issued a Send_Error call on a mapped or basic half-duplex conversation and the conversation for the remote program was in **Send-Pending** state. No truncation of data has occurred. This return code indicates that the remote program has issued Set_Error_Direction to set the *error_direction* characteristic to CM_SEND_ERROR. The return code is reported to the local program on a Receive call the program issues before receiving any data records or after receiving one or more data records.

The conversation remains in **Receive** state for a half-duplex conversation or in **Send-Receive** or **Receive-Only** state for a full-duplex conversation.

CM_PROGRAM_ERROR_PURGING
One of the following occurred:

- The remote program issued a Send_Error call on a basic or mapped half-duplex conversation while its end of the conversation was in **Receive** or **Confirm** state. The call may have caused information enroute to the remote program to be purged (discarded), but not necessarily.

  Purging occurs when the remote program issues Send_Error for a half-duplex conversation in **Receive** state before receiving all the information being sent by the local program. No purging occurs when the remote program issues Send_Error for a conversation in **Receive** state if the remote program has already received all the information sent by the local program. Also, no purging occurs when the remote program issues Send_Error for a conversation in **Confirm** state.

  When information is purged, the purging can occur at the local system, the remote system, or both.

- The remote program issued a Send_Error call on a mapped or basic half-duplex conversation and the conversation for the remote program was in **Send-Pending** state. No purging of data has occurred. This return code indicates that the remote program has issued a Send_Error call with *error_direction* set to CM_RECEIVE_ERROR.

- The full-duplex conversation is allocated using an OSI TP CRM and the remote program issued a Send_Error call while its end of the conversation was in **Send-Receive**, **Send-Only**, or **Confirm-Deallocate** state. Purging of data sent by the local program may have occurred in transit, if the remote program was in **Send-Receive** or **Send-Only** state when it issued Send_Error.

For a half-duplex conversation, this return code is normally reported to the local program on a call the program issues after sending some information to the remote program. However, the return code can be reported on a call the program issues before sending any information, depending on the call and when it is issued. For a full-duplex conversation, this return code is returned on the Receive call. The half-duplex conversation remains in **Receive** state. The full-duplex conversation remains in **Send-Receive** or **Receive-Only** state.

CM_PROGRAM_ERROR_TRUNC (LU 6.2 CRM ONLY)
The remote program issued a Send_Error call on a basic conversation, the conversation for the remote program was in **Send** state (half-duplex conversations only) or in **Send-Receive** or **Send-Only** state (full-duplex conversations only), and the call truncated a logical record. Truncation occurs at the basic conversation protocol boundary when a program begins sending a logical record and then issues Send_Error before sending the complete logical record. This return code is reported to the local program on a Receive call the program issues after receiving the truncated logical record. The conversation remains in **Receive** state for a half-duplex conversation or in **Send-Receive** or **Receive-Only** state for a full-duplex conversation.

CM_PROGRAM_PARAMETER_CHECK
The local program issued a call in which a programming error has been found in one or more parameters. ("Parameters" include not only the parameters described as part of the call syntax, but also characteristics associated with the *conversation_ID*, the CRM type used by the conversation, and the transaction role (superior or subordinate) of the program.) The source of the error is considered to be inside the program definition (under the control of the local program). This return code may be caused by the failure of the program to pass a valid parameter address. The program should not examine any other returned variables associated with the call as nothing is placed in the variables. The state of the conversation remains unchanged.

CM_PROGRAM_STATE_CHECK
This return code may be returned under one of the following conditions:

- The local program issued a call for a conversation in a state that was not valid for that call.
- There is no incoming conversation. The Accept_Conversation call was issued but did not complete successfully.
- No name is associated with the program. The Accept_Conversation or Accept_Incoming call was issued but did not complete successfully.
- The program started but did not finish sending a logical record.
- There is no outstanding operation. The Wait_For_Completion or Wait_For_Conversation call was issued but did not complete successfully.
- For a conversation with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, the conversation's context is in the **Backout-Required** condition. The program issued a call that is not allowed for this conversation while its context is in this condition.
- The program has received a *status_received* value of CM_JOIN_TRANSACTION. The program issued a call that is not allowed before the program joins the transaction.
- The conversation is included in a transaction. The program issued a call that is allowed only when the conversation is not currently included in a transaction.
- The conversation is not currently included in a transaction. The program issued a call that is allowed only when the conversation is included in a transaction.
- A prior Deferred_Deallocate call is still in effect for the conversation. The Prepare_To_Receive call was issued but is not allowed.

- The program has not received a take-commit notification from its superior. The Prepare call was issued but is not allowed.

The program should not examine any other returned variables associated with the call as nothing is placed in the variables. The state of the conversation remains unchanged.

CM_RESOURCE_FAILURE_NO_RETRY

This return code may be returned under one of the following conditions:

- A failure occurred that caused the conversation to be prematurely terminated. For example, the logical connection being used for the conversation was deactivated because of a logical-connection protocol error, or the conversation was deallocated because of a protocol error between the mapped conversation components of the systems. The condition is not temporary, and the program should not retry the transaction until the condition is corrected.
- The remote program terminated normally but did not deallocate the conversation before terminating. Node services at the remote system deallocated the conversation on behalf of the remote program.

This return code can be reported to the local program on a call it issues for a conversation in any state other than **Reset** or **Initialize** state for a half-duplex or full-duplex conversation, or **Sync-Point**, **Sync-Point-Deallocate**, or **Defer-Deallocate** state for a full-duplex conversation.

If *conversation_security_type* is set to CM_SECURITY_MUTUAL, then this return code may be returned on the Allocate call.

For a full-duplex conversation, this return code is returned on the Receive call, at which time the conversation goes to **Reset** state. Calls associated with the Send queue (except the Deallocate call with *deallocate_type* set to CM_DEALLOCATE_ABEND) that complete before this return code is returned on the Receive call also get this return code, and the conversation is in **Receive-Only** or **Reset** state, depending on whether the call was issued in **Send-Receive** or **Send-Only** state. The conversation is in **Reset** state if this a half-duplex conversation.

CM_RESOURCE_FAIL_NO_RETRY_BO

This return code is returned only for conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and with the conversation included in a transaction.

A failure occurred that caused the conversation to be prematurely terminated. For example, the logical connection being used for the conversation was deactivated because of a logical-connection protocol error, or the conversation was deallocated because of a protocol error between the mapped conversation components of the systems. The condition is not temporary, and the program should not retry the transaction until the condition is corrected. This return code can be reported to the local program on a call issued in any state other than **Reset** or **Initialize** state. For a full-duplex conversation, incoming information may not be received if this return code is returned on a call associated with the Send queue. The conversation is in **Reset** state.

The local conversation's context is in the **Backout-Required** condition and the program must issue a resource recovery backout call in order to restore all of the context's protected resources to their status as of the last synchronization point.

CM_RESOURCE_FAILURE_RETRY
A failure occurred that caused the conversation to be prematurely terminated. For example, the logical connection being used for the conversation was deactivated because of a logical-connection outage such as a line failure, a modem failure, or a crypto engine failure. The condition may be temporary, and the program can retry the transaction.

This return code can be reported to the local program on a call it issues for a conversation in any state other than **Reset** or **Initialize** state for a half-duplex or full-duplex conversation, or **Sync-Point**, **Sync-Point-Deallocate**, or **Defer-Deallocate** state for a full-duplex conversation. For a full-duplex conversation, this return code is returned on the Receive call, at which time the conversation goes to **Reset** state. Calls associated with the Send queue (except the Deallocate call with *deallocate_type* set to CM_DEALLOCATE_ABEND) that complete before this return code is returned on the Receive call also get this return code, and the conversation is in **Receive-Only** or **Reset** state, depending on whether the call was issued in **Send-Receive** or **Send-Only** state. The conversation is in **Reset** state if this is a half-duplex conversation.

If *conversation_security_type* is set to CM_SECURITY_MUTUAL, then this return code may be returned on the Allocate call.

CM_RESOURCE_FAILURE_RETRY_BO
This return code is returned only for conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and with the conversation included in a transaction.

A failure occurred that caused the conversation to be prematurely terminated. For example, the logical connection being used for the conversation was deactivated because of a logical-connection outage such as a line failure, a modem failure, or a crypto engine failure. The condition may be temporary, and the program can retry the transaction. This return code can be reported to the local program on a call it issues for a conversation in any state other than **Reset** or **Initialize**. For a full-duplex conversation, incoming information may not be received if this return code is returned on a call associated with the Send queue. The conversation is in **Reset** state.

The local conversation's context is in the **Backout-Required** condition and the program must issue a resource recovery backout call in order to restore all of the context's protected resources to their status as of the last synchronization point.

CM_RETRY_LIMIT_EXCEEDED
The conversation cannot be allocated on a logical connection because CPI Communications has exceeded the local system's retry limit. When this *return_code* value is returned to the program, the conversation is in **Reset** state.

CM_SECURITY_MUTUAL_FAILED
This return code is returned only for conversations with *conversation_security_type* set to CM_SECURITY_MUTUAL.

The local system failed the allocate request because the local system was not able to authenticate the remote system. When this *return_code* value is returned to the program, the conversation is in **Reset** state.

CM_SECURITY_NOT_SUPPORTED
The local system rejected the allocate request because the local program specified a required user name type and conversation security type combination that is not supported between the local and remote systems. When this *return_code* value is returned to the program, the conversation is in **Reset** state.

CM_SECURITY_NOT_VALID
The remote system rejected the conversation startup request because the access security information (provided by the local system) is invalid. This return code is returned on a call issued after the Allocate for a half-duplex conversation. For a full-duplex conversation, this return code is returned on the Receive call. Calls associated with the Send queue that complete before this return code is returned on the Receive call are notified of the error by a CM_ALLOCATION_ERROR return code. When this *return_code* value is returned to the program, the conversation is in **Reset** state.

If *conversation_security_type* is set to CM_SECURITY_MUTUAL, then this return code may be returned on the Allocate call.

CM_SEND_RCV_MODE_NOT_SUPPORTED
This return code indicates that the conversation startup request was rejected because of one of the following:

- The *send_receive_mode* characteristic is set to CM_HALF_DUPLEX but the remote system does not support half-duplex conversations.
- The *send_receive_mode* characteristic is set to CM_FULL_DUPLEX but the remote system does not support full-duplex conversations.

The state of the conversation remains unchanged.

CM_SVC_ERROR_NO_TRUNC (LU 6.2 CRM ONLY)
This return code is returned only for basic conversations. In addition, it is returned only when the remote program is using an LU 6.2 application programming interface and is not using CPI Communications.

The remote LU 6.2 transaction program issued a Send_Error verb specifying a TYPE parameter of SVC, the conversation for the remote program was in **Send** state for a half-duplex conversation or in **Send-Receive** or **Send-Only** state for a full-duplex conversation, and the verb did not truncate a logical record. This return code is returned on a Receive call. When this return code is returned to the local program on a half-duplex conversation, the conversation is in **Receive** state. There is no state change for a full-duplex conversation.

CM_SVC_ERROR_PURGING (LU 6.2 CRM ONLY)
This return code is returned only for basic half-duplex conversations. In addition, it is returned only when the remote program is using an LU 6.2 application programming interface and is not using CPI Communications.

The remote LU 6.2 transaction program issued a Send_Error verb specifying a TYPE parameter of SVC; the conversation for the remote program was in **Receive**, **Confirm**, or **Sync-Point** state; and the verb may have caused information to be purged. This return code is normally reported to the local program on a call the local program issues after sending some information to the remote program. However, the return code can be reported on a call the local program issues before sending any information, depending on the call and when it is issued. When this return code is returned to the local program, the conversation is in **Receive** state.

CM_SVC_ERROR_TRUNC (LU 6.2 CRM ONLY)
: This return code is returned only when the remote program is using an LU 6.2 application programming interface and is not using CPI Communications.

  The remote LU 6.2 transaction program issued a Send_Error verb specifying a TYPE parameter of SVC, the conversation for the remote program was in **Send** state for a half-duplex conversation or in **Send-Receive** or **Send-Only** state for a full-duplex conversation, and the verb truncated a logical record. Truncation occurs at the basic conversation protocol boundary when a program begins sending a logical record and then issues Send_Error before sending the complete logical record. This return code is reported to the local program on a Receive call the local program issues after receiving the truncated logical record. The state of the conversation remains unchanged.

CM_SYNC_LVL_NOT_SUPPORTED_SYS
: This return code is returned only for conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM.

  The local program specified a *sync_level* of CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, which the remote system does not support. This return code is returned on the Allocate call.

  For a full-duplex conversation, this return code is returned on the Receive call if an attempt to allocate the conversation was made by the local program running on an OSI TP CRM and the remote system does not support the *sync_level* of CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM specified in the conversation startup request. The remote system has rejected the allocation attempt. Calls associated with the local Send queue that complete before this return code is returned on the Receive call are notified of the error by a CM_ALLOCATION_ERROR return code.

  When this *return_code* value is returned to the program, the conversation is in **Reset** state.

CM_SYNC_LVL_NOT_SUPPORTED_PGM
: The remote system rejected the conversation startup request because the local program specified a synchronization level (with the *sync_level* parameter) that the remote program does not support. For a half-duplex conversation, this return code is returned on a call issued after the Allocate. For a full-duplex conversation, this return code is returned on the Receive call. Calls associated with the Send queue that complete before this return code is returned on the Receive call are notified of the error by a CM_ALLOCATION_ERROR return code.

  When this *return_code* value is returned to the program, the conversation is in **Reset** state.

  If *conversation_security_type* is set to CM_SECURITY_MUTUAL, then this return code may be returned on the Allocate call.

CM_SYSTEM_EVENT
: The Wait_For_Conversation call was being executed when an event (such as a signal) handled by the program occurred. Wait_For_Conversation returns this return code to allow the program to reissue the Wait_For_Conversation call or to perform other processing. It is the responsibility of the event-handling portion of the program to record sufficient information for the program to decide how to proceed upon receipt of this return code. The state of the conversation remains unchanged.

CM_TAKE_BACKOUT
: This return code is returned only for conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and with the conversation included in a transaction.

  The remote program, the local system, or the remote system issued a resource recovery backout call, and the local application must issue a backout call in order to restore all protected resources for a context to their status as of the last synchronization point. The conversation's context is in the **Backout-Required** condition upon receipt of this return code. Once the local program issues a backout call, the conversation is placed in the state it was in at the time of the last sync point operation.

CM_TPN_NOT_RECOGNIZED
: The remote system rejected the conversation startup request because the local program specified a remote program name that the remote system does not recognize. For a half-duplex conversation, this return code is returned on a call issued after the Allocate. For a full-duplex conversation, this return code is returned on the Receive call. Calls associated with the Send queue that complete before this return code is returned on the Receive call are notified of the error by a CM_ALLOCATION_ERROR return code. When this *return_code* value is returned to the program, the conversation is in **Reset** state.

  If *conversation_security_type* is set to CM_SECURITY_MUTUAL, then this return code may be returned on the Allocate call.

CM_TP_NOT_AVAILABLE_NO_RETRY
: The remote system rejected the conversation startup request because the local program specified a remote program that the remote system recognizes but cannot start. The condition is not temporary, and the program should not retry the allocation request. For a half-duplex conversation, this return code is returned on a call issued after the Allocate. For a full-duplex conversation, this return code is returned on the Receive call. Calls associated with the Send queue that complete before this return code is returned on the Receive call are notified of the error by a CM_ALLOCATION_ERROR return code. When this *return_code* value is returned to the program, the conversation is in **Reset** state.

  If *conversation_security_type* is set to CM_SECURITY_MUTUAL, then this return code may be returned on the Allocate call.

CM_TP_NOT_AVAILABLE_RETRY
: The remote system rejected the conversation startup request because the local program specified a remote program that the remote system recognizes but currently cannot start. The condition may be temporary, and the program can retry the allocation request. For a half-duplex conversation, this return code is returned on a call issued after the Allocate. For a full-duplex conversation, this return code is returned on the Receive call. Calls associated with the Send queue that complete before this return code is returned on the Receive call are notified of the error by a CM_ALLOCATION_ERROR return code. When this *return_code* value is returned to the program, the conversation is in **Reset** state.

  If *conversation_security_type* is set to CM_SECURITY_MUTUAL, then this return code may be returned on the Allocate call.

CM_UNKNOWN_MAP_NAME_RECEIVED
: This return code is returned on Receive_Mapped_Data or Extract_Mapped_Initialization_Data when the incoming map name is invalid

because the map routine cannot recognize it. The function request returns the undecoded incoming data in the buffer and expects the application program to take appropriate action. This is a serious error which indicates that the two partners do not have the necessary common understanding to communicate. Under the OSI TP CRM, this would indicate of the partners has violated the associations's application context. Unser the LU 6.2 CRM, both partners should review what is expected and determine which partner is in error.

CM_UNKNOWN_MAP_NAME_REQUESTED
This return code is returned on Send_Mapped_Data, or Set_Mapped_Initialization_Data when a map_name is specified that the underlying map routine finds is invalid. The function requested is not performed and the application program can perform appropriate error recovery. A user should check to ensure that the proper map routine is being used and the spelling of the map_name.

CM_UNSUCCESSFUL
The call issued by the local program did not execute successfully. This return code is returned on the unsuccessful call. The state of the conversation remains unchanged.

Secondary Information

Associated with the return code, there may be secondary information available for the program to extract using the Extract_Secondary_Information call. The secondary information can be used to determine the cause of the return code and to aid problem determination. Based on its origin, the secondary information and associated return code can belong to one of the four types, as shown in Table 23.

Table 23. Secondary Information Types and Associated Return Codes

Secondary Information Type	Associated Return Codes
Application-oriented	CM_DEALLOCATED_ABEND CM_DEALLOCATED_ABEND_BO CM_DEALLOCATED_ABEND_SVC CM_DEALLOCATED_ABEND_SVC_BO CM_DEALLOCATED_ABEND_TIMER CM_DEALLOCATED_ABEND_TIMER_BO CM_PROGRAM_ERROR_NO_TRUNC CM_PROGRAM_ERROR_PURGING CM_PROGRAM_ERROR_TRUNC CM_SVC_ERROR_NO_TRUNC CM_SVC_ERROR_PURGING CM_SVC_ERROR_TRUNC
CPI Communications-defined	CM_DEALLOCATED_ABEND CM_DEALLOCATED_ABEND_BO CM_PARAMETER_ERROR CM_PROGRAM_PARAMETER_CHECK CM_PROGRAM_STATE_CHECK CM_SECURITY_NOT_SUPPORTED
CRM-specific	CM_ALLOCATE_FAILURE_NO_RETRY CM_ALLOCATE_FAILURE_RETRY CM_CONVERSATION_TYPE_MISMATCH CM_PIP_NOT_SPECIFIED_CORRECTLY CM_RESOURCE_FAIL_NO_RETRY_BO CM_RESOURCE_FAILURE_NO_RETRY CM_RESOURCE_FAILURE_RETRY CM_RESOURCE_FAILURE_RETRY_BO CM_RETRY_LIMIT_EXCEEDED CM_SECURITY_MUTUAL_FAILED CM_SECURITY_NOT_SUPPORTED CM_SECURITY_NOT_VALID CM_SEND_RCV_MODE_NOT_SUPPORTED CM_SYNC_LVL_NOT_SUPPORTED_PGM CM_SYNC_LVL_NOT_SUPPORTED_SYS CM_TP_NOT_AVAILABLE_NO_RETRY CM_TP_NOT_AVAILABLE_RETRY CM_TPN_NOT_RECOGNIZED
Implementation-related	CM_PRODUCT_SPECIFIC_ERROR

The following return codes, upon being returned to the program, are not associated with any secondary information:

- CM_ALLOCATION_ERROR
- CM_BUFFER_TOO_SMALL
- CM_CALL_NOT_SUPPORTED
- CM_CONV_DEALLOC_AFTER_SYNCPT
- CM_CONVERSATION_CANCELLED
- CM_CONVERSATION_ENDING
- CM_DEALLOC_CONFIRM_REJECT
- CM_DEALLOCATED_NORMAL
- CM_DEALLOCATED_NORMAL_BO

- CM_EXP_DATA_NOT_SUPPORTED
- CM_INCLUDE_PARTNER_REJECT_BO
- 3 CM_MAP_ROUTINE_ERROR
- CM_NO_SECONDARY_INFORMATION
- CM_OK
- CM_OPERATION_INCOMPLETE
- CM_OPERATION_NOT_ACCEPTED
- CM_PARM_VALUE_NOT_SUPPORTED
- CM_SYSTEM_EVENT
- CM_TAKE_BACKOUT
- CM_UNSUCCESSFUL
- 1 CM_UNKNOWN_MAP_NAME_RECEIVED
- 1 CM_UNKNOWN_MAP_NAME_REQUESTED

Except for application-oriented information, which is defined entirely by the application, secondary information is a string of printable characters and, in general, consists of the following information in the order described:

1. Condition code
2. Description of the condition
3. Cause of the condition
4. Suggested actions
5. Additional information from the implementation

For different secondary information types, the condition codes are in the range specified in Table 24. In some cases, secondary information may not have all these fields. Fields present in secondary information are separated by two consecutive semicolons. The following sections provide examples of secondary information in different types.

Table 24. Range of Condition Codes for Different Secondary Information Types

Secondary Information Type	Condition Codes
CPI Communications-defined	1 - 4000
CRM-specific	4001 (for an LU 6.2 CRM), 4002 (for an OSI TP CRM)
Implementation-related	4003

Application-Oriented Information

When a program discovers an abnormal condition during its processing, the program may use log data to convey the condition to its partner program. The partner program receives the log data when it issues the Extract_Secondary_Information call. Since log data is application data, it is up to the application designer to define and interpret its content.

CPI Communications-Defined Information

Table 25 lists all CPI Communications-defined secondary information.

Table 25 (Page 1 of 9). CPI Communications-Defined Secondary Information

Condition Code	Description
Associated with CM_PROGRAM_PARAMETER_CHECK:	
0 < *n* < 101	The *n*th parameter specifies an invalid address.
101	The *conversation_ID* specifies an unassigned conversation identifier.
102	The *sync_level* is set to CM_NONE.
103	The *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM.
104	The *send_receive_mode* is set to CM_FULL_DUPLEX.
105	The *send_receive_mode* is set to CM_FULL_DUPLEX, and conversation is using an LU 6.2 CRM.
106	The *buffer_length* specifies a value that is invalid for the range permitted by the implementation.
107	The conversation is using an OSI TP CRM, and the program is not the superior for the conversation.
108	The conversation is using an LU 6.2 CRM.
109	The *requested_length* specifies a value less than 0.
110	The *transaction_control* is set to CM_CHAINED_TRANSACTIONS.
111	The *sym_dest_name* specifies an unrecognized value.
112	The *sync_level* is set to CM_CONFIRM.
113	The *requested_length* specifies a value that exceeds the range permitted by the implementation.
114	The *requested_length* specifies a value less than 0 or greater than 86.
115	The *expedited_receive_type* specifies an undefined value.
116	The conversation is using an OSI TP CRM.
117	The *TP_name* specifies a name that is not associated with this program.
118	The *TP_name_length* specifies a value less than 1 or greater than 64.
119	The *send_length* specifies a value that exceeds the range permitted by the implementation.
120	The *conversation_type* is set to CM_BASIC_CONVERSATION and *buffer* contains an invalid logical record length (LL) value of X'0000', X'0001', X'8000', X'8001'.
121	The *send_type* is set to CM_SEND_AND_PREP_TO_RECEIVE, *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_SYNC_LEVEL, *sync_level* is set to CM_SYNC_POINT, the conversation using an OSI TP CRM is included in a transaction, and the program is not the superior for the conversation.
122	The *send_type* is set to CM_SEND_AND_PREP_TO_RECEIVE, *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_SYNC_LEVEL, *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM, the conversation using an OSI TP CRM is included in a transaction, and the program is not the superior for the conversation.

Secondary Information

Table 25 (Page 2 of 9). CPI Communications-Defined Secondary Information

Condition Code	Description
123	The *send_type* is set to CM_SEND_AND_DEALLOCATE, *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL, *sync_level* is set to CM_SYNC_POINT, the conversation using an OSI TP CRM is included in a transaction, and the program is not the superior for the conversation.
124	The *send_type* is set to CM_SEND_AND_DEALLOCATE, *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL, *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM, the conversation using an OSI TP CRM is included in a transaction, and the program is not the superior for the conversation.
125	The *send_length* specifies a value less than 1 or greater than 86.
126	The *AE_qualifier_length* specifies a value less than 1 or greater than 1024.
127	The *AE_qualifier_format* specifies an undefined value.
128	The *partner_ID* is set to a non-null value.
129	The *allocate_confirm* specifies an undefined value.
130	The *allocate_confirm* specifies CM_ALLOCATE_CONFIRM, and the conversation is using an LU 6.2 CRM.
131	The *AP_title_length* specifies a value less than 1 or greater than 1024.
132	The *AP_title_format* specifies an undefined value.
133	The *application_context_name_length* specifies a value less than 1 or greater than 256.
134	The *begin_transaction* specifies an undefined value.
135	The *confirmation_urgency* specifies an undefined value.
136	The *security_password_length* specifies a value less than 0 or greater than 10.
137	The *conversation_security_type* specifies an undefined value.
138	The *security_user_ID_length* specifies a value less than 0 or greater than 10.
139	The *conversation_type* specifies an undefined value.
140	The *conversation_type* specifies CM_MAPPED_CONVERSATION, and *fill* is set to CM_FILL_BUFFER.
141	The *conversation_type* specifies CM_MAPPED_CONVERSATION, and a prior call to Set_Log_Data is still in effect.
142	The *deallocate_type* specifies CM_DEALLOCATE_FLUSH, *sync_level* is set to CM_SYNC_POINT, and *transaction_control* is set to CM_CHAINED_TRANSACTIONS.
143	The *deallocate_type* specifies CM_DEALLOCATE_FLUSH, *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM, and *transaction_control* is set to CM_CHAINED_TRANSACTIONS.
144	The *deallocate_type* specifies CM_DEALLOCATE_CONFIRM, *sync_level* is set to CM_NONE, and the conversation is using an LU 6.2 CRM.
145	The *deallocate_type* specifies CM_DEALLOCATE_CONFIRM, *sync_level* is set to CM_SYNC_POINT, and the conversation is using an LU 6.2 CRM.

Table 25 (Page 3 of 9). CPI Communications-Defined Secondary Information

Condition Code	Description
146	The *deallocate_type* specifies CM_DEALLOCATE_CONFIRM, *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM, and the conversation is using an LU 6.2 CRM.
147	The *deallocate_type* specifies CM_DEALLOCATE_CONFIRM, *sync_level* is set to CM_SYNC_POINT, *transaction_control* is set to CM_CHAINED_TRANSACTIONS, and the conversation is using an OSI TP CRM.
148	The *deallocate_type* specifies CM_DEALLOCATE_CONFIRM, *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM, *transaction_control* is set to CM_CHAINED_TRANSACTIONS, and the conversation is using an OSI TP CRM.
149	The *deallocate_type* specifies an undefined value.
150	The *error_direction* specifies CM_SEND_ERROR, and the conversation is using an OSI TP CRM.
151	The *error_direction* specifies an undefined value.
152	The *conversation_type* is set to CM_MAPPED_CONVERSATION.
153	The *fill* specifies an undefined value.
154	The *initialization_data_length* specifies a value less than 0 or greater than 10000.
155	The *conversation_type* is set to CM_MAPPED_CONVERSATION, and the conversation is using an LU 6.2 CRM.
156	The *log_data_length* specifies a value less than 0 or greater than 512.
157	The *map_name_length* specifies a value less than 0 or greater than 8.
158	The *partner_ID_type* specifies an undefined value.
159	The *partner_ID_type* specifies CM_PROGRAM_BINDING, and *partner_ID_length* specifies a value less than 0 or greater than 32767.
160	The *partner_ID_type* specifies CM_DISTINGUISHED_NAME or CM_PROGRAM_FUNCTION_ID, and *partner_ID_length* specifies a value less than 0 or greater than 1024.
161	The *partner_ID_scope* specifies an undefined value.
162	The *directory_syntax* specifies an undefined value.
163	The *directory_encoding* specifies an undefined value.
164	The *partner_LU_name_length* specifies a value less than 1 or greater than 17.
165	The *prepare_data_permitted* specifies CM_PREPARE_DATA_PERMITTED, and the conversation is using an LU 6.2 CRM.
166	The *prepare_data_permitted* specifies an undefined value.
167	The *prepare_to_receive_type* specifies CM_PREP_TO_RECEIVE_CONFIRM, and *sync_level* set to CM_NONE.
168	The *prepare_to_receive_type* specifies CM_PREP_TO_RECEIVE_CONFIRM, and *sync_level* set to CM_SYNC_POINT_NO_CONFIRM.
169	The *prepare_to_receive_type* specifies an undefined value.
170	The *processing_mode* specifies an undefined value.

Secondary Information

Table 25 (Page 4 of 9). CPI Communications-Defined Secondary Information

Condition Code	Description
171	The program has chosen queue-level non-blocking for the conversation.
172	The *conversation_queue* specifies a value that is not defined for the *send_receive_mode* conversation characteristic.
173	The program has chosen conversation-level non-blocking for the conversation.
174	The *queue_processing_mode* specifies an undefined value.
175	The *receive_type* specifies an undefined value.
176	The *return_control* specifies an undefined value.
177	The *send_receive_mode* specifies CM_FULL_DUPLEX, and *sync_level* is set to CM_CONFIRM.
178	The *send_receive_mode* specifies CM_FULL_DUPLEX, and *sync_level* is set to CM_SYNC_POINT.
179	The *send_receive_mode* specifies CM_FULL_DUPLEX, and *send_type* is set to CM_SEND_AND_PREP_TO_RECEIVE.
180	The *send_receive_mode* specifies CM_FULL_DUPLEX, and the program has chosen conversation-level non-blocking for the conversation.
181	The *send_receive_mode* specifies an undefined value.
182	The *send_type* specifies CM_SEND_AND_CONFIRM, and *sync_level* is set to CM_NONE.
183	The *send_type* specifies CM_SEND_AND_CONFIRM, and *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM.
184	The *send_type* specifies CM_SEND_AND_CONFIRM, and *send_receive_mode* is set to CM_FULL_DUPLEX.
185	The *send_type* specifies CM_SEND_AND_PREP_TO_RECEIVE, and *send_receive_mode* is set to CM_FULL_DUPLEX.
186	The *send_type* specifies an undefined value.
187	The *sync_level* specifies CM_NONE, *deallocate_type* is set to CM_DEALLOCATE_CONFIRM, and the conversation is using an LU 6.2 CRM.
188	The *sync_level* specifies CM_NONE, *send_receive_mode* is set to CM_HALF_DUPLEX, and *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_CONFIRM.
189	The *sync_level* specifies CM_NONE, *send_receive_mode* is set to CM_HALF_DUPLEX, and *send_type* is set to CM_SEND_AND_CONFIRM.
190	The *sync_level* specifies CM_SYNC_POINT_NO_CONFIRM, *send_receive_mode* is set to CM_HALF_DUPLEX, and *send_type* is set to CM_SEND_AND_CONFIRM.
191	The *sync_level* specifies CM_CONFIRM, and *send_receive_mode* is set to CM_FULL_DUPLEX.
192	The *sync_level* specifies CM_SYNC_POINT, and *send_receive_mode* is set to CM_FULL_DUPLEX.
193	The *sync_level* specifies CM_SYNC_POINT, *deallocate_type* is set to CM_DEALLOCATE_FLUSH, and the conversation is using an LU 6.2 CRM.

Table 25 (Page 5 of 9). CPI Communications-Defined Secondary Information

Condition Code	Description
194	The *sync_level* specifies CM_SYNC_POINT, *deallocate_type* is set to CM_DEALLOCATE_CONFIRM, and the conversation is using an LU 6.2 CRM.
195	The *sync_level* specifies CM_SYNC_POINT_NO_CONFIRM, *deallocate_type* is set to CM_DEALLOCATE_FLUSH, and the conversation is using an LU 6.2 CRM.
196	The *sync_level* specifies CM_SYNC_POINT_NO_CONFIRM, *deallocate_type* is set to CM_DEALLOCATE_CONFIRM, and the conversation is using an LU 6.2 CRM.
197	The *sync_level* specifies CM_SYNC_POINT_NO_CONFIRM, *send_receive_mode* is set to CM_HALF_DUPLEX, and the conversation is using an LU 6.2 CRM.
198	The *sync_level* specifies an undefined value.
199	The *transaction_control* specifies CM_UNCHAINED_TRANSACTIONS, and the conversation is using an LU 6.2 CRM.
200	The *transaction_control* specifies an undefined value.
201	The *TP_name_length* specifies a value less than 1 or greater than 64.
202	The *TP_name* specifies a name that is restricted in some way by node services.
203	The *TP_name* has incorrect internal syntax as defined by node services.
204	The *TP_name_length* specifies a value less than 1 or greater than 64.
205	The *OOID_list_count* specifies a value less than 1.
206	The number of OOIDs in *OOID_list* is less than the value specified in *OOID_list_count*.
207	The *OOID_list* contains an unassigned OOID.
208	The *timeout* specifies a value less than 0.
209	The *send_length* calculated by the map routine, specifies a value less than < 1 or > 86.
210	The *conversation_type is set to CM_BASIC_CONVERSATION.*
211	The *transaction_control* is set to CM_CHAINED_TRANSACTION.
212 - 1000	Reserved for future conditions to be associated with CM_PROGRAM_PARAMETER_CHECK.
Associated with CM_PROGRAM_STATE_CHECK:	
1001	No incoming conversation exists.
1002	No name is associated with the program. A program associates a name with itself by issuing the Specify_Local_TP_Name call.
1003	The conversation is not in **Initialize-Incoming** state.
1004	The conversation is not in **Initialize** state.
1005	The conversation's context is in the **Backout-Required** condition.
1006	The conversation is not in **Send**, **Send-Pending**, or **Defer-Receive** state.

Secondary Information

Table 25 (Page 6 of 9). CPI Communications-Defined Secondary Information

Condition Code	Description
1007	The conversation is basic, and the program started but did not finish sending a logical record.
1008	The conversation is not in **Confirm**, **Confirm-Send**, or **Confirm-Deallocate** state.
1009	The conversation is not in **Confirm-Deallocate** state.
1010	The conversation is not in **Send** or **Send-Pending** state.
1011	The *deallocate_type* is set to CM_DEALLOCATE_FLUSH, and the conversation is currently included in a transaction.
1012	The *deallocate_type* is set to CM_DEALLOCATE_CONFIRM, and the conversation is currently included in a transaction.
1013	The program has received a *status_received* value of CM_JOIN_TRANSACTION and must issue a tx_begin call to the X/Open TX interface to join the transaction.
1014	The conversation is not in **Send-Receive** or **Send-Only** state.
1015	The conversation is not in **Send-Receive** state.
1016	The conversation is not currently included in a transaction.
1017	The conversation is in **Initialize-Incoming** state.
1018	The conversation is in **Initialize** state.
1019	The conversation's context is not in transaction. The program must issue a tx_begin call to the X/Open TX interface to start a transaction.
1020	The conversation is already included in the current transaction.
1021	The conversation is using an OSI TP CRM, *begin_transaction* is set to CM_BEGIN_EXPLICIT, and the conversation is not currently included in a transaction.
1022	The conversation is using an OSI TP CRM, and the program is not the root of the transaction and has not received a take-commit notification from its superior.
1023	A prior call to Deferred_Deallocate is still in effect for the conversation.
1024	The *receive_type* is set to CM_RECEIVE_AND_WAIT, and the conversation is not in **Send**, **Receive**, **Send-Pending**, or **Prepared** state.
1025	The *receive_type* is set to CM_RECEIVE_IMMEDIATE, and the conversation is not in **Receive** or **Prepared** state.
1026	The conversation is not in **Send-Receive**, **Receive-Only**, or **Prepared** state.
1027	The conversation is not in **Send**, **Receive**, **Send-Pending**, **Confirm**, **Confirm-Send**, **Confirm-Deallocate**, **Sync-Point**, **Sync-Point-Send**, **Sync-Point-Deallocate**, or **Prepared** state.
1028	For a conversation using an OSI TP CRM, the Request_To_Send call is not allowed from **Send** state.
1029	The conversation is not in **Send**, **Send-Pending**, **Sync-Point**, **Sync-Point-Send**, or **Sync-Point-Deallocate** state.
1030	The program received a take-commit notification not ending in *_DATA_OK, and the conversation is in **Sync-Point**, **Sync-Point-Send**, or **Sync-Point-Deallocate** state.

Table 25 (Page 7 of 9). CPI Communications-Defined Secondary Information

Condition Code	Description
1031	The *send_type* is set to CM_SEND_AND_CONFIRM or CM_SEND_AND_PREP_TO_RECEIVE, and the conversation is in **Sync-Point**, **Sync-Point-Send**, or **Sync-Point-Deallocate** state.
1032	The *send_type* is set to CM_SEND_AND_DEALLOCATE, *deallocate_type* is not set to CM_DEALLOCATE_ABEND, and the conversation is in **Sync-Point**, **Sync-Point-Send**, or **Sync-Point-Deallocate** state.
1033	The *send_type* is set to CM_SEND_AND_DEALLOCATE, *deallocate_type* is set to CM_DEALLOCATE_FLUSH, *sync_level* is set to CM_SYNC_POINT, and the conversation is included in a transaction.
1034	The *send_type* is set to CM_SEND_AND_DEALLOCATE, *deallocate_type* is set to CM_DEALLOCATE_FLUSH, *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM, and the conversation is included in a transaction.
1035	The *send_type* is set to CM_SEND_AND_DEALLOCATE, *deallocate_type* is set to CM_DEALLOCATE_CONFIRM, *sync_level* is set to CM_SYNC_POINT, and the conversation is included in a transaction.
1036	The *send_type* is set to CM_SEND_AND_DEALLOCATE, *deallocate_type* is set to CM_DEALLOCATE_CONFIRM, *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM, and the conversation is included in a transaction.
1037	The conversation is not in **Send-Receive**, **Send-Only**, **Sync-Point**, or **Sync-Point-Deallocate** state.
1038	The program received a take-commit notification not ending in *_DATA_OK, and the conversation is in **Sync-Point** or **Sync-Point-Deallocate** state.
1039	The *send_type* is set to CM_SEND_AND_DEALLOCATE, *deallocate_type* is not set to CM_DEALLOCATE_ABEND, and the conversation is in **Sync-Point** or **Sync-Point-Deallocate** state.
1040	The conversation is not in **Send-Receive**, **Send-Only**, or **Confirm-Deallocate** state.
1041	The *conversation_security_type* is not set to CM_SECURITY_PROGRAM or CM_SECURITY_PROGRAM_STRONG.
1042	The conversation is not in **Initialize** or **Initialize-Incoming** state.
1043	The conversation is not in **Initialize** or **Receive** state.
1044	The conversation is not in **Initialize** or **Send-Receive** state.
1045	The *conversation_queue* specifies CM_INITIALIZATION_QUEUE, and the conversation is not in **Initialize** or **Initialize-Incoming** state.
1046	The *conversation_queue* specifies a value other than CM_INITIALIZATION_QUEUE, and the conversation is in **Initialize-Incoming** state.
1047	The conversation is not in **Send**, **Receive**, **Send-Pending**, **Defer-Receive**, or **Defer-Deallocate** state.
1048	There is no outstanding operation associated with any of the OOIDs specified in *OOID_list* or by use of a defined value of *OOID_list_count* has completed.
1049	There were no conversation-level outstanding operations for the program.

Secondary Information

Table 25 (Page 8 of 9). CPI Communications-Defined Secondary Information

Condition Code	Description
1050	The *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, *transaction_control* is set to CM_CHAINED_TRANSACTIONS, and the conversation's context is not in transaction.
1051	The program has issued a successful Accept_Conversation or Accept_Incoming call on a conversation with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM and using an OSI TP CRM, and the program has not issued a Receive call on this conversation.
1052 - 2000	Reserved for future conditions to be associated with CM_PROGRAM_STATE_CHECK.
Associated with CM_PARAMETER_ERROR:	
2001	The *mode_name* characteristic (set from side information or by Set_Mode_Name) specifies a mode name that is not recognized by the LU as being valid.
2002	The *mode_name* characteristic (set from side information or by Set_Mode_Name) specifies a mode name that the local program does not have the authority to specify. For example, SNASVCMG requires special authority with LU 6.2.
2003	The *TP_name* characteristic (set from side information or by Set_TP_Name) specifies a transaction program name that the local program does not have the appropriate authority to allocate a conversation to. For example, SNA service programs require special authority with LU 6.2.
2004	The *TP_name* characteristic (set from side information or by Set_TP_Name) specifies an SNA service transaction program and *conversation_type* is set to CM_MAPPED_CONVERSATION.
2005	The *partner_LU_name* characteristic (set from side information or by Set_Partner_LU_Name) specifies a partner LU name that is not recognized as being valid.
2006	The *AP_title* characteristic (set from side information or using Set_AP_Title call or the *AE_qualifier* characteristic (set from side information or using Set_AE_Qualifier call), or the *application_context_name* characteristic (set from side information or using the Set_Application_Context_Name call) specifies an AP title or an AE qualifier or an application context name that is not recognized as being valid.
2007	The *conversation_security_type* characteristic is set to CM_SECURITY_PROGRAM or CM_SECURITY_PROGRAM_STRONG, and the *security_password* characteristic or the *security_user_ID* characteristic (set from side information or by Set calls) or both, are null.
2008	The *conversation_security_type* characteristic is set to CM_SECURITY_DISTRIBUTED or CM_SECURITY_MUTUAL, and the partner principal name (set from the program binding) is null or is not recognized by the CRM as being valid.
2009	A *partner_ID* characteristic was provided that caused a search of the distributed directory, but no program binding was retrieved.

Table 25 (Page 9 of 9). CPI Communications-Defined Secondary Information

Condition Code	Description
2010	The program binding for the conversation, either specified directly on the Set_Partner_ID call or obtained from the distributed directory, was invalid.
2011 - 2500	Reserved for future conditions to be associated with CM_PARAMETER_ERROR.
Associated with CM_SECURITY_NOT_SUPPORTED:	
2501	The *conversation_security_type* does not provide for the user name type indicated by the required_user_name_type field in the program binding.
2502 - 3000	Reserved for future conditions to be associated with CM_SECURITY_NOT_SUPPORTED.
Associated with CM_DEALLOCATED_ABEND (full-duplex conversations using an OSI TP CRM only):	
3001	There was a collision between a Deallocate call with *deallocate_type* set to CM_DEALLOCATE_CONFIRM issued by the local program and an Include_Partner_In_Transaction call issued by the partner program. No log data is available.
3002	There was a collision between a Deallocate call with *deallocate_type* set to CM_DEALLOCATE_CONFIRM issued by the local program and a Deallocate call with *deallocate_type* set to CM_DEALLOCATE_CONFIRM call issued by the partner program. No log data is available.
3003	CPI Communications deallocated the incoming conversation because an implicit call of tx_set_transaction_control failed with TX return code TX_PROTOCOL_ERROR.
3004	CPI Communications deallocated the incoming conversation because an implicit call of tx_set_transaction_control failed with TX return code TX_FAIL.
3005	CPI Communications deallocated the conversation because an implicit call of tx_begin failed with TX return code TX_OUTSIDE.
3006	CPI Communications deallocated the conversation because an implicit call of tx_begin failed with TX return code TX_PROTOCOL_ERROR.
3007	CPI Communications deallocated the conversation because an implicit call of tx_begin failed with TX return code TX_ERROR.
3008	CPI Communications deallocated the conversation because an implicit call of tx_begin failed with TX return code TX_FAIL.
3009 - 3500	Reserved for future conditions to be associated with CM_DEALLOCATED_ABEND.
Associated with CM_DEALLOCATED_ABEND_BO (full-duplex conversations using an OSI TP CRM only):	
3501	There was a collision between a Include_Partner_In_Transaction call issued by the local program and a Deallocate call with *deallocate_type* set to CM_DEALLOCATE_CONFIRM issued by the partner program. No log data is available.
3502 - 4000	Reserved for future conditions to be associated with CM_DEALLOCATED_ABEND_BO.

CRM-Specific Secondary Information

When the underlying CRM discovers an abnormal condition, the condition, identified by a CRM-specific message, is then mapped to a CPI Communications return code and returned to the program. The CRM-specific message is the SNA sense data information for the CRM type of LU 6.2 and OSI diagnostic information for the CRM type of OSI TP.

Table 26. Examples of LU 6.2 CRM-Specific Secondary Information

Associated with CM_CONVERSATION_TYPE_MISMATCH:
4001;;1008 6034 The FMH-5 Attach command specifies a conversation type that the receiver does not support for the specified transaction program. This sense data is sent only in FMH-7.
Associated with CM_TPN_NOT_RECOGNIZED:
4001;;1008 6021 Transaction Program Name Not Recognized: The FMH-5 Attach command specifies a transaction program name that the receiver does not recognize. This sense data is sent only in FMH-7.
Associated with CM_SYNC_LVL_NOT_SUPPORTED_SYS:
4001;;1008 6040 Invalid Attach Parameter: A parameter in the FMH-5 Attach command conflicts with the statements of LU capability previously provided in the BIND negotiation.

Note: See Chapter 10 of *System Network Architecture Formats* (IBM document number GA27-3136) for complete information about sense data.

Table 27. Examples of OSI TP CRM-Specific Secondary Information

Associated with CM_RESOURCE_FAILURE_NO_RETRY, CM_RESOURCE_FAIL_NO_RETRY_BO:
4002;;recipient-unknown.
4002;;no-reason-given.
4002;;permanent-failure.
4002;;protocol-error.
Associated with CM_TPN_NOT_RECOGNIZED:
4002;;recipient-tpsu-title-unknown.
4002;;recipient-tpsu-title-required.
Associated with CM_SYNC_LEVEL_NOT_SUPPORTED_SYS:
4002;;functional-unit-not-supported.
4002;;functional-unit-combination-not-supported.

Implementation-Related Information

An implementation may return CM_PRODUCT_SPECIFIC_ERROR to the program for any errors that are specific to the implementation or to the system that supports the implementation. In this case, secondary information is the error message defined by the implementation or system.

Table 28. Examples of Implementation-Related Secondary Information

Example 1:
4003;;0001 STACK_TOO_SMALL;;A minimum stack size of 3500 bytes is required by CPI-C when a call is issued. CPI-C runs on the stack of the program that calls it. When the call was issued, CPI-C found the stack size to be less than the minimum size.;;Programmer Response: Increase the stack size specified in the .DEF file used in linking. If your program calls CPI-C from a thread it has created, be sure the stack size on the NewThreadStack parameter of your DosCreateThread function call is large enough.
Example 2:
4003;;0002 CANNOT_ALLOCATE_SHARED_SEGMENT;;Communications Manager could not allocate the shared segment named \SHAREMEM\ACSLGMEM.;;Programmer Response: A necessary shared segment is not currently available. There is no corrective action that your program can take. This problem will recur until the Communications Manager is stopped and restarted. Operator Response: Communications Manager must be restarted to correct the problem.

Appendix C. State Tables

The CPI Communications state tables show when and where different CPI Communications calls can be issued. For example, a program must issue an Initialize_Conversation call before issuing an Allocate call, and it cannot issue a Send_Data call before the conversation is allocated.

As described in “Program Flow—States and Transitions” on page 50, CPI Communications uses the concepts of states and state transitions to simplify explanations of the restrictions that are placed on the calls. A number of states are defined for CPI Communications and, for any given call, a number of transitions are allowed.

- Table 29 on page 472 describes the state transitions that are allowed for the CPI Communications calls on half-duplex conversations.
- Table 32 on page 489 describes the state transitions that are allowed for CPI Communications calls on full-duplex conversations.
- Table 30 on page 479 shows the effects of SAA resource recovery Commit and Backout calls on CPI Communications conversation states for half-duplex conversations.
- Table 31 on page 480 shows the effects of X/Open TX resource recovery calls on CPI Communications conversation states for half-duplex conversations.
- Table 33 on page 495 shows the effects of SAA resource recovery calls on CPI Communications conversation states for full-duplex conversations.
- Table 34 on page 496 shows the effects of X/Open TX resource recovery calls on CPI Communications conversation states for full-duplex conversations.

How to Use the State Tables

Each CPI Communications call[5] is represented in the table by a group of input rows. The possible conversation states are shown across the top of the table. The states correspond to the columns of the matrix. The intersection of input (row) and state (column) represents the validity of a CPI Communications call in that particular state and, for valid calls, what state transition (if any) occurs.

The first row of each call input grouping (delineated by horizontal lines) contains the name of the call and a symbol in each state column showing whether the call is valid for that state. A call is valid for a given state only if that state's column contains a downward pointing arrow (↓) on this row. If the [sc] or [pc] symbol appears in a state's column, the call is invalid for that state and receives a return code of CM_PROGRAM_STATE_CHECK or CM_PROGRAM_PARAMETER_CHECK, respectively. No state transitions occur for invalid CPI Communications calls.

[5] Only the calls that affect conversation states are included in the State table.

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The remaining input rows in the call group show the state transitions for valid calls. The transition from one conversation state to another often depends on the value of the return code returned by the call; therefore, a given call group may have several rows, each showing the state transitions for a particular return code or set of return codes.

For calls that are processed in non-blocking processing mode, the following special considerations apply:

- When a call gets the CM_OPERATION_INCOMPLETE return code, the operation remains in progress as an oustanding operation on the conversation (when conversation-level non-blocking is used) or on the queue with which the call is associated (when queue-level non-blocking is used). Any other calls (except Cancel_Conversation) on that conversation or queue get a return code of CM_OPERATION_NOT_ACCEPTED, and no conversation state transition occurs.
- The CM_OPERATION_NOT_ACCEPTED return code is not included in the state table.

For conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, the following special considerations apply:

- A state transition symbol ending with a caret (for example, 1^ or –^) means that the conversation's context may be in the **Backout-Required** condition following the call. (Note that the state change for the conversation is indicated by the **first** character of these symbols.)
- When a context is in the **Backout-Required** condition, its protected conversations are restricted from issuing certain CPI Communications calls. These calls are designated in the table with the symbol ↓′. Where this symbol appears, the call is valid in this state unless the conversation is protected and its context is in the **Backout-Required** condition. If the call is invalid, a *return_code* of CM_PROGRAM_STATE_CHECK is returned and no conversation state transition occurs.

Example

For an example of how the half-duplex state table might be used, look at the group of input rows for the **Deallocate(C)** call. The **(C)** here means that this group is for the Deallocate call when either *deallocate_type* is set to CM_DEALLOCATE_CONFIRM or *deallocate_type* is set to CM_DEALLOCATE_SYNC_LVL and *sync_level* is set to CM_CONFIRM. The first row in this group shows that this call is valid only when the conversation is in **Send** or **Send-Pending** state. For all other states, either the call is invalid and a *return_code* of CM_PROGRAM_PARAMETER_CHECK or CM_PROGRAM_STATE_CHECK is returned, or the call is not possible.

Beneath the input row containing **Deallocate(C)**, there are several rows showing the possible return codes returned by this call. Since the call is valid only in **Send** and **Send-Pending** states, only these states' columns contain transition values on these rows. These transition values provide the following information:

- The conversation goes from **Send** or **Send-Pending** state to **Reset** state (state 1) when a return code abbreviated as “ok,” “da,” or “rf” is returned. See “Return Code Values [ ]” on page 468 to find out what these abbreviations mean.

- The conversation goes from **Send** state to **Reset** state when a return code abbreviated as “ae” is returned. A return code abbreviated as “ae” will never be returned when this call is issued from **Send-Pending** state.
- The conversation goes from **Send** or **Send-Pending** state to **Receive** state (state 4) when a return code abbreviated as “ep” is returned.
- There is no state transition when a return code of CM_PROGRAM_PARAMETER_CHECK (“pc”) or CM_OPERATION_INCOMPLETE (“oi”) is returned.
- There is no state transition for a conversation in **Send** state when a return code of CM_PROGRAM_STATE_CHECK (“sc”) is returned. This return code will never be returned when this call is issued from **Send-Pending** state.

Explanation of Half-Duplex State Table Abbreviations

Abbreviations are used in the state table to indicate the different permutations of calls and characteristics. There are four categories of abbreviations:

- **Conversation characteristic** abbreviations are enclosed by parentheses— (. . .)
- **Conversation queue** abbreviations are enclosed by parentheses— (. . .)
- **return_code** abbreviations are enclosed by brackets — [. . .]
- **data_received and status_received** abbreviations are enclosed by braces and separated by a comma— { . . . , . . . }. The abbreviation before the comma represents the *data_received* value, and the abbreviation after the comma represents the value of *status_received*.

The next sections show the abbreviations used in each category.

Conversation Characteristics ( )

The following abbreviations are used for conversation characteristics:

Abbreviation	Meaning
A	*deallocate_type* is set to CM_DEALLOCATE_ABEND
B	*send_type* is set to CM_BUFFER_DATA
C	For a Deallocate call, C means one of the following: • *deallocate_type* is set to CM_DEALLOCATE_CONFIRM • *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL and *sync_level* is set to CM_CONFIRM • *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL and *sync_level* is set to CM_SYNC_POINT, but the conversation is not currently included in a transaction For a Prepare_To_Receive call, C means one of the following: • *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_CONFIRM • *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_SYNC_LEVEL and *sync_level* is set to CM_CONFIRM • *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_SYNC_LEVEL and *sync_level* is set to CM_SYNC_POINT, but the conversation is not currently included in a transaction For a Send_Data call, C means the following: • *send_type* is set to CM_SEND_AND_CONFIRM
D(x)	*send_type* is set to CM_SEND_AND_DEALLOCATE. *x* represents the *deallocate_type* and can be A, C, F, or S. Refer to the appropriate entries in this table for a description of these values.

Abbreviation	Meaning
F	For a Deallocate call, F means one of the following: • *deallocate_type* is set to CM_DEALLOCATE_FLUSH • *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL and either *sync_level* is set to CM_NONE or the conversation is in **Initialize_Incoming** state • *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL and *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM, but the conversation is not currently included in a transaction For a Prepare_To_Receive call, F means one of the following: • *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_FLUSH • *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_SYNC_LEVEL and *sync_level* is set to CM_NONE • *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_SYNC_LEVEL and *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM, but the conversation is not currently included in a transaction For a Send_Data call, F means the following: • *send_type* is set to CM_SEND_AND_FLUSH
I	*receive_type* is set to CM_RECEIVE_IMMEDIATE
P(x)	*send_type* is set to CM_SEND_AND_PREP_TO_RECEIVE. *x* represents the *prepare_to_receive_type* and can be C, F, or S. Refer to the appropriate entries in this table for a description of these values.
S	For a Deallocate call, S means the following: • *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL, *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and the conversation is currently included in a transaction For a Prepare_To_Receive call, S means the following: • *prepare_to_receive_type* is set to CM_PREP_TO_RECEIVE_SYNC_LEVEL, *sync_level* is set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, and the conversation is currently included in a transaction
W	*receive_type* is set to CM_RECEIVE_AND_WAIT.

Conversation Queues ()

The following abbreviations are used for conversation queues:

Abbreviation	Meaning
N	*conversation_queue* is set to CM_INITIALIZATION_QUEUE
Q	*conversation_queue* is set to one of the following: • CM_SEND_RECEIVE_QUEUE • CM_EXPEDITED_SEND_QUEUE • CM_EXPEDITED_RECEIVE_QUEUE

Return Code Values [ ]

The following abbreviations are used for return codes:

Abbreviation	Meaning
ae	For an Allocate call, ae means one of the following: • CM_ALLOCATE_FAILURE_NO_RETRY • CM_ALLOCATE_FAILURE_RETRY • CM_CONVERSATION_TYPE_MISMATCH • CM_PIP_NOT_SPECIFIED_CORRECTLY • CM_RESOURCE_FAILURE_NO_RETRY • CM_RESOURCE_FAILURE_RETRY • CM_RETRY_LIMIT_EXCEEDED • CM_SECURITY_MUTUAL_FAILED • CM_SECURITY_NOT_SUPPORTED • CM_SECURITY_NOT_VALID • CM_SEND_RCV_MODE_NOT_SUPPORTED • CM_SYNC_LVL_NOT_SUPPORTED_PGM • CM_SYNC_LVL_NOT_SUPPORTED_SYS • CM_TP_NOT_AVAILABLE_NO_RETRY • CM_TP_NOT_AVAILABLE_RETRY • CM_TPN_NOT_RECOGNIZED For any other call, ae means one of the following: • CM_CONVERSATION_TYPE_MISMATCH • CM_PIP_NOT_SPECIFIED_CORRECTLY • CM_SECURITY_NOT_VALID • CM_SEND_RCV_MODE_NOT_SUPPORTED • CM_SYNC_LVL_NOT_SUPPORTED_PGM • CM_SYNC_LVL_NOT_SUPPORTED_SYS • CM_TP_NOT_AVAILABLE_NO_RETRY • CM_TP_NOT_AVAILABLE_RETRY • CM_TPN_NOT_RECOGNIZED
bo	CM_TAKE_BACKOUT. This return code is returned only for conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM.
bs	CM_BUFFER_TOO_SMALL
da	da means one of the following: • CM_DEALLOCATED_ABEND • CM_DEALLOCATED_ABEND_SVC • CM_DEALLOCATED_ABEND_TIMER
db	db is returned only for conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM and means one of the following: • CM_DEALLOCATED_ABEND_BO • CM_DEALLOCATED_ABEND_SVC_BO • CM_DEALLOCATED_ABEND_TIMER_BO
dn	CM_DEALLOCATED_NORMAL
dnb	CM_DEALLOCATED_NORMAL_BO. This return code is returned only for conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM.
ed	ed means one of the following: • CM_EXP_DATA_NOT_SUPPORTED • CM_CONVERSATION_ENDING

Abbreviation	Meaning
en	en means one of the following: • CM_PROGRAM_ERROR_NO_TRUNC • CM_SVC_ERROR_NO_TRUNC
ep	ep means one of the following: • CM_PROGRAM_ERROR_PURGING • CM_SVC_ERROR_PURGING
et	et means one of the following: • CM_PROGRAM_ERROR_TRUNC • CM_SVC_ERROR_TRUNC
mp	mp means one of the following: CM_UNKNOWN_MAP_NAME_REQUESTED CM_UNKNOWN_MAP_NAME_RECEIVED CM_MAP_ROUTINE_ERROR
ns	CM_NO_SECONDARY_INFORMATION
oi	CM_OPERATION_INCOMPLETE
ok	CM_OK
pb	CM_INCLUDE_PARTNER_REJECT_BO
pc	CM_PROGRAM_PARAMETER_CHECK. This return code means an error was found in one or more parameters. For calls illegally issued in **Reset** state, pc is returned because the *conversation_ID* is undefined in that state.
pe	CM_PARAMETER_ERROR
pn	CM_PARM_VALUE_NOT_SUPPORTED
rb	rb means one of the following: • CM_RESOURCE_FAIL_NO_RETRY_BO • CM_RESOURCE_FAILURE_RETRY_BO
rf	rf means one of the following: • CM_RESOURCE_FAILURE_NO_RETRY • CM_RESOURCE_FAILURE_RETRY
sc	CM_PROGRAM_STATE_CHECK
se	CM_SYSTEM_EVENT
un	CM_UNSUCCESSFUL

Notes:

1. The return code CM_PRODUCT_SPECIFIC_ERROR is not included in the state table because the state transitions caused by this return code are product-specific.
2. The CM_OPERATION_NOT_ACCEPTED return code is not included in the state table. If conversation-level non-blocking is being used on a conversation, a program receives CM_OPERATION_NOT_ACCEPTED when it issues any call (except Cancel_Conversation) on the conversation while a previous operation is still in progress, regardless of the state. If conversation-level non-blocking is not being used on a conversation, a program receives CM_OPERATION_NOT_ACCEPTED when it issues any call associated with a queue that has a previous operation still in progress, regardless of the state. No conversation state transition occurs.

3. The CM_CALL_NOT_SUPPORTED return code is not included in the state table. It is returned when the local system provides an entry point for the call but does not support the function requested by the call, regardless of the state. No state transition occurs.

data_received and status_received { , }

The following abbreviations are used for the *data_received* values:

Abbreviation	Meaning
dr	Means one of the following: • CM_DATA_RECEIVED • CM_COMPLETE_DATA_RECEIVED • CM_INCOMPLETE_DATA_RECEIVED
nd	CM_NO_DATA_RECEIVED
*	Means one of the following: • CM_DATA_RECEIVED • CM_COMPLETE_DATA_RECEIVED • CM_NO_DATA_RECEIVED

The following abbreviations are used for the *status_received* values:

Abbreviation	Meaning
cd	CM_CONFIRM_DEALLOC_RECEIVED
co	CM_CONFIRM_RECEIVED
cs	CM_CONFIRM_SEND_RECEIVED
jt	CM_JOIN_TRANSACTION
no	CM_NO_STATUS_RECEIVED
po	CM_PREPARE_OK
se	CM_SEND_RECEIVED
tc	CM_TAKE_COMMIT or CM_TAKE_COMMIT_DATA_OK. These values are returned only for conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM.
td	CM_TAKE_COMMIT_DEALLOCATE or CM_TAKE_COMMIT_DEALLOC_DATA_OK. These values are returned only for conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM.
ts	CM_TAKE_COMMIT_SEND or CM_TAKE_COMMIT_SEND_DATA_OK. These values are returned only for conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM.

Table Symbols for the Half-Duplex State Table

The following symbols are used in the state table to indicate the condition that results when a call is issued from a certain state:

Symbol	Meaning
/	Cannot occur. CPI Communications either will not allow this input or will never return the indicated return codes for this input in this state.
–	Remain in current state
1-18	Number of next state
↓	It is valid to make this call from this state. See the table entries immediately below this symbol to determine the state transition resulting from the call.
↓′	For a conversation not using *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, or not currently included in a transaction, this is equivalent to ↓. If the conversation has *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM and the conversation is currently included in a transaction, however, ↓′ means it is valid to make this call from this state *unless the conversation's context is in the* **Backout-Required** *condition*. In that case, the call is invalid and CM_PROGRAM_STATE_CHECK is returned. For valid calls, see the table entries immediately below this symbol to determine the state transition resulting from the call.
^	For a conversation not using *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM or not currently included in a transaction, this symbol should be ignored. For a conversation using *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM and currently included in a transaction, when this symbol follows a state number or a – (for example, 1^ or –^), it means the conversation's context may be in the **Backout-Required** condition following the call.
#	A conversation with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM and currently included in a transaction goes to the state it was in at the completion of the most recent synchronization point. If there was no prior synchronization event, the side of the conversation that was initialized with an Allocate call goes to **Send** state, and the side of the conversation that accepted the conversation goes to **Receive** state.
%	Wait_For_Completion and Wait_For_Conversation can only be issued when one or more calls have received a *return_code* of CM_OPERATION_INCOMPLETE. When Wait_For_Completion or Wait_For_Conversation completes with a *return_code* of CM_OK, it indicates one or more conversations on which an operation has completed. Each of those conversations then moves to the appropriate state as determined by the return code for the operation that is now completed and by the other factors that determine state transitions.
?	For programs using the X/Open TX interface with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM, the state of the conversation with respect to the transaction is unknown.

Half-Duplex State Tables

Table 29 (Page 1 of 7). States and Transitions for CPI Communications Calls on Half-Duplex Conversations

Inputs	States 1–8 and 14 are used by all conversations								Used only by conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM						
	Reset 1	Initialize 2	Send 3	Receive 4	Send-Pending 5	Confirm 6	Confirm-Send 7	Confirm-Deallocate 8	Defer-Receive 9	Defer-Deallocate 10	Sync-Point 11	Sync-Point Send 12	Sync-Point Deallocate 13	Prepared 18	Initialize-Incoming 14
Accept_Conversation	↓	/	/	/	/	/	/	/	/	/	/	/	/	/	/
[ok]	4														
[da,sc]	–														
Accept_Incoming	[pc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	↓
[ok]															4
[da]															1
[oi,pc,sc]															–
Allocate	[pc]	↓′	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok]		3													
[ae]		1													
[oi,pc,pe,sc,un]		–													
Cancel_Conversation	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
[ok]		1^	1^	1^	1^	1^	1^	1^	1^	1^	1^	1^	1^	1^	1^
[pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	–
Confirm	[pc]	[sc]	↓′	[sc]	↓′	[sc]	[sc]	[sc]	↓′	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok]			–		3				4						
[ae]			1		/				1						
[bo]			–^		3^				4^						
[da,rf]			1		1				1						
[db,pb,rb]			1^		1^				1^						
[ep]			4		4				4						
[oi,pc]			–		–				–						
[sc]			–		/				/						
Confirmed	[pc]	[sc]	[sc]	[sc]	[sc]	↓′	↓′	↓′	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok]						4	3	1							
[oi,pc]						–	–	–							
Deallocate(A)	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	/
[ok]		1	1^	1^	1^	1^	1^	1^	1^	1^	1^	1^	1^	1^	
[oi,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	
Deallocate(C)	[pc]	[sc]	↓	[sc]	↓	[sc]	[sc]	[sc]	/	/	/	/	/	/	/
[ok,da,rf]			1		1										
[ae]			1		/										
[ep]			4		4										
[oi,pc]			–		–										
[sc]			–		/										
Deallocate(F)	[pc]	[sc]	↓	[sc]	↓	[sc]	[sc]	[sc]	/	/	/	/	/	/	↓
[ok]			1		1										1
[oi,pc]			–		–										–
[sc]			–		/										/
Deallocate(S)	[pc]	[sc]	↓′	[sc]	↓′	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	/
[ok]			10		10										
[oi,pc]			–		–										
[sc]			–		/										
Deferred_Deallocate[6]	[pc]	[sc]	↓′	[sc]	↓′	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok]			–7		–7										
[ae]			1		/										
[bo]			–^		3^										
[db,rb]			1^		1^										
[ep]			4		4										
[oi,pc]			–		–										
[pb]			1^		/										
Extract_AE_Qualifier	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	[sc]
[ok,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	
Extract_AP_Title	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	[sc]
[ok,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	

Table 29 (Page 2 of 7). States and Transitions for CPI Communications Calls on Half-Duplex Conversations

Inputs	States 1–8 and 14 are used by all conversations								Used only by conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM						
	Reset 1	Initialize 2	Send 3	Receive 4	Send-Pending 5	Confirm 6	Confirm-Send 7	Confirm-Deallocate 8	Defer-Receive 9	Defer-Deallocate 10	Sync-Point 11	Sync-Point Send 12	Sync-Point Deallocate 13	Prepared 18	Initialize-Incoming 14
Extract_Appl_Ctx_Name	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	[sc]
[ok,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	
Extract_Conv_Context	[pc]	[sc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	[sc]
[ok,sc]			–	–	–	–	–	–	–	–	–	–	–	–	
Extract_Conv_State	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
[ok,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	–
[bo]		/	–	–	–	–	–	/	–	–	–	–	–	–	/
Extract_Conv_Type	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	[sc]
[ok,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	
Extract_Init_Data	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	[sc]
1 [ok,bs,pc,bs]		–	–	–	–	–	–	–	–	–	–	–	–	–	
Extract_Mapped_Initialization_Data	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	[sc]
1 [ok,pc,mp,bs]		–	–	–	–	–	–	–	–	–	–	–	–	–	
1															
Extract_Mode_Name	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	[sc]
[ok,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	
Extract_Part_LU_Name	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	[sc]
[ok,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	
Extract_Partner_ID	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	[sc]
1 [ok,bs,pc]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	
Extr_Sec_User_ID	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	[sc]
[ok,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	
Extract_Secondary_Info	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
[ok,ns,pc]	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Extr_Send_Rcv_Mode	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	[sc]
[ok,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	
Extract_Sync_Level	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	[sc]
[ok,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	
Extr_Transaction_Control	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	[sc]
[ok,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	
Extract_TP_Name	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	[sc]
[ok,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	
Flush	[pc]	[sc]	↓′	[sc]	↓′	[sc]	[sc]	[sc]	↓′	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok]			–		3				4						
[oi,pc]			–		–				–						
Include_Ptr_In_Trans[6]	[pc]	[sc]	↓′	[sc]	↓′	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok]			–		3										
[ae]			1		/										
[da,rf]			1		1										
[ep]			4		4										
[oi,pc,sc]			–		–										
Init_Conversation[8]	↓	/	/	/	/	/	/	/	/	/	/	/	/	/	/
[ok]	2														
[pc]	–														
Init_For_Incoming	↓	/	/	/	/	/	/	/	/	/	/	/	/	/	/
[ok]	14														

Table 29 (Page 3 of 7). States and Transitions for CPI Communications Calls on Half-Duplex Conversations

Inputs	States 1–8 and 14 are used by all conversations								Used only by conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM						
	Reset 1	Initialize 2	Send 3	Receive 4	Send-Pending 5	Confirm 6	Confirm-Send 7	Confirm-Deallocate 8	Defer-Receive 9	Defer-Deallocate 10	Sync-Point 11	Sync-Point Send 12	Sync-Point Deallocate 13	Prepared 18	Initialize-Incoming 14
Prepare	[pc]	[sc]	↓′	[sc]	↓′	[sc]	[sc]	[sc]	↓′	↓′	[sc]	[sc]	[sc]	[sc]	[sc]
[ok]			18		18				18	18					
[ae]			1		/				1	1					
[bo]			–^		–^				–^	–^					
[db,pb,rb]			1^		1^				1^	1^					
[ep]			4		4				4	4					
[oi,pc,sc]			–		–				–	–					
Prepare_To_Receive(C)	[pc]	[sc]	↓′	[sc]	↓′	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,ep]			4		4										
[ae]			1		/										
[bo]			4^		4^										
[da,rf]			1		1										
[db,pb,rb]			1^		1^										
[oi,pc]			–		–										
[sc]			–		/										
Prepare_To_Receive(F)	[pc]	[sc]	↓′	[sc]	↓′	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok]			4		4										
[oi,pc]			–		–										
[sc]			–		/										
Prepare_To_Receive(S)	[pc]	[sc]	↓′	[sc]	↓′	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok]			9		9										
[oi,pc]			–		–										
[sc]			–		/										
Receive(I)	[pc]	[sc]	[sc]	↓′	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	↓′	[sc]
[ok] {dr,no}				–										–	
[ok] {dr,se}				5										/	
[ok] {nd,se}				3										/	
[ok] {*,cd}				8										/	
[ok] {*,co}				6										/	
[ok] {*,cs}				7										/	
[ok] {*,jt}				–										/	
[ok] {*,po}				/										–	
[ok] {*,tc}				11										/	
[ok] {*,td}				13										/	
[ok] {*,ts}				12										/	
[ae]				1										1	
[bo]				–^										–^	
[da,dn,rf]				1										/	
[db,pb,rb]				1^										1^	
[en,ep]				–										4	
[et]				–										/	
[pc,sc,un]				–										–	
Receive(W)	[pc]	[sc]	↓′	↓′	↓′	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	↓′	[sc]
[ok] {dr,no}			4	–	4									–	
[ok] {dr,se}			5	5	–									/	
[ok] {nd,se}			–	3	3									/	
[ok] {*,cd}			8	8	8									/	
[ok] {*,co}			6	6	6									/	
[ok] {*,cs}			7	7	7									/	
[ok] {*,jt}			–	–	/									/	
[ok] {*,po}			/	/	/									–	
[ok] {*,tc}			11	11	11									/	
[ok] {*,td}			13	13	13									/	
[ok] {*,ts}			12	12	12									/	
[ae]			1	1	/									1	
[bo]			4^	–^	4^									–^	
[da,dn,rf]			1	1	1									/	
[db,pb,rb]			1^	1^	1^									1^	
[en,ep]			4	–	4									4	
[et]			/	–	/									/	
[oi,pc]			–	–	–									–	
[sc]			–	–	/									–	
Rcv_Exp_Data	[pc]	[sc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	[sc]
[ok,bs,ed,oi,pc]			–	–	–	–	–	–	–	–	–	–	–	–	

Table 29 (Page 4 of 7). States and Transitions for CPI Communications Calls on Half-Duplex Conversations

Inputs	States 1–8 and 14 are used by all conversations								Used only by conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM						
	Reset 1	Initialize 2	Send 3	Receive 4	Send-Pending 5	Confirm 6	Confirm-Send 7	Confirm-Deallocate 8	Defer-Receive 9	Defer-Deallocate 10	Sync-Point 11	Sync-Point Send 12	Sync-Point Deallocate 13	Prepared 18	Initialize-Incoming 14
Receive_Mapped_Data(I)	[pc]	[sc]	[sc]	↓′	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	↓′	[sc]
[ok] {dr,no}				–										–	
[ok] {dr,se}				5										/	
[ok] {nd,se}				3										/	
[ok] {*,cd}				8										/	
[ok] {*,co}				6										/	
[ok] {*,cs}				7										/	
[ok] {*,jt}				–										/	
[ok] {*,po}				/										–	
[ok] {*,tc}				11										/	
[ok] {*,td}				13										/	
[ok] {*,ts}				12										/	
[ae]				1										1	
[bo]				–^										–^	
[da,dn,rf]				1										/	
[db,pb,rb]				1^										1^	
[en,ep]				–										4	
[et]				–										/	
[pc,sc,un]				–										–	
Receive_Mapped_Data(W)	[pc]	[sc]	↓′	↓′	↓′	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	↓′	[sc]
[ok] {dr,no}			4	–	4									–	
[ok] {dr,se}			5	5	–									/	
[ok] {nd,se}			–	3	3									/	
[ok] {*,cd}			8	8	8									/	
[ok] {*,co}			6	6	6									/	
[ok] {*,cs}			7	7	7									/	
[ok] {*,jt}			–	–	/									/	
[ok] {*,po}			/	/	/									–	
[ok] {*,tc}			11	11	11									/	
[ok] {*,td}			13	13	13									/	
[ok] {*,ts}			12	12	12									/	
[ae]			1	1	/									1	
[bo]			4^	–^	4^									–^	
[da,dn,rf]			1	1	1									/	
[db,pb,rb]			1^	1^	1^									1^	
[en,ep]			4	–	4									4	
[et]			/	–	/									/	
[oi,pc]			–	–	–									–	
[sc]			–	–	/									–	
Request_To_Send[9]	[pc]	[sc]	↓′	↓′	↓′	↓′	↓′	↓′	[sc]	[sc]	↓′	↓′	↓′	↓′	[sc]
[oi,ok,pc]			–	–	–	–	–	–			–	–	–	–	
[sc]			/	–	/	/	/	/			/	/	/	/	
Send_Data	[pc]	[sc]	↓′	[sc]	↓′	[sc]	[sc]	[sc]	[sc]	[sc]	↓′	↓′	↓′	[sc]	[sc]
(B) [ok]			–		3						–	–	–		
(C) [ok]			–		3						/	/	/		
(D(A)) [ok]			1^		1^						1^	1^	1^		
(D(C)) [ok]			1		1						/	/	/		
(D(F)) [ok]			1		1						/	/	/		
(D(S)) [ok]			10		10						/	/	/		
(F) [ok]			–		3						–	–	–		
(P(C)) [ok]			4		4						/	/	/		
(P(F)) [ok]			4		4						/	/	/		
(P(S)) [ok]			9		9						/	/	/		
[ae]			1		/						/	/	/		
[bo]			–^		3^						–^	–^	–^		
[da,rf]			1		1						/	/	/		
[db,rb]			1^		1^						1^	1^	1^		
[ep]			4		4						/	/	/		
[oi,pc]			–		–						–	–	–		
[pb]			1^		/						/	/	/		
[sc]			–		/						–	–	–		

Table 29 (Page 5 of 7). States and Transitions for CPI Communications Calls on Half-Duplex Conversations

Inputs	States 1–8 and 14 are used by all conversations								Used only by conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM						
	Reset 1	Initialize 2	Send 3	Receive 4	Send-Pending 5	Confirm 6	Confirm-Send 7	Confirm-Deallocate 8	Defer-Receive 9	Defer-Deallocate 10	Sync-Point 11	Sync-Point Send 12	Sync-Point Deallocate 13	Prepared 18	Initialize-Incoming 14
Send_Error	[pc]	[sc]	↓′	↓′	↓′	↓′	↓′	↓′	[sc]	[sc]	↓′	↓′	↓′	[sc]	[sc]
[ok]			–	3	3	3	3	3			3	3	3		
[ae,da]			1	1	/	/	/	/			/	/	/		
[bo]			–^	–^	3^	/	/	/			–^	–^	–^		
[db]			1^	1^	/	/	/	/			/	/	/		
[dn]			/	1	/	/	/	/			/	/	/		
[dnb]			/	1^	/	/	/	/			/	/	/		
[ep]			4	–	/	/	/	/			/	/	/		
[oi,pc]			–	–	–	–	–	–			–	–	–		
[pb]			1^	1^	/	/	/	/			/	/	/		
[rb]			1^	1^	1^	1^	1^	1^			1^	1^	1^		
[rf]			1	1	1	1	1	1			1	1	1		
[sc]			–	–	/	/	/	/			–	–	–		
Send_Exp_Data	[pc]	[sc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	[sc]
[ok,ed,oi,pc]			–	–	–	–	–	–	–	–	–	–	–	–	
Send_Mapped_Data	[pc]	[sc]	↓′	[sc]	↓′	[sc]	[sc]	[sc]	[sc]	[sc]	↓′	↓′	↓′	[sc]	[sc]
[mp]															
(B) [ok]			–		3						–	–	–		
(C) [ok]			–		3						/	/	/		
(D(A)) [ok]			1^		1^						1^	1^	1^		
(D(C)) [ok]			1		1						/	/	/		
(D(F)) [ok]			1		1						/	/	/		
(D(S)) [ok]			10		10						/	/	/		
(F) [ok]			–		3						–	–	–		
(P(C)) [ok]			4		4						/	/	/		
(P(F)) [ok]			4		4						/	/	/		
(P(S)) [ok]			9		9						/	/	/		
[ae]			1		/						/	/	/		
[bo]			–^		3^						–^	–^	–^		
[da,rf]			1		1						/	/	/		
[db,rb]			1^		1^						1^	1^	1^		
[ep]			4		4						/	/	/		
[oi,pc]			–		–						–	–	–		
[pb]			1^		/						/	/	/		
[sc]			–		/						–	–	–		
Set_AE_Qualifier	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–													
Set_Allocate_Confirm	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–													
Set_AP_Title	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–													
Set_Appl_Context_Name	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–													
Set_Begin_Transaction	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	[sc]
[ok,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	
Set_Confirmation_Urgency	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
[ok,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	–
Set_Conv_Sec_PW	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–													
Set_Conv_Sec_Type	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc,pn]		–													
Set_Conv_Sec_User_ID	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–													
Set_Conv_Type	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–													

Table 29 (Page 6 of 7). States and Transitions for CPI Communications Calls on Half-Duplex Conversations

Inputs	States 1–8 and 14 are used by all conversations								Used only by conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM						
	Reset 1	Initialize 2	Send 3	Receive 4	Send-Pending 5	Confirm 6	Confirm-Send 7	Confirm-Deallocate 8	Defer-Receive 9	Defer-Deallocate 10	Sync-Point 11	Sync-Point Send 12	Sync-Point Deallocate 13	Prepared 18	Initialize-Incoming 14
Set_Deallocate_Type	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	[sc]
[ok,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	
Set_Error_Direction	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
[ok,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	–
Set_Fill	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
[ok,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	–
Set_Initialization_Data	[pc]	↓	[sc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–		–											
Set_Log_Data	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
[ok,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	–
Set_Mapped_Initialization_Data	[ok,pc,mp]↓		[sc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–		–											
Set_Mode_Name	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–													
Set_Partner_ID	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–													
Set_Partner_LU_Name	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–													
Set_Prep_Data_Permitted	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	[sc]
[ok,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	
Set_Prep_To_Rcv_Type	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	[sc]
[ok,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	
Set_Processing_Mode	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
[ok,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	–
Set_Q_Callback_Func(N)	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	↓
[ok,pc]		–													–
Set_Q_Callback_Func(Q)	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	[sc]
[ok,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	
Set_Q_Proc_Mode(N)	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	↓
[ok,pc]		–													–
Set_Q_Proc_Mode(Q)	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	[sc]
[ok,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	
Set_Receive_Type	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
[ok,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	–
Set_Return_Control	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–													
Set_Send_Rcv_Mode	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–													
Set_Send_Type	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	[sc]
[ok,pc]		–	–	–	–	–	–	–	–	–	–	–	–	–	
Set_Sync_Level	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc,pn]		–													

Table 29 (Page 7 of 7). States and Transitions for CPI Communications Calls on Half-Duplex Conversations

Inputs	States 1–8 and 14 are used by all conversations								Used only by conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM						
	Reset 1	Initialize 2	Send 3	Receive 4	Send-Pending 5	Confirm 6	Confirm-Send 7	Confirm-Deallocate 8	Defer-Receive 9	Defer-Deallocate 10	Sync-Point 11	Sync-Point Send 12	Sync-Point Deallocate 13	Prepared 18	Initialize-Incoming 14
Set_TP_Name	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	↓
[ok,pc]		–													–
Set_Transaction_Control	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–													
Test_Req_To_Send_Rcd	[pc]	[sc]	↓′	↓′	↓′	[sc]	[sc]	[sc]	↓′	↓′	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]			–	–	–				–	–					
Wait_For_Completion	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
[ok]	/	%	%	%	%	%	%	%	%	%	%	%	%	%	%
[pc]	/	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Wait_For_Conversation	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
[ok]	/	%	%	%	%	%	%	%	%	%	%	%	%	%	%
[sc,se]	/	–	–	–	–	–	–	–	–	–	–	–	–	–	–

6 The state table entries for Deferred_Deallocate and Include_Partner_In_Transaction calls are for conversations using an OSI TP CRM only. These calls get the CM_PROGRAM_PARAMETER_CHECK if issued on a conversation using an LU 6.2 CRM, regardless of the state.

7 CPI Communications suspends action on the Deferred_Deallocate call until the transaction is committed or backed out.

8 While the Initialize_Conversation call can be issued only once for any given conversation, a program can issue multiple Initialize_Conversation calls to establish concurrent conversations with different partners. For more information, see “Multiple Conversations” on page 27.

9 The Request_To_Send call is not allowed in **Send, Send-Pending, Confirm-Send, Confirm-Deallocate, Sync-Point, Sync-Point-Send** or **Sync-Point-Deallocate**, or **Prepared** state when the conversation is using an OSI TP CRM. The call gets the CM_PROGRAM_STATE_CHECK return code.

Effects of Calls to the SAA Resource Recovery Interface on Half-Duplex Conversations

Table 30 shows the state transitions resulting from calls to the SAA resource recovery interface on half-duplex conversations. This table applies only to conversations with *sync_level* set to CM_SYNC_POINT.

The following abbreviations are used for return codes in Table 30:

Abbreviation	Meaning
bo	RR_BACKED_OUT
bom	RR_BACKED_OUT_OUTCOME_MIXED
bop	RR_BACKED_OUT_OUTCOME_PENDING
com	RR_COMMITTED_OUTCOME_MIXED
cop	RR_COMMITTED_OUTCOME_PENDING
ok	RR_OK
sc	RR_PROGRAM_STATE_CHECK

Table 30. States and Transitions for Protected Half-Duplex Conversations (CPIRR)

Inputs	Reset 1	Initialize 2	Send 3	Receive 4	Send-Pending 5	Confirm 6	Confirm-Send 7	Confirm-Deallocate 8	Defer-Receive 9	Defer-Deallocate 10	Sync-Point 11	Sync-Point Send 12	Sync-Point Deallocate 13	Prepared 18	Initialize_Incoming 14
Commit call	[sc][10]	↓[11]	↓	[sc]	↓	[sc]	[sc]	↓[11]	↓	↓	↓	↓	↓	↓	↓[11]
[ok,com,cop]		–	–[12]		3			–	4	1	4	3	1	3[13]	–
[bo,bom,bop]		–	#		#			–	#	#	#	#	#	#	–
[sc]		–	–		–			–	–	–	–	–	–	–	–
Backout call	↓[14]	↓[11]	↓	↓	↓	↓	↓	↓[11]	↓	↓	↓	↓	↓	↓	↓[11]
[ok,bop,bom]	–	–	#	#	#	#	#	–	#	#	#	#	#	#	–

[10] When a program started by an incoming conversation startup request issues a Commit call before issuing an Accept_Conversation call, a state check results. The Commit call has no effect on other conversations in **Reset** state.

[11] Conversations in **Initialize**, **Initialize-Incoming**, or **Confirm-Deallocate** state are not affected by Commit and Backout calls.

[12] The conversation goes to **Reset** state if the local program had issued a Deferred_Deallocate call prior to issuing the Commit call.

[13] The conversation goes to **Reset** or **Receive** state if the local program had issued a Deferred_Deallocate call or a Prepare_To_Receive call with *prepare_to_receive_type* set to CM_PREP_TO_RECEIVE_SYNC_LEVEL, respectively, prior to entering **Prepared** state.

[14] When a program started by an incoming conversation startup request issues a Backout call before issuing an Accept_Conversation call, the underlying conversation is actually backed out, though the CPI Communications conversation remains in **Reset** state.

Effects of Calls on Half-Duplex Conversations to the X/Open TX Interface

Table 31 shows the state transitions resulting from calls to the X/Open TX interface on half-duplex conversations. This table applies only to conversations with *sync_level* set to CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM.

The following abbreviations are used for return codes in Table 31:

Abbreviation	Meaning
bo	TX_ROLLBACK or TX_ROLLBACK_NO_BEGIN
bom	TX_ROLLBACK_MIXED or TX_ROLLBACK_MIXED_NO_BEGIN
bop	TX_ROLLBACK_HAZARD or TX_ROLLBACK_HAZARD_NO_BEGIN
com	TX_MIXED or TX_MIXED_NO_BEGIN
cop	TX_HAZARD or TX_HAZARD_NO_BEGIN
fa	TX_FAIL
ok	TX_OK or TX_NO_BEGIN
sc	TX_PROTOCOL_ERROR

Table 31. States and Transitions for Protected Half-Duplex Conversations (X/Open TX)

Inputs	Reset 1	Initialize 2	Send 3	Receive 4	Send-Pending 5	Confirm 6	Confirm-Send 7	Confirm-Deallocate 8	Defer-Receive 9	Defer-Deallocate 10	Sync-Point 11	Sync-Point Send 12	Sync-Point Deallocate 13	Prepared 18	Initialize_Incoming 14
tx_commit	[sc][15]	↓[16]	↓	[sc]	↓	[sc]	[sc]	↓[16]	↓	↓	↓	↓	↓	↓	↓[16]
[ok,com,cop]		–	–[17]		3			–	4	1	4	3	1	3[18]	–
[bo,bom,bop]		–	#		#			–	#	#	#	#	#	#	–
[sc]		–	–		–			–	–	–	–	–	–	–	–
[fa]		–	?		?			–	?	?	?	?	?	?	–
tx_rollback	↓[19]	↓[16]	↓	↓	↓	↓	↓	↓[16]	↓	↓	↓	↓	↓	↓	↓[16]
[ok,bop,bom]	–	–	#	#	#	#	#	–	#	#	#	#	#	#	–
[fa]		–	?	?	?	?	?	–	?	?	?	?	?	?	–
tx_begin	–	–	–	–	–	–	–	–	–	–	/	/	/	/	–
tx_close	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
tx_info	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
tx_open	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
tx_set_commit_return	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
tx_set_trans_control	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
tx_set_trans_timeout	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

15 When a program started by an incoming conversation startup request issues a tx_commit call before issuing an Accept_Conversation call, a state check results. The tx_commit call has no effect on other conversations in **Reset** state.

16 Conversations in **Initialize**, **Initialize-Incoming**, or **Confirm-Deallocate** state are not affected by tx_commit and tx_rollback calls.

17 The conversation goes to **Reset** state if the local program had issued a Deferred_Deallocate call prior to issuing the tx_commit call.

18 The conversation goes to **Reset** or **Receive** state if the local program had issued a Deferred_Deallocate call or a Prepare_To_Receive call with *prepare_to_receive_type* set to CM_PREP_TO_RECEIVE_SYNC_LEVEL, respectively, prior to entering **Prepared** state.

19 When a program started by an incoming conversation startup request issues a tx_rollback call before issuing an Accept_Conversation call, the underlying conversation is actually backed out, though the CPI Communications conversation remains in **Reset** state.

Explanation of Full-Duplex State Table Abbreviations

Abbreviations are used in the state table to indicate the different permutations of calls and characteristics. There are four categories of abbreviations:

- **Conversation characteristic** abbreviations are enclosed by parentheses— (. . .)
- **Conversation queue** abbreviations are enclosed by parentheses— (. . .)
- **return_code** abbreviations are enclosed by brackets — [. . .]
- **data_received and status_received** abbreviations are enclosed by braces and separated by a comma— { . . . , . . . }. The abbreviation before the comma represents the *data_received* value, and the abbreviation after the comma represents the value of *status_received*.

The next sections show the abbreviations used in each category.

Conversation Characteristics ( )

The following abbreviations are used for conversation characteristics:

Abbreviation	Meaning
A	*deallocate_type* is set to CM_DEALLOCATE_ABEND
B	*send_type* is set to CM_BUFFER_DATA
C	*deallocate_type* is set to CM_DEALLOCATE_CONFIRM
D(x)	*send_type* is set to CM_SEND_AND_DEALLOCATE. *x* represents the *deallocate_type* and can be A, C, F, or S. Refer to the appropriate entries in this table for a description of these values.
F	For a Deallocate call, F means one of the following: • *deallocate_type* is set to CM_DEALLOCATE_FLUSH • *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL and either *sync_level* is set to CM_NONE or the conversation is in **Initialize_Incoming** state • *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL and *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM, but the conversation is not currently included in a transaction For a Send_Data call, F means the following: • *send_type* is set to CM_SEND_AND_FLUSH
I	*receive_type* is set to CM_RECEIVE_IMMEDIATE
S	For a Deallocate call, S means the following: • *deallocate_type* is set to CM_DEALLOCATE_SYNC_LEVEL, *sync_level* is set to CM_SYNC_POINT_NO_CONFIRM and the conversation is currently included in a transaction
W	*receive_type* is set to CM_RECEIVE_AND_WAIT.

Conversation Queues ()

The following abbreviations are used for conversation queues:

Abbreviation	Meaning
N	*conversation_queue* is set to CM_INITIALIZATION_QUEUE
Q	*conversation_queue* is set to one of the following: • CM_SEND_QUEUE • CM_RECEIVE_QUEUE • CM_EXPEDITED_SEND_QUEUE • CM_EXPEDITED_RECEIVE_QUEUE

Return Code Values [ ]

The following table shows abbreviations that are used for return codes. The state table for CPI Communications calls on full-duplex conversations follows.

Abbreviation	Meaning
ae	For an Allocate call, ae means one of the following: • CM_ALLOCATE_FAILURE_NO_RETRY • CM_ALLOCATE_FAILURE_RETRY • CM_CONVERSATION_TYPE_MISMATCH • CM_PIP_NOT_SPECIFIED_CORRECTLY • CM_RESOURCE_FAILURE_NO_RETRY • CM_RESOURCE_FAILURE_RETRY • CM_RETRY_LIMIT_EXCEEDED • CM_SECURITY_MUTUAL_FAILED • CM_SECURITY_NOT_SUPPORTED • CM_SECURITY_NOT_VALID • CM_SEND_RCV_MODE_NOT_SUPPORTED • CM_SYNC_LVL_NOT_SUPPORTED_PGM • CM_SYNC_LVL_NOT_SUPPORTED_SYS • CM_TP_NOT_AVAILABLE_NO_RETRY • CM_TP_NOT_AVAILABLE_RETRY • CM_TPN_NOT_RECOGNIZED For any other call, ae means one of the following: • CM_ALLOCATION_ERROR • CM_CONVERSATION_TYPE_MISMATCH • CM_PIP_NOT_SPECIFIED_CORRECTLY • CM_SECURITY_NOT_VALID • CM_SEND_RCV_MODE_NOT_SUPPORTED • CM_SYNC_LVL_NOT_SUPPORTED_PGM • CM_SYNC_LVL_NOT_SUPPORTED_SYS • CM_TP_NOT_AVAILABLE_NO_RETRY • CM_TP_NOT_AVAILABLE_RETRY • CM_TPN_NOT_RECOGNIZED
bo	CM_TAKE_BACKOUT. This return code is returned only for conversations with *sync_level* set to CM_SYNC_POINT_NO_CONFIRM.
bs	CM_BUFFER_TOO_SMALL
da	da means one of the following: • CM_DEALLOCATED_ABEND • CM_DEALLOCATED_ABEND_SVC • CM_DEALLOCATED_ABEND_TIMER
db	db is returned only for conversations with *sync_level* set to CM_SYNC_POINT_NO_CONFIRM and means one of the following: • CM_DEALLOCATED_ABEND_BO • CM_DEALLOCATED_ABEND_SVC_BO • CM_DEALLOCATED_ABEND_TIMER_BO
dn	CM_DEALLOCATED_NORMAL
dr	CM_DEALLOCATE_CONFIRM_REJECT
ds	CM_CONV_DEALLOCATED_AFTER_SYNCPT. This return code is returned only for conversations with *sync_level* set to CM_SYNC_POINT_NO_CONFIRM.

Abbreviation	Meaning
ed	This return code is reported for expedited-data calls only. ed means one of the following: • CM_EXP_DATA_NOT_SUPPORTED • CM_CONVERSATION_ENDING
en	en means one of the following: • CM_PROGRAM_ERROR_NO_TRUNC • CM_SVC_ERROR_NO_TRUNC
mp	mp means one of the following: • CM_UNKNOWN_MAP_NAME_REQUESTED • CM_UNKNOWN_MAP_NAME_RECEIVED • CM_MAP_ROUTINE_ERROR
ep	ep means one of the following: • CM_PROGRAM_ERROR_PURGING • CM_SVC_ERROR_PURGING
et	et means one of the following: • CM_PROGRAM_ERROR_TRUNC • CM_SVC_ERROR_TRUNC
ns	CM_NO_SECONDARY_INFORMATION
oi	CM_OPERATION_INCOMPLETE
ok	CM_OK
pb	CM_INCLUDE_PARTNER_REJECT_BO
pc	CM_PROGRAM_PARAMETER_CHECK. This return code means an error was found in one or more parameters. For calls illegally issued in **Reset** state, pc is returned because the *conversation_ID* is undefined in that state.
pe	CM_PARAMETER_ERROR
pn	CM_PARM_VALUE_NOT_SUPPORTED
rb	rb means one of the following: • CM_RESOURCE_FAIL_NO_RETRY_BO • CM_RESOURCE_FAILURE_RETRY_BO
rf	rf means one of the following: • CM_RESOURCE_FAILURE_NO_RETRY • CM_RESOURCE_FAILURE_RETRY
sc	CM_PROGRAM_STATE_CHECK
un	CM_UNSUCCESSFUL

Notes:

1. The return code CM_PRODUCT_SPECIFIC_ERROR is not included in the state table because the state transitions caused by this return code are product-specific.
2. The CM_OPERATION_NOT_ACCEPTED return code is not included in the state table. A program receives CM_OPERATION_NOT_ACCEPTED when it issues a call associated with a queue that has a a previous operation still in progress, regardless of the state. No conversation state transition occurs.

3. The CM_CALL_NOT_SUPPORTED return code is not included in the state table. It is returned when the local system provides an entry point for the call but does not support the function requested by the call, regardless of the state. No state transition occurs.

data_received and status_received { , }

The following abbreviations are used for the *data_received* values:

Abbreviation	Meaning
dr	Means one of the following: • CM_DATA_RECEIVED • CM_COMPLETE_DATA_RECEIVED • CM_INCOMPLETE_DATA_RECEIVED
*	Means one of the following: • CM_DATA_RECEIVED • CM_COMPLETE_DATA_RECEIVED • CM_NO_DATA_RECEIVED

The following abbreviations are used for the *status_received* values:

Abbreviation	Meaning
cd	CM_CONFIRM_DEALLOCATE_RECEIVED
jt	CM_JOIN_TRANSACTION
no	CM_NO_STATUS_RECEIVED
po	CM_PREPARE_OK
tc	CM_TAKE_COMMIT or CM_TAKE_COMMIT_DATA_OK. These values are returned only for conversations with *sync_level* set to CM_SYNC_POINT_NO_CONFIRM.
td	CM_TAKE_COMMIT_DEALLOCATE or CM_TAKE_COMMIT_DEALLOC_DATA_OK. These values are returned only for conversations with *sync_level* set to CM_SYNC_POINT_NO_CONFIRM.

Table Symbols for the Full-Duplex State Table

The following symbols are used in the state table to indicate the condition that results when a call is issued from a certain state:

Symbol	Meaning
/	Cannot occur. CPI Communications either will not allow this input or will never return the indicated return codes for this input in this state.
–	Remain in current state
1-18	Number of next state
↓	It is valid to make this call from this state. See the table entries immediately below this symbol to determine the state transition resulting from the call.
%	Wait_for_Completion (CMWCMP) can only be issued when one or more of the calls issued by the program has received a *return code* of CM_OPERATION_INCOMPLETE. When Wait_for_Completion completes with a return code of CM_OK, it returns a list of outstanding-operation-IDs that identify the operations that have completed. Each of the conversations on which a call has completed then makes a transition to the appropriate state as indicated for the operations that are now complete.
↓′	For a conversation with *sync_level* set to CM_NONE or not currently included in a transaction, this is equivalent to ↓. If the conversation has *sync_level* set to CM_SYNC_POINT_NO_CONFIRM and the conversation is currently included in a transaction, however, ↓′ means it is valid to make this call from this state *unless the conversation's context is in the* **Backout-Required** *condition*. In that case, the call is invalid and CM_PROGRAM_STATE_CHECK is returned. For valid calls, see the table entries immediately below this symbol to determine the state transition resulting from the call.
^	For a conversation with *sync_level* set to CM_NONE or not currently included in a transaction, this symbol should be ignored. For a conversation using *sync_level* set to CM_SYNC_POINT_NO_CONFIRM and currently included in a transaction, when this symbol follows a state number or a – (for example, 1^ or –^), it means the conversation's context may be in the **Backout-Required** condition following the call.
#	Conversations with *sync_level* set to CM_SYNC_POINT_NO_CONFIRM go to the state they were in at the completion of the most recent synchronization point. If there was no prior synchronization event, both sides of the conversation go to **Send-Receive** state.

Full-Duplex State Tables

Note: The following calls can only be issued on half-duplex conversations. When issued on full-duplex conversations, CM_PROGRAM_PARAMETER_CHECK is returned for all conversation states except Reset. These calls are, therefore, not shown in the state tables.

- Confirm
- Prepare_To_Receive
- Request_To_Send
- Set_Confirmation_Urgency
- Set_Error_Direction
- Set_Prepare_To_Receive_Type
- Set_Processing_Mode
- Test_Request_To_Send_Received

Table 32 (Page 1 of 5). States and Transitions for CPI Communications Calls on Full-Duplex Conversations

Inputs	Used by CPI–C FDX conversations										
	Reset	**Ini-tialize**	**Confirm-Dealloc**[20]	**Defer-Dealloc**	**Sync-Point**	**Sync-Pt-Dealloc**	**Ini-tialize-Incoming**	**Send-Only**	**Receive-Only**	**Send-Receive**	**Prepared**
	1	**2**	**8**	**10**	**11**	**13**	**14**	**15**	**16**	**17**	**18**
Accept_Conversation	↓	/	/	/	/	/	/	/	/	/	/
[ok] [da,sc]	17 –										
Accept_Incoming	[pc]	[sc]	[sc]	[sc]	[sc]	[sc]	↓	[sc]	[sc]	[sc]	[sc]
[ok] [da] [oi,pc,sc]							17 1 –				
Allocate	[pc]	↓′	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok] [ae] [oi,pc,pe,sc,un]		17 1 –									
Cancel_Conversation	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
[ok] [pc]		1^ –	1^ –	1^ –	1^ –	1^ –	1^ –	1^ –	1^ –	1^ –	1^ –
Confirmed[21]	[pc]	[sc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok] [oi,pc]			1 –								
Deallocate(A)	[pc]	↓	↓	↓	↓	↓	/	↓	↓	↓	↓
[ok] [oi,pc]		1^ –	1^ –	1^ –	1^ –	1^ –		1^ –	1^ –	1^ –	1^ –
Deallocate(C)[21]	[pc]	[sc]	[sc]	[sc]	[sc]	[sc]	/	[sc]	[sc]	↓	[sc]
[ok,ae,da,dn,rf] [dr,oi,pc,sc]										16 –	
Deallocate(F)	[pc]	[sc]	[sc]	[sc]	[sc]	[sc]	↓	↓	[sc]	↓	[sc]
[ok] [ae] [da,dn,rf] [oi,pc] [sc]							1 / / – /	1 / 1 – /		16 16 16 – –	
Deallocate(S)	[pc]	[sc]	[sc]	[sc]	[sc]	[sc]	/	/	/	↓′	[sc]
[ok] [ae,oi,pc,sc] [bo] [db,pb,rb] [ds]										10 – –^ 1^ 1	
Deferred_Deallocate[22]	[pc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	↓′	[sc]
[ok] [ae] [bo] [db,pb,rb] [oi,pc]										_23 – –^ 1^ –	
Extract_AE_Qualifier	[pc]	↓	↓	↓	↓	↓	[sc]	↓	↓	↓	↓
[ok,pc]		–	–	–	–	–		–	–	–	–
Extract_AP_Title	[pc]	↓	↓	↓	↓	↓	[sc]	↓	↓	↓	↓
[ok,pc]		–	–	–	–	–		–	–	–	–
Extract_Appl_Ctx_Name	[pc]	↓	↓	↓	↓	↓	[sc]	↓	↓	↓	↓
[ok,pc]		–	–	–	–	–		–	–	–	–
Extract_Conv_Context	[pc]	[sc]	↓	↓	↓	↓	[sc]	↓	↓	↓	↓
[ok,pc]			–	–	–	–		–	–	–	–
Extract_Conv_State	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
[ok,pc] [bo]		– /	– /	– –	– –	– –	– /	– /	– /	– –	– –
Extract_Conv_Type	[pc]	↓	↓	↓	↓	↓	[sc]	↓	↓	↓	↓
[ok,pc]		–	–	–	–	–		–	–	–	–

Full-Duplex State Tables

Table 32 (Page 2 of 5). States and Transitions for CPI Communications Calls on Full-Duplex Conversations

Inputs	Used by CPI–C FDX conversations										
	Reset	Ini-tialize	Confirm-Dealloc[20]	Defer-Dealloc	Sync-Point	Sync-Pt-Dealloc	Ini-tialize-Incoming	Send-Only	Receive-Only	Send-Receive	Prepared
	1	2	8	10	11	13	14	15	16	17	18
Extract_Init_Data	[pc]	[sc]	↓	↓	↓	↓	[sc]	↓	↓	↓	↓
[ok,pc]			–	–	–	–		–	–	–	–
Extract_Mapped_Initialization_Data	[pc]	[sc]	↓	↓	↓	↓	[sc]	↓	↓	↓	↓
[ok,pc,mp,bs]			–	–	–	–		–	–	–	–
Extract_Mode_Name	[pc]	↓	↓	↓	↓	↓	[sc]	↓	↓	↓	↓
[ok,pc,]		–	–	–	–	–		–	–	–	–
Extract_Part_LU_Name	[pc]	↓	↓	↓	↓	↓	[sc]	↓	↓	↓	↓
[ok,bs,pc,]		–	–	–	–	–		–	–	–	–
Extract_Partner_ID	↓	↓	↓	↓	↓	↓	[sc]	↓	↓	↓	↓
[ok,pc]	–	–	–	–	–	–		–	–	–	–
Extract_Sec_User_ID	[sc]	↓	↓	↓	↓	↓	[sc]	↓	↓	↓	↓
[ok,pc]		–	–	–	–	–		–	–	–	–
Extract_Secondary_Info	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
[ok,ns,pc]	–	–	–	–	–	–	–	–	–	–	–
Extract_Send_Receive_Mode	[pc]	↓	↓	↓	↓	↓	[sc]	↓	↓	↓	↓
[ok,pc]		–	–	–	–	–		–	–	–	–
Extract_Sync_Level	[pc]	↓	↓	↓	↓	↓	[sc]	↓	↓	↓	↓
[ok,pc]		–	–	–	–	–		–	–	–	–
Extract_Transaction_Control	[pc]	↓	↓	↓	↓	↓	[sc]	↓	↓	↓	↓
[ok,pc]		–	–	–	–	–		–	–	–	–
Extract_TP_Name	[pc]	↓	↓	↓	↓	↓	[sc]	↓	↓	↓	↓
[ok,pc]		–	–	–	–	–		–	–	–	–
Flush	[pc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	↓	[sc]	↓′	[sc]
[ok] [ae] [bo] [da,dn,rf] [db,rb] [ds] [oi,pc] [pb] [sc]								– / / 1 / / – / /		– 16 –^ 16 1^ 1 – 1^ –	
Include_Ptr_In_Trans[22]	[pc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	↓′	[sc]
[ok] [ae] [da,dn,rf] [oi,pc]										– – 16 –	
Initialize_Conversation[24]	↓	/	/	/	/	/	/	/	/	/	/
[ok] [pc]	2 –										
Initialize_for_Incoming	↓	/	/	/	/	/	/	/	/	/	/
[ok] [pc]	17 –										
Prepare	[pc]	[sc]	[sc]	↓′	[sc]	[sc]	[sc]	[sc]	[sc]	↓′	[sc]
[ok] [ae] [bo] [db,pb,rb] [ds] [oi,pc]				18 – –^ 1^ 1 –						18 – –^ 1^ 1 –	

Table 32 (Page 3 of 5). States and Transitions for CPI Communications Calls on Full-Duplex Conversations

Inputs	Used by CPI–C FDX conversations										
	Reset	Initialize	Confirm-Dealloc[20]	Defer-Dealloc	Sync-Point	Sync-Pt-Dealloc	Initialize-Incoming	Send-Only	Receive-Only	Send-Receive	Prepared
	1	2	8	10	11	13	14	15	16	17	18
Receive(I)	[pc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	↓	↓′	↓′
[ok] {dr,no}									–	–	–
[ok] {*,cd}									/	8	/
[ok] {*,jt}									/	–	/
[ok] {*,po}									/	/	–
[ok] {*,tc}									/	11	/
[ok] {*,td}									/	13	/
[ae]									1	1	1
[bo]									/	–^	–^
[da,rf]									1	1	/
[db,pb,rb]									/	1^	1^
[dn]									1	15	/
[ds]									/	1	/
[en,et]									–	–	17
[ep]									–	–	/
[pc,un]									–	–	–
[sc]									/	–	–
Receive_Mapped_Data(I)	[pc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	↓	↓′	↓′
[ok,mp] {dr,no}									–	–	–
[ok] {*,cd}									/	8	/
[ok] {*,jt}									/	–	/
[ok] {*,po}									/	/	–
[ok] {*,tc}									/	11	/
[ok] {*,td}									/	13	/
[ae]									1	1	1
[bo]									/	–^	–^
[da,rf]									1	1	/
[db,pb,rb]									/	1^	1^
[dn]									1	15	/
[ds]									/	1	/
[en,et]									–	–	17
[ep]									–	–	/
[pc,un]									–	–	–
[sc]									/	–	–
Receive(W)	[pc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	↓	↓′	↓′
[ok] {dr,no}									–	–	–
[ok] {*,cd}									/	8	/
[ok] {*,jt}									/	–	/
[ok] {*,po}									/	/	–
[ok] {*,tc}									/	11	/
[ok] {*,td}									/	13	/
[ae]									1	1	1
[bo]									/	–^	–^
[da,rf]									1	1	/
[db,pb,rb]									/	1^	1^
[dn]									1	15	/
[ds]									/	1	/
[en,et]									–	–	17
[ep]									–	–	/
[oi,pc]									–	–	–
[sc]									/	–	–
Receive_Mapped_Data(W)	[pc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	↓	↓′	↓′
[ok] {dr,no}									–	–	–
[ok] {*,cd}									/	8	/
[ok] {*,jt}									/	–	/
[ok] {*,po}									/	/	–
[ok] {*,tc}									/	11	/
[ok] {*,td}									/	13	/
[ae,mp]									1	1	1
[bo]									/	–^	–^
[da,rf]									1	1	/
[db,pb,rb]									/	1^	1^
[dn]									1	15	/
[ds]									/	1	/
[en,et]									–	–	17
[ep]									–	–	/
[oi,pc]									–	–	–
[sc]									/	–	–
Receive_Exp_Data	[pc]	[sc]	↓	↓	↓	↓	[sc]	↓	↓	↓	↓
[ok,ed,oi,pc,un]			–	–	–	–		–	–	–	–

Full-Duplex State Tables

Table 32 (Page 4 of 5). States and Transitions for CPI Communications Calls on Full-Duplex Conversations

Inputs	Used by CPI–C FDX conversations										
	Reset	**Ini-tialize**	**Confirm-Dealloc**[20]	**Defer-Dealloc**	**Sync-Point**	**Sync-Pt-Dealloc**	**Ini-tialize-Incoming**	**Send-Only**	**Receive-Only**	**Send-Receive**	**Prepared**
	1	**2**	**8**	**10**	**11**	**13**	**14**	**15**	**16**	**17**	**18**
Send_Data	[pc]	[sc]	[sc]	[sc]	↓′	↓′	[sc]	↓	[sc]	↓′	[sc]
(B) [ok]					–	–		–		–	
(D(A)) [ok]					1^	1^		1		1^	
(D(C)) [ok]					/	/		/		16	
(D(F)) [ok]					/	/		1		16	
(D(S)) [ok]					/	/		/		10	
(F) [ok]					–	–		–		–	
[ae]					/	/		/		16	
[bo]					–^	–^		/		–^	
[da,dn,rf]					/	/		1		16	
[db,rb]					1^	1^		/		1^	
[dr,oi,pc]					–	–		–		–	
[ds]					/	/		/		1	
[pb]					/	/		/		1^	
[sc]					–	–		/		–	
Send_Error	[pc]	[sc]	↓	[sc]	[sc]	[sc]	[sc]	↓	[sc]	↓′	[sc]
[ok]			17					–		–	
[ae]			/					/		16	
[bo]			/					/		–^	
[da,dn,rf]			1					1		16	
[db,rb]			/					/		1^	
[ds]			/					/		1	
[oi,pc]			–					–		–	
[pb]			/					/		1^	
[sc]			/					/		–	
Send_Expedited_Data	[pc]	[sc]	↓	↓	↓	↓	[sc]	↓	↓	↓	↓
[ok,ed,oi,pc]			–	–	–	–		–	–	–	–
Set_AE_Qualifier	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–									
Set_Allocate_Confirm	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–									
Set_AP_Title	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–									
Set_Appl_Context_Name	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–									
Set_Begin_Transaction	[pc]	↓	↓	↓	↓	↓	[sc]	↓	↓	↓	↓
[ok,pc]		–	–	–	–	–		–	–	–	–
Set_Conv_Sec_PW	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–									
Set_Conv_Sec_Type	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc,pn]		–									
Set_Conv_Sec_User_ID	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–									
Set_Conversation_Type	[pc]	↓	[sc]	[sc]	[sc]	[sc]	↓	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–					–				
Set_Deallocate_Type	[pc]	↓	↓	↓	↓	↓	[sc]	↓	↓	↓	↓
[ok,pc]		–	–	–	–	–		–	–	–	–
Set_Fill	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
[ok,pc]		–	–	–	–	–	–	–	–	–	–
Set_Initialization_Data	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	↓	[sc]
[ok,pc]		–								–	
Set_Log_Data	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
[ok,pc]		–	–	–	–	–	–	–	–	–	–

Table 32 (Page 5 of 5). States and Transitions for CPI Communications Calls on Full-Duplex Conversations

Inputs	Used by CPI–C FDX conversations										
	Reset	Ini-tialize	Confirm-Dealloc[20]	Defer-Dealloc	Sync-Point	Sync-Pt-Dealloc	Ini-tialize-Incoming	Send-Only	Receive-Only	Send-Receive	Prepared
	1	2	8	10	11	13	14	15	16	17	18
Set_Mapped_Initialization_Data	[ok,pc,mp]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	↓	[sc]
[ok,pc]		–								–	
Set_Mode_Name	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–									
Set_Partner_LU_Name	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–									
Set_Partner_ID	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–									
Set_Prep_Data_Permitted	[pc]	↓	↓	↓	↓	↓	[sc]	↓	↓	↓	↓
[ok,pc]		–	–	–	–	–	–	–	–	–	–
Set_Q_Callback_Func(N)	[pc]	↓	[sc]	[sc]	[sc]	[sc]	↓	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–					–				
Set_Q_Callback_Func(Q)	[pc]	↓	↓	↓	↓	↓	[sc]	↓	↓	↓	↓
[ok,pc]		–	–	–	–	–		–	–	–	–
Set_Q_Proc_Mode(N)	[pc]	↓	[sc]	[sc]	[sc]	[sc]	↓	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–					–				
Set_Q_Proc_Mode(Q)	[pc]	↓	↓	↓	↓	↓	[sc]	↓	↓	↓	↓
[ok,pc]		–	–	–	–	–		–	–	–	–
Set_Receive_Type	[pc]	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
[ok,pc]		–	–	–	–	–	–	–	–	–	–
Set_Return_Control	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–									
Set_Send_Receive_Mode	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–									
Set_Send_Type	[pc]	↓	↓	↓	↓	↓	[sc]	↓	↓	↓	↓
[ok,pc]		–	–	–	–	–		–	–	–	–
Set_Sync_Level	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc,pn]		–									
Set_TP_Name	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	↓
[ok,pc]		–								–	
Set_Transaction_Control	[pc]	↓	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]	[sc]
[ok,pc]		–									
Wait_For_Completion	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓	↓
[ok]	/	%	%	%	%	%	%	%	%	%	%
[pc]	/	–	–	–	–	–	–	–	–	–	–

[20] This state is entered only if the conversation is allocated using an OSI TP CRM.

[21] This call can be issued only if the conversation is allocated using an OSI TP CRM.

[22] The state table entries for Deferred_Deallocate and Include_Partner_In_Transaction calls are for conversations using an OSI TP CRM only. These calls get the CM_PROGRAM_PARAMETER_CHECK if issued on a conversation using an LU 6.2 CRM, regardless of the state.

[23] CPI Communications suspends action on the Deferred_Deallocate call until the transaction is committed or backed out.

Full-Duplex State Tables

[24] While the Initialize_Conversation call can be issued only once for any given conversation, a program can issue multiple Initialize_Conversation calls to establish concurrent conversations with different partners. For more information, see “Multiple Conversations” on page 27.

Effects of Calls to the SAA Resource Recovery Interface on Full-Duplex Conversations

Table 33 shows the state transitions resulting from calls to the SAA resource recovery interface on full-duplex conversations. This table applies only to conversations with *sync_level* set to CM_SYNC_POINT_NO_CONFIRM.

Commit and Backout are resource recovery calls. Their return codes are as follows.

Abbreviation	Meaning
bo	RR_BACKED_OUT
bom	RR_BACKED_OUT_OUTCOME_MIXED
bop	RR_BACKED_OUT_OUTCOME_PENDING
com	RR_COMMITTED_OUTCOME_MIXED
cop	RR_COMMITTED_OUTCOME_PENDING
ok	RR_OK
sc	RR_STATE_CHECK

Table 33. States and Transitions for Protected Full-Duplex Conversations (CPIRR)

	Used by CPI–C FDX conversations										
Inputs	Reset 1	Ini-tialize 2	Confirm-Dealloc 8	Defer-Dealloc 10	Sync-Point 11	Sync-Pt-Dealloc 13	Ini-tialize-Incoming 14	Send-Only 15	Receive-Only 16	Send-Receive 17	Prepared 18
Commit call[25]	[sc]	↓[26]	↓[26]	↓	↓	↓	↓[26]	[sc]	[sc]	↓	↓
[ok,com,cop]	–	–		1	17	1	–			–[27]	17[28]
[bo,bom,bop]		–	–	17	17	17	–			–	17
[fa,sc]		–	–	–	–	–	–			–	–
Backout call[29]	↓	↓[26]	↓[26]	↓	↓	↓	↓[26]	[sc]	[sc]	↓	↓
[bo,bom,bop]	–	–		17	17	17	–			–	17

[25] When a program started by an incoming conversation startup request issues a Commit call before issuing an Accept_Conversation call, a state check results. The Commit call has no effect on other conversations in **Reset** state.

[26] Conversations in **Initialize**, **Initialize-Incoming**, or **Confirm-Deallocate** state are not affected by Commit and Backout calls.

[27] The conversation goes to **Reset** state if the local program had issued a Deferred_Deallocate call prior to issuing the Commit call.

[28] The conversation goes to **Reset** state if the local program had issued a Deferred_Deallocate call prior to entering **Prepared** state.

[29] When a program started by an incoming conversation startup request issues a Backout call before issuing an Accept_Conversation call, the underlying conversation is actually backed out, though the CPI Communications conversation remains in **Reset** state.

Effects of Calls on Full-Duplex Conversations to the X/Open TX Interface

Table 34 shows the state transitions resulting from calls to the X/Open TX interface on full-duplex conversations. This table applies only to conversations with *sync_level* set to CM_SYNC_POINT_NO_CONFIRM.

The following abbreviations are used for return codes in Table 34:

Abbreviation	Meaning
bo	TX_ROLLBACK or TX_ROLLBACK_NO_BEGIN
bom	TX_ROLLBACK_MIXED or TX_ROLLBACK_MIXED_NO_BEGIN
bop	TX_ROLLBACK_HAZARD or TX_ROLLBACK_HAZARD_NO_BEGIN
com	TX_MIXED or TX_MIXED_NO_BEGIN
cop	TX_HAZARD or TX_HAZARD_NO_BEGIN
fa	TX_FAIL
ok	TX_OK or TX_NO_BEGIN
sc	TX_PROTOCOL_ERROR

Table 34. States and Transitions for Protected Full-Duplex Conversations (X/Open TX)

	Used by CPI–C FDX conversations										
Inputs	**Reset** 1	**Ini-tialize** 2	**Confirm-Dealloc** 8	**Defer-Dealloc** 10	**Sync-Point** 11	**Sync-Pt-Dealloc** 13	**Ini-tialize-Incoming** 14	**Send-Only** 15	**Receive-Only** 16	**Send-Receive** 17	**Prepared** 18
tx_commit	[sc][30]	↓[31]	↓[31]	↓	↓	↓	↓[31]	[sc]	[sc]	↓	↓
[ok,com,cop]		–	–	1	17	1	–			_[32]	17[33]
[bo,bom,bop]		–	–	17	17	17	–			–	17
[fa]		–	–	–	–	–	–			–	–
[sc]		–	–	–	–	–	–			–	–
tx_rollback	↓[34]	↓[31]	↓[31]	↓	↓	↓	↓[31]	[sc]	[sc]	↓	↓
[bo,bom,bop]	–	–		17	17	17	–			–	17
[fa]		–		–	–	–	–			–	–
tx_begin	–	–	/	–	–	/	–	–	–	–	/
tx_close	–	–	–	–	–	–	–	–	–	–	–
tx_info	–	–	–	–	–	–	–	–	–	–	–
tx_open	–	–	–	–	–	–	–	–	–	–	–
tx_set_commit_return	–	–	–	–	–	–	–	–	–	–	–
tx_set_trans_control	–	–	–	–	–	–	–	–	–	–	–
tx_set_trans_timeout	–	–	–	–	–	–	–	–	–	–	–

[30] When a program started by an incoming conversation startup request issues a tx_commit call before issuing an Accept_Conversation call, a state check results. The tx_commit call has no effect on other conversations in **Reset** state.

[31] Conversations in **Initialize**, **Initialize-Incoming**, or **Confirm-Deallocate** state are not affected by tx_commit and tx_rollback calls.

[32] The conversation goes to **Reset** state if the local program had issued a Deferred_Deallocate call prior to issuing the tx_commit call.

[33] The conversation goes to **Reset** state if the local program had issued a Deferred_Deallocate call prior to entering **Prepared** state.

[34] When a program started by an incoming conversation startup request issues a tx_rollback call before issuing an Accept_Conversation call, the underlying conversation is actually backed out, though the CPI Communications conversation remains in **Reset** state.

Appendix D. Mapping CPI Communications to LU 6.2 and OSI TP CRMs

This appendix is intended to help programmers match CPI Communications functions to equivalent LU 6.2 and OSI TP functions. It is divided into two sections, one for LU 6.2 and one for OSI TP.

Some CPI Communications functions are not part of the LU 6.2 or OSI TP services. Specifically, these functions are provided by calls that map to local function only. The following is a list of such calls:

- Convert_Incoming
- Convert_Outgoing
- Extract_Conversation_Context
- Extract_Initialization_Data
- Extract_Maximum_Buffer_Size
- Extract_Partner_ID
- Extract_Secondary_Information
- Release_Local_TP_Name
- Set_Partner_ID
- Set_Processing_Mode
- Set_Queue_Callback_Function
- Set_Queue_Processing_Mode
- Specify_Local_TP_Name
- Wait_For_Completion
- Wait_For_Conversation

Calls that are not specifically a part of LU 6.2 or OSI TP services are not listed in the CPI Communications mappings to LU 6.2 and OSI TP.

CPI Communications and LU 6.2 CRMs

This section is intended for programmers who are familiar with the LU 6.2 application programming interface. (LU 6.2 is also known as Advanced Program-to-Program Communication or APPC.) It describes the functional relationship between the APPC “verbs” and the CPI Communications calls described in this manual.

The CPI Communications calls have been built on top of the LU 6.2 verbs described in *SNA Transaction Programmer’s Reference Manual for LU Type 6.2*. Table 35 beginning on page 501 shows the relationship between APPC verbs and CPI Communications calls. Use this table to determine how the function of a particular LU 6.2 verb is provided through CPI Communications.

Note: Although much of the LU 6.2 function has been included in CPI Communications, some of the function has not. Likewise, CPI Communications contains features that are not found in LU 6.2. These features are differences in syntax. The semantics of LU 6.2 function have not been changed or extended.

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CPI Communications contains the following features not found in LU 6.2:

- The Initialize_Conversation call and side information, used to initialize conversation characteristics without requiring the application program to explicitly specify these parameters.
- A conversation state of **Send-Pending** (discussed in more detail in "Send-Pending State and the error_direction Characteristic").
- The Accept_Conversation call for use by a remote program to explicitly establish a conversation, the conversation identifier, and the conversation's characteristics.
- The *error_direction* conversation characteristic (discussed in more detail in "Send-Pending State and the error_direction Characteristic").
- A *send_type* conversation characteristic for use in combining functions (this function was available with LU 6.2 verbs, but the verbs had to be issued separately).
- The capability to return both data and conversation status on the same Receive call.

CPI Communications does not support the USER_CONTROL_DATA available with the LU 6.2 interface.

Finally, to increase portability between systems, the character sets used to specify the partner *TP_name*, *partner_LU_name*, and *log_data* have been modified slightly from the character sets allowed by LU 6.2. To answer specific questions of compatibility, check the character sets described in Appendix A, "Variables and Characteristics."

Send-Pending State and the error_direction Characteristic

The **Send-Pending** state and *error_direction* characteristic are used in CPI Communications to eliminate ambiguity about the source of some errors. A program using CPI Communications can receive data and a change-of-direction indication at the same time. This "double function" creates a possibly ambiguous error condition, since it is impossible to determine whether a reported error (from Send_Error) was encountered because of the received data or after the processing of the change of direction.

The ambiguity is eliminated in CPI Communications by use of the **Send-Pending** state and *error_direction* characteristic. CPI Communications places the conversation in **Send-Pending** state whenever the program has received data

and a *status_received* parameter of CM_SEND_RECEIVED (indicating a change of direction). Then, if the program encounters an error, it uses the Set_Error_Direction call to indicate how the error occurred. If the conversation is in **Send-Pending** state and the program issues a Send_Error call, CPI Communications examines the *error_direction* characteristic and notifies the partner program accordingly:

- If *error_direction* is set to CM_RECEIVE_ERROR, the partner program receives a *return_code* of CM_PROGRAM_ERROR_PURGING. This indicates that the error at the remote program occurred in the data, before (in LU 6.2 terms) the change-direction indicator was received.
- If *error_direction* is set to CM_SEND_ERROR, the partner program receives a *return_code* of CM_PROGRAM_ERROR_NO_TRUNC. This indicates that the error at the remote program occurred in the send processing after the change-direction indicator was received.

For an example of how CPI Communications uses the **Send-Pending** state and the *error_direction* characteristic, see “Example 7: Error Direction and Send-Pending State” on page 80.

CPI Communications Programs Communicating with APPC Programs

Programs written using CPI Communications can communicate with APPC programs. Some examples of the limitations on the APPC program are:

- CPI Communications does not allow the specification of User_Control_Data.
- APPC programs with names containing characters no longer allowed may require a name change. See “SNA Service Transaction Programs” for a discussion of naming conventions for service transaction programs.

SNA Service Transaction Programs

If a CPI Communications program wants to specify an SNA service transaction program, the character set shown for *TP_name* in Appendix A, “Variables and Characteristics” is inadequate. The first character of an SNA service transaction program name is a character with a value in the range from X'00' through X'0D' or X'10' through X'3F' (excluding X'0E' and X'0F'). Refer to *SNA Transaction Programmer's Reference Manual for LU Type 6.2* for more details on SNA service transaction programs.

Therefore, whenever an SNA Service Transaction Program name is used as an input parameter on a CPI communications call, the first character must be closed between straight single quote characters (‘ ‘). CPI Communications will parse the TP_name field using the following rules:

1. The name must contain a second straight single quote character.
2. The name must contain a non-zero even number of characters between the straight single quote characters.
3. The name may contain only the characters 0-9, a-f, and A-F between the straight single quote characters (upper and lower case are equivalent).

If the name starts with a straight single quote character and fails to satisfy any of the preceeding rules, the call will fail with a return code of CM_PROGRAM_PARAMETER_CHECK.

When a TP_name field is received from the application,

- Release_Local_TP_Name
- Set_TP_Name
- Specify_Local_TP_Name

any characters within the straight single quote characters are treated as hex representation and not subject to data conversion from the native encoding to EBCDIC, and any characters following the second straight single quote character are to be converted when appropriate.

When a TP_name field is returned to the application,

Extract_TP_Name

any TP_name containing one of the special characters used in SNA service transaction names (X'00' - X'0D' and X'10' - X'3F') in the first character of the name, will be returned in hex represenation between paired straight single quote characters. For example, '21F0F0F6'.

A CPI Communications program that has the appropriate privilege may specify the name of an SNA service transaction program for its partner *TP_name*. **Privilege** is an identification that a product or installation defines in order to differentiate LU service transaction programs from other programs, such as application programs. *TP_name* cannot specify an SNA service transaction program name at the mapped conversation protocol boundary.

Implementation Considerations

If the CRM used by the CPI-C implementation does not support full-duplex conversations, and the implementer desires to provide simulated full-duplex support, then the implementation should follow the *Simulated FDX Interoperability Recommendation* in order to interoperate with existing full-duplex simulations. The *Simulated FDX Interoperability Recommendation* is available on the Internet at URL:

`ftp://networking.raleigh.ibm.com/pub/standards/ciw/spec/fdxsim.psbin`

Relationship between LU 6.2 Verbs and CPI Communications Calls

Table 35 through Table 40 show CPI Communications calls on the left side and LU 6.2 verbs and their parameters across the top. The tables relate a verb or verb parameter to a call (not a call to a verb). A letter at the intersection of a verb or verb parameter column and a call row is interpreted as follows:

D This parameter has been set to a default value by the CPI Communications call. Default values can be found in the individual call descriptions.

X A similar or equal function for the LU 6.2 verb or parameter is available from the CPI Communications call. If more than one X appears on a line for a verb, the function is available by issuing a combination of the calls.

S This parameter can be set using the CPI Communications call.

Note: The mapping for the following calls is applicable for half-duplex conversations only:

- Confirm
- Prepare_To_Receive
- Request_To_Send
- Set_Error_Direction
- Set_Prepare_To_Receive_Type

- Test_Request_To_Send_Received

Table 35. Relationship of LU 6.2 Verbs to CPI Communications Calls (Part 1)

CPI Communications Calls	**MC_ALLOCATE**	- LU_NAME	- MODE_NAME	- TPN	- TYPE	- RETURN_CONTROL	- CONVERSATION_GROUP_ID	- SYNC_LEVEL	- SECURITY	- PIP	**MC_CONFIRM**	- REQ_TO_SEND_RECEIVED	- EXPEDITED_DATA_RECEIVED	**MC_CONFIRMED**	**MC_DEALLOCATE**	- TYPE	- EXPEDITED_DATA_RECEIVED	**MC_FLUSH**	**MC_GET_ATTRIBUTES**	- PARTNER_LU_NAME	- PART_FULL_QUAL_LU_NAME	- MODE_NAME	- SYNC_LEVEL	- CONVERSATION_STATE	- CONV_CORRELATOR	- SESSION_ID	- CONVERSATION_GROUP_ID
Starter Set																											
Accept_Conversation																D											
Allocate	X																										
Deallocate															X												
Initilize_Conversation	X	D	D	D	D	D		D	D	D						D											
Receive																											
Send_Data																											
Advanced Function																											
Accept_Incoming																											
Cancel_Conversation															X	D											
Confirm											X	X	X														
Confirmed														X													
Extract_Conversation_State																			X					X			
Extract_Conversation_Type																											
Extract_Initialization_Data																											
Extract_Mapped_Initialization_Data																											
Extract_Mode_Name																			X			X					
Extract_Partner_LU_Name																			X	X	X						
Extract_Security_User_ID																											
Extract_Send_Receive_Mode																											
Extract_Sync_Level																			X				X				
Extract_TP_Name																											
Flush																		X									
Initialize_For_Incoming																D											
Prepare																											
Prepare_To_Receive																											
Receive_Expedited_Data																											
Receive_Mapped_Data																											
Request_To_Send																											
Send_Error																											
Send_Expedited_Data																											
Send_Mapped_Data																											
Set_Confirmation_Urgency																											
Set_Conversation_Security_Password	X								S																		
Set_Conversation_Security_Type	X								S																		
Set_Conversation_Security_User_ID	X								S																		
Set_Conversation_Type	X																										
Set_Deallocate_Type															X	S											
Set_Error_Direction																											
Set_Fill																											
Set_Initialization_Data	X									S																	
Set_Mapped_Initialization_Data	X									S																	
Set_Log_Data																											
Set_Mode_Name	X		S																								
Set_Partner_LU_Name	X	S																									
Set_Prepare_To_Receive_Type																											
Set_Receive_Type																											
Set_Return_Control	X					S																					
Set_Send_Receive_Mode	X				S																						
Set_Send_Type																											
Set_Sync_Level	X							S																			
Set_TP_Name	X			S																							
Test_Request_To_Send_Received																											

Table 36. Relationship of LU 6.2 Verbs to CPI Communications Calls (Part 2)

CPI Communications Calls	**MC_POST_ON_RECEIPT**	**MC_PREPARE_FOR_SYNCPT**	**MC_PREPARE_TO_RECEIVE**	- TYPE	- LOCKS	**MC_RECEIVE_AND_WAIT**	- REQ_TO_SEND_RECEIVED	- EXPEDITED_DATA_RECEIVED	- WHAT_RECEIVED	- MAP_NAME	**MC_RCV_EXPEDITED_DATA**	- REQ_TO_SEND_RECEIVED	- EXPEDITED_DATA_RECEIVED	**MC_RECEIVE_IMMEDIATE**	- REQ_TO_SEND_RECEIVED	- EXPEDITED_DATA_RECEIVED	- WHAT_RECEIVED	- MAP_NAME	**MC_REQUEST_TO_SEND**	**MC_SEND_DATA**	- MAP_NAME	- USER_CONTROL_DATA	- ENCRYPT	- REQ_TO_SEND_RECEIVED	- EXPEDITED_DATA_RECEIVED
Starter Set																									
Accept_Conversation				D	D																				
Allocate																									
Deallocate																									
Initilize_Conversation				D	D																				
Receive						X	X	X	X					X	X	X	X								
Send_Data																				X				X	X
Advanced Function																									
Accept_Incoming																									
Cancel_Conversation																									
Confirm																									
Confirmed																									
Extract_Conversation_State																									
Extract_Conversation_Type																									
Extract_Mapped_Initialization_Data																									
Extract_Mode_Name																									
Extract_Partner_LU_Name																									
Extract_Security_User_ID																									
Extract_Send_Receive_Mode																									
Extract_Sync_Level																									
Extract_TP_Name																									
Flush																									
Initialize_For_Incoming				D	D																				
Prepare		X																							
Prepare_To_Receive			X																						
Receive_Expedited_Data											X	X	X												
Receive_Mapped_Data						X	X	X	X	X				X	X	X	X	X							
Request_To_Send																			X						
Send_Error																									
Send_Expedited_Data																									
Send_Mapped_Data																				X	X			X	X
Set_Confirmation_Urgency			X		S																				
Set_Conversation_Security_Password																									
Set_Conversation_Security_Type																									
Set_Conversation_Security_User_ID																									
Set_Conversation_Type																									
Set_Deallocate_Type																									
Set_Error_Direction																									
Set_Fill																									
Set_Initialization_Data																									
Set_Log_Data																									
Set_Mapped_Initialization_Data																									
Set_Mode_Name																									
Set_Partner_LU_Name																									
Set_Prepare_To_Receive_Type			X	S																					
Set_Receive_Type						X								X											
Set_Return_Control																									
Set_Send_Receive_Mode																									
Set_Send_Type																									
Set_Sync_Level																									
Set_TP_Name																									
Test_Request_To_Send_Received																									

Table 37. Relationship of LU 6.2 Verbs to CPI Communications Calls (Part 3)

CPI Communications Calls	**MC_SEND_ERROR**	- REQ_TO_SEND_RECEIVED	- EXPEDITED_DATA_RECEIVED	**MC_SEND_EXPEDITED_DATA**	- REQ_TO_SEND_RECEIVED	- EXPEDITED_DATA_RECEIVED	**MC_TEST**	- TEST_POSTED	- TEST_REQ_TO_SEND_RCVD	**BACKOUT**	**GET_TP_PROPERTIES**	- OWN_FULLY_QUAL_LU_NAME	- OWN_TP_NAME	- OWN_TP_INSTANCE	- SECURITY_USER_ID	- SECURITY_PROFILE	- LUW_IDENTIFIER	- PROTECTED_LUW_IDENTIFIER	**GET_TYPE**	**SET_SYNCPT_OPTIONS**	**SYNCPT**	- REQ_TO_SEND_RECEIVED	**WAIT**	- RESOURCE_POSTED	**WAIT_FOR_COMPLETION**
Starter Set																									
Accept_Conversation																									
Allocate																									
Deallocate																									
Initilize_Conversation																									
Receive																									
Send_Data																									
Advanced Function																									
Accept_Incoming																									
Cancel_Conversation																									
Confirm																									
Confirmed																									
Extract_Conversation_State																									
Extract_Conversation_Type																			X						
Extract_Mode_Name																									
Extract_Partner_LU_Name																									
Extract_Security_User_ID											X				X										
Extract_Send_Receive_Mode																			X						
Extract_Sync_Level																									
Extract_TP_Name											X		X												
Flush																									
Initialize_For_Incoming																									
Prepare																									
Prepare_To_Receive																									
Receive_Expedited_Data																									
Request_To_Send																									
Send_Error	X	X	X																						
Send_Expedited_Data				X	X	X																			
Set_Confirmation_Urgency																									
Set_Conversation_Security_Password																									
Set_Conversation_Security_Type																									
Set_Conversation_Security_User_ID																									
Set_Conversation_Type																									
Set_Deallocate_Type																									
Set_Error_Direction	X																								
Set_Fill																									
Set_Initialization_Data																									
Set_Log_Data																									
Set_Mode_Name																									
Set_Partner_LU_Name																									
Set_Prepare_To_Receive_Type																									
Set_Receive_Type																									
Set_Return_Control																									
Set_Send_Receive_Mode																									
Set_Send_Type																									
Set_Sync_Level																									
Set_TP_Name																									
Test_Request_To_Send_Received							X		X																

Table 38. Relationship of LU 6.2 Verbs to CPI Communications Calls (Part 4)

CPI Communications Calls	**ALLOCATE**	- LU_NAME	- MODE_NAME	- TPN	- TYPE	- RETURN_CONTROL	- CONVERSATION_GROUP_ID	- SYNC_LEVEL	- SECURITY	- PIP	**CONFIRM**	- REQ_TO_SEND_RECEIVED	- EXPEDITED_DATA_RECEIVED	**CONFIRMED**	**DEALLOCATE**	- TYPE	- LOG_DATA	- EXPEDITED_DATA_RECEIVED	**FLUSH**
Starter Set																			
Accept_Conversation																D	D		
Allocate	X																		
Deallocate															X				
Initilize_Conversation	X	D	D	D	D	D		D	D	D						D	D		
Receive																			
Send_Data																			
Advanced Function																			
Accept_Incoming																			
Cancel_Conversation																			
Confirm											X	X	X						
Confirmed														X					
Extract_Conversation_State																			
Extract_Conversation_Type																			
Extract_Mode_Name																			
Extract_Partner_LU_Name																			
Extract_Security_User_ID																			
Extract_Send_Receive_Mode																			
Extract_Sync_Level																			
Extract_TP_Name																			
Flush																			X
Initialize_For_Incoming																D	D		
Prepare																			
Prepare_To_Receive																			
Receive_Expedited_Data																			
Request_To_Send																			
Send_Error																			
Send_Expedited_Data																			
Set_Confirmation_Urgency																			
Set_Conversation_Security_Password	X								S										
Set_Conversation_Security_Type	X								S										
Set_Conversation_Security_User_ID	X								S										
Set_Conversation_Type	X				S														
Set_Deallocate_Type															X	S			
Set_Error_Direction																			
Set_Fill																			
Set_Initialization_Data	X									S									
Set_Log_Data															X		S		
Set_Mode_Name	X		S																
Set_Partner_LU_Name	X	S																	
Set_Prepare_To_Receive_Type																			
Set_Receive_Type																			
Set_Return_Control	X					S													
Set_Send_Receive_Mode	X				S														
Set_Send_Type																			
Set_Sync_Level	X							S											
Set_TP_Name	X			S															
Test_Request_To_Send_Received																			

Table 39. Relationship of LU 6.2 Verbs to CPI Communications Calls (Part 5)

CPI Communications Calls	**GET_ATTRIBUTES**	- PARTNER_LU_NAME	- PART_FULL_QUAL_LU_NAME	- MODE_NAME	- SYNC_LEVEL	- CONVERSATION_STATE	- CONV_CORRELATOR	- SESSION_ID	- CONVERSATION_GROUP_ID	**POST_ON_RECEIPT**	- FILL	**PREPARE_FOR_SYNCPT**	**PREAPARE_TO_RECEIVE**	- TYPE	- LOCKS	**RECEIVE_AND_WAIT**	- FILL	- REQ_TO_SEND_RECEIVED	- EXPEDITED_DATA_RECEIVED	- WHAT_RECEIVED	**RECEIVE_EXPEDITED_DATA**	- REQ_TO_SEND_RECEIVED	- EXPEDITED_DATA_RECEIVED
Starter Set																							
Accept_Conversation														D	D		D						
Allocate																							
Deallocate																							
Initilize_Conversation														D	D		D						
Receive																X		X	X	X			
Send_Data																							
Advanced Function																							
Accept_Incoming																							
Cancel_Conversation																							
Confirm																							
Confirmed																							
Extract_Conversation_State	X					X																	
Extract_Conversation_Type																							
Extract_Mode_Name	X			X																			
Extract_Partner_LU_Name	X	X	X																				
Extract_Security_User_ID																							
Extract_Send_Receive_Mode																							
Extract_Sync_Level	X				X																		
Extract_TP_Name																							
Flush																							
Initialize_For_Incoming														D	D		D						
Prepare												X											
Prepare_To_Receive													X										
Receive_Expedited_Data																					X	X	X
Request_To_Send																							
Send_Error																							
Send_Expedited_Data																							
Set_Confirmation_Urgency													X		S								
Set_Conversation_Security_Password																							
Set_Conversation_Security_Type																							
Set_Conversation_Security_User_ID																							
Set_Conversation_Type																							
Set_Deallocate_Type																							
Set_Error_Direction																							
Set_Fill																X	S						
Set_Initialization_Data																							
Set_Log_Data																							
Set_Mode_Name																							
Set_Partner_LU_Name																							
Set_Prepare_To_Receive_Type													X	S									
Set_Receive_Type																X							
Set_Return_Control																							
Set_Send_Receive_Mode																							
Set_Send_Type																							
Set_Sync_Level																							
Set_TP_Name																							
Test_Request_To_Send_Received																							

Table 40. Relationship of LU 6.2 Verbs to CPI Communications Calls (Part 6)

CPI Communications Calls	RECEIVE_IMMEDIATE	- FILL	- REQ_TO_SEND_RECEIVED	- EXPEDITED_DATA_RECEIVED	- WHAT_RECEIVED	REQUEST_TO_SEND	SEND_DATA	- ENCRYPT	- REQ_TO_SEND_RECEIVED	- EXPEDITED_DATA_RECEIVED	SEND_EXPEDITED_DATA	- REQ_TO_SEND_RECEIVED	- EXPEDITED_DATA_RECEIVED	SEND_ERROR	- TYPE	- LOG_DATA	- REQ_TO_SEND_RECEIVED	- EXPEDITED_DATA_RECEIVED	TEST	- TEST_POSTED	- TEST_REQ_TO_SEND_RCVD
Starter Set																					
Accept_Conversation		D														D					
Allocate																					
Deallocate																					
Initilize_Conversation		D														D					
Receive	X		X	X	X																
Send_Data							X		X	X											
Advanced Function																					
Accept_Incoming																					
Cancel_Conversation																					
Confirm																					
Confirmed																					
Extract_Conversation_State																					
Extract_Conversation_Type																					
Extract_Mode_Name																					
Extract_Partner_LU_Name																					
Extract_Security_User_ID																					
Extract_Send_Receive_Mode																					
Extract_Sync_Level																					
Extract_TP_Name																					
Flush																					
Initialize_For_Incoming		D															D				
Prepare																					
Prepare_To_Receive																					
Receive_Expedited_Data																					
Request_To_Send						X															
Send_Error														X	D		X	X			
Send_Expedited_Data											X	X	X								
Set_Confirmation_Urgency																					
Set_Conversation_Security_Password																					
Set_Conversation_Security_Type																					
Set_Conversation_Security_User_ID																					
Set_Conversation_Type																					
Set_Deallocate_Type																					
Set_Error_Direction														X							
Set_Fill	X	S																			
Set_Initialization_Data																					
Set_Log_Data														X		S					
Set_Mode_Name																					
Set_Partner_LU_Name																					
Set_Prepare_To_Receive_Type																					
Set_Receive_Type	X																				
Set_Return_Control																					
Set_Send_Receive_Mode																					
Set_Send_Type																					
Set_Sync_Level																					
Set_TP_Name																					
Test_Request_To_Send_Received																			X		X

CPI Communications and OSI TP CRMs for Half-Duplex Conversations

This section summarizes the CPI-C application service element (ASE) services, maps the services both to and from the OSI TP services, and defines the sequencing rules and state table for CPI-C use by OSI TP programs using half-duplex (HDX) conversations.

The CPI Communications calls have been mapped to the OSI TP services described in ISO/IEC 10026-2, *Information Technology — Open Systems Interconnection — Distributed Transaction Processing — Part 2: OSI TP Service Definition*.

Programs written using CPI Communications can communicate with OSI TP programs. Two sets of tables beginning with Table 41 on page 507 and Table 58 on page 522 show the functional relationships between OSI TP services and CPI Communications calls. Use these tables to determine how the function of a particular OSI TP service is provided through CPI Communications for half-duplex conversations.

This section is intended for programmers who are familiar with OSI TP.

Summary of CPI-C ASE Services

The CPI-C ASE services are defined in “Set_Return_Control (CMSRC)” on page 337.

Mapping CPI-C to OSI TP Services

The following tables present the complete mapping from the CPI-C calls to the OSI TP services. Some of the CPI-C calls provide local services only (such as CMSST, Set_Send_Type), and are not included in these tables. However, the effect of these calls can be determined from this mapping.

If the application is using the UNSTRUCTED_DATA_TRANSFER ASE, it should use SET_INITIALIZATION_DATA and EXTRACT_INITIALIZATION_DATA function calls.

If the application is **not** using the UNSTRUCTED_DATA_TRANSFER ASE, it should use SET_MAPPED_INITIALIZATION_DATA and EXTRACT_MAPPED_INITIALIZATION_DATA function calls.

The following conventions are used within the tables in this section:

*****	The parameter is not directly supported by CPI-C.
=xxx	The value "xxx" is always used.
n/a	The value is not applicable in this case.

Table 41 (Page 1 of 2). Mapping CPI-C Calls to OSI TP Services

CPI-C Call	OSI TP Service
CMALLC - Allocate (See Table 42 on page 509 for details.)	TP-BEGIN-DIALOGUE request
CMCANC - Cancel_Conversation (See Table 43 on page 511 for details.)	TP-BEGIN-DIALOGUE response TP-U-ABORT request
CMCFM - Confirm (See Table 44 on page 511 for details.)	TP-BEGIN-TRANSACTION request TP-HANDSHAKE request TP-HANDSHAKE-AND-GRANT-CONTROL request

Table 41 (Page 2 of 2). Mapping CPI-C Calls to OSI TP Services

CPI-C Call	OSI TP Service
CMCFMD - Confirmed (See Table 45 on page 511 for details.)	TP-HANDSHAKE response TP-HANDSHAKE-AND-GRANT-CONTROL response TP-END-DIALOGUE response
CMDEAL - Deallocate (See Table 46 on page 512 for details.)	TP-BEGIN-DIALOGUE response TP-END-DIALOGUE request TP-DEFERRED-END-DIALOGUE request TP-U-ABORT request
CMDFDE - Deferred_Deallocate (See Table 47 on page 513 for details.)	TP-DEFERRED-END-DIALOGUE request
CMFLUS - Flush (See Table 48 on page 513 for details.)	TP-GRANT-CONTROL request
CMINCL - Include_Partner_In_Transaction (See Table 49 on page 513 for details.)	TP-BEGIN-TRANSACTION request
CMPREP - Prepare (See Table 50 on page 513 for details.)	TP-BEGIN-TRANSACTION request TP-PREPARE request
CMPTR - Prepare_to_Receive (See Table 51 on page 514 for details.)	TP-BEGIN-TRANSACTION request TP-GRANT-CONTROL request TP-HANDSHAKE-AND-GRANT-CONTROL request TP-DEFERRED-GRANT-CONTROL request
CMRTS - Request_to_Send (See Table 52 on page 514 for details.)	TP-REQUEST-CONTROL request
CMRCV - Receive (See Table 53 on page 515 for details.)	TP-BEGIN-DIALOGUE response TP-BEGIN-TRANSACTION request TP-GRANT-CONTROL request
CMRCVM - Receive_Mapped_Data (See Table 54 on page 515 for details.)	TP-BEGIN-DIALOGUE response TP-BEGIN-TRANSACTION request TP-GRANT-CONTROL request
CMSEND - Send_Data (See Table 55 on page 515 for details.)	TP-BEGIN-TRANSACTION request (TP-DATA request) UD-TRANSFER request TP-HANDSHAKE request TP-GRANT-CONTROL request TP-HANDSHAKE-AND-GRANT-CONTROL request TP-DEFERRED-GRANT-CONTROL request TP-END-DIALOGUE request TP-DEFERRED-END-DIALOGUE request TP-U-ABORT request
CMSERR - Send_Error (See Table 56 on page 518 for details.)	TP-BEGIN-DIALOGUE response TP-BEGIN-TRANSACTION request TP-U-ERROR request
CMSNDM - Send_Mapped_Data (See Table 55 on page 515 for details)	TP-BEGIN-DIALOGUE request TP-BEGIN-TRANSACTION request TP-BEGIN-TRANSACTION request (TP-DATA request) U-ASE TP-HANDSHAKE request TP-GRANT-CONTROL request TP-HANDSHAKE-AND-GRANT-CONTROL request TP-DEFERRED-GRANT-CONTROL request TP-END-DIALOGUE request TP-DEFERRED-END-DIALOGUE request TP-U-ABORT request

The following OSI TP services are not directly mapped to the CPI-C calls:

TP-COMMIT request is supported through a resource recovery interface.
TP-DONE request is not externalized to the application program.
TP-ROLLBACK request is supported through a resource recovery interface.

Table 42 (Page 1 of 2). CMALLC - Allocate Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
if: *sync_level* = CM_NONE	
CMALLC - Allocate	TP-BEGIN-DIALOGUE request
*	Initiating-TPSU-Title
AP_title (characteristic)	Recipient-AP-Title
*	Recipient-API-Identifier
AE_qualifier (characteristic)	Recipient-AE-Qualifier
*	Recipient-AEI-Identifier
TP_name (characteristic)	Recipient-TPSU-Title
=Dialogue and Polarized	Functional-Units
mode_name (characteristic)	Quality-of-Service
application_context_name (characteristic)	Application-Context-Name
n/a	Begin-Transaction
allocate_confirm (characteristic)	Confirmation
initialization_data (characteristic)	User-Data
if: *sync_level* = CM_CONFIRM	
CMALLC - Allocate	TP-BEGIN-DIALOGUE request
*	Initiating-TPSU-Title
AP_title (characteristic)	Recipient-AP-Title
*	Recipient-API-Identifier
AE_qualifier (characteristic)	Recipient-AE-Qualifier
*	Recipient-AEI-Identifier
TP_name (characteristic)	Recipient-TPSU-Title
=Dialogue, Polarized, and Handshake	Functional-Units
mode_name (characteristic)	Quality-of-Service
application_context_name (characteristic)	Application-Context-Name
n/a	Begin-Transaction
allocate_confirm (characteristic)	Confirmation
initialization_data (characteristic)	User-Data
if: *sync_level* = CM_SYNC_POINT **and** *transaction_control* = CM_CHAINED_TRANSACTIONS	
CMALLC - Allocate	TP-BEGIN-DIALOGUE request
*	Initiating-TPSU-Title
AP_title (characteristic)	Recipient-AP-Title
*	Recipient-API-Identifier
AE_qualifier (characteristic)	Recipient-AE-Qualifier
*	Recipient-AEI-Identifier
TP_name (characteristic)	Recipient-TPSU-Title
=Dialogue, Polarized, Handshake, Commit, and Chained Transactions	Functional-Units
mode_name (characteristic)	Quality-of-Service
application_context_name (characteristic)	Application-Context-Name
n/a	Begin-Transaction
allocate_confirm (characteristic)	Confirmation
initialization_data (characteristic)	User-Data
if: *sync_level* = CM_SYNC_POINT **and** *transaction_control* = CM_UNCHAINED_TRANSACTIONS	

Table 42 (Page 2 of 2). CMALLC - Allocate Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
CMALLC - Allocate	TP-BEGIN-DIALOGUE request
*	Initiating-TPSU-Title
AP_title (characteristic)	Recipient-AP-Title
*	Recipient-API-Identifier
AE_qualifier (characteristic)	Recipient-AE-Qualifier
*	Recipient-AEI-Identifier
TP_name (characteristic)	Recipient-TPSU-Title
=Dialogue, Polarized, Handshake, Commit, and Unchained Transactions	Functional-Units
mode_name (characteristic)	Quality-of-Service
application_context_name (characteristic)	Application-Context-Name
begin_transaction (characteristic)	Begin-Transaction (See note at end of table.)
allocate_confirm (characteristic)	Confirmation
initialization_data (characteristic)	User-Data
if: *sync_level* = CM_SYNC_POINT_NO_CONFIRM **and** *transaction_control* = CM_CHAINED_TRANSACTIONS	
CMALLC - Allocate	TP-BEGIN-DIALOGUE request
*	Initiating-TPSU-Title
AP_title (characteristic)	Recipient-AP-Title
*	Recipient-API-Identifier
AE_qualifier (characteristic)	Recipient-AE-Qualifier
*	Recipient-AEI-Identifier
TP_name (characteristic)	Recipient-TPSU-Title
=Dialogue, Polarized, Commit, and Chained Transactions	Functional-Units
mode_name (characteristic)	Quality-of-Service
application_context_name (characteristic)	Application-Context-Name
n/a	Begin-Transaction
allocate_confirm (characteristic)	Confirmation
initialization_data (characteristic)	User-Data
if: *sync_level* = CM_SYNC_POINT_NO_CONFIRM **and** *transaction_control* = CM_UNCHAINED_TRANSACTIONS	
CMALLC - Allocate	TP-BEGIN-DIALOGUE request
*	Initiating-TPSU-Title
AP_title (characteristic)	Recipient-AP-Title
*	Recipient-API-Identifier
AE_qualifier (characteristic)	Recipient-AE-Qualifier
*	Recipient-AEI-Identifier
TP_name (characteristic)	Recipient-TPSU-Title
=Dialogue, Polarized, Commit, and Unchained Transactions	Functional-Units
mode_name (characteristic)	Quality-of-Service
application_context_name (characteristic)	Application-Context-Name
begin_transaction (characteristic)	Begin-Transaction (See note at end of table.)
allocate_confirm (characteristic)	Confirmation
initialization_data (characteristic)	User-Data

Note: if *begin_transaction* = CM_BEGIN_IMPLICIT
and *transaction_control* = CM_UNCHAINED_TRANSACTIONS
and the conversation's context is in transaction
then Begin-Transaction is set to true;
otherwise, Begin-Transaction is set to false.

Table 43. CMCANC - Cancel_Conversation Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
if: Confirmation = true on TP-BEGIN-DIALOGUE indication **and** it is the first activity on the conversation following Accept_Conversation or Accept_Incoming	
CMCANC - Cancel_Conversation = rejected(user) *initialization_data* (characteristic)	TP-BEGIN-DIALOGUE response Result User-Data
otherwise:	
CMCANC - Cancel_Conversation =null	TP-U-ABORT request User-Data

Table 44. CMCFM - Confirm Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
if: *sync_level* = CM_SYNC_POINT **and** *transaction_control* = CM_UNCHAINED_TRANSACTIONS **and** *begin_transaction* = CM_BEGIN_IMPLICIT **and** it is the first activity on the conversation following the start of the current transaction	
CMCFM - Confirm *confirmation_urgency* (characteristic)	TP-BEGIN-TRANSACTION request (no parameters) TP-HANDSHAKE request Confirmation-Urgency
if: *sync_level* = CM_SYNC_POINT **and** the previous operation on the conversation was a Prepare_To_Receive with *prepare_to_receive_type* = CM_PREP_TO_RECEIVE_SYNC_LEVEL	
CMCFM - Confirm	TP-HANDSHAKE-AND-GRANT-CONTROL request (no parameters)
if: *sync_level* = CM_CONFIRM or *sync_level* = CM_SYNC_POINT	
CMCFM - Confirm *confirmation_urgency* (characteristic)	TP-HANDSHAKE request Confirmation-Urgency

Table 45. CMCFMD - Confirmed Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
if in response to: *status_received* = CM_CONFIRM_RECEIVED	
CMCFMD - Confirmed	TP-HANDSHAKE response (no parameters)
if in response to: *status_received* = CM_CONFIRM_SEND_RECEIVED	
CMCFMD - Confirmed	TP-HANDSHAKE_AND-GRANT-CONTROL response (no parameters)
if in response to: *status_received* = CM_CONFIRM_DEALLOC_RECEIVED	
CMCFMD - Confirmed	TP-END-DIALOGUE response (no parameters)

Table 46. CMDEAL - Deallocate Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
if: *deallocate_type* = CM_DEALLOCATE_SYNC_LEVEL **and** *sync_level* = CM_NONE	

Table 46. CMDEAL - Deallocate Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
CMDEAL - Deallocate =false	(See note at end of table.) TP-END-DIALOGUE request Confirmation
if: *deallocate_type* = CM_DEALLOCATE_SYNC_LEVEL **and** *sync_level* = CM_CONFIRM	
CMDEAL - Deallocate =true	(See note at end of table.) TP-END-DIALOGUE request Confirmation
if: *deallocate_type* = CM_DEALLOCATE_SYNC_LEVEL **and** (*sync_level* = CM_SYNC_POINT or *sync_level* = CM_SYNC_POINT_NO_CONFIRM) **and** (*transaction_control* = CM_CHAINED_TRANSACTIONS or (*transaction_control* = CM_UNCHAINED_TRANSACTIONS and the conversation is included in the current transaction))	
CMDEAL - Deallocate	(See note at end of table.) TP-DEFERRED-END-DIALOGUE request (no parameters)
if: *deallocate_type* = CM_DEALLOCATE_SYNC_LEVEL **and** *sync_level* = CM_SYNC_POINT **and** (*transaction_control* = CM_UNCHAINED_TRANSACTIONS and the conversation is not currently included in the transaction)	
CMDEAL - Deallocate =true	(See note at end of table.) TP-END-DIALOGUE request Confirmation
if: *deallocate_type* = CM_DEALLOCATE_SYNC_LEVEL **and** *sync_level* = CM_SYNC_POINT_NO_CONFIRM **and** (*transaction_control* = CM_UNCHAINED_TRANSACTIONS and the conversation is not currently included in the transaction)	
CMDEAL - Deallocate =false	(See note at end of table.) TP-END-DIALOGUE request Confirmation
if: *deallocate_type* = CM_DEALLOCATE_FLUSH	
CMDEAL - Deallocate =false	(See note at end of table.) TP-END-DIALOGUE request Confirmation
if: *deallocate_type* = CM_DEALLOCATE_CONFIRM	
CMDEAL - Deallocate =true	(See note at end of table.) TP-END-DIALOGUE request Confirmation
if: *deallocate_type* = CM_DEALLOCATE_ABEND **and** it is the first activity on the conversation following Accept_Conversation or Accept_Incoming	
CMDEAL - Deallocate =rejected(user) *initialization_data* (characteristic)	TP-BEGIN-DIALOGUE response Result User-Data
if: *deallocate_type* = CM_DEALLOCATE_ABEND **and** it is not the first activity on the conversation following Accept_Conversation or Accept_Incoming	
CMDEAL - Deallocate *log_data* (characteristic)	TP-U-ABORT request User-Data

Note: if Confirmation = true on TP-BEGIN-DIALOGUE indication
and it is the first activity on the conversation following Accept_Conversation or Accept_Incoming
then the identified OSI TP Service primitives will be preceded by TP-BEGIN-DIALOGUE response (Result = accepted and User-Data = *initialization_data* (characteristic)).

Table 47. CMDFDE - Deferred_Deallocate Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
CMDFDE - Deferred_Deallocate	TP-DEFERRED-END-DIALOGUE request (no parameters)

Table 48. CMFLUS - Flush

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
if: the previous operation on the conversation was a Prepare_To_Receive with *prepare_to_receive_type* = CM_PREP_TO_RECEIVE_SYNC_LEVEL	
CMFLUS - Flush	TP-GRANT-CONTROL request (no parameters)

Table 49. CMINCL - Include_Partner_In_Transaction Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
CMINCL - Include_Partner_In_Transaction	TP-BEGIN-TRANSACTION request (no parameters)

Table 50. CMPREP - Prepare Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
if: *sync_level* = CM_SYNC_POINT or *sync_level* = CM_SYNC_POINT_NO_CONFIRM **and** *transaction_control* = CM_UNCHAINED_TRANSACTIONS **and** *begin_transaction* = CM_BEGIN_IMPLICIT **and** it is the first activity on the conversation following the start of the current transaction	
CMPREP - Prepare	TP-BEGIN-TRANSACTION request (no parameters) TP-PREPARE request
prepare_data_permitted (characteristic)	Data-Permitted
if: *sync_level* = CM_SYNC_POINT or *sync_level* = CM_SYNC_POINT_NO_CONFIRM **and** the previous operation on the conversation was a Prepare_To_Receive with *prepare_to_receive_type* = CM_PREP_TO_RECEIVE_SYNC_LEVEL	
CMPREP - Prepare	TP-DEFERRED-GRANT-CONTROL request (no parameters) TP-PREPARE request
prepare_data_permitted (characteristic)	Data-Permitted
if: *sync_level* = CM_SYNC_POINT or *sync_level* = CM_SYNC_POINT_NO_CONFIRM	
CMPREP - Prepare	TP-PREPARE request
prepare_data_permitted (characteristic)	Data-Permitted

Table 51. CMPTR - Prepare_To_Receive Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
if: *prepare_to_receive_type* = CM_PREP_TO_RECEIVE_SYNC_LEVEL **and** *sync_level* = CM_NONE	
CMPTR - Prepare_To_Receive	TP-GRANT-CONTROL request (no parameters)
if: *prepare_to_receive_type* = CM_PREP_TO_RECEIVE_SYNC_LEVEL **and** *sync_level* = CM_CONFIRM	
CMPTR - Prepare_To_Receive *confirmation_urgency* (characteristic)	TP-HANDSHAKE-AND-GRANT-CONTROL request Confirmation-Urgency
if: *prepare_to_receive_type* = CM_PREP_TO_RECEIVE_SYNC_LEVEL **and** *sync_level* = CM_SYNC_POINT or *sync_level* = CM_SYNC_POINT_NO_CONFIRM **and** the conversation is included in the current transaction	
CMPTR - Prepare_To_Receive	(See notes 1 and 2 at end of table.)
if: *prepare_to_receive_type* = CM_PREP_TO_RECEIVE_SYNC_LEVEL **and** *sync_level* = CM_SYNC_POINT **and** (*transaction_control* = CM_UNCHAINED_TRANSACTIONS and the conversation is not currently included in the transaction)	
CMPTR - Prepare_To_Receive *confirmation_urgency* (characteristic)	TP-HANDSHAKE-AND-GRANT-CONTROL request Confirmation-Urgency
if: *prepare_to_receive_type* = CM_PREP_TO_RECEIVE_SYNC_LEVEL **and** *sync_level* = CM_SYNC_POINT_NO_CONFIRM **and** (*transaction_control* = CM_UNCHAINED_TRANSACTIONS and the conversation is not currently included in the transaction)	
CMPTR - Prepare_To_Receive	TP-GRANT-CONTROL request (no parameters)
if: *prepare_to_receive_type* = CM_PREP_TO_RECEIVE_FLUSH	
CMPTR - Prepare_To_Receive	(See note 2 at end of table.) TP-GRANT-CONTROL request (no parameters)
if: *prepare_to_receive_type* = CM_PREP_TO_RECEIVE_CONFIRM	
CMPTR - Prepare_To_Receive *confirmation_urgency* (characteristic)	(See note 2 at end of table.) TP-HANDSHAKE-AND-GRANT-CONTROL request Confirmation-Urgency

Notes:

Note 1:

The completion of the mapping of Prepare_To_Receive depends on the following operation on the conversation. If the operation is:

- Flush - a TP-GRANT-CONTROL request will be sent
- Confirm - a TP-HANDSHAKE-AND-GRANT-CONTROL request will be sent
- a commit call - a TP-DEFERRED-GRANT-CONTROL request will be sent
- a Prepare call - a TP-DEFERRED-GRANT-CONTROL request will be sent

Note 2:

if: *sync_level* = CM_SYNC_POINT or *sync_level* = CM_SYNC_POINT_NO_CONFIRM
and *transaction_control* = CM_UNCHAINED_TRANSACTIONS
and *begin_transaction* = CM_BEGIN_IMPLICIT
and the Prepare_To_Receive call is the first activity on the conversation following the start of the current transaction,
then the identified OSI TP Service primitives are preceded by a TP-BEGIN-TRANSACTION request.

Table 52. CMRTS - Request_To_Send Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
CMRTS - Request_To_Send	TP-REQUEST-CONTROL request (no parameters)

Table 53. CMRCV - Receive

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
if: Confirmation = true on TP-BEGIN-DIALOGUE indication **and** it is the first activity on the conversation following Accept_Conversation or Accept_Incoming	
CMRCV - Receive = accepted *initialization_data* (characteristic)	TP-BEGIN-DIALOGUE response Result User-Data
if: *conversation_state* = CM_SEND_STATE or CM_SEND_PENDING_STATE **and** *sync_level* = CM_SYNC_POINT or *sync_level* = CM_SYNC_POINT_NO_CONFIRM **and** *transaction_control* = CM_UNCHAINED_TRANSACTIONS **and** *begin_transaction* = CM_BEGIN_IMPLICIT **and** it is the first activity on the conversation following the start of the current transaction	
CMRCV - Receive	TP-BEGIN-TRANSACTION request (no parameters) TP-GRANT-CONTROL request (no parameters)
if: *conversation_state* = CM_SEND_STATE or CM_SEND_PENDING_STATE	
CMRCV - Receive	TP-GRANT-CONTROL request (no parameters)

Table 54. CMRCVM - Receive_Mapped_Data

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
if: *confirmation* = true on TP_BEGIN-DIALOGUE **and** it is the first activity on the conversation following Accept_Conversation or Accept_Incoming	
CMRCVM - Receive_Mapped_Data = accepted initialization_data (characteristic)	TP-BEGIN-DIALOGUE response Result User-Data
if: *conversation_state*=SEND_STATE **and** *sync_level*=CM_SYNC_POINT or *sync_level*= CM_SYNC_POINT_NO_CONFIRM **and** *transaction_control*=CM_UNCHAINED_TRANSACTIONS **and** *begin_transaction*=CM_BEGIN_IMPLICIT **and** it is the first activity on the conversation following the start of the current transaction	
CMRCVM - RECEIVE_MAPPED_DATA	TP-BEGIN_TRANSACTION request (no parameters) TP-GRANT-CONTROL request (no parameters)
if: *sync_level*=CM_SYNC_POINT_NO_CONFIRM **and** *transaction_control* = CM_UNCHANGED_TRANSACTIONS and *begin_transaction* = CM_BEGIN_IMPLICIT **and** it is the first activity on the conversation following the start of the current transaction	
CMRCVM - Receive_Mapped_Data	TP-BEGIN-TRANSACTION request (no parameters) TP-GRANT-CONTROL request (no parameters)

Table 55 (Page 1 of 4). CMSEND - Send_Data Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
if: *send_type* = CM_BUFFER_DATA	
CMSEND - Send_Data *buffer* (parameter)	(See note at end of table.) (TP-DATA request) UD-TRANSFER request User-Data

Table 55 (Page 2 of 4). CMSEND - Send_Data Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
if: *send_type* = CM_SEND_AND_FLUSH	
CMSEND - Send_Data	(See note at end of table.) (TP-DATA request) UD-TRANSFER request
buffer (parameter)	User-Data
if: *send_type* = CM_SEND_AND_CONFIRM	
CMSEND - Send_Data	(See note at end of table.) (TP-DATA request) UD-TRANSFER request
buffer (parameter)	User-Data TP-HANDSHAKE request
confirmation_urgency (characteristic)	Confirmation-Urgency
if: *send_type* = CM_SEND_AND_PREP_TO_RECEIVE **and** *prepare_to_receive_type* = CM_PREP_TO_RECEIVE_SYNC_LEVEL **and** *sync_level* = CM_NONE	
CMSEND - Send_Data *buffer* (parameter)	(TP-DATA request) UD-TRANSFER request User-Data TP-GRANT-CONTROL request (no parameters)
if: *send_type* = CM_SEND_AND_PREP_TO_RECEIVE **and** *prepare_to_receive_type* = CM_PREP_TO_RECEIVE_SYNC_LEVEL **and** *sync_level* = CM_CONFIRM	
CMSEND - Send_Data *buffer* (parameter)	(TP-DATA request) UD-TRANSFER request User-Data TP-HANDSHAKE-AND-GRANT-CONTROL request
confirmation_urgency (characteristic)	Confirmation-Urgency
if: *send_type* = CM_SEND_AND_PREP_TO_RECEIVE **and** *prepare_to_receive_type* = CM_PREP_TO_RECEIVE_SYNC_LEVEL **and** *sync_level* = CM_SYNC_POINT or *sync_level* = CM_SYNC_POINT_NO_CONFIRM **and** the conversation is included in the current transaction	
CMSEND - Send_Data	(See note at end of table.) (TP-DATA request) UD-TRANSFER request
buffer (parameter)	User-Data TP-DEFERRED-GRANT-CONTROL request (no parameters)
if: *send_type* = CM_SEND_AND_PREP_TO_RECEIVE **and** *prepare_to_receive_type* = CM_PREP_TO_RECEIVE_SYNC_LEVEL **and** *sync_level* = CM_SYNC_POINT **and** (*transaction_control* = CM_UNCHAINED_TRANSACTIONS and the conversation is not currently included in a transaction)	
CMSEND - Send_Data *buffer* (parameter)	(TP-DATA request) UD-TRANSFER request User-Data TP-HANDSHAKE-AND-GRANT-CONTROL request
confirmation_urgency (characteristic)	Confirmation-Urgency
if: *send_type* = CM_SEND_AND_PREP_TO_RECEIVE **and** *prepare_to_receive_type* = CM_PREP_TO_RECEIVE_SYNC_LEVEL **and** *sync_level* = CM_SYNC_POINT_NO_CONFIRM **and** (*transaction_control* = CM_UNCHAINED_TRANSACTIONS and the conversation is not currently included in a transaction)	
CMSEND - Send_Data *buffer* (parameter)	(TP-DATA request) UD-TRANSFER request User-Data TP-GRANT-CONTROL request (no parameters)
if: *send_type* = CM_SEND_AND_PREP_TO_RECEIVE **and** *prepare_to_receive_type* = CM_PREP_TO_RECEIVE_FLUSH	

Table 55 (Page 3 of 4). CMSEND - Send_Data Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
CMSEND - Send_Data *buffer* (parameter)	(See note at end of table.) (TP-DATA request) UD-TRANSFER request User-Data TP-GRANT-CONTROL request (no parameters)
if: *send_type* = CM_SEND_AND_PREP_TO_RECEIVE **and** *prepare_to_receive_type* = CM_PREP_TO_RECEIVE_CONFIRM	
CMSEND - Send_Data *buffer* (parameter) *confirmation_urgency* (characteristic)	(See note at end of table.) (TP-DATA request) UD-TRANSFER request User-Data TP-HANDSHAKE-AND-GRANT-CONTROL request Confirmation-Urgency
if: *send_type* = CM_SEND_AND_DEALLOCATE **and** *deallocate_type* = CM_DEALLOCATE_SYNC_LEVEL **and** *sync_level* = CM_NONE	
CMSEND - Send_Data *buffer* (parameter) =false	(TP-DATA request) UD-TRANSFER request User-Data TP-END-DIALOGUE request Confirmation
if: *send_type* = CM_SEND_AND_DEALLOCATE **and** *deallocate_type* = CM_DEALLOCATE_SYNC_LEVEL **and** *sync_level* = CM_CONFIRM	
CMSEND - Send_Data *buffer* (parameter) =true	(TP-DATA request) UD-TRANSFER request User-Data TP-END-DIALOGUE request Confirmation
if: *send_type* = CM_SEND_AND_DEALLOCATE **and** *deallocate_type* = CM_DEALLOCATE_SYNC_LEVEL **and** *sync_level* = CM_SYNC_POINT or *sync_level* = CM_SYNC_POINT_NO_CONFIRM **and** the conversation is included in the current transaction	
CMSEND - Send_Data *buffer* (parameter)	(See note at end of table.) (TP-DATA request) UD-TRANSFER request User-Data TP-DEFERRED-END-DIALOGUE request (no parameters)
if: *send_type* = CM_SEND_AND_DEALLOCATE **and** *deallocate_type* = CM_DEALLOCATE_SYNC_LEVEL **and** *sync_level* = CM_SYNC_POINT **and** (*transaction_control* = CM_UNCHAINED_TRANSACTIONS and the conversation is not currently included in a transaction)	
CMSEND - Send_Data *buffer* (parameter) =true	(TP-DATA request) UD-TRANSFER request User-Data TP-END-DIALOGUE request Confirmation
if: *send_type* = CM_SEND_AND_DEALLOCATE **and** *deallocate_type* = CM_DEALLOCATE_SYNC_LEVEL **and** *sync_level* = CM_SYNC_POINT_NO_CONFIRM **and** (*transaction_control* = CM_UNCHAINED_TRANSACTIONS and the conversation is not currently included in a transaction)	
CMSEND - Send_Data *buffer* (parameter) =false	(TP-DATA request) UD-TRANSFER request User-Data TP-END-DIALOGUE request Confirmation
if: *send_type* = CM_SEND_AND_DEALLOCATE **and** *deallocate_type* = CM_DEALLOCATE_FLUSH	

Table 55 (Page 4 of 4). CMSEND - Send_Data Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
CMSEND - Send_Data *buffer* (parameter) =false	(TP-DATA request) UD-TRANSFER request User-Data TP-END-DIALOGUE request Confirmation
if: *send_type* = CM_SEND_AND_DEALLOCATE **and** *deallocate_type* = CM_DEALLOCATE_CONFIRM	
CMSEND - Send_Data *buffer* (parameter) =true	(TP-DATA request) UD-TRANSFER request User-Data TP-END-DIALOGUE request Confirmation
if: *send_type* = CM_SEND_AND_DEALLOCATE **and** *deallocate_type* = CM_DEALLOCATE_ABEND	
CMSEND - Send_Data *buffer* (parameter) *log_data* (characteristic)	(See note at end of table.) (TP-DATA request) UD-TRANSFER request User-Data TP-U-ABORT request User-Data

Note:
if: *sync_level* = CM_SYNC_POINT or *sync_level* = CM_SYNC_POINT_NO_CONFIRM
and *transaction_control* = CM_UNCHAINED_TRANSACTIONS
and *begin_transaction* = CM_BEGIN_IMPLICIT
and the Send_Data call is the first activity on the conversation following the start of the current transaction,
then the identified OSI TP Service primitives are preceded by a TP-BEGIN-TRANSACTION request.

Table 56. CMSERR - Send_Error Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
if: Confirmation = true on TP-BEGIN-DIALOGUE indication **and** it is the first activity on the conversation following Accept_Conversation or Accept_Incoming	
CMSERR - Send_Error = accepted *initialization_data* (characteristic)	TP-BEGIN-DIALOGUE response Result User-Data TP-U-ERROR request (no parameters)
if: *conversation_state* = CM_SEND_STATE or CM_SEND_PENDING_STATE **and** *sync_level* = CM_SYNC_POINT or CM_SYNC_POINT_NO_CONFIRM **and** *transaction_control* = CM_UNCHAINED_TRANSACTIONS **and** *begin_transaction* = CM_BEGIN_IMPLICIT **and** it is the first activity on the conversation following the start of the current transaction	
CMSERR - Send_Error	TP-BEGIN-TRANSACTION request (no parameters) TP-U-ERROR request (no parameters)
if: *conversation_state* = CM_SYNC_POINT_STATE, CM_SYNC_POINT_SEND_STATE, or CM_SYNC_POINT_DEALLOCATE_STATE or if the local CRM has received a TP-PREPARE indication.	
CMSERR - Send_Error	TP-ROLLBACK request (no parameters)
otherwise:	
CMSERR - Send_Error	TP-U-ERROR request (no parameters)

Table 57 (Page 1 of 3). CMSNDM - Send_Mapped_Data

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
if: *send_type* = CM_BUFFER-DATA	
CMSNDM Send_Mapped_Data *buffer* (parameter) *map_name* (parameter)	(See note at end of table.) (TP-DATA request) U-ASE request User-Data local U-ASE routine map routine identifer
if: *send-type* = CM-SEND_AND_FLUSH	
CMSNDM Send_Mapped_Data	(See note at end of table.) (TP-DATA request) U-ASE request User-Data local U-ASE routine map routine identifer
if: *send_type* = CMSEND_AND_DEALLOCATE **and** *deallocate_type* = CM_DEALLOCATE_SYNC_LEVEL **and** *sync_level* = CM_NONE	
CMSNDM Send_Mapped_Data *buffer* (parameter) *map_name* (parameter) false =false	(See note at end of table.) (TP-DATA request) U-ASE request User-Data local U-ASE routine map routine identifier TP-END-DIALOGUE request Confirmation (and TP-END-DIALOGUE indication Confirmation if (TP-END_DIALOGUE or 7P-oABORT indication) has not been processed)
if: *send_type* = CMSEND_AND_DEALLOCATE **and** *deallocate_type* = CM_DEALLOCATE_SYNC_LEVEL **and** *sync_level* = CM_SYNC_POINT_NO_CONFIRM **and** *transaction_control* = CM_UNCHANGED_TRANSACTIONS **and***(begin_transaction* = CM_BEGIN_IMPLICIT **and** it is the first activity on the conversation following the current transaction)	
CMSNDM Send_Mapped_Data *buffer* (parameter) *map_name* (parameter)	(See note at end of table.) TP-BEGIN-TRANSACTION request (no parameters) (TP-DATA request) U-ASE request User-Data local U-ASE routine map routine identifier TP-DEFERRED-END-DIALOGUE request
if: *send_type* = CMSEND_AND_DEALLOCATE **and** *deallocate_type* = CM_DEALLOCATE_SYNC_LEVEL **and** *sync_level* = CM_SYNC_POINT_NO_CONFIRM **and** *((transaction_control* = CM_UNCHAINED_TRANSACTIONS **and not** *(begin_transaction* = CM_BEGIN_IMPLICIT **and**it is the first activity on the conversation following the start of the current transaction)) or *transaction_control* = CM_CHAINED_TRANSACTIONS) **and** the conversation is included in a transaction.	
CMSNDM Send_Mapped_Data *buffer* (parameter) *map_name* (parameter)	(See note at end of table.) (TP-DATA request) U-ASE request User-Data local U-ASE routine map routine identifier TP-DEFERRED-END-DIALOGUE request (no parameters)

1 *Table 57 (Page 2 of 3). CMSNDM - Send_Mapped_Data*

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
if: *send_type* = CMSEND_AND_DEALLOCATE **and** *deallocate_type* = CM_DEALLOCATE_SYNC_LEVEL **and** *sync_level* = CM_SYNC_POINT_NO_CONFIRM **and** *((transaction_control* = CM_UNCHAINED_TRANSACTIONS **and not** *(begin_transaction* = CM_BEGIN_IMPLICIT **and**it is the first activity on the conversation following the start of the current transaction)) or *transaction_control* = CM_CHAINED_TRANSACTIONS) **and** the conversation is **not** included in a transaction.	
CMSNDM Send_Mapped_Data *buffer* (parameter) *map_name* (parameter) false false	(See nte at end of table.) (TP-DATA request) U-ASE request User-Data local U-ASE routine map routine identifier TP-END-DIALOGUE request Confirmation (and TP-END-DIALOGUE indication Confirmation **if** (TP-END-DIALOGUE or TP-o-ABORT indication) has not ben processed)
if: *send_type* = CM_SEND_AND_DEALLOCATE **and** *deallocate_type* = CMDEALLOCATE_FLUSH	
CMSNDM Send_Mapped_Data *buffer* (parameter) *map_name* (parameter) =false =false	(See nte at end of table.) (TP-DATA request) U-ASE request User-Data local U-ASE routine map routine identifier TP-END-DIALOGUE request Confirmation (and TP-END-DIALOGUE indication Confirmation **if** (TP-END-DIALOGUE or TP-o-ABORT indication) has not ben processed)
if.: *send_type* = CM_SEND_AND_DEALLOCATE **and** *deallocate_type* = CM_DEALLOCATE_CONFIRM	
CMSNDM Send_Mapped_Data *buffer* (parameter) *map_name* (parameter) =true	(See note at end of table.) (TP-DATA request) U-ASE request User-Data local U-ASE routine map routine identifier if no collision with CM_ERROR_* OR (OK,(*JT)) **or** (OK,(O,CD)) TP-END-DIALOGUE REQUEST CONFIRMATION **otherwise** RETURN, RESPECTIVELY. CM_DEALLOC_CONFIRM_REJECT (S), OR TP_U_ABORT REQUEST (ROLLBACK = TRUE). CM_DEALLOCATED_ABEND.BEGIN_TRANSACTION_COLLISION (RI AND CM_DEALLOCATED_ABEND.BEGIN_TRANSACTION_COLLISION (S). OR TP-U-ABORT REQUEST (ROLLBACK = FALSE). CM_DEALLOCATED_ABEND DEALLOCATE_CONFIRM_COLLISION (R) AND CM_DEALLOCATED_ABEND.DEALLOC_CONFIRM_COLLISION (S) IF COLLISION RESULTS IN A RETURN CODE TO THE RECEIVE CALL. REPLACE THE *status_received* VALUE THAT CAUSED THE COLLISION.
if: *send_type* = CM_SEND_AND_DEALLOCATE **and** *deallocate* = CM_DEALLOCATE_ABEND	

CMSNDM Send_Mapped_Data	(See note at end of table.)
buffer (parameter)	(TP-DATA request) U-ASE request
map_name (parameter)	.br
	User-Data
log_data (characteristic)	local U-ASE routine map routine identifier
	TP-U-ABORT request
	User-Data

Note: **if** confirmation = true on TP-BEGIN-DIALOGUE indication
and it is the first activity on the conversation following Accept_Conversation or Accept_Incoming
then the identified OSI TP Service primitive will be preceded by TP-BEGIN-DIALOGUE response
(Result = accepted and User-Data
= *initialization_data* (characteristic)

Mapping OSI TP Services to CPI-C for Half-Duplex Conversations

The following tables present the complete mapping from the OSI TP services to CPI-C for half-duplex conversations.

The following conventions are used within the tables in this section:

-	The parameter is not applicable because of other parameter settings.
*****	The parameter is not directly supported by CPI-C.
=xxx	The value "xxx" is expected by CPI-C.

Table 58 (Page 1 of 2). Mapping OSI TP Services to CPI-C Calls, Parameters, and Conversation Characteristics

OSI TP Service Parameters	CPI-C Calls, Parameters, and Characteristics
(TP-DATA indication) UD-TRANSFER indication	Completes an outstanding CMRCV - Receive. (TP-DATA indication) U-ASE indication Completes an outstanding CMRCVM - Receive_Mapped_Data and sets *map_name*.
TP-BEGIN-DIALOGUE indication (See Table 59 on page 524 for details.)	Completes an outstanding CMACCP - Accept_Conversation CMACCI - Accept_Incoming and maps to conversation characteristics.
TP-BEGIN-DIALOGUE confirm (See Table 60 on page 524 for details.)	Completes an outstanding CMRCV - Receive CMRCVM - Receive_Mapped_Data and maps to *control_information_received* values.
TP-END-DIALOGUE indication (See Table 61 on page 525 for details.)	Completes an outstanding CMRCV - Receive CMRCVM - Receive_Mapped_Data and maps to *status_received* or *return_code* values.
TP-END-DIALOGUE confirm (no parameters)	Completes an outstanding CMSEND - Send_Data CMSNDM - Send_Mapped_Data CMDEAL - Deallocate and maps to *return_code* = CM_OK.
TP-U-ERROR indication (no parameters)	Completes an outstanding CMCFM - Confirm CMDEAL - Deallocate CMDFDE - Deferred_Deallocate CMINCL - Include_Partner_In_Transaction CMPREP - Prepare CMPTR - Prepare_To_Receive CMRCV - Receive CMRCVM - Receive_Mapped_Data CMSEND - Send_Data CMSNDM - Send_Mapped_Data CMSERR - Send_Error and maps to *return_code* = CM_PROGRAM_ERROR_PURGING.
TP-U-ABORT indication (See Table 62 on page 525 for details.)	Completes an outstanding CMRCV - Receive and maps to *return_code* values. CMRCVM - Receive_Mapped_Data
TP-P-ABORT indication (See Table 63 on page 526 for details.)	Completes an outstanding CMRCV - Receive CMRCVM - Receive_Mapped_Data and maps to *return_code* values.

Table 58 (Page 2 of 2). Mapping OSI TP Services to CPI-C Calls, Parameters, and Conversation Characteristics

OSI TP Service Parameters	CPI-C Calls, Parameters, and Characteristics
TP-GRANT-CONTROL indication (no parameters)	Completes an outstanding CMRCV - Receive CMRCVM - Receive_Mapped_Data and maps to *status_received* = CM_SEND_RECEIVED.
TP-REQUEST-CONTROL indication (no parameters)	Maps to *control_information_received* = CM_REQ_TO_SEND_RECEIVED.
TP-HANDSHAKE indication (no parameters)	Completes an outstanding CMRCV - Receive CMRCVM - Receive_Mapped_Data and maps to *status_received* = CM_CONFIRM_RECEIVED.
TP-HANDSHAKE confirm (no parameters)	Completes an outstanding CMCFM - Confirm CMSEND - Send_Data CMSNDM - Send_Mapped_Data and maps to *return_code* = CM_OK.
TP-HANDSHAKE-AND-GRANT-CONTROL indication (no parameters)	Completes an outstanding CMRCV - Receive CMRCVM - Receive_Mapped_Data and maps to *status_received* = CM_CONFIRM_SEND_RECEIVED.
TP-HANDSHAKE-AND-GRANT-CONTROL confirm (no parameters)	Completes an outstanding CMPTR - Prepare_To_Receive CMSEND - Send_Data CMSNDM - Send_Mapped_Data and maps to *return_code* = CM_OK.
TP-BEGIN-TRANSACTION indication (no parameters)	Completes an outstanding CMRCV - Receive CMRCVM - Receive_Mapped_Data and maps to *status_received* = CM_JOIN_TRANSACTION.
TP-DEFERRED-END-DIALOGUE indication (See Table 64 on page 526 for details.)	Maps to *status_received* values.
TP-DEFERRED-GRANT-CONTROL indication (See Table 64 on page 526 for details.)	Maps to *status_received* values.
TP-PREPARE indication (See Table 64 on page 526 for details.)	Completes an outstanding CMRCV - Receive CMRCVM - Receive_Mapped_Data and maps to *status_received* values.
TP-READY indication (no parameters)	Completes an outstanding CMRCV - Receive CMRCVM - Receive_Mapped_Data and maps to *status_received* = CM_PREPARE_OK.
TP-COMMIT indication	(Handled by a resource recovery component.)
TP-COMMIT-COMPLETE indication	(Handled by a resource recovery component.)
TP-ROLLBACK indication (no parameters)	Maps to *return_code* = CM_TAKE_BACKOUT.
TP-ROLLBACK-COMPLETE indication	(Handled by a resource recovery component.)
TP-HEURISTIC-REPORT indication	(Handled by a resource recovery component.)

Table 59. TP-BEGIN-DIALOGUE indication Mapping

OSI TP Service Parameters	CPI-C Calls, Parameters, and Characteristics
TP-BEGIN-DIALOGUE indication	Maps to conversation characteristics:
Initiating-AP-Title	*AP_title* (characteristic)
Initiating-API-Identifier	*
Initiating-AE-Qualifier	*AE_qualifier* (characteristic)
Initiating-AEI-Identifier	*
Recipient-TPSU-Title	*TP_name* (characteristic)
Functional-Units	*transaction_control* (characteristic), *send_receive_mode*, and *sync_level*
Begin-Transaction	
true	Completes an outstanding CMRCV - Receive and maps to status_received = CM_JOIN_TRANSACTION (also available through a resource recovery interface)
false	*(through a resource recovery interface)
Confirmation	*(confirmation is implicit)
User-Data	*initialization_data* (characteristic)

Table 60 (Page 1 of 2). TP-BEGIN-DIALOGUE confirm Mapping

OSI TP Service Parameters	CPI-C Calls, Parameters, and Characteristics
if: Result = accepted **and** User-Data is not present	
TP-BEGIN-DIALOGUE confirm	Maps to *control_information_received* = CM_ALLOCATE_CONFIRMED.
Functional-Units	*
Diagnostic	-
Rollback	-
User-Data	-
if: Result = accepted **and** User-Data is present	
TP-BEGIN-DIALOGUE confirm	Maps to *control_information_received* = CM_ALLOCATE_CONFIRMED_WITH_DATA.
Functional-Units	*
Diagnostic	-
Rollback	-
User-Data	*initialization_data* (characteristic)
if: Result = rejected(user) **and** User-Data is not present	
TP-BEGIN-DIALOGUE confirm	Maps to *return_code* values.
Functional-Units	*
Diagnostic	-
Rollback	
true	CM_DEALLOCATED_ABEND_BO
false	CM_DEALLOCATED_ABEND
User-Data	*initialization_data* (characteristic)
if: Result = rejected(user) **and** User-Data is present	
TP-BEGIN-DIALOGUE confirm	Maps to *control_information_received* = CM_ALLOCATE_REJECTED_WITH_DATA.
Functional-Units	*
Diagnostic	-
Rollback	-
User-Data	*initialization_data* (characteristic)
	Note: CM_DEALLOCATED_ABEND will be returned to the next call.

Table 60 (Page 2 of 2). TP-BEGIN-DIALOGUE confirm Mapping

OSI TP Service Parameters	CPI-C Calls, Parameters, and Characteristics
if: Result = rejected(provider) **and** Rollback = true	
TP-BEGIN-DIALOGUE confirm	Maps to *return_code* values.
Functional-Units	*
Diagnostic	
recipient-unknown	CM_RESOURCE_FAIL_NO_RETRY_BO
recipient-tpsu-title-unknown	CM_TPN_NOT_RECOGNIZED
tpsu-not-available(permanent)	CM_TP_NOT_AVAILABLE_NO_RETRY
tpsu-not-available(transient)	CM_TP_NOT_AVAILABLE_RETRY
recipient-tpsu-title-required	CM_TPN_NOT_RECOGNIZED
functional-unit-not-supported	CM_SYNC_LVL_NOT_SUPPORTED_SYS
functional-unit-combination-not-supported	CM_SYNC_LVL_NOT_SUPPORTED_SYS
no-reason-given	CM_RESOURCE_FAIL_NO_RETRY_BO
User-Data	*initialization_data* (characteristic)
if: Result = rejected(provider) **and** Rollback = false	
TP-BEGIN-DIALOGUE confirm	Maps to *return_code* values.
Functional-Units	*
Diagnostic	
recipient-unknown	CM_RESOURCE_FAILURE_NO_RETRY
recipient-tpsu-title-unknown	CM_TPN_NOT_RECOGNIZED
tpsu-not-available(permanent)	CM_TP_NOT_AVAILABLE_NO_RETRY
tpsu-not-available(transient)	CM_TP_NOT_AVAILABLE_RETRY
recipient-tpsu-title-required	CM_TPN_NOT_RECOGNIZED
functional-unit-not-supported	CM_SYNC_LVL_NOT_SUPPORTED_SYS
functional-unit-combination-not-supported	CM_SYNC_LVL_NOT_SUPPORTED_SYS
no-reason-given	CM_RESOURCE_FAILURE_NO_RETRY
User-Data	*initialization_data* (characteristic)

Table 61. TP-END-DIALOGUE indication Mapping

OSI TP Service Parameters	CPI-C Calls, Parameters, and Characteristics
if: Confirmation = true	
TP-END-DIALOGUE indication (no parameters)	*status_received* = CM_CONFIRM_DEALLOCATE_RECEIVED
if: Confirmation = false	
TP-END-DIALOGUE indication (no parameters)	*return_code* = CM_DEALLOCATED_NORMAL

Table 62. TP-U-ABORT indication Mapping

OSI TP Service Parameters	CPI-C Calls, Parameters, and Characteristics
if: Rollback = true	
TP-U-ABORT indication User_Data	*return_code* = CM_DEALLOCATED_ABEND_BO *log_data* (characteristic)
if: Rollback = false	
TP-U-ABORT indication User_Data	*return_code* = CM_DEALLOCATED_ABEND *log_data* (characteristic)

Table 63. TP-P-ABORT indication Mapping

OSI TP Service Parameters	CPI-C Calls, Parameters, and Characteristics
if: Rollback = true	
TP-P-ABORT indication	Maps to *return_code* values:
Diagnostic	
permanent-failure	CM_RESOURCE_FAIL_NO_RETRY_BO
transient-failure	CM_RESOURCE_FAILURE_RETRY_BO
protocol-error	CM_RESOURCE_FAIL_NO_RETRY_BO
begin-transaction-reject	*
end-dialogue-collision	*
begin-transaction-end-dialogue-collision	*
if: Rollback = false	
TP-P-ABORT indication	Maps to *return_code* values:
Diagnostic	
permanent-failure	CM_RESOURCE_FAILURE_NO_RETRY
transient-failure	CM_RESOURCE_FAILURE_RETRY
protocol-error	CM_RESOURCE_FAILURE_NO_RETRY
begin-transaction-reject	*
end-dialogue-collision	*
begin-transaction-end-dialogue-collision	*

Table 64. TP-DEFERRED-END-DIALOGUE, TP-DEFERRED-GRANT-CONTROL, and TP-PREPARE indication Mapping

OSI TP Service Parameters	CPI-C Calls, Parameters, and Characteristics
if: a TP-DEFERRED-END-DIALOGUE indication has been received	
TP-PREPARE indication	Maps to *status_received* values:
Data-Permitted	
false	CM_TAKE_COMMIT_DEALLOCATE
true	CM_TAKE_COMMIT_DEALLOCATE_DATA_OK
if: a TP-DEFERRED-END-DIALOGUE indication has NOT been received **and** a TP-DEFERRED-GRANT-CONTROL indication has been received	
TP-PREPARE indication	Maps to *status_received* values:
Data-Permitted	
false	CM_TAKE_COMMIT_SEND
true	CM_TAKE_COMMIT_SEND_DATA_OK
if: a TP-DEFERRED-END-DIALOGUE indication has NOT been received **and** a TP-DEFERRED-GRANT-CONTROL indication has NOT been received	
TP-PREPARE indication	Maps to *status_received* values:
Data-Permitted	
false	CM_TAKE_COMMIT
true	CM_TAKE_COMMIT_DATA_OK

Sequencing Rules and State Tables

The sequencing rules and state tables for the CPI-C ASE are contained in Appendix C, “State Tables” on page 463.

CPI-C ASE Protocol Definition

There are no additional protocol definitions required by the CPI-C ASE beyond those defined in ISO/IEC 10026, Parts 1 - 3.

CPI-C ASE Structure and Encoding of APDUs

There are no additional APDUs required by the CPI-C ASE beyond those defined in ISO/IEC 10026, Parts 1 - 3.

CPI Communications and OSI TP CRMs for Full-Duplex Conversations

This section summarizes the CPI-C application service element (ASE) services, maps the services both to and from the OSI TP services, and defines the sequencing rules and state table for CPI-C use by OSI TP programs using full-duplex (FDX) conversations.

The CPI Communications calls have been mapped to the OSI TP services described in ISO/IEC 10026-2, *Information Technology — Open Systems Interconnection — Distributed Transaction Processing — Part 2: OSI TP Service Definition*.

This section is intended for programmers who are familiar with OSI TP.

The following conventions are used within the tables in this section:

*****	The parameter is not directly supported by CPI-C.
=xxx	The value "xxx" is always used.
(R)	The return code is returned on the Receive call.
(S)	The return code is returned on calls associated with the Send queue.

The abbreviations for *status_received* and return code values used in this mapping are given in “Return Code Values [ ]” on page 483 and “data_received and status_received { , }” on page 486, respectively.

Table 65 (Page 1 of 2). Mapping CPI-C Calls on Full-Duplex Conversations to OSI TP Services

CPI-C Call	OSI TP Service
CMALLC - Allocate (See Table 66 on page 528 for details.)	TP-BEGIN-DIALOGUE request
CMCANC - Cancel_Conversation (See Table 67 on page 529 for details.)	TP-BEGIN-DIALOGUE response TP-U-ABORT request
CMCFMD - Confirmed (See Table 68 on page 530 for details.)	TP-END-DIALOGUE response
CMDEAL - Deallocate (See Table 69 on page 531 for details.)	TP-END-DIALOGUE request TP-DEFERRED-END-DIALOGUE request TP-BEGIN-DIALOGUE response TP-U-ABORT request
CMDFDE - Deferred_Deallocate (See Table 70 on page 532 for details.)	TP-DEFERRED-END-DIALOGUE request
CMINCL - Include_Partner_In_Transaction (See Table 71 on page 532 for details.)	TP-BEGIN-TRANSACTION request

Table 65 (Page 2 of 2). Mapping CPI-C Calls on Full-Duplex Conversations to OSI TP Services

CPI-C Call	OSI TP Service
CMPREP - Prepare (See Table 72 on page 532 for details.)	TP-BEGIN-TRANSACTION request TP-PREPARE request
CMRCV - Receive (See Table 73 on page 533 for details.)	TP-BEGIN-DIALOGUE response TP-BEGIN-TRANSACTION request
CMRCVM - Receive_Mapped_Data (See Table 54 on page 515 for details.)	TP-BEGIN-DIALOGUE response TP-BEGIN-TRANSACTION request
CMSEND - Send_Data (See Table 74 on page 533 for details.)	TP-BEGIN-DIALOGUE response TP-BEGIN-TRANSACTION request (TP-DATA request) UD-TRANSFER request TP-END-DIALOGUE request TP-DEFERRED-END-DIALOGUE request TP-U-ABORT request
CMSERR - Send_Error (See Table 75 on page 535 for details.)	TP-BEGIN-DIALOGUE response TP-BEGIN-TRANSACTION request TP-U-ERROR request
CMSNDM - Send_Mapped_Data (See Table 57 on page 519 for details)	TP-BEGIN-DIALOGUE response TP-BEGIN-TRANSACTION request (TP-DATA request) UD-TRANSFER request TP-END-DIALOGUE request TP-DEFERRED-END-DIALOGUE request TP-U-ABORT request

The following OSI TP services are not directly mapped to from the CPI-C calls:

TP-COMMIT request is supported through a resource recovery interface.
TP-DONE request is not externalized to the application program.
TP-ROLLBACK request is supported through a resource recovery interface.

Table 66 (Page 1 of 2). CMALLC - Allocate Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
if: *sync_level* = CM_NONE	
CMALLC - Allocate	TP-BEGIN-DIALOGUE request
*	Initiating-TPSU-Title
AP_title (characteristic)	Recipient-AP-Title
*	Recipient-API-Identifier
AE_qualifier (characteristic)	Recipient-AE-Qualifier
*	Recipient-AEI-Identifier
TP_name (characteristic)	Recipient-TPSU-Title
=Dialogue and Shared	Functional-Units
mode_name (characteristic)	Quality-of-Service
application_context_name (characteristic)	Application-Context-Name
n/a	Begin-Transaction
allocate_confirm (characteristic)	Confirmation
initialization_data (characteristic)	User-Data

if: *sync_level* = CM_SYNC_POINT_NO_CONFIRM
and *transaction_control* = CM_CHAINED_TRANSACTIONS

Table 66 (Page 2 of 2). CMALLC - Allocate Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
CMALLC - Allocate	TP-BEGIN-DIALOGUE request
*	Initiating-TPSU-Title
AP_title (characteristic)	Recipient-AP-Title
*	Recipient-API-Identifier
AE_qualifier (characteristic)	Recipient-AE-Qualifier
*	Recipient-AEI-Identifier
TP_name (characteristic)	Recipient-TPSU-Title
=Dialogue, Shared, Commit and Chained Transactions	Functional-Units
mode_name (characteristic)	Quality-of-Service
application_context_name (characteristic)	Application-Context-Name
n/a	Begin-Transaction
allocate_confirm (characteristic)	Confirmation
initialization_data (characteristic)	User-Data
if: *sync_level* = CM_SYNC_POINT_NO_CONFIRM **and** *transaction_control* = CM_UNCHAINED_TRANSACTIONS	
CMALLC - Allocate	TP-BEGIN-DIALOGUE request
*	Initiating-TPSU-Title
AP_title (characteristic)	Recipient-AP-Title
*	Recipient-API-Identifier
AE_qualifier (characteristic)	Recipient-AE-Qualifier
*	Recipient-AEI-Identifier
TP_name (characteristic)	Recipient-TPSU-Title
=Dialogue, Shared, Commit, and Unchained Transactions	Functional-Units
mode_name (characteristic)	Quality-of-Service
application_context_name (characteristic)	Application-Context-Name
begin_transaction (characteristic)	Begin-Transaction (See note at end of table.)
allocate_confirm (characteristic)	Confirmation
initialization_data (characteristic)	User-Data

Note: **if** *begin_transaction* = CM_BEGIN_IMPLICIT
and *transaction_control* = CM_UNCHAINED_TRANSACTIONS
and the conversation's context is in transaction
then Begin-Transaction is set to true;
otherwise, Begin-Transaction is set to false.

Table 67. CMCANC - Cancel_Conversation Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
if: Confirmation = true on TP-BEGIN-DIALOGUE indication **and** it is the first activity on the conversation following Accept_Conversation or Accept_Incoming	
CMCANC - Cancel_Conversation	TP-BEGIN-DIALOGUE response
= rejected(user)	Result
initialization_data (characteristic)	User-Data
otherwise:	
CMCANC - Cancel_Conversation	TP-U-ABORT request
=null	User-Data

Table 68. CMCFMD - Confirmed Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
if in response to: *status_received* = CM_CONFIRM_DEALLOC_RECEIVED	
CMCFMD - Confirmed	TP-END-DIALOGUE response (no parameters)

Table 69 (Page 1 of 2). CMDEAL - Deallocate Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
if: *deallocate_type* = CM_DEALLOCATE_SYNC_LEVEL **and** *sync_level* = CM_NONE	
CMDEAL - Deallocate =false =false	(See note at end of table.) TP-END-DIALOGUE request Confirmation (and TP-END-DIALOGUE indication Confirmation **if** (TP-END-DIALOGUE or TP-*-ABORT indication) has not been processed)
if: *deallocate_type* = CM_DEALLOCATE_SYNC_LEVEL **and** *sync_level* = CM_SYNC_POINT_NO_CONFIRM **and** (*transaction_control* = CM_CHAINED_TRANSACTIONS **or** (*transaction_control* = CM_UNCHAINED_TRANSACTIONS **and** conversation is included in a transaction))	
CMDEAL - Deallocate	(See note at end of table.) TP-DEFERRED-END-DIALOGUE request (no parameters)
if: *deallocate_type* = CM_DEALLOCATE_SYNC_LEVEL **and** *sync_level* = CM_SYNC_POINT_NO_CONFIRM **and NOT** (*transaction_control* = CM_CHAINED_TRANSACTIONS **or** (*transaction_control* = CM_UNCHAINED_TRANSACTIONS **and** conversation is included in a transaction))	
CMDEAL - Deallocate =false =false	(See note at end of table.) TP-END-DIALOGUE request Confirmation (and TP-END-DIALOGUE indication Confirmation **if** (TP-END-DIALOGUE or TP-*-ABORT indication) has not been processed)
if: *deallocate_type* = CM_DEALLOCATE_FLUSH	
CMDEAL - Deallocate =false =false	(See note at end of table.) TP-END-DIALOGUE request Confirmation (and TP-END-DIALOGUE indication Confirmation **if** (TP-END-DIALOGUE or TP-*-ABORT indication) has not been processed)
if: *deallocate_type* = CM_DEALLOCATE_CONFIRM	
CMDEAL - Deallocate =true	(See note at end of table.) **if** no collision with cm_error_* **or** (ok,(*,jt)) **or** (ok,(*,cd)) TP-END-DIALOGUE request Confirmation **otherwise** return, respectively, CM_DEALLOC_CONFIRM_REJECT (S), **or** TP-U-ABORT request (Rollback = true), CM_DEALLOCATED_ABEND.begin_transaction_collision (R) and CM_DEALLOCATED_ABEND.begin_transaction_collision (S), **or** TP-U-ABORT request (Rollback = false), CM_DEALLOCATED_ABEND.dealloc_confirm_collision (R) and CM_DEALLOCATED_ABEND.dealloc_confirm_collision (S). If collision results in a return code on the Receive call, replace the status_received value that caused the collision.
if: *deallocate_type* = CM_DEALLOCATE_ABEND **and** it is the first activity on the conversation following Accept_Conversation or Accept_Incoming	
CMDEAL - Deallocate =rejected(user) *initialization_data* (characteristic)	TP-BEGIN-DIALOGUE response Result User-Data

Table 69 (Page 2 of 2). CMDEAL - Deallocate Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
if: *deallocate_type* = CM_DEALLOCATE_ABEND **and** it is not the first activity on the conversation following Accept_Conversation or Accept_Incoming	
CMDEAL - Deallocate *log_data* (characteristic)	TP-U-ABORT request User-Data
Note: if Confirmation = true on TP-BEGIN-DIALOGUE indication **and** it is the first activity on the conversation following Accept_Conversation or Accept_Incoming **then** the identified OSI TP Service primitive will be preceded by TP-BEGIN-DIALOGUE response (Result = accepted and User-Data = *initialization_data* (characteristic)).	

Table 70. CMDFDE - Deferred_Deallocate Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
CMDFDE - Deferred_Deallocate	TP-DEFERRED-END-DIALOGUE request (no parameters)

Table 71. CMINCL - Include_Partner_In_Transaction Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
CMINCL - Include_Partner_In_Transaction	TP-BEGIN-TRANSACTION request (no parameters) if no collision with (ok,(*,dc)); **otherwise** return CM_DEALLOCATED_ABEND_BO.dealloc_confirm_collision (R), instead of (ok,(*,dc)), or CM_DEALLOCATED_ABEND_BO.dealloc_confirm_collision (S), and send TP-U-ABORT request (Rollback = false).

Table 72. CMPREP - Prepare Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
if: *sync_level* = CM_SYNC_POINT_NO_CONFIRM **and** *transaction_control* = CM_UNCHAINED_TRANSACTIONS **and** *begin_transaction* = CM_BEGIN_IMPLICIT **and** it is the first activity on the conversation following the start of the current transaction	
CMPREP - Prepare *prepare_data_permitted* (characteristic)	TP-BEGIN-TRANSACTION request (no parameters) TP-PREPARE request Data-Permitted
if: *sync_level* = CM_SYNC_POINT_NO_CONFIRM **and not** (*transaction_control* = CM_UNCHAINED_TRANSACTIONS **and** *begin_transaction* = CM_BEGIN_IMPLICIT **and** it is the first activity on the conversation following the start of the current transaction)	
CMPREP - Prepare *prepare_data_permitted* (characteristic)	TP-PREPARE request Data-Permitted

Table 73. CMRCV - Receive

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
if: Confirmation = true on TP-BEGIN-DIALOGUE indication **and** it is the first activity on the conversation following Accept_Conversation or Accept_Incoming	
CMRCV - Receive = accepted *initialization_data* (characteristic)	TP-BEGIN-DIALOGUE response Result User-Data
if: *sync_level* = CM_SYNC_POINT_NO_CONFIRM **and** *transaction_control* = CM_UNCHAINED_TRANSACTIONS **and** *begin_transaction* = CM_BEGIN_IMPLICIT **and** it is the first activity on the conversation following the start of the current transaction	
CMRCV - Receive	TP-BEGIN-TRANSACTION request (no parameters)

Table 74 (Page 1 of 2). CMSEND - Send_Data Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
if: *send_type* = CM_BUFFER_DATA	
CMSEND - Send_Data *buffer* (parameter)	(See notes 1 and 2 at end of table.) (TP-DATA request) UD-TRANSFER request User-Data
if: *send_type* = CM_SEND_AND_FLUSH	
CMSEND - Send_Data *buffer* (parameter)	(See notes 1 and 2 at end of table.) (TP-DATA request) UD-TRANSFER request User-Data
if: *send_type* = CM_SEND_AND_DEALLOCATE **and** *deallocate_type* = CM_DEALLOCATE_SYNC_LEVEL **and** *sync_level* = CM_NONE	
CMSEND - Send_Data *buffer* (parameter) =false =false	(See note 1 at end of table.) (TP-DATA request) UD-TRANSFER request User-Data TP-END-DIALOGUE request Confirmation (and TP-END-DIALOGUE indication Confirmation **if** (TP-END-DIALOGUE or TP-*-ABORT indication) has not been processed)
if: *send_type* = CM_SEND_AND_DEALLOCATE **and** *deallocate_type* = CM_DEALLOCATE_SYNC_LEVEL **and** *sync_level* = CM_SYNC_POINT_NO_CONFIRM **and** the conversation is included in the current transaction	
CMSEND - Send_Data *buffer* (parameter)	(See notes 1 and 2 at end of table.) (TP-DATA request) UD-TRANSFER request User-Data TP-DEFERRED-END-DIALOGUE request (no parameters)
if: *send_type* = CM_SEND_AND_DEALLOCATE **and** *deallocate_type* = CM_DEALLOCATE_SYNC_LEVEL **and** *sync_level* = CM_SYNC_POINT_NO_CONFIRM **and** *transaction_control* = CM_UNCHAINED_TRANSACTIONS **and** the conversation is **not** currently included in a transaction	

Table 74 (Page 2 of 2). CMSEND - Send_Data Mapping

CPI-C Call Parameters and Conversation Characteristics	OSI TP Service Parameters
	(See note 1 at end of table.)
CMSEND - Send_Data	(TP-DATA request) UD-TRANSFER request
buffer (parameter)	User-Data
	TP-END-DIALOGUE request
=false	Confirmation
	(and TP-END-DIALOGUE indication
=false	Confirmation
	if (TP-END-DIALOGUE or TP-*-ABORT indication)
	has not been processed)
if: *send_type* = CM_SEND_AND_DEALLOCATE **and** *deallocate_type* = CM_DEALLOCATE_FLUSH	
	(See note 1 at end of table.)
CMSEND - Send_Data	(TP-DATA request) UD-TRANSFER request
buffer (parameter)	User-Data
	TP-END-DIALOGUE request
=false	Confirmation
	(and TP-END-DIALOGUE indication
=false	Confirmation
	if (TP-END-DIALOGUE or TP-*-ABORT indication)
	has not been processed)
if: *send_type* = CM_SEND_AND_DEALLOCATE **and** *deallocate_type* = CM_DEALLOCATE_CONFIRM	
	(See note 1 at end of table.)
CMSEND - Send_Data	(TP-DATA request) UD-TRANSFER request
buffer (parameter)	User-Data. **if** no collision with CM_ERROR_* **or** (ok,(*,jt)) **or** (ok,(*,cd))
	TP-END-DIALOGUE request
=true	Confirmation
	otherwise return, respectively, CM_DEALLOC_CONFIRM_REJECT (S), **or** TP-U-ABORT request (Rollback = true), CM_DEALLOCATED_ABEND.begin_transaction_collision (R) and CM_DEALLOCATED_ABEND.begin_transaction_collision (S), **or** TP-U-ABORT request (Rollback = false), CM_DEALLOCATED_ABEND.dealloc_confirm_collision (R) and CM_DEALLOCATED_ABEND.dealloc_confirm_collision (S). If collision results in a return code to the Receive call, replace the *status_received* value that caused the collision.
if: *send_type* = CM_SEND_AND_DEALLOCATE **and** *deallocate_type* = CM_DEALLOCATE_ABEND	
	(See notes 1 and 2 at end of table.)
CMSEND - Send_Data	(TP-DATA request) UD-TRANSFER request
buffer (parameter)	User-Data
	TP-U-ABORT request
log_data (characteristic)	User-Data

Notes:

Note 1:
if Confirmation = true on TP-BEGIN-DIALOGUE indication
and it is the first activity on the conversation following Accept_Conversation or Accept_Incoming
then the identified OSI TP Service primitives will be preceded by TP-BEGIN-DIALOGUE response
(Result = accepted and User-Data = *initialization_data* (characteristic)).

Note 2:
if *sync_level* = CM_SYNC_POINT_NO_CONFIRM
and *transaction_control* = CM_UNCHAINED_TRANSACTIONS
and *begin_transaction* = CM_BEGIN_IMPLICIT
and the Send_Data call is the first activity on the conversation following the start of the current transaction
then the identified OSI TP Service primitives are preceded by a TP-BEGIN-TRANSACTION request.

Table 75. CMSERR - Send_Error Mapping

CPI-C Call Parameters and Conversation Characteristics	**OSI TP Service Parameters**
if: Confirmation = true on TP-BEGIN-DIALOGUE indication **and** it is the first activity on the conversation following Accept_Conversation or Accept_Incoming	
CMSERR - Send_Error = accepted *initialization_data* (characteristic)	TP-BEGIN-DIALOGUE response Result User-Data TP-U-ERROR request (no parameters)
if: *sync_level* = CM_SYNC_POINT_NO_CONFIRM **and** *transaction_control* = CM_UNCHAINED_TRANSACTIONS **and** *begin_transaction* = CM_BEGIN_IMPLICIT **and** it is the first activity on the conversation following the start of the current transaction	
CMSERR - Send_Error	TP-BEGIN-TRANSACTION request (no parameters) TP-U-ERROR request (no parameters)
otherwise:	
CMSERR - Send_Error	TP-U-ERROR request (no parameters)

Mapping OSI TP Services to CPI-C for Full-Duplex Conversations

The following tables present the complete mapping from the OSI TP services to CPI-C for full-duplex conversations.

The following conventions are used within the tables in this section:

-	The parameter is not applicable because of other parameter settings.
*	The parameter is not directly supported by CPI-C.
=xxx	The value "xxx" is expected by CPI-C.
(R)	The return code is returned on the Receive call.
(S)	The return code is returned on calls associated with Send queue.
x (R) [+ y (S)]	If x is returned before y, then y need not be returned. If y is returned before x, then x must also be returned.
a.b	"a" is the return code and "b" is the secondary information associated with the return code.

Table 76 (Page 1 of 2). Mapping OSI TP Services to CPI-C Calls, Parameters, and Conversation Characteristics

OSI TP Service	CPI-C Calls, Parameters, and Characteristics
(TP-DATA indication) UD-TRANSFER indication	Completes an outstanding CMRCV - Receive CMRCVM - Receive_Mapped_Data
TP-BEGIN-DIALOGUE indication (See Table 59 on page 524 for details.)	Completes an outstanding CMACCP - Accept_Conversation CMACCI - Accept_Incoming and maps to conversation characteristics.
TP-BEGIN-DIALOGUE confirm (See Table 60 on page 524 for details.)	Completes an outstanding CMRCV - Receive CMRCVM - Receive_Mapped_Data and maps to *control_information_received* values
TP-END-DIALOGUE indication (See Table 61 on page 525 for details.)	Completes an outstanding CMRCV - Receive CMRCVM - Receive_Mapped_Data and maps to status_received or return_code values.
TP-END-DIALOGUE confirm (no parameters)	Completes an outstanding CMSEND - Send_Data CMDEAL - Deallocate and maps to *return_code* = CM_OK (S) and CM_DEALLOCATED_NORMAL (R)
TP-U-ERROR indication (no parameters)	Completes an outstanding CMRCV - Receive CMRCVM - Receive_Mapped_Data CMDEAL - Deallocate(Confirm) and maps to *return_code* = CM_PROGRAM_ERROR_PURGING (R) (**if** CMDEAL - Deallocate(Confirm) is being processed, also maps to CM_DEALLOC_CONFIRM_REJECT (S))
TP-U-ABORT indication (See Table 62 on page 525 for details.)	Completes an outstanding CMRCV - Receive CMRCVM - Receive_Mapped_Data and maps to *return_code* values.

Table 76 (Page 2 of 2). Mapping OSI TP Services to CPI-C Calls, Parameters, and Conversation Characteristics

OSI TP Service	CPI-C Calls, Parameters, and Characteristics
TP-P-ABORT indication (See Table 63 on page 526 for details.)	Completes an outstanding CMRCV - Receive CMRCVM - Receive_Mapped_Data CMDEAL - Deallocate(Confirm) and maps to *return_code* values.
TP-BEGIN-TRANSACTION indication (no parameters)	**If** collision with outstanding CMDEAL(Confirm), **then** completes the outstanding CMDEAL - Deallocate(Confirm) and maps to *return_code*=CM_DEALLOCATED_ABEND.begin_transaction_collision (R) and CM_DEALLOCATED_ABEND.begin_transaction_collision (S) and TP-U-ABORT request (Rollback = true) **else** if *conversation_state* = CM_SEND_RECEIVE_STATE **then** completes an outstanding CMRCV - Receive CMRCVM - Receive_Mapped_Data and maps to *status_received* = CM_JOIN_TRANSACTION
TP-DEFERRED-END-DIALOGUE indication (See Table 64 on page 526 for details.)	Maps to *status_received* values.
TP-PREPARE indication (See Table 64 on page 526 for details.)	Completes an outstanding CMRCV - Receive CMRCVM - Receive_Mapped_Data and maps to *status_received* values.
TP-READY indication (no parameters)	Completes an outstanding CMRCV - Receive CMRCVM - Receive_Mapped_Data and maps to *status_received* = CM_PREPARE_OK.
TP-COMMIT indication	(Handled by a resource recovery component.)
TP-COMMIT-COMPLETE indication	(Handled by a resource recovery component.)
TP-ROLLBACK indication (no parameters)	Maps to *return_code* = CM_TAKE_BACKOUT.
TP-ROLLBACK-COMPLETE indication	(Handled by a resource recovery component.)
TP-HEURISTIC-REPORT indication	(Handled by a resource recovery component.)

Table 77. TP-BEGIN-DIALOGUE indication Mapping

OSI TP Service Parameters	CPI-C Calls, Parameters, and Characteristics
TP-BEGIN-DIALOGUE indication	Maps to conversation characteristics:
Initiating-AP-Title	*AP_title* (characteristic)
Initiating-API-Identifier	*
Initiating-AE-Qualifier	*AE_qualifier* (characteristic)
Initiating-AEI-Identifier	*
Recipient-TPSU-Title	*TP_name* (characteristic)
Functional-Units	*transaction_control* (characteristic), *send_receive_mode*, and *sync_level*
Begin-Transaction	
true	Completes an outstanding CMRCV - Receive and maps to status_received = CM_JOIN_TRANSACTION; (also available through a resource recovery interface)
false	*(through a resource recovery interface)
Confirmation	*(confirmation is implicit)
User-Data	*initialization_data* (characteristic)

Table 78 (Page 1 of 2). TP-BEGIN-DIALOGUE confirm Mapping

OSI TP Service Parameters	CPI-C Calls, Parameters, and Characteristics
if: Result = accepted **and** User-Data is not present	
TP-BEGIN-DIALOGUE confirm	Maps to *control_information_received* = CM_ALLOCATE_CONFIRMED.
Functional-Units	*
Diagnostic	-
Rollback	-
User-Data	-
if: Result = accepted **and** User-Data is present	
TP-BEGIN-DIALOGUE confirm	Maps to *control_information_received* = CM_ALLOCATE_CONFIRMED_WITH_DATA.
Functional-Units	*
Diagnostic	-
Rollback	-
User-Data	*initialization_data* (characteristic)
if: Result = rejected(user) **and** User-Data is not present	
TP-BEGIN-DIALOGUE confirm	Maps to *return_code* values.
Functional-Units	*
Diagnostic	-
Rollback	
true	CM_DEALLOCATED_ABEND_BO (S or R)
false	CM_DEALLOCATED_ABEND (R) [+ CM_DEALLOCATED_ABEND (S)]
User-Data	*initialization_data* (characteristic)
if: Result = rejected(user) **and** User-Data is present	

Table 78 (Page 2 of 2). TP-BEGIN-DIALOGUE confirm Mapping

OSI TP Service Parameters	CPI-C Calls, Parameters, and Characteristics
TP-BEGIN-DIALOGUE confirm	Maps to *control_information_received* = CM_ALLOCATE_REJECTED_WITH_DATA
Functional-Units	*
Diagnostic	-
Rollback	-
User-Data	*initialization_data* (characteristic) **Note:** CM_DEALLOCATED_ABEND will be returned to the next call.
if: Result = rejected(provider) **and** Rollback = true	
TP-BEGIN-DIALOGUE confirm	Maps to *return_code* values.
Functional-Units	*
Diagnostic	
recipient-unknown	CM_RESOURCE_FAIL_NO_RETRY_BO (S or R)
recipient-tpsu-title-unknown	CM_TPN_NOT_RECOGNIZED (R) [+ CM_ALLOCATION_ERROR (S)]
tpsu-not-available(permanent)	CM_TP_NOT_AVAILABLE_NO_RETRY (R) [+ CM_ALLOCATION_ERROR (S)]
tpsu-not-available(transient)	CM_TP_NOT_AVAILABLE_RETRY (R) [+ CM_ALLOCATION_ERROR (S)]
recipient-tpsu-title-required	CM_TPN_NOT_RECOGNIZED (R) [+ CM_ALLOCATION_ERROR (S)]
functional-unit-not-supported	CM_SYNC_LEVEL_NOT_SUPPORTED_SYS (R) or CM_SEND_RECEIVE_MODE_NOT_SUPPORTED (R), [+ CM_ALLOCATION_ERROR (S)]
functional-unit-combo-not-supported	CM_SYNC_LEVEL_NOT_SUPPORTED_SYS (R) and/or CM_SEND_RECEIVE_MODE_NOT_SUPPORTED (R), [+ CM_ALLOCATION_ERROR (S)]
no-reason-given	CM_RESOURCE_FAIL_NO_RETRY_BO (S or R)
User-Data	-
if: Result = rejected(provider) **and** Rollback = false	
TP-BEGIN-DIALOGUE confirm	Maps to *return_code* values.
Functional-Units	*
Diagnostic	
recipient-unknown	CM_RESOURCE_FAILURE_NO_RETRY (R) [+ CM_RESOURCE_FAILURE_NO_RETRY (S)]
recipient-tpsu-title-unknown	CM_TPN_NOT_RECOGNIZED (R) [+ CM_ALLOCATION_ERROR (S)]
tpsu-not-available(permanent)	CM_TP_NOT_AVAILABLE_NO_RETRY (R) [+ CM_ALLOCATION_ERROR(S)]
tpsu-not-available(transient)	CM_TP_NOT_AVAILABLE_RETRY (R) [+ CM_ALLOCATION_ERROR (S)]
recipient-tpsu-title-required	CM_TPN_NOT_RECOGNIZED (R) [+ CM_ALLOCATION_ERROR (S)]
functional-unit-not-supported	CM_SYNC_LEVEL_NOT_SUPPORTED_SYS (R) or CM_SEND_RECEIVE_MODE_NOT_SUPPORTED (R), [+ CM_ALLOCATION_ERROR (S)]
functional-unit-combo-not-supported	CM_SYNC_LEVEL_NOT_SUPPORTED_SYS (R) and/or CM_SEND_RECEIVE_MODE_NOT_SUPPORTED (R), [+ CM_ALLOCATION_ERROR (S)]
no-reason-given	CM_RESOURCE_FAILURE_NO_RETRY (R) [+ CM_RESOURCE_FAILURE_NO_RETRY (S)]
User-Data	-

Table 79. TP-END-DIALOGUE indication Mapping

OSI TP Service Parameters	CPI-C Calls, Parameters, and Characteristics
if: Confirmation = true	
TP-END-DIALOGUE indication	**if** no collision with CMSERR **or** CMDEAL(C) **or** CMINCL, *status_received* = CM_CONFIRM_DEALLOCATE_RECEIVED **otherwise**, respectively, no-op **or** CM_DEALLOCATED_ABEND.dealloc_confirm_collision (R) [+ CM_DEALLOCATED_ABEND.dealloc_confirm_collision (S)], and TP-U-ABORT request (Rollback = false) **or** CM_DEALLOCATED_ABEND_BO.dealloc_confirm_collision (S or R) and TP-U-ABORT request (Rollback = false).
(no parameters)	
if: Confirmation = false	
TP-END-DIALOGUE indication	*return_code* = CM_DEALLOCATED_NORMAL (R) [+ CM_DEALLOCATED_NORMAL (S)]
(no parameters)	

Table 80. TP-U-ABORT indication Mapping

OSI TP Service Parameters	CPI-C Calls, Parameters, and Characteristics
if: Rollback = true	
TP-U-ABORT indication	*return_code* = CM_DEALLOCATED_ABEND_BO (S or R)
User-Data	*log_data* (characteristic)
if: Rollback = false	
TP-U-ABORT indication	*return_code* = CM_DEALLOCATED_ABEND (R) [+ CM_DEALLOCATED_ABEND (S)]
User-Data	*log_data* (characteristic)

Table 81. TP-P-ABORT indication Mapping

OSI TP Service Parameters	CPI-C Calls, Parameters, and Characteristics
if: Rollback = true	
TP-P-ABORT indication	Maps to *return_code* values:
Diagnostic	
permanent-failure	CM_RESOURCE_FAIL_NO_RETRY_BO (S or R)
transient-failure	CM_RESOURCE_FAILURE_RETRY_BO (S or R)
protocol-error	CM_RESOURCE_FAIL_NO_RETRY_BO (S or R)
begin-transaction-reject	CM_INCLUDE_PARTNER_REJECTED_BO (S or R)
end-dialogue-collision	-
begin-transaction-end-dialogue-collision	CM_DEALLOCATED_ABEND_BO.dealloc_confirm_collision (S or R)
if: Rollback = false	
TP-P-ABORT indication	Maps to *return_code* values:
Diagnostic	
permanent-failure	CM_RESOURCE_FAILURE_NO_RETRY (R) [+ CM_RESOURCE_FAILURE_NO_RETRY (S)]
transient-failure	CM_RESOURCE_FAILURE_RETRY (R) [+ CM_RESOURCE_FAILURE_RETRY (S)]
protocol-error	CM_RESOURCE_FAILURE_NO_RETRY (R) [+ CM_RESOURCE_FAILURE_NO_RETRY (S)]
begin-transaction-reject	-
end-dialogue-collision	CM_DEALLOCATED_ABEND.dealloc_confirm_collision (R) [+ CM_DEALLOCATED_ABEND.dealloc_confirm_collision (S)]
begin-transaction-end-dialogue-collision	CM_DEALLOCATED_ABEND.begin_transaction_collision (R) [+CM_DEALLOCATED_ABEND.begin_transaction_collision (S)]

Table 82. TP-DEFERRED-END-DIALOGUE and TP-PREPARE indication Mapping

OSI TP Service Parameters	CPI-C Calls, Parameters, and Characteristics
if: a TP-DEFERRED-END-DIALOGUE indication has been received	
TP-PREPARE indication Data-Permitted	*status_received* = CM_TAKE_COMMIT_DEALLOCATE = false
if: a TP-DEFERRED-END-DIALOGUE indication has NOT been received	
TP-PREPARE indication Data-Permitted	*status_received* = CM_TAKE_COMMIT = false

Sequencing Rules and State Tables

The sequencing rules and state tables for the CPI-C ASE are contained in Appendix C, “State Tables” on page 463.

CPI-C ASE Protocol Definition

There are no additional protocol definitions required by the CPI-C ASE beyond those defined in ISO/IEC 10026, Parts 1-3.

CPI-C ASE Structure and Encoding of APDUs

There are no additional APDUs required by the CPI-C ASE beyond those defined in ISO/IEC 10026, Parts 1-3.

Appendix E. Application Migration from X/Open CPI-C

This appendix describes the application migration from the original X/Open CPI-C (as defined in the 1990 edition of *X/Open Developers' Specification CPI-C*) to CPI-C 2.0. The following section lists the differences between X/Open CPI-C and CPI-C 2.0 that may require that changes be made to move a program from X/Open CPI-C to CPI-C 2.0.

Application Migration Considerations

- When the Accept_Conversation call is issued and no incoming conversation exists, CPI-C 2.0 returns CM_PROGRAM_STATE_CHECK; X/Open CPI-C returns CM_OPERATION_INCOMPLETE and a conversation identifier. Programs that want to accept multiple conversations using the non-blocking processing mode should use the following calls instead of Accept_Conversation:
  - Initialize_For_Incoming
  - Set_Processing_Mode, with *processing_mode* set to CM_NON_BLOCKING
  - Accept_Incoming.

  See “Example 13: Accepting Multiple Conversations Using Conversation-Level Non-Blocking Calls” on page 92 for accepting conversations using non-blocking Accept_Incoming calls.
- CPI-C 2.0 returns the CM_OPERATION_NOT_ACCEPTED return code if a conversation call is issued and the previous call on the conversation has not completed. X/Open CPI-C returns CM_PROGRAM_STATE_CHECK.
- The Extract_Conversation_Security_User_ID (CMECSU) call of X/Open CPI-C is not supported in CPI-C 2.0. The function is available in CPI-C 2.0 using the Extract_Security_User_ID (CMESUI) call, which supports an increased length of the *security_user_id*.
- The CPI-C 2.0 Convert_Incoming and Convert_Outgoing calls return CM_PROGRAM_PARAMETER_CHECK if the string_length exceeds the maximum length permitted by the local implementation. This return code is not supported in X/Open CPI-C for these calls.
- The CM_SYNC_LEVEL_NOT_SUPPORTED_PGM return code of X/Open CPI-C must be changed to CM_SYNC_LVL_NOT_SUPPORTED_PGM.
- The specify_Local_TP_Name call of X/Open CPI-C must be changed to Specify_Local_TP_Name.
- X/Open CPI-C allows several processes to share the same conversation identifier. In CPI-C 2.0, the scope of the *conversation_ID* is system-dependent.
- X/Open defines all functions as type CM_RETCODE (for example, extern CM_RETCODE CMACCP;). CPI-C 2.0 defines all functions as type void (for example, extern CM_ENTRY cmaccp;). Programs that test the return value of an X/Open CPI-C call have to test the *return_code* parameter value in CPI-C 2.0.

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- The readable macros (for example, Accept_Conversation instead of CMACCP) are only available in CPI-C 2.0 if the program or the include file contains a line

  ```
  #define READABLE_MACROS
  ```

- Some parameter types in X/Open CPI-C and CPI-C 2.0 differ, as shown in Table 83. Some compilers may give out warnings when compiling existing X/Open CPI-C programs with the new CPI-C 2.0 include file.

Table 83. Parameter Type Differences

Parameter Type	**X/Open CPI-C**	**CPI-C 2.0**
Conversation ID Parameters	CONVERSATION_ID (that is, char [8])	unsigned char CM_PTR (that is, unsigned char *)
Character Pointers	char *	unsigned char CM_PTR (that is, unsigned char *)
Length Parameters	int *	CM_INT32 CM_PTR (that is, signed long int *)
Definitions of Return Codes and Numeric Parameters	typedef enum	#define

Appendix F. CPI Communications Extensions for Use with DCE Directory

This appendix describes CPI Communications extensions in two areas:

- Additional directory objects (beyond program installation object) to provide additional functionality. Three new objects are introduced to allow enhanced program use of the directory at a functional level equivalent to Distributed Computing Environment (DCE) Remote Procedure Call (RPC) use. The three new objects are:
  - **Profile** object, accessed by a profile distinguished name (PDN)
  - **Server** object, accessed by a server distinguished name (SDN)
  - **Server Group** object, accessed by a server group distinguished name (SGDN)
- A CPI Communications-specific interface for interaction with the DCE directory, referred to here as the CPI-C name service interface (CNSI).

The rest of this appendix describes the three new objects, the CNSI, and how they can be used to interact with CPI Communications.

Profile Object

The profile object enables the establishment of a search priority for all of the other directory objects. For example, a typical profile might define a primary server for first attempts in locating function, but also define a secondary server if the primary server is unable.

The structure of the profile object is a list of profile elements, where each element contains three parts:

- PFID—the program function identifier for the profile element. This field can be null if a default ordering for all function is desired.
- Priority—the priority of the element relative to all other profile elements.
- Distinguished Name (DN)—points to either a profile, server, server-group, or program-installation object.

Server Object

Conceptually, the server object represents a collection of programs and resources; examples are a single system or a file server on a LAN.

The server object enables two key capabilities:

1. Location/search for a particular function. For example, is OfficeNetMail application available on this server?

   This function is provided by maintaining a list of (PFID, PIDN) pairs in the server object, where the PIDN is a DN for the program installation object that provides the function of the PFID. If a function is available from more than one program installation on the server, there are multiple (PFID, PIDN) pairs.

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2. Location/search of a particular resource. For example, does the PAYROLL DATABASE reside on this server?

   This function is provided by maintaining a list of resources that are available on the server.

Server Group Object

The server group object extends the concept of a server by allowing servers to be grouped. Grouping provides such additional value as transparent redundancy and the ability to specify equivalent servers.

The server group object pointed to by an SGDN simply contains a list of server distinguished names (SDNs).

Interaction of Directory Objects

Figure 32 shows a simple diagram of the different directory objects and their interactions. The arrows show the interconnection of information between different objects.

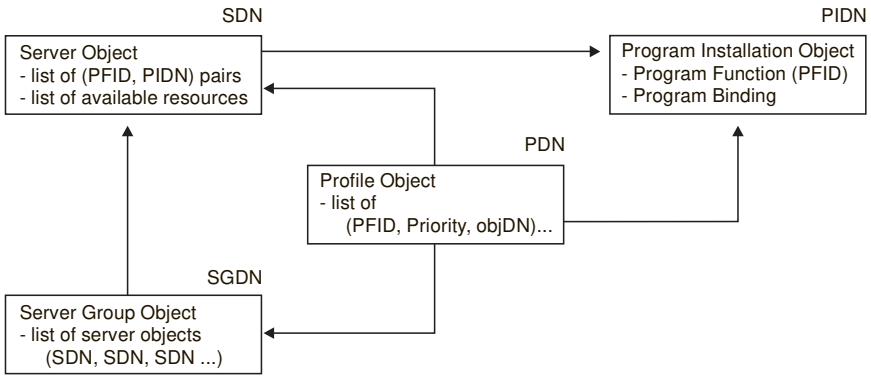

Figure 32. Interactions of Directory Objects

Here is an example of how a program might use the objects:

- The program specifies a profile object, a PFID, and a resource.
- The profile object is accessed first to determine servers that have the requested function. By using the priority field, a prioritized list of relevant servers is obtained.
- The first server object in the list is accessed. The resource list in the server object is then searched to determine if the server has the requested resource. If the resource is not found, the next server object in the list is accessed.
- Once a server with the correct resource is located, the (PFID, PIDN) list is used to determine the DN for the program installation object.
- The program installation object is accessed to obtain the program binding.

CPI-C Name Service Interface

The objects described above reside in the distributed directory and are accessed by a directory interface. For example, programs using the DCE distributed directory can access directory objects using the X/OPEN Directory Services (XDS) and X/OPEN Object Management (XOM) programming interfaces. Because these interfaces are not specific to the CPI Communications directory objects, this Appendix describes a local service, referred to here as the **CPI-C name service interface** (CNSI), which programs can use to interact with CPI Communications directory objects in the directory.

Figure 33 shows the interaction between the program, CPI-C, and CNSI.

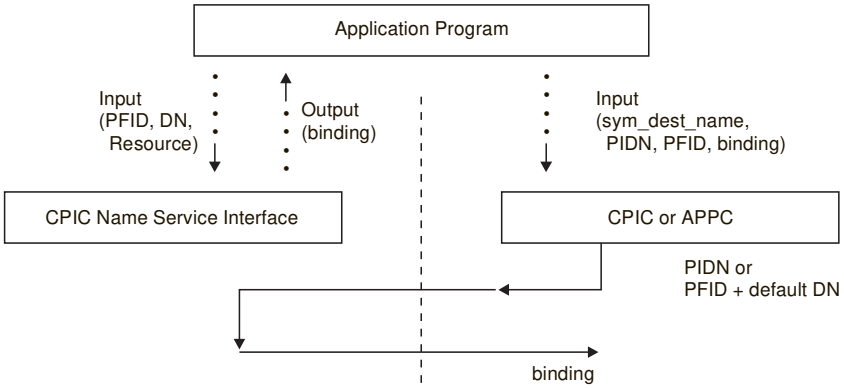

Figure 33. CPI-C Name Service Interface (CNSI) and CPI Communications

The right side of the figure shows how a program makes calls to CPI Communications using the function described in Chapter 2, “CPI Communications Terms and Concepts.”

If the program specifies a sym_dest_name pointing to a DN, or a PFID or DN directly, CPI Communications accesses the distributed directory and acquires a program binding. CPI-C uses the program binding to establish a conversation with the partner program. When a PFID is specified, a default DN is used to begin the search. This default DN may be either a PDN, SDN, or SGDN. Definition of a default DN is system specific.

The left side of Figure 33 shows how a program uses the CNSI and objects defined in this Appendix to locate the partner program. The application program makes a call to the CNSI and specifies a three-parameter search criteria:

- **program function ID**—a PFID that represents the function the partner program provides.
- **priority/location**—a DN representing either a profile, server, or server group object.
- **resource**—a resource_ID identifying a particular resource (that is, a file that is required along with a particular function).

CNSI Calls

As previously discussed, the program uses CNSI calls to retrieve a PIDN, which it then passes to CPI-C using the Set_Partner_ID call. Although CNSI calls are not CPI Communications calls and, thus, not formally defined, the interface would look very much like DCE's NSI interface for RPC. Here is a sample listing of the type of calls that would be required to manipulate the objects.

Table 84. Sample Calls for CNSI

cpic_ns_binding_export	cpic_ns_group_mbr_inq_done
cpic_ns_binding_import_begin	cpic_ns_group_mbr_inq_next
cpic_ns_binding_import_done	cpic_ns_group_mbr_remove
cpic_ns_binding_import_next	cpic_ns_mgmt_binding_unexport
cpic_ns_binding_inq_entry_name	cpic_ns_mgmt_entry_create
cpic_ns_binding_lookup_begin	cpic_ns_mgmt_entry_delete
cpic_ns_binding_lookup_done	cpic_ns_mgmt_entry_inq_if_ids
cpic_ns_binding_lookup_next	cpic_ns_mgmt_handle_set_exp_age
cpic_ns_binding_select	cpic_ns_mgmt_inq_exp_age
cpic_ns_binding_unexport	cpic_ns_mgmt_set_exp_age
cpic_ns_entry_expand_name	cpic_ns_profile_delete
cpic_ns_entry_object_inq_begin	cpic_ns_profile_elt_add
cpic_ns_entry_object_inq_done	cpic_ns_profile_elt_inq_begin
cpic_ns_entry_object_inq_next	cpic_ns_profile_elt_inq_done
cpic_ns_group_delete	cpic_ns_profile_elt_inq_next
cpic_ns_group_mbr_add	cpic_ns_profile_elt_remove
cpic_ns_group_mbr_inq_begin	cpic_ns_set_authn

Definition of New Objects

Three new objects are required:

- Profile
- Server
- Server Group

This section discusses terminology and then provides definitions for attributes in the new objects.

Terminology

The following terminology is used to define the new CNSI attributes:

- A **multi-valued** attribute means the directory stores (and is aware of) multiple values for the attribute.
- A **single-valued** attribute means the directory has only one value for the attribute.
- A **complex** attribute means the directory is only aware of a single value for the attribute, but the single-value is encoded to contain multiple fields. A complex field follows the generic coding guidelines provided in Appendix A, “Variables and Characteristics” for the program binding.
- A **simple** attribute means the attribute value is not encoded; that is, there is only one field.

Profile Object

The Profile object contains one attribute, a profile record attribute:

- profile record (complex, multi-valued)

  A value for the profile record has three parts: priority, PFID, DN

  1. priority is 2-character decimal digits (00=highest)
  2. PFID is a program function identifier (as defined in Appendix A, "Variables and Characteristics")
  3. DN is a distinguished name for one of the following:
     - Server object
     - Server group object
     - Profile object
     - Program installation object

Note: The profile object has the unique object identifier of 1.3.18.0.2.6.8. The profile record attribute has the unique object identifier of 1.3.18.0.2.4.15.

Server Object

The Server object contains two attributes, a server record and resource record attribute:

- Server record (complex, multi-valued)

  A value for the server record has two parts: PFID and DN.

  1. PFID is a program function identifier.
  2. DN is a distinguished name for a program installation object.

- Resource record (simple, multi-valued)

  A value for the resource record is a customer-defined byte string with a maximum length of 64 bytes.

Note: The server object has the unique object identifier of 1.3.18.0.2.6.9. The server record attribute has the unique object identifier of 1.3.18.0.2.4.16. The resource record attribute has the unique object identifier of 1.3.18.0.2.4.17.

Server Group Object

The Server Group object contains one attribute, a distinguished name attribute:

- distinguished name (simple, multi-valued)

  Valid DN values are distinguished names that represent:

  - Profile object
  - Server object
  - Server group object

Note: The server group object has the unique object identifier of 1.3.18.0.2.6.10. The distinguished name attribute is stored with an object identifier of 2.5.4.31.

Program Installation Object

The Program Installation object is defined by CPI Communications, but is included here for completeness. It contains two attributes, a program_function_ID and a program binding attribute:

- Program function ID (simple, single-valued)

  See Appendix A, “Variables and Characteristics” for a description.

- Program binding (complex, single-valued)

  See Appendix A, “Variables and Characteristics” for a description.

Encoding Method for Complex Attribute Values

The encoding method for complex attribute values is to follow the general method outlined in Appendix A, “Variables and Characteristics” for the program binding. Each complex value is a string of the general pattern “field_type=field_value; field_type=field_value” where field_type is a four-byte identifier for the field and field_value is a variable-length field. The end of a field_value is determined by the semicolon character. If the field_value itself contains a semicolon, the textual semicolon is repeated. Correct ordering of fields is shown above in the object definitions.

Table 85 shows the 4-byte code for the field types required in the complex attributes of the new objects, along with a maximum length for each field_value.

Table 85. Fields in Complex Attributes

Description of Field Contents	4-Byte field_type Code	Maximum Length of Field
priority—used in the profile record and server record attribute.	PRIO	2
program function ID—used in the profile record and server record attribute	PFID	1024
distinguished name—used in the profile record and server record attribute	DSTN	1024

Scenarios for Use of CNSI

Programs access the CNSI directly by specifying a tuple of (function, priority/location, resource) and retrieve a PIDN. This PIDN is then passed to CPI-C using the Set_Partner_ID call. The program is able to control retry because it has the explicit option of retrieving each successive PIDN and attempting the Allocate.

A sample sequence of calls is illustrated in Figure 34.

```
cpic_ns_binding_lookup_begin (
               PFID,                      (input)
               entry_name_syntax,         (input)
               entry_DN_to_start_search, (input)
               ResID,                     (input)
               ns_handle,                 (output)
               status  )                  (output)

While unsucessful do
  begin

     cpic_ns_binding_lookup_next  (
                    ns_handle,  (input)
                    next_PIDN,       (output)
                    status  )   (output)

     CMINIT(sym_dest_name = '        ',
            conversation_id)

     CMSPID(conversation_ID,
           partner_ID_type = CM_DISTINGUISHED_NAME,
                partner_ID = next_PIDN,
           partner_ID_length = length(next_PIDN),
            partner_ID_scope = CM_EXPLICIT,
             return_code)

     CMALLC(conversation_id, return_code)

  end

  cpic_ns_done(ns_handle,         (input)  /* clear up control blocks   */
          return_code)       (output)
```

Figure 34. Program Uses CNSI to Locate PIDN

The sections that follow show the different combinations of parameters that can be provided to CNSI. The three-tuple shown as headings represents (program_function_ID, DN, resource_ID).

(PFID, *, *)

- Target: any program installation providing the function of the PFID.
- CNSI reads default profile using PFID, returns PIDNs.

(PFID, SDN, *)

- Target: any program installation within the server that provides the function specified by the PFID.
- CNSI reads SDN object, returns PIDNs paired with specified PFID.

(PFID, SGDN, *)

- Target: any program installation on any server within a server group.
- CNSI reads SGDN object, obtaining list of SDNs. CNSI reads SDN objects (in random order), returning PIDNs that were paired with the specified PFID.

(PFID, SDN, resID)

- Target: program installation on the server with the specified resource and function.
- CNSI reads SDN object and searches for match with resID. If match found, CNSI returns PIDNs that were paired with the specified PFID.

(PFID, SGDN, resID)

- Target: program installation on the server with the specified resource, within a server group.
- CNSI reads SGDN object, obtaining list of SDNs. CNSI reads SDN objects (in random order) and searches for match with resID. If match found, CNSI returns PIDNs that were paired with the specified PFID.

(PFID, PDN, *)

- Target: any program installation providing the function specified by the PFID, using the priority specified by the profile object.
- CNSI reads profile object and creates a list of elements with the specified PFID. In priority order, the associated object (PIDN, SDN, or SGDN) is read, and PIDNs are returned as above.

(PFID, PDN, resID)

- Target: program installation providing the specified function on a server with the specified resource, search order specified by profile object.
- CNSI reads profile object and orders the list of elements with the PFID. In priority order, the associated object (SDN or SGDN) is read, and PIDNs are returned as above. Note that any PIDN found in the profile would have no meaning in this case, as there would be no associated resource.

Appendix G. CPI Communications 2.1 Conformance Classes

The purpose of the CPI-C 2.1 conformance classes is to foster an orderly marketplace for CPI-C 2.1 implementation, purchase, and use. The conformance class definition assists the CPI-C implementer in deciding what to build, the CPI-C purchaser in knowing what to buy, and the CPI-C application builder in knowing what to use. Uses of the conformance class definition include the following:

- Product announcements
- Application requirements specifications
- Procurement specifications
- Conformance test suite development

Definitions

Mandatory conformance class
A function set that an implementation must support to conform to CPI-C. All of the function within the set must be implemented.

Optional conformance class
A function set that an implementation may support. To support an optional conformance class, an implementation must support all the function in the optional conformance class and in its prerequisite conformance classes.

Prerequisite conformance class
A conformance class required for support of another conformance class.

Conformance Requirements

To conform with CPI-C 2.1, an implementation must support the following:

- The mandatory conformance class (conversations)
- Either the LU 6.2 or the OSI TP conformance class, or both

Additionally, an implementation may support any optional conformance class.

Multi-Threading Support

While CPI Communications itself does not provide multi-threading support, some implementations are designed to work with multi-threading support in the base operating system and to allow multi-threaded programs to use CPI Communications. It is assumed that an implementation that supports multi-threaded programs allows concurrent operations through the use of multiple program threads. See “Concurrent Operations” on page 42.

CPI-C 2.1 Conformance Classes

CPI-C 2.1 conformance classes consist of a mandatory conformance class and a number of optional conformance classes. A conformance class may be a functional conformance class, consisting of function that may be supported by a CPI-C implementation, or a configuration conformance class, specifying how a CPI-C

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implementation may allow an installation to configure the available support. The conformance classes are listed here and described below.

Functional conformance classes:

- Conversations (mandatory)
- LU 6.2
- OSI TP
- Recoverable transactions
- Unchained transactions
- Conversation-level non-blocking
- Queue-level non-blocking
- Callback function
- Server
- Data conversion routines
- Security
- Distributed security
- Full-duplex
- Expedited data
- Directory
- Secondary information
- Initialization data
- Automatic data conversion

Configuration conformance class:

- OSI TP addressing disable

Functional Conformance Class Descriptions

For each conformance class, the following information is provided:

- Brief description
- Prerequisite conformance classes
- Required calls
- Whether support is mandatory or optional

Additional details of the required support (characteristics, variables, and values) are included in the tables in “Conformance Class Details” on page 564.

Conversations

Description: allows a program to start and end half-duplex conversations, to exchange data on those converations, to use confirmation, error notification, the attention mechanism (Request_To_Send), and the optimization calls (Flush, Prepare_To_Receive), and to modify and examine conversation or system characteristics.

Prerequisites: none

Required Starter Set calls:

- CMACCP - Accept_Conversation
- CMALLC - Allocate
- CMDEAL - Deallocate
- CMINIT - Initialize_Conversation
- CMRCV - Receive

- CMSEND - Send_Data

Required Advanced Function calls:

- CMCFM - Confirm
- CMCFMD - Confirmed
- CMECS - Extract_Conversation_State
- CMECT - Extract_Conversation_Type
- CMEMBS - Extract_Maximum_Buffer_Size
- CMEMN - Extract_Mode_Name
- CMESL - Extract_Sync_Level
- CMFLUS - Flush
- CMPTR - Prepare_To_Receive
- CMRTS - Request_To_Send
- CMSERR - Send_Error
- CMSCT - Set_Conversation_Type
- CMSDT - Set_Deallocate_Type
- CMSF - Set_Fill
- CMSLD - Set_Log_Data
- CMSMN - Set_Mode_Name
- CMSPTR - Set_Prepare_To_Receive_Type
- CMSRT - Set_Receive_Type
- CMSRC - Set_Return_Control
- CMSST - Set_Send_Type
- CMSSL - Set_Sync_Level
  Required *sync_level* values:
  - CM_NONE
  - CM_CONFIRM
- CMSTPN - Set_TP_Name
- CMTRTS - Test_Request_To_Send_Received

Support: mandatory

LU 6.2

Description: allows a program to use LU 6.2-specific services.

Prerequisites: conversations

Required calls:

- CMEPLN - Extract_Partner_LU_Name
- CMSED - Set_Error_Direction
- CMSPLN - Set_Partner_LU_Name

Support: optional. However, an implementation must support either this conformance class or the OSI TP conformance class.

OSI TP

Description: allows a program to use OSI TP-specific services.

Prerequisites: conversations

Required calls:

- CMEAEQ - Extract_AE_Qualifier
- CMEAPT - Extract_AP_Title
- CMEACN - Extract_Application_Context_Name

- CMSAC - Set_Allocate_Confirm
- CMSAEQ - Set_AE_Qualifier
- CMSAPT - Set_AP_Title
- CMSACN - Set_Application_Context_Name
- CMSCU - Set_Confirmation_Urgency

Support: optional. However, an implementation must support either this conformance class or the LU 6.2 conformance class.

Recoverable Transactions

Description: allows a program to use CPI-C in conjunction with a resource recovery interface to coordinate changes to distributed resources using two-phase commit protocols.

Prerequisites: conversations

Required calls:

- CMSSL - Set_Sync_Level
  Required *sync_level* value:
  - CM_SYNC_POINT

  Required *sync_level* value if either full duplex or OSI TP is also supported:
  - CM_SYNC_POINT_NO_CONFIRM

Required calls if OSI TP is also supported:

- CMDFDE - Deferred_Deallocate
- CMPREP - Prepare
- CMSPDP - Set_Prepare_Data_Permitted

Required call if X/Open TX resource recovery interface is also supported:

- CMSJT - Set_Join_Transaction

Support: optional

Unchained Transactions

Description: allows a program to complete a recoverable transaction with a commit call without immediately starting a new recoverable transaction. The program may begin a new recoverable transaction at a later time.

Prerequisites: conversations, recoverable transactions, OSI TP

Required calls:

- CMETC - Extract_Transaction_Control
- CMINCL - Include_Partner_In_Transaction
- CMSBT - Set_Begin_Transaction
- CMSTC - Set_Transaction_Control

Support: optional

Conversation-Level Non-Blocking

Description: allows a program to regain control if a call cannot complete immediately. The call remains in progress. A program can have one outstanding operation on a conversation.

Prerequisites: conversations

Required calls:

- CMCANC - Cancel_Conversation
- CMSPM - Set_Processing_Mode
- CMWAIT - Wait_For_Conversation

Support: optional

Queue-Level Non-Blocking

Description: allows a program to regain control if a call cannot complete immediately. The call remains in progress. A program can have one outstanding operation per conversation queue.

Prerequisites: conversations

Required calls:

- CMCANC - Cancel_Conversation
- CMSQPM - Set_Queue_Processing_Mode
- CMWCMP - Wait_For_Completion

Support: optional

Callback Function

Description: allows a program to regain control if a call cannot complete immediately. The call remains in progress. A program can have one outstanding operation per conversation queue. A program receives an asynchronous notification when an outstanding operation completes.

Prerequisites: conversations

Required calls:

- CMCANC - Cancel_Conversation
- CMSQCF - Set_Queue_Callback_Function

Support: optional

Server

Description: allows a program to register multiple TP names with CPI-C, to accept multiple incoming conversations, and to manage contexts for different clients.

Prerequisites: conversations. Additionally, for a system that does not support multi-threaded programs: one or more of conversation-level non-blocking, queue-level non-blocking, or callback function.

Required calls:

- CMACCI - Accept_Incoming
- CMECTX - Extract_Conversation_Context
- CMETPN - Extract_TP_Name
- CMINIC - Initialize_For_Incoming
- CMRLTP - Release_Local_TP_Name
- CMSLTP - Specify_Local_TP_Name

Support: optional

Data Conversion Routines

Description: allows a program to call local routines to change the encoding of a character string from the local encoding to EBCDIC, or vice versa.

Prerequisites: conversations

Required calls:

- CMCNVI - Convert_Incoming
- CMCNVO - Convert_Outgoing

Support: optional

Security

Description: allows a program to establish conversations that use access security information provided administratively in side information or set directly by the program.

Prerequisites: conversations

Required calls:

- CMESUI - Extract_Security_User_ID
- CMSCSP - Set_Conversation_Security_Password
- CMSCST - Set_Conversation_Security_Type
  Required *conversation_security_type* values:
  - CM_SECURITY_NONE
  - CM_SECURITY_PROGRAM
  - CM_SECURITY_PROGRAM_STRONG
  - CM_SECURITY_SAME
- CMSCSU Set_Conversation_Security_User_ID

Support: optional

Distributed Security

Description: allows a program to use security services provided by a distributed security server.

Prerequisites: conversations, directory

Required calls:

- CMESUI - Extract_Security_User_ID
- CMSCST - Set_Conversation_Security_Type
  Required *conversation_security_type* values:
  - CM_SECURITY_NONE
  - CM_SECURITY_SAME
  - CM_SECURITY_DISTRIBUTED
  - CM_SECURITY_MUTUAL

Support: optional

Full-Duplex

Description: allows a program to use full-duplex conversations.

Prerequisites: conversations. Additionally, for a system that does not support multi-threaded programs: either queue-level non-blocking or callback function.

Required calls:

- CMESRM - Extract_Send_Receive_Mode
- CMSSRM - Set_Send_Receive_Mode

Support: optional

Expedited Data

Description: allows a program to exchange expedited data with the partner program.

Prerequisites: conversations, LU 6.2

Required calls:

- CMRCVX - Receive_Expedited_Data
- CMSNDX - Send_Expedited_Data

Support: optional

Directory

Description: allows a program to use destination information stored in a distributed directory.

Prerequisites: conversations

Required calls:

- CMEPID - Extract_Partner_ID
- CMSPID - Set_Partner_ID

Support: optional

Secondary Information

Description: allows a program to extract secondary information associated with the return code for a given call.

Prerequisites: conversations

Required calls:

- CMESI - Extract_Secondary_Information

Support: optional

Initialization Data

Description: allows a program to exchange initialization data at conversation start-up.

Prerequisites: conversations

Required calls:

- CMEID - Extract_Initialization_Data
- CMSID - Set_Initialization_Data

Support: mandatory if OSI TP is supported; otherwise, optional.

Automatic Data Conversation

Description: allows a program to use automatic data conversion on initialization data and data records sent and received.

Prerequisites: conversations

Required calls:

- CMRCVM - Receive_Mapped_Data
- CMSNDM - Send_Mapped_Data

Required calls if Initialization_Data is also supported:

- CMEMID - Extract_Mapped_Initialization_Data
- CMSMID - Set_Mapped_Initialization_Data

Support: optional

Configuration Conformance Class Description

Configuration conformance classes specify configuration options that an implementation may support. This section describes the configuration conformance class. The following information is provided:

- Brief description
- Prerequisite conformance classes
- Required configuration options
- Whether support is mandatory or optional

OSI TP Addressing Disable

Description: an installation may disable the addressing Set calls for OSI TP. A program that issues a disabled call gets the CM_CALL_NOT_SUPPORTED return code.

Prerequisites: conversations, OSI TP

Calls that may be disabled:

- CMSAEQ - Set_AE_Qualifier
- CMSAPT - Set_AP_Title
- CMSACN - Set_Application_Context_Name

Support: optional

Relationship to OSI TP Functional Units and OSI TP Profiles

Table 86 shows the OSI TP service functional units and the corresponding CPI-C 2.1 conformance classes. For each functional unit, the calls in the corresponding conformance classes map to the services defined by the functional unit. For the Commit, Chained Transactions, and Unchained Transactions functional units, support for a resource recovery interface is also required.

Table 86. OSI TP Service Functional Units and Corresponding Conformance Classes

Service Functional Unit	Conformance Classes
Dialogue	conversations, OSI TP
Shared Control	full-duplex
Polarized Control	conversations
Handshake	conversations
Commit	recoverable transactions
Chained Transactions	recoverable transactions
Unchained Transactions	unchained transactions

Table 87 shows the OSI TP profiles defined by the OSI Implementers Workshop and the corresponding CPI-C 2.1 conformance classes. For each profile, the calls in the corresponding conformance classes map to the services defined by the profile. The protocol functional units included in each profile are shown (in parentheses). For the Commit, Chained Transactions, Unchained Transactions, and Recovery functional units, support for a resource recovery interface is also required.

Note: Profiles ATP12, ATP22, and ATP32 specify that the handshake functional unit is optional. CPI-C does not support the use of Confirm/Confirmed (handshake) on a full duplex conversation.

Table 87. OSI TP Profiles and Corresponding Conformance Classes

Profile (protocol functional units)	Conformance Classes
ATP11 (dialogue, handshake, polarized control)	conversations, OSI TP
ATP21 (dialogue, handshake, polarized control, commit, unchained transactions, recovery)	conversations, OSI TP, recoverable transactions, unchained transactions
ATP31 (dialogue, handshake, polarized control, commit, chained transactions, recovery)	conversations, OSI TP, recoverable transactions
ATP12 (dialogue, handshake (optional), shared control)	conversations, OSI TP, full-duplex
ATP22 (dialogue, handshake (optional), shared control, commit, unchained transactions, recovery)	conversations, OSI TP, full-duplex, recoverable transactions, unchained transactions
ATP32 (dialogue, handshake (optional), shared control, commit, chained transactions, recovery)	conversations, OSI TP, full-duplex, recoverable transactions

Conformance Class Details

This section provides additional information on the required support for each functional conformance class. The tables below list each CPI-C call, characteristic, variable, and value in the left column; any conformance class or combination of conformance classes that requires the implementation of that call, characteristic, variable, or value is listed in the right column. Combinations are enclosed in parentheses. For example, (OSI TP and recoverable transactions) to the right of the Deferred_Deallocate call indicates that the call is required if both the OSI TP and recoverable transactions conformance classes are supported.

The conformance class requirements for calls are presented in Table 88, and the conformance class requirements for characteristics, variables, and values are presented in Table 89 on page 566.

Table 88 (Page 1 of 3). Conformance Class Requirements—Calls

	Call	Required by
	CMACCP — Accept_Conversation	conversations
	CMACCI — Accept_Incoming	server
	CMALLC — Allocate	conversations
	CMCANC — Cancel_Conversation	conversation-level non-blocking, callback function, queue-level non-blocking
	CMCFM — Confirm	conversations
	CMCFMD — Confirmed	conversations
	CMCNVI — Convert_Incoming	data conversion routines
	CMCNVO — Convert_Outgoing	data conversion routines
	CMDEAL — Deallocate	conversations
	CMDFDE — Deferred_Deallocate	(OSI TP and recoverable transactions)
	CMEAEQ — Extract_AE_Qualifier	OSI TP
	CMEAPT — Extract_AP_Title	OSI TP
	CMEACN — Extract_Application_Context_Name	OSI TP
	CMECTX — Extract_Conversation_Context	server
	CMECS — Extract_Conversation_State	conversations
	CMECT — Extract_Conversation_Type	conversations
2	CMEID — Extract_Initialization_Data	initialization data
	CMEMBS — Extract_Maximum_Buffer_Size	conversations
1	CMEMID — Extract_Mapped_Initialization_Data	automatic data conversion
	CMEMN — Extract_Mode_Name	conversations
	CMEPB — Extract_Partner_ID	directory
	CMEPLN — Extract_Partner_LU_Name	LU 6.2
	CMESI — Extract_Secondary_Information	secondary information
	CMESUI — Extract_Security_User_ID	security, distributed security
	CMESRM — Extract_Send_Receive_Mode	full-duplex
	CMESL — Extract_Sync_Level	conversations
	CMETPN — Extract_TP_Name	conversations
	CMETC — Extract_Transaction_Control	unchained transactions
	CMFLUS — Flush	conversations
	CMINCL — Include_Partner_In_Transaction	unchained transactions

Table 88 (Page 2 of 3). Conformance Class Requirements—Calls

	Call	Required by
	CMINIC — Initialize_For_Incoming	server
	CMINIT — Initialize_Conversation	conversations
	CMPREP — Prepare	(OSI TP and recoverable transactions)
	CMPTR — Prepare_To_Receive	conversations
	CMRCV — Receive	conversations
1	CMRCVM — Receive_Mapped_Data	automatic data conversion
	CMRCVX — Receive_Expedited_Data	expedited data
	CMRLTP — Release_Local_TP_Name	server
	CMRTS — Request_To_Send	conversations
	CMSEND — Send_Data	conversations
	CMSERR — Send_Error	conversations
1	CMSNDM — Send_Mapped_Data	automatic data conversion
	CMSNDX — Send_Expedited_Data	expedited data
	CMSAEQ — Set_AE_Qualifier	OSI TP
	CMSAC — Set_Allocate_Confirm	OSI TP
	CMSAPT — Set_AP_Title	OSI TP
	CMSACN — Set_Application_Context_Name	OSI TP
	CMSBT — Set_Begin_Transaction	unchained transactions
	CMSCU — Set_Confirmation_Urgency	OSI TP
	CMSCSP — Set_Conversation_Security_Password	security
	CMSCST — Set_Conversation_Security_Type	security, distributed security
	CMSCSU — Set_Conversation_Security_User_ID	security
	CMSCT — Set_Conversation_Type	conversations
	CMSDT — Set_Deallocate_Type	conversations
	CMSED — Set_Error_Direction	LU 6.2
	CMSF — Set_Fill	conversations
2	CMSID — Set_Initialization_Data	initialization data
	CMSJT — Set_Join_Transaction	recoverable transactions (if TX interface is supported)
	CMSLD — Set_Log_Data	conversations
1	CMSMID — Set_Mapped_Initialization_Data	automatic data conversion
	CMSMN — Set_Mode_Name	conversations
	CMSPID — Set_Partner_ID	directory
	CMSPLN — Set_Partner_LU_Name	LU 6.2
	CMSPDP — Set_Prepare_Data_Permitted	(OSI TP and recoverable transactions)
	CMSPTR — Set_Prepare_to_Receive_Type	conversations
	CMSPM — Set_Processing_Mode	conversation-level non-blocking
	CMSQCF — Set_Queue_Callback_Function	callback function
	CMSQPM — Set_Queue_Processing_Mode	queue-level non-blocking
	CMSRT — Set_Receive_Type	conversations
	CMSRC — Set_Return_Control	conversations
	CMSSRM — Set_Send_Receive_Mode	full-duplex
	CMSST — Set_Send_Type	conversations
	CMSSL — Set_Sync_Level	conversations

Conformance Classes

Table 88 (Page 3 of 3). Conformance Class Requirements—Calls

Call	Required by
CMSTPN — Set_TP_Name	conversations
CMSTC — Set_Transaction_Control	unchained transactions
CMSLTP — Specify_Local_TP_Name	server
CMTRTS — Test_Request_To_Send_Received	conversations
CMWCMP — Wait_For_Completion	queue-level non-blocking
CMWAIT — Wait_For_Conversation	conversation-level non-blocking

Table 89 (Page 1 of 5). Conformance Class Requirements—Characteristics, Variables, and Values

Characteristics, Variables, and Values	Required by
ae_qualifier	OSI TP
ae_qualifier_format	OSI TP
cm_dn	OSI TP
cm_oid	OSI TP
ae_qualifier_length	OSI TP
allocate_confirm	OSI TP
cm_allocate_confirm	OSI TP
cm_allocate_no_confirm	OSI TP
ap_title	OSI TP
ap_title_format	OSI TP
cm_dn	OSI TP
cm_oid	OSI TP
ap_title_length	OSI TP
application_context_name	OSI TP
application_context_name_length	OSI TP
begin_transaction	OSI TP
cm_begin_explicit	OSI TP
cm_begin_implicit	OSI TP
buffer	conversations
buffer_length	conversations
callback_function	callback function
call_ID	secondary information
completed_op_index_list	queue-level non-blocking
completed_op_count	queue-level non-blocking
confirmation_urgency	OSI TP
cm_confirmation_not_urgent	OSI TP
cm_confirmation_urgent	OSI TP
context_ID	server
context_ID_length	server
control_information_received	conversations
cm_no_control_info_received	conversations
cm_req_to_send_received	conversations
cm_exp_data_received	expedited data
cm_rts_and_exp_data_received	expedited data
cm_allocate_confirmed	OSI TP
cm_allocate_confirmed_with_data	OSI TP
cm_allocate_rejected_with_data	OSI TP
conversation_ID	conversations

Table 89 (Page 2 of 5). Conformance Class Requirements—Characteristics, Variables, and Values

Characteristics, Variables, and Values	Required by
conversation_queue	queue-level non-blocking, callback function
cm_initialization_queue	queue-level non-blocking, callback function
cm_send_queue	queue-level non-blocking, callback function
cm_receive_queue	queue-level non-blocking, callback function
cm_send_receive_queue	queue-level non-blocking, callback function
cm_expedited_send_queue	queue-level non-blocking, callback function
cm_expedited_receive_queue	queue-level non-blocking, callback function
conversation_return_code	conversation-level non-blocking
(same values as return_code)	
conversation_security_type	security, distributed security
cm_security_none	security, distributed security
cm_security_same	security, distributed security
cm_security_program	security
cm_security_program_strong	security
cm_security_distributed	distributed security
cm_security_mutual	distributed security
conversation_state	conversations
cm_initialize_state	conversations
cm_send_state	conversations
cm_receive_state	conversations
cm_send_pending_state	conversations
cm_confirm_state	conversations
cm_confirm_send_state	conversations
cm_confirm_deallocate_state	conversations
cm_defer_receive_state	recoverable transactions
cm_defer_deallocate_state	recoverable transactions
cm_sync_point_state	recoverable transactions
cm_sync_point_send_state	recoverable transactions
cm_sync_point_deallocate_state	recoverable transactions
cm_initialize_incoming_state	server
cm_prepared_state	recoverable transactions
cm_send_only_state	full-duplex
cm_receive_only_state	full-duplex
cm_send_and_receive_state	full-duplex
conversation_type	conversations
cm_basic_conversation	conversations
cm_mapped_conversation	conversations
data_received	conversations
cm_no_data_received	conversations
cm_data_received	conversations
cm_complete_data_received	conversations
cm_incomplete_data_received	conversations
deallocate_type	conversations
cm_deallocate_sync_level	conversations
cm_deallocate_flush	conversations
cm_deallocate_confirm	conversations
cm_deallocate_abend	conversations
directory_encoding	directory
cm_default_encoding	directory
cm_unicode_encoding	directory
directory_syntax	directory
cm_default_syntax	directory
cm_DCE_syntax	directory
cm_XDS_syntax	directory
cm_NDS_syntax	directory
error_direction	LU 6.2
cm_receive_error	LU 6.2
cm_send_error	LU 6.2

Table 89 (Page 3 of 5). Conformance Class Requirements—Characteristics, Variables, and Values

Characteristics, Variables, and Values	Required by
expedited_receive_type	expedited data
cm_receive_and_wait	expedited data
cm_receive_immediate	expedited data
fill	conversations
cm_fill_ll	conversations
cm_fill_buffer	conversations
initialization_data	OSI TP
initialization_data_length	OSI TP
join_transaction	recoverable transactions (if TX interface is supported)
cm_explicit	recoverable transactions (if TX interface is supported)
cm_implicit	recoverable transactions (if TX interface is supported)
log_data	conversations
log_data_length	conversations
1 map_name	automatic data conversion
1 map_name_length	automatic data conversion
maximum_buffer_size	conversations
mode_name	conversations
mode_name_length	conversations
OOID	queue-level non-blocking
OOID_list	queue-level non-blocking
OOID_list_count	queue-level non-blocking
partner_ID	directory
partner_ID_length	directory
partner_ID_scope	directory
cm_explicit	directory
cm_reference	directory
partner_ID_type	directory
cm_distinguished_name	directory
cm_local_distinguished_name	directory
cm_program_function_ID	directory
cm_OSI_TPSU_title_OID	directory
cm_program_binding	directory
partner_LU_name	LU 6.2
partner_LU_name_length	LU 6.2
prepare_data_permitted	(OSI TP and recoverable transactions)
cm_prepare_data_permitted	(OSI TP and recoverable transactions)
cm_prepare_data_not_permitted	(OSI TP and recoverable transactions)
prepare_to_receive_type	conversations
cm_prep_to_receive_sync_level	conversations
cm_prep_to_receive_flush	conversations
cm_prep_to_receive_confirm	conversations
processing_mode	conversation-level non-blocking
cm_blocking	conversation-level non-blocking
cm_non_blocking	conversation-level non-blocking
queue_processing_mode	queue-level non-blocking
cm_blocking	queue-level non-blocking
cm_non_blocking	queue-level non-blocking
receive_type	conversations
cm_receive_and_wait	conversations
cm_receive_immediate	conversations
received_length	conversations

Table 89 (Page 4 of 5). Conformance Class Requirements—Characteristics, Variables, and Values

Characteristics, Variables, and Values	Required by
requested_length	conversations
return_code	conversations
cm_ok	conversations
cm_allocate_failure_no_retry	conversations
cm_allocate_failure_retry	conversations
cm_conversation_type_mismatch	LU 6.2
cm_pip_not_specified_correctly	LU 6.2
cm_security_not_valid	conversations
cm_sync_lvl_not_supported_sys	conversations
cm_sync_lvl_not_supported_pgm	LU 6.2
cm_tpn_not_recognized	conversations
cm_tp_not_available_no_retry	conversations
cm_tp_not_available_retry	conversations
cm_deallocated_abend	conversations
cm_deallocated_normal	conversations
cm_parameter_error	conversations
cm_product_specific_error	conversations
cm_program_error_no_trunc	LU 6.2
cm_program_error_purging	conversations
cm_program_error_trunc	LU 6.2
cm_program_parameter_check	conversations
cm_program_state_check	conversations
cm_resource_failure_no_retry	conversations
cm_resource_failure_retry	conversations
cm_unsuccessful	conversations
cm_deallocated_abend_svc	LU 6.2
cm_deallocated_abend_timer	LU 6.2
cm_svc_error_no_trunc	LU 6.2
cm_svc_error_purging	LU 6.2
cm_svc_error_trunc	LU 6.2
cm_operation_incomplete	conversation-level non-blocking, callback function, queue-level non-blocking
cm_system_event	conversation-level non-blocking
cm_operation_not_accepted	conversation-level non-blocking, callback function, queue-level non-blocking
cm_conversation_ending	full-duplex
cm_send_rcv_mode_not_supported	OSI TP, full-duplex
cm_buffer_too_small	expedited data, OSI TP, directory
cm_exp_data_not_supported	expedited data
cm_deallocate_confirm_reject	(OSI TP and full-duplex)
cm_allocation_error	full-duplex
cm_retry_limit_exceeded	directory
cm_no_secondary_information	secondary information
cm_security_not_supported	security, distributed security
cm_security_mutual_failed	distributed security
cm_call_not_supported	-
cm_parm_value_not_supported	conversations, security, distributed security recoverable transactions
3 cm_unknown_map_name_requested	automatic data conversion
3 cm_unknown_map_name_received	automatic data conversion
3 cm_map_routine_error	automatic data conversion
2 cm_conversation_canceled 3	conversation-level non-blocking, callback function, queue-level non-blocking
cm_take_backout	recoverable transactions
cm_deallocated_abend_bo	recoverable transactions
cm_deallocated_abend_svc_bo	(LU 6.2 and recoverable transactions)
cm_deallocated_abend_timer_bo	(LU 6.2 and recoverable transactions)
cm_resource_fail_no_retry_bo	recoverable transactions
cm_resource_failure_retry_bo	recoverable transactions
cm_deallocated_normal_bo	recoverable transactions
cm_conv_dealloc_after_syncpt	(full-duplex, recoverable transactions and LU 6.2)
cm_include_partner_reject_bo	unchained transactions

Table 89 (Page 5 of 5). Conformance Class Requirements—Characteristics, Variables, and Values

Characteristics, Variables, and Values	Required by
return_control	conversations
cm_when_session_allocated	conversations
cm_immediate	conversations
1 cm_when_conwinner_allocated	conversations
1 cm_when_session_free	conversations
security_password	security
security_password_length	security
security_user_ID	security, distributed security
security_user_ID_length	security, distributed security
send_length	conversations
send_receive_mode	full-duplex
cm_full_duplex	full-duplex
cm_half_duplex	full-duplex
send_type	conversations
cm_buffer_data	conversations
cm_send_and_flush	conversations
cm_send_and_confirm	conversations
cm_send_and_prep_to_receive	conversations
cm_send_and_deallocate	conversations
status_received	conversations
cm_no_status_received	conversations
cm_send_received	conversations
cm_confirm_received	conversations
cm_confirm_send_received	conversations
cm_confirm_dealloc_received	conversations
cm_take_commit	recoverable transactions
cm_take_commit_send	recoverable transactions
cm_take_commit_deallocate	recoverable transactions
cm_take_commit_data_permitted	(OSI TP and recoverable transactions)
cm_take_commit_send_data_permitted	(OSI TP and recoverable transactions)
cm_take_commit_deallocate_data_permitted	(OSI TP and recoverable transactions)
cm_prepare_ok	recoverable transactions
cm_join_transaction	unchained transactions
sym_dest_name	conversations
sync_level	conversations
cm_none	conversations
cm_confirm	conversations
cm_sync_point	recoverable transactions
cm_sync_point_no_confirm	(OSI TP and recoverable transactions), (recoverable transactions and full-duplex)
timeout	queue-level non-blocking
TP_name	conversations
TP_name_length	conversations
transaction_control	unchained transactions
cm_chained_transactions	unchained transactions
cm_unchained_transactions	unchained transactions
user_field	queue-level non-blocking, callback function
user_field_list	queue-level non-blocking

Glossary

A

alias. (1) An alternative name used to identify an object, a logical unit, or a database. (2) A nickname set up by the network administrator for a file, printer, or serial device.

API. Application programming interface.

application-entity. The part of an application-process that exclusively defines communications formats and protocols for OSI-compliant systems.

application-entity-qualifier. The qualifier that is used to identify a specific instance of an application-entity. It must be unambiguous within the scope of the application-process. See also ISO/IEC 7498-3.

application-process. The part of an open system that performs the information processing for a particular application. See also ISO/IEC 7498:1984.

application-process-title. The unambiguous title of the application-process. It must be unambiguous within the OSI environment. See also ISO/IEC 7498-3.

application context. The set of rules that define the exchange of information between two application programs. See also ISO/IEC 9545.

application context name. The registered name of the application context. See also ISO/IEC 9545.

application programming interface (API). The set of programming language constructs or statements that can be coded in an application program to invoke the specific functions and services provided by an underlying operating system or service program.

association. A relationship between two application-entity instances for the purpose of exchanging data. An association is similar to an SNA LU 6.2 session and is sometimes called a logical connection. See also ISO/IEC 9594.

B

basic conversation. A conversation in which programs exchange data records in an SNA-defined format. This format is a stream of data containing 2-byte length prefixes that specify the amount of data to follow before the next prefix.

blocking. A CPI Communications call-processing mode in which a call operation completes before control is returned to the program. The program (or thread) is blocked (unable to perform any other work) until the call operation is completed.

C

callback function. An application-defined function that is called when an outstanding operation completes.

chained transactions. A series of transactions in which the (n+1)th transaction begins immediately upon the termination of the nth transaction. See also ISO/IEC 10026-1.

Common Programming Interface Communications (CPI-C). A programming interface for applications that require program-to-program communication using the conversational model.

communications resource manager (CRM). The component within a system that manages a particular resource — in this case, a conversational communications resource. See also *X/Open Guide: Distributed Transaction Processing Reference Model*.

context. A system-wide entity used by node services to group logical attributes for work done by a program on behalf of a partner program.

context identifier. A system-wide identifier used by node services to identify a context.

conversation. A logical connection between two programs over an LU type 6.2 session or OSI TP association that allows them to communicate with each other while processing a transaction. See also basic conversation and mapped conversation.

conversation characteristics. The attributes of a conversation that determine the functions and capabilities of programs within the conversation.

conversation partner. One of the two programs involved in a conversation.

conversation queue. A logical grouping of CPI Communications calls on a conversation. Calls associated with a specific queue are processed serially. Calls associated with different queues are processed independently.

conversation state. The condition of a conversation that reflects what the past action on that conversation has been and that determines what the next set of actions may be.

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CPI-C. Common Programming Interface Communications.

current context. For a program, the context within which work is currently being done.

D

directory object. A collection of information that is represented in the distributed directory as a single entry. Directory objects consist of attributes, each of which has a type and one or more values.

distinguished name. A completely qualified name that is used to access an entry in a distributed directory. Contrast with *local distinguished name*.

distributed directory. A collection of open systems that cooperate to hold information about **directory objects**. The directory is referred to as distributed because the data can be accessed from multiple locations in a network using local directory interfaces.

DN. See distinguished name.

F

full-duplex. Pertaining to communication in which data can be sent and received at the same time. ***Contrast with half-duplex***.

H

half-duplex. Pertaining to communication in which data can only be transmitted in one direction at a time. ***Contrast with full-duplex***.

I

initialization data. Application-specific data that may be exchanged between two application programs during conversation initialization. See also ISO/IEC 10026-2 for User-Data on TP-BEGIN-DIALOGUE and *SNA Transaction Programmers Reference Manual for LU Type 6.2*.

L

local distinguished name. An incomplete distinguished name for an object in a distributed directory. The complete distinguished name is formed by prefixing the local distinguished name with a system-specific local prefix.

local program. The program being discussed within a particular context. Contrast with remote program.

logical connection. The generic term used to refer to either an SNA LU 6.2 session or an OSI association.

logical unit. A port providing formatting, state synchronization, and other high-level services through which an end user communicates with another end user over an SNA network.

logical unit type 6.2. The SNA logical unit type that supports general communication between programs in a distributed processing environment; the SNA logical unit type on which CPI Communications is built.

M

mapped conversation. A conversation in which programs exchange data records with arbitrary data formats agreed upon by the applications' programmers.

mode name. Part of the CPI Communications side information. The mode name is used by LU 6.2 to designate the properties for the logical connection that will be allocated for a conversation.

N

network name. In SNA, the symbolic identifier by which end users refer to a network accessible unit (NAU), link station, or link.

non-blocking. A CPI Communications call-processing mode in which, if possible, a call operation completes immediately. If the call operation cannot complete immediately, control is returned to the program with the CM_OPERATION_INCOMPLETE return code. The call operation remains in progress, and completion of the call operation occurs at a later time. Meanwhile, the program is free to perform other work.

O

OSI TP. Refers to the International Standard ISO/IEC 10026, Information Technology — Open Systems Interconnection — Distributed Transaction Processing. ISO/IEC 10026 is one of a set of standards produced to facilitate the interconnection of computer systems.

outstanding operation. A call operation for which the program has received the CM_OPERATION_INCOMPLETE return code. The call operation remains in progress, and completion occurs at a later time. An outstanding operation can only occur on a conversation using non-blocking processing mode.

P

partial distinguished name. See local distinguished name.

partner. See conversation partner.

partner principal name. The name by which the distributed security service knows the target partner.

PFID. See program function ID.

principal. Any entity which participates in an authentication exchange.

privilege. An identification that a product or installation defines in order to differentiate SNA service transaction programs from other programs, such as application programs.

program function ID. A unique identifier for the function performed by a particular program. Multiple installations of a program may have equivalent program function IDs (PFID).

protected resource. A local or distributed resource that is updated in a synchronized manner during processing managed by a resource recovery interface and a sync point manager.

pseudonym file. A file that provides CPI Communications declarations for a particular programming language.

R

remote program. The program at the other end of a conversation with respect to the reference program. Contrast with local program.

resource recovery interface. An interface to services and facilities that use two-phase commit protocols to coordinate changes to distributed resources.

S

secondary information. Information associated with the return code at the completion of a call. The information can be used to determine the cause of the return code.

session. A logical connection between two logical units that can be activated, tailored to provide various protocols, and deactivated as requested.

side information. System-defined values that are used for the initial values of the *conversation_security_type*, *mode_name*, *partner_LU_name*, *security_password*, *security_user_ID*, and *TP_name* characteristics.

state. See conversation state.

state transition. The act of moving from one conversation state to another.

subordinate program. The application program that issued either Accept_Conversation or Accept_Incoming for a protected conversation.

superior program. The application program that issued Initialize_Conversation for a protected conversation.

symbolic destination name. Variable corresponding to an entry in the side information.

synchronization point. A reference point during transaction processing to which resources can be restored if a failure occurs.

sync point manager. A component of the operating environment that coordinates commit and backout processing among all the protected resources involved in a sync point transaction. Synonymous with transaction manager.

Systems Network Architecture. A description of the logical structure, formats, protocols, and operational sequences for transmitting information units through, and controlling the configuration and operation of, networks.

T

transaction. A related set of operations that are characterized by the ACID (atomicity, consistency, isolation, and durability) properties. See also ISO/IEC 10026-1.

transaction manager. The component within a system that manages the coordination of resources within a transaction. Synonymous with sync point manager. See also *X/Open Guide: Distributed Transaction Processing Reference Model*.

transition. See state transition.

U

unchained transactions. A series of transactions in which the (n+1)th transaction does not begin immediately upon the termination of the nth transaction, but is explicitly started at a later time. See also ISO/IEC 10026-1.

user field. Application data that can be associated with an outstanding operation. The data, as specified by the program, can be returned to the program through a Wait_For_Completion call issued for that outstanding operation, or it can be passed to the callback function associated with the outstanding operation, when the operation completes.

X

X/Open. X/Open is an independent, worldwide, open systems organization whose mission is to bring users greater value from computing, through the practical implementation of open systems.

X/Open TX interface. *X/Open Distributed Transaction Processing: The TX (Transaction Demarcation) Specification* defines an interface between the transaction manager and the application program. It is similar to the IBM SAA resource recovery interface.

Index

Special Characters

- (dash) 109
_ (underscore) 11, 109
. (period) 425
& (ampersand) 108

A

abnormal program ending 20
Accept Conversation (CMACCP) 116
  OS/2 considerations
  VM/ESA-specific errors
  VM/ESA-specific notes 401
Accept_Incoming (CMACCI) 118
access security information
  on OS/2
acknowledgement xvii
advanced program-to-program communications
  See also LU 6.2
  verbs 501
advanced-function calls
  automatic data conversion 40
  examples 72—101
AE_qualifier, defined 21
AIX
  allocation request
  compiling
  concept
  conformance classes
  conversation scope
  conversation_ID, scope of
  dangling conversation, deallocating
  deviation
  diagnosing error
  documentation
  extension calls
  Extract_Conversation_Security_Type (XCECST)
  Extract_Conversation_Security_User_ID (XCECSU)
  identifying error
  languages supported
  list
  operating environment
  product-specific errors
  profile, working with
  pseudonym file
  pseudonym files
  reference publications
  security, using
  Set_Conversation_Security_Password (XCSCSP)
  Set_Conversation_Security_Type (XCSCST)
  Set_Conversation_Security_User_ID (XCSCSU)
AIX *(continued)*
  side information
  starting SMIT
  transaction program, running
alias name for partner LU on OS/2
Allocate (CMALLC) 121
  OS/2 considerations
  VM/ESA-specific errors
  VM/ESA-specific notes 401
allocate_confirm 277
allocating data buffers on OS/2
allocation requests, when sent
  MVS/ESA
  OS/2
  OS/400
  VM/ESA
allocation wrapback in VM/ESA 400
AP_title 279
AP_title, defined 21
APPC
  See advanced program-to-program communications
APPC/MVS services, use with CPI Communications
APPCLLU OS/2 environment variable
APPCTPN OS/2 environment variable
Application Generator considerations
  general 108
  in OS/400
  in VM/ESA
application migration 543
  from X/Open CPI-C to CPI-C 2.0 543
application TP names on OS/2
application_context_name 281
application_context_name, defined 21
ASCII, conversion of 424
Assembler considerations (VM/ESA)
attach manager-started programs on OS/2

B

backout-required condition
  described 57
  effect on multiple conversations 50
basic conversation 15, 251
begin conversation
  CMALLC (Allocate) 121
  example flow 67, 82, 86
  program startup 19
  simple example 27
begin_transaction 283
blank *sym_dest_name* 22, 197
blocking operations 45

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buffering of data
  description 42, 251
  example flow 68

C

C considerations
  general 108
  in Networking Services for Windows
    function calls
    pseudonym files
  in OS/2
  in VM/ESA
call reference
  format 107
  how to use 110
  in VM/ESA
  parameters 107
  related information 107
  RPG 110
  state changes 107
  usage notes 107
call_ID 412
callback_function 329
callback_info 329
calls
  advanced-function
    examples 72—101
  call characteristics
    See characteristics, call characteristics
  for resource recovery interfaces 52
  format for AIX
  format for MVS/ESA
  format for Networking Services for Windows
  format for OS/2
    conversation, overview
  format for VM/ESA
  naming convention 11
  possible values, table 412
  starter-set
    examples 66—71
Cancel_Conversation (CMCANC) 128
chained transactions 59, 190
changing data flow direction
  by receiving program 74
  by sending program 70, 72
changing side information on OS/2
character sets
  exceptions for SNA TP names 499
  general 418
  on OS/2
  T61String 418
character strings 421
characteristics
  automatic conversion of 39
  call characteristics
    AE_qualifier 275
characteristics *(continued)*
  call characteristics *(continued)*
    allocate_confirm 277
    AP_title 279
    application_context_name 281
    begin_transaction 283
    call_ID 412
    confirmation_urgency 285, 412
    context_ID 159
    conversation_queue 412
    conversation_return_code 412
    conversation_security_type 289
    conversation_state 161
    conversation_type 163
    deallocate_type 296
    directory_encoding 412
    directory_syntax 412
    error_direction 300
    expedited_receive_type 412
    fill 303
    initialization_data 305
    log_data 309
    mode_name 172
    OOID_list_count 412
    partner_ID_scope 412
    partner_ID_type 412
    partner_LU_name 177
    prepare_data_permitted 322
    prepare_to_receive_type 324
    processing_mode 326
    queue_callback_function 329
    queue_processing_mode 332, 412
    receive_type 335
    return_control 337
    security_password 287
    security_user_ID 182
    send_receive_mode 340
    send_type 342
    sync_level 344
    TP_name 347
    transaction_control 349, 412
  comparison of defaults 33
  default values 27
  examining 32
  initial values
    on OS/2, set by Accept_Conversation
    on OS/2, set by Initialize_Conversation
  initial values, table 33
  integer values 411
  modifying 32
  naming convention 11
  OS/2 additions
  pseudonym 11
  viewing 32
CICS/ESA
  allocation requests

CICS/ESA *(continued)*
  conformance classes
  documentation
  extension calls
  reference publications
CMACCI (Accept_Incoming) 118
CMACCP (Accept_Conversation) 116
  OS/2 considerations
  VM/ESA-specific errors
  VM/ESA-specific notes 401
CMALLC (Allocate) 121
  OS/2 considerations
  VM/ESA-specific errors
  VM/ESA-specific notes 401
CMC COPY (VM/ESA)
CMCANC (Cancel_Conversation) 128
CMCFM (Confirm) 130
  protocol error in VM/ESA
  VM/ESA-specific errors
CMCFMD (Confirmed) 134
CMCNVI (Convert_Incoming) 136
CMCNVO (Convert_Outgoing) 138
CMCSP COPY (VM/ESA)
CMD.EXE program for OS/2
CMDEAL (Deallocate) 140
  Networking Services for Windows considerations
  protocol error in VM/ESA
  VM/ESA-specific errors
CMDFDE (Deferred_Deallocate) 151
CMEACN (Extract_Application_Context_Name) 157
CMEAEQ (Extract_AE_Qualifier) 153
CMEAPT (Extract_AP_Title) 155
CMECS (Extract_Conversation_State) 161
CMECT (Extract_Conversation_Type) 163
CMECTX (Extract_Conversation_Context) 159
CMEID (Extract_Initialization_Data) 165
CMEMBS (Extract_Maximum_Buffer_Size) 170
CMEMID (Extract_Mapped_Initialization_Data) 167
CMEMN (Extract_Mode_Name) 172
CMEPID (Extract_Partner_ID) 174
CMEPLN (Extract_Partner_LU_Name) 177
CMESI (Extract_Secondary_Information) 179
CMESL (Extract_Sync_Level) 186
CMESRM (Extract_Send_Receive_Mode) 184
CMESUI (Extract_Security_User_ID) 182
  AIX call
  OS/2 call
CMETC (Extract_Transaction_Control) 190
CMETPN (Extract_TP_Name) 188
CMFLUS (Flush) 192
  VM/ESA-specific errors 402
CMFORTRN COPY (VM/ESA)
CMHASM COPY (VM/ESA)
CMINCL (Include_Partner_IN_Transaction) 195
CMINIC (Initialize_For_Incoming) 199
CMINIT (Initialize_Conversation) 197
  OS/2 considerations
  VM/ESA-specific errors 402
CMPASCAL COPY (VM/ESA)
CMPREP (Prepare) 201
CMPTR (Prepare_To_Receive) 204
  protocol error in VM/ESA
  VM/ESA-specific errors
CMRCV (Receive) 209
  OS/2 considerations
  protocol error in VM/ESA
  VM/ESA-specific errors
CMRCVM (Receive_Mapped_Data) 226
CMRCVX (Receive_Expedited_Data) 223
CMREXX COPY (VM/ESA)
CMRLTP (Release_Local_TP_Name) 239
CMRTS (Request_To_Send) 241
CMSAC (Set_Allocate_Confirm) 277
CMSACN (Set Application_Context_Name) 281
CMSAEQ (Set_AE_Qualifier) 275
CMSAPT (Set_AP_Title) 279
CMSBT (Set_Begin_Transaction) 283
CMSCT (Set_Conversation_Type) 294
CMSCU (Set_Confirmation_Urgency) 285
CMSDT (Set_Deallocate_Type) 296
CMSED (Set_Error_Direction) 300
CMSEND (Send_Data) 244
  OS/2 considerations
  protocol error in VM/ESA
  VM/ESA-specific errors 403
  VM/ESA-specific notes
CMSERR (Send_Error) 254
  protocol error in VM/ESA
  VM/ESA-specific errors
CMSF (Set_Fill) 303
CMSID (Set_Initialization_Data) 305, 311
CMSJT (Set_Join_Transaction) 307
CMSLD (Set_Log_Data) 309
  Networking Services for Windows considerations
  OS/2 considerations
  VM/ESA-specific errors 403
CMSLTP (Specify_Local_TP_Name) 351
CMSMID (Set_Mapped_Initialization_Data
CMSMN (Set_Mode_Name) 314
  Networking Services for Windows considerations
  OS/2 considerations
CMSNDM (Send_Mapped_Data) 266
CMSNDX (Send_Expedited_Data) 263
CMSPDP (Set_Prepare_Data_Permitted) 322
CMSPID (Set_Partner_ID) 316
CMSPLN (Set_Partner_LU_Name) 320
  OS/2 considerations
  VM/ESA-specific errors
CMSPM (Set_Processing_Mode) 326
CMSPTR (Set_Prepare_To_Receive_Type) 324

Index

CMSQCF (Set_Queue_Callback_Function) 329
CMSQPM (Set_Queue_Processing_Mode) 332
CMSRC (Set_Return_Control) 337
CMSRT (Set_Receive_Type) 335
CMSSAA TXTLIB (VM/ESA)
CMSSL (Set_Sync_Level) 344
  OS/2 considerations
CMSSRM (Set_Send_Receive_Mode) 340
CMSST (Set_Send_Type) 342
CMSTC (Set_Transaction_Control) 349
CMSTPN (Set_TP_Name) 347
  OS/2 considerations
CMTRTS (Test_Request_To_Send_Received) 353
CMWAIT (Wait_For_Conversation) 359
CMWCMP (Wait_For_Completion) 356
CNSI (CPI Communications name service interface) 547
  attributes
    complex 548
    simple 548
    single-valued 548
  encoding for complex attributes
    fields 550
  profile object 548
  program_installation object 549
  sample calls 547
  scenarios 550
  server object 548
COBOL considerations 109
  in OS/2
  in VM/ESA
commit call
  by sending program 96
  conversation deallocation before 100
  example flow 96, 99, 101
  with conversation state change 98
commit tree, illustrated 61
common programming interface (CPI)
  communications
    See CPI Communications
communication
  across an SNA network 14
  resource manager (CRM) 14
  with an APPC program 499
communications directory, CMS (VM/ESA)
Communications Manager
  See OS/2
completed_op_count 356
completed_op_index_list 356
concurrent conversations 27
concurrent operations
  conversation queues 42
  multiple program threads 42
    association of calls, table 43
Confirm (CMCFM) 130
  protocol error in VM/ESA
Confirm (CMCFM) *(continued)*
  VM/ESA-specific errors
Confirm state 50
Confirm-Deallocate state 50
Confirm-Send state 50
confirmation processing
  Confirm call 130
  Confirmed call 134
  example flow 77
confirmation_urgency 412
Confirmed (CMCFMD) 134
conformance class 553
  callback function 558
  conversation-level non-blocking 558
  conversations 554
  data conversion routines 559
  directory 560
  distributed security 560
  expedited data 560
  full-duplex 560
  LU 6.2 556
  OSI TP 556
  product implementation, table
  queue-level non-blocking 558
  recoverable transactions 557
  secondary information 561
  security 559
  server 559
  unchained transactions 557
contexts
  changing 29
  creating 29
  current 29
  identifier 29
  relationship
    conversation 30
    security parameter 30
  setting 29
control_information_received 412
control_information_received parameter 26
convention, naming 11
conversation
  accept 116
  allocate 121
  basic 15, 251
  canceling 128
  characteristics
    See also characteristics, call characteristics
    described 31
    overview 31
  concurrent 27
  dangling
    See dangling conversation, deallocating
  deallocate 140
  description 15
  effects on 496

conversation *(continued)*
examples 27, 66—101
full-duplex
setting up 84
terminating 87
using 84
identifier 27
illustration
inbound and outbound 30
initialize 197
mapped 15, 251
multiple 27
multiple inbound
illustration 28, 29
in server programs 28
multiple outbound
conversation_ID 19
illustration 28
queues 88
security 49
states
See states, conversation
synchronization and control
Confirm call 130
Confirmed call 134
Flush call 192
Prepare_To_Receive call 204
Request_To_Send call 241
Send_Error 254
Test_Request_To_Send_Received 353
transition from a state 50
types 15
conversation calls on OS/2
conversation_ID
described 27
scope of
in CICS/ESA
in MVS/ESA
in OS/2
in OS/400
in VM/ESA
sharing across tasks, in MVS/ESA
conversation security
access security information 49
incompatible values, table 50
on OS/2
conversation_security_type characteristic
on OS/2
on VM/ESA 382, 397
conversation states
additional CPI states 62
description 50
extracting 161
full-duplex protected conversations (CPIRR) 495
full-duplex protected conversations (X/Open) 496
half-duplex protected conversations (CPIRR) 479
conversation states *(continued)*
half-duplex protected conversations (X/Open) 463, 480
list 50
possible values 412
pseudonym 11
table
full-duplex 489
half-duplex 472
valid for resource recovery 63
conversation type characteristic 294
conversation_queue 329, 412
conversation_return_code 412
conversation_security_type, defined 22
conversion
characteristics 39
data 41
conversion of characteristics
on OS/2
conversion to and from ASCII 424
on OS/2
Convert_Incoming (CMCNVI) 136
Convert_Outgoing (CMCNVO) 138
Coordinated Resource Recovery (VM/ESA) 397
CPI Communications
additional information sources 6
audience 5
communication with APPC programs 499
conversational model 5
CPI-C 1.0 7
CPI-C 1.1 7
CPI-C 1.2 7
CPI-C 2.0 8
directory object 16
functional levels 7
in SNA networks 14
introducing 5
name service interface (CNSI) 546
naming convention 11
program operating environment 17
related APPC/LU 6.2 publications 6
relationship to 2.0 spec
relationship to LU 6.2 interface 497
relationship to products
versions of, table 9
what's new in this release 6
with resource recovery interfaces 52
X/Open CPI-C 2.0 8
X/Open extensions 7
CPI-C
See CPI Communications
CPIC.LIB for OS/2 link edit
CPICOBOL.LIB for OS/2 link edit
CPICOMM LOGDATA file on VM/ESA
CPICOMM REXX environment for OS/2

CPICREXX.EXE program for OS/2
CPIFORTN.LIB for OS/2 link edit
CPSVCMG mode name
  OS/2 considerations
CRM
  characteristic values 37
  for LU 6.2 14, 37
  for OSI TP 37, 460
  using particular type 37
CSP considerations 108

D

dangling conversation, deallocating 19
  in AIX
  in CICS/ESA
  in MVS/ESA
  in Networking Services for Windows
  in OS/2
  in OS/400
  in VM/ESA
data
  buffer allocation on OS/2
  direction, changing
    by receiving program 74
    by sending program 70, 72
  flow
    in both directions 70
    in one direction 67, 82, 86
  purging 78, 260
  reception and validation of 76
data records
  description 15
  Receive call 210
  Send_Data call 251
data_received parameter 26
DCE directory
  DCE interface 545
  directory objects 546
    interaction of 546
  extensions 545
  profile object 545
  server group object 546
  server object 545
Deallocate (CMDEAL) 140
  Networking Services for Windows considerations
  protocol error in VM/ESA
  VM/ESA-specific errors
deallocate_type characteristic 140
defaults for TPs on OS/2
Deferred_Deallocate (CMDFDE) 151
defining a program (TP) on OS/2
defining side information on OS/2
Delete_CPIC_Side_Information (XCMDSI)
  OS/2 call
destination name, symbolic
  blank 22, 197
  defined 17
  example 67, 82, 86
  OS/2 considerations
deviations from CPI Communications architecture
  CICS/ESA
  MVS/ESA
  OS/2
  VM/ESA
diagnosing errors
  CICS/ESA
  MVS/ESA
  Networking Services for Windows
  OS/2
  OS/400
  VM/ESA
directory_encoding 316, 412
directory_syntax 316, 412
distinguished name, naming convention 426
distinguished_name, defined 21
distributed directory
  defined 22
  directory object 23
  distinguished name (DN) 21
  illustration of
    generic program interaction 22
    interaction with CPI Communications 24
  locating partner program 22, 94
  program function identifier (PFID) 22
  program interaction 23
  using 23
distributed security
  illustration of CRM interaction 25
  principal names 25
DN, specifying default 316
double-byte TP names on OS/2

E

EBCDIC, conversion to 136, 559
  on OS/2
environment requirements for MVS/ESA
environment variables on OS/2
  for local LU name (APPCLLU)
  for TP name (APPCTPN)
environment, operating
  CICS/ESA
  MVS/ESA
  OS/2
  OS/400
  VM/ESA
error codes (VM/ESA)
error_direction characteristic
  and Send-Pending state 80, 498

error reporting
  example 78
  OS/2 considerations with REXX
  Send_Error call 259
errors, diagnosing
  CICS/ESA
  MVS/ESA
  Networking Services for Windows
  OS/2
  OS/400
  VM/ESA
errors, product-specific
  See product-specific errors, identifying
event (VM/ESA)
  communications 403
  services 403
  system 403
event management in VM/ESA
  using for CPI Communications 387, 393, 403
event management services (VM/ESA) 387, 393, 403
examining conversation characteristics 32
  See also extract calls
example flows
  See tutorial information
expedited_receive_type 412
extension calls, CPI Communications
  CICS/ESA
  MVS/ESA
  OS/2
  OS/400
  VM/ESA 394
extract calls
  AE Qualifier (CMEAEQ) 153
  AP_Title (CMEAPT) 155
  Application_Context_Name (CMEACN) 157
  Conversation_Context (CMECTX) 159
  Conversation_Security_Type (XCECST)
    on OS/2
  Conversation_Security_User_ID (XCECSU)
    on OS/2
  Conversation_State (CMECS) 161
  Conversation_Type (CMECT) 163
  Initialization_Data (CMEID) 165
  Mapped_Initialization_Data (CMEMID) 167
  Maximum_Buffer_Size (CMEMBS) 170
  Mode_Name (CMEMN) 172
  Partner_ID (CMEPID) 174
  Partner_LU_Name (CMEPLN) 177
  Secondary_Information (CMESI) 179
  Security_User_ID (CMESUI) 182
  Send_Receive_Mode (CMESRM) 184
  Side_Info_Entry (XCMESI) (OS/2)
  Sync_Level (CMESL) 186
  TP_Name (CMETPN) 188
  Transaction_Control (CMETC) 190
Extract_AE_Qualifier (CMEAEQ) 153
Extract_AP_Title (CMEAPT) 155
Extract_Application_Context_Name (CMEACN) 157
Extract_Conversation_Context (CMECTX) 159
Extract_Conversation_LUWID (XCECL) call on
  VM/ESA 362
Extract_Conversation_Security_Type (XCECST)
  AIX call
  OS/2 call
Extract_Conversation_State (CMECS) 161
Extract_Conversation_Type (CMECT) 163
Extract_Conversation_Workunit_ID (XCECWU) call on
  VM/ESA 366
Extract_CPIC_Side_Information (XCMESI)
  OS/2 call
Extract_Initialization_Data (CMEID) 165
Extract_Local_Fully_Qualified_LU_Name (XCELFQ)
  VM/ESA call 368
Extract_Mapped_Initialization_Data (CMEMID) 167
Extract_Maximum_Buffer_Size (CMEMBS) 170
Extract_Mode_Name (CMEMN) 172
Extract_Partner_ID (CMEPID) 174
Extract_Partner_LU_Name (CMEPLN) 177
Extract_Remote_Fully_Qualified_LU_Name (XCERFQ)
  VM/ESA call 370
Extract_Secondary_Information (CMESI) 179
Extract_Security_User_ID (CMESUI) 182
  AIX call
  OS/2 call
Extract_Send_Receive_Mode (CMESRM) 184
Extract_Sync_Level (CMESL) 186
Extract_TP_Name (CMETPN) 188
Extract_TP_Name (XCETPN) call on VM/ESA 372
Extract_Transaction_Control (CMETC) 190

F

fields
  defined for OS/2
  of side_info_entry on OS/2
fill characteristic 303
flow
  definition of 65
  diagrams 67—101
Flush (CMFLUS) 192
  VM/ESA-specific errors 402
FORTRAN considerations
  general 109
  in OS/2
  in VM/ESA
full-duplex
  See states, conversation

G

graphic representations for character sets
  OS/2 additions
  table 418
green ink, use of

H

half-duplex
  See states, conversation
HELP, VM/ESA online 406

I

identifier (PFID) 22
IMS/ESA
  documentation
  reference publications
Include_Partner_In_Transaction (CMINCL)
  subordinate 195
initialize
  conversation 197
  state 50
Initialize_Conv_For_TP (XCINCT)
  OS/2 call
Initialize_Conversation (CMINIT) 197
  OS/2 considerations
  VM/ESA-specific errors 402
Initialize_For_Incoming (CMINIC) 199
Initialize_Incoming state 51
integer
  values 411
integer values
  OS/2 additions
interface, communications
  See CPI Communications
invoking routines
  in MVS/ESA
  in VM/ESA

K

key variable on OS/2
keylock feature on OS/2
keys in VM/ESA 404

L

language considerations, programming 108
  in MVS/ESA
  in OS/2
  in OS/400
  in VM/ESA
languages supported
  CICS/ESA
  MVS/ESA
languages supported *(continued)*
  OS/2
  OS/400
  VM/ESA
link edit for OS/2
linkage conventions in MVS/ESA
load module for CPI Communications in MVS/ESA
local partner 16
locating partner program
  using distributed directory 94
log_data characteristic
  OS/2 considerations
  set 309
logical connection
  association 14
  session 14
logical records
  description 15
  OS/2 considerations
  Receive call 210
  Send_Data call 251
logical unit
  See also LU 6.2
  illustration 14
logical unit of work identifier (LUWID) format on VM/ESA 363
logical unit of work identifier on OS/2
LU
  See logical unit
LU 6.2
  and CPI communications calls 497
    relationship of verbs, table 501—506
  considerations in VM/ESA 398
  related information
luname tag in VM/ESA
LUWID (logical unit of work identifier) format on VM/ESA 363

M

MAP_NAME 498
mapped conversation 15, 251
match keys in VM/ESA 404
mode name, defined 21
mode_name characteristic
  defined 21
  extract 172
  length 424
  OS/2 considerations
  set 314
mode_name CPSVCMG
  OS/2 considerations
mode_name SNASVCMG
  Allocate call 122
  OS/2 considerations
  Set_Mode_Name call 314

mode, processing 326
modename tag in VM/ESA
modifying conversation characteristics 32
  See also set calls
multiple conversations
  inbound 27
  outbound 27
multiple program threads 43
multitasking, CMS (VM/ESA)
  using event management services 393, 403
MVS/ESA
  conformance classes
  documentation
  errors
  reference publications

N

naming conventions 11
native encoding on OS/2 (ASCII)
network name for partner LU
  OS/2 considerations
Networking Services for Windows
  conformance classes
  dangling conversations in
  deviations from CPI-C
  diagnosing errors
  documentation
  linking with CPI-C import library
  memory considerations
    data buffers
    stack size
  mode_name
  product-specific errors
  pseudonym files
  reference publications
  side information
nick tag in VM/ESA
node services 19
non-blocking operations
  calls returning incomplete, table 46
  context management 48
  conversation-level 46
  operations 45
  outstanding operation 45
  processing_mode 46
  queue-level
    callback function 47
    using 47
    wait facility 47
non-queued programs on OS/2

O

online HELP Facility (VM/ESA) 406
OOID_list 356
OOID_list_count 356, 412
operating environment
  CICS/ESA
  example in CPI 17
  generic elements 17
  illustration 17
  MVS/ESA
  OS/2
  OS/400
  VM/ESA
Operating System/2
  See OS/2
  documentation
Operating System/400
  See OS/400
  documentation
OS/2
  characteristics, fields, and variables
  conformance classes
  considerations for CPI Communications calls
  conversation calls
  CPI Communications functions not available
  defining and running a program
  extension calls
    Delete_CPIC_Side_Information (XCMDSI)
    Extract_Conversation_Security_Type (XCECST)
    Extract_Conversation_Security_User_ID (XCECSU)
    Extract_CPIC_Side_Information (XCMESI)
    Initialize_Conv_For_TP (XCINCT)
    Set_Conversation_Security_Password (XCSCSP)
    Set_Conversation_Security_Type (XCSCST)
    Set_Conversation_Security_User_ID (XCSCSU)
    Set_CPIC_Side_Information (XCMSSI)
  programming languages supported
  pseudonym files
  reference publications
  sample programs
  side information
  system management calls
  transaction program control
OS/400
  conformance classes
  considerations, programming language
    See OS/400, programming language considerations
  conversation_ID, scope of
  conversation support, multiple
  incoming conversations, prestarting jobs
  jobs
  log_data
  multiple conversation support
  node services
    dangling conversations, ending
    reclaim resource processing

OS/400 *(continued)*
operating environment
Application Generator
C/400
communications side information, described
Cross System Product (CSP)
CSP/Application Development
CSP/Application Execution
FORTRAN/400
REXX
REXX error and failure conditions
REXX reserved RC variable
side information, communications
overview
portability considerations
prestarting jobs for incoming conversations
programming language considerations
pseudonym files
reference publications
return codes
reasons for an error return_code, determining
scope of a *conversation_ID*
side information, communications
described
subsystems
support of *log_data*
terms and concepts
converation support, multiple
conversation_ID, scope of
incoming conversations, prestarting jobs
jobs
multiple converation support
prestarting jobs for incoming conversations
scope of a *conversation_ID*
subsystems
outstanding operations 46, 359

P

parameters
input 26
output 26
partner
identify partner program
distributed directory 16
program supplied 16
side information 16
install
naming programs 28
program binding 19, 23
program function ID 16, 23
program installation object 22
partner_ID 316
partner_ID_scope 316, 412
partner_ID_type 316, 412
partner_LU_name characteristic
extract 177
length 424
OS/2 considerations
set 320
partner_LU_name, defined 21
Pascal considerations (VM/ESA)
password tag in VM/ESA
performance considerations
for CPI Communications calls in MVS/ESA
PFID (program function identifier)
defined 427
relationship to DNs, illustrated 427
PFID assignment algorithms 427
PIP data 498
PL/I considerations 109
Prepare (CMPREP)
preparing for commit 201
prepare_data_permitted 412
Prepare_To_Receive (CMPTR) 204
protocol error in VM/ESA
VM/ESA-specific errors
prepare_to_receive_type characteristic 204
Procedures Language (REXX) considerations
general 109
in OS/2
in VM/ESA
processing requirements for MVS/ESA
product publications
AIX publications
CICS/ESA publications
IMS/ESA publications
MVS/ESA publications
Networking Services for Windows publications
OS/2 publications
OS/400 publications
VM/ESA publications
product-specific errors, identifying
CICS/ESA
MVS/ESA
OS/2
OS/400
VM/ESA
program
asynchronous updates of variables 108, 109
calls 26
compilation 26
partners 16
startup processing 19
states
See states, conversation
termination processing 19
TP definition on OS/2
types on OS/2
attach manager-started
non-queued

program binding
  defined 428
  errors 429
  extracting 429
  fields
    table 429
  sample 429
program defined side information on OS/2
programming language considerations 108
  in MVS/ESA
  in OS/2
  in OS/400
  in VM/ESA
protected conversation 52
protected resource 52
protocol errors (VM/ESA)
pseudonym
  example 11
  explanation 11
  values 411
    OS/2 additions
pseudonym files
  for CICS/ESA
  for MVS/ESA
  for OS/2
  for OS/400
  for VM/ESA

Q

queue-level
  example flow 89
  non-blocking 88
queue_processing_mode 412
queues
  calls associated with 42
  conversation queues 42

R

Receive (CMRCV) 209
  OS/2 considerations
  protocol error in VM/ESA
  VM/ESA-specific errors
Receive state
  description 50
  how a program enters 242
Receive_Expedited_Data (CMRCVX)
  expedited_receive_type 223
Receive_Mapped_Data (CMRCVM)
receive_type characteristic 335
records, logical
  description 15
  OS/2 considerations
  Receive call 210
  Send_Data call 251
relative distinguished_name, defined 426
Release_Local_TP_Name (CMRLTP) 239
remote partner
  definition 16
  residing on local system 16
reporting errors
  example 78
  OS/2 considerations with REXX
  Send_Error call 259
Request_To_Send (CMRTS) 241
Reset state 50
resource recovery interfaces
  described 52
  VM/ESA support 397
return codes 412, 431—448
return_code parameter
  definitions of values 431—448
  described 26
  possible values 412
return_control characteristic 337
REXX considerations
  general 109
  in OS/2
  in VM/ESA

S

SAA resource recovery interface
  VM/ESA support 397
  with CPI Communications 52
sample programs
  CPI Communications (generic)
  for OS/2
secondary information
  application-oriented 449
  CPI-defined 449
    table 451
  CRM-specific
    examples from LU 6.2 460
  different types and condition codes 450
    table 450
  implementation-related
    examples 461
  types and return codes
    not associated with 449
    table 449
security information
  on OS/2
security tag in VM/ESA
security_password characteristic
  on OS/2
security_password_length characteristic
  on OS/2
security_password, defined 287
security_type characteristic
  on VM/ESA 382, 397

Index

security_user_ID characteristic
  on OS/2
security_user_ID_length characteristic
  on OS/2
security_user_ID, defined 22
Send state
  description 50
Send-Pending state
  and *error_direction* characteristic 498
  description 50
  error direction 80
send-receive mode
  characteristic values
    not set for full-duplex, table 15, 38
    not set for half-duplex, table 15, 38
  send control 15
Send_Data (CMSEND) 244
  OS/2 considerations
  protocol error in VM/ESA
  VM/ESA-specific errors 403
  VM/ESA-specific notes
Send_Error (CMSERR) 254
  protocol error in VM/ESA
  VM/ESA-specific errors
Send_Expedited_Data (CMSNDX) 263
Send_Mapped_Data (CMSNDM) 266
send_type characteristic 342
service transaction programs
  general 499
  OS/2 considerations
set calls
  AE_qualifier 275
  allocate_confirm 277
  AP_title 279
  application_context_name 281
  begin_transaction 283
  confirmation_urgency 285
  conversation_security_password 287
    on OS/2
  conversation_security_type 289
    on OS/2
  conversation_security_user 292
    on OS/2
  conversation_type 294
  deallocate_type 296
  error_direction 300
  fill 303
  initialization_data 305
  join_transaction 307
  log_data 309
  mode_name 314
  partner_ID 316
  partner_LU_name 320
  prepare_data_permitted 322
  prepare_to_receive_type 324
  processing_mode 326
set calls *(continued)*
  queue_callback_function 329
  queue_processing_mode 332
  receive_type 335
  return_control 337
  send_receive_mode 340
  send_type 342
  side_info_entry (on OS/2)
  sync_level 344
  TP_name 347
  transaction_control 349
SET COMDIR command (CMS)
Set_AE_Qualifier (CMSAEQ) 275
Set_Allocate_Confirm (CMSAC) 277
Set_AP_Title (CMSAPT) 279
Set_Application_Context_Name (CMSACN) 281
Set_Begin_Transaction (CMSBT) 283
Set_Confirmation_Urgency (CMSCU) 285
Set_Conversation_Security_Password (XCSCSP) 287
  AIX call
  OS/2 call
Set_Conversation_Security_Type (XCSCST)
  AIX call
  OS/2 call
Set_Conversation_Security_User_ID (XCSCSU)
  AIX call
  OS/2 call
Set_Conversation_Type (CMSCT) 294
Set_CPIC_Side_Information (XCMSSI)
  OS/2 call
Set_Deallocate_Type (CMSDT) 296
Set_Error_Direction (CMSED) 300
Set_Fill (CMSF) 303
Set_Initialization_Data (CMSID) 305
Set_Join_Transaction (CMSJT) 307
Set_Log_Data (CMSLD) 309
  Networking Services for Windows considerations
  OS/2 considerations
  VM/ESA-specific errors 403
Set_Mapped_Initialization_Data (CMSMID) 311
Set_Mode_Name (CMSMN) 314
  Networking Services for Windows considerations
  OS/2 considerations
Set_Partner_ID (CMSPID) 316
Set_Partner_LU_Name (CMSPLN) 320
  OS/2 considerations
  VM/ESA-specific errors
Set_Prepare_Data_Permitted (CMSPDP) 322
Set_Prepare_To_Receive_Type (CMSPTR) 324
Set_Processing_Mode (CMSPM) 326
Set_Queue_Callback_Function (CMSQCF) 329
Set_Queue_Processing_Mode (CMSQPM) 332
Set_Receive_Type (CMSRT) 335
Set_Return_Control (CMSRC) 337
Set_Send_Receive_Mode (CMSSRM) 340

Set_Send_Type (CMSST) 342
Set_Sync_Level (CMSSL) 344
  OS/2 considerations
Set_TP_Name (CMSTPN) 347
  OS/2 considerations
Set_Transaction_Control (CMSTC) 349
shared memory, allocation of data buffers on OS/2
side information, defining
  in CICS/ESA
  in MVS/ESA
  in OS/2
  in OS/400
  in VM/ESA
  overview 19
  parameters, on OS/2
    conversation_security_type
    mode_name
    partner_LU_name
    security_password
    security_user_ID
    sym_dest_name
    TP_name
    TP_name_type
  purpose 21
  setting and accessing 19
side_info_entry structure layout for OS/2 calls
  Extract_CPIC_Side_Information (XCMESI)
  Set_CPIC_Side_Information (XCMSSI)
side_info_entry variable on OS/2
side_info_entry_length variable on OS/2
Signal_User_Event (XCSUE) call on VM/ESA 386
SNA
  network 14
  service transaction programs 499
SNA service TP names on OS/2
SNASVCMG mode name
  OS/2 considerations
special notes for CPI Communications products
  CICS/ESA
  MVS/ESA
  OS/2
  OS/400
  VM/ESA 395
Specify_Local_TP_Name (CMSLTP) 351
starter-set calls
  examples 66—71
state tables, full-duplex
  abbreviations
    conversation characteristics 481
    conversation queues 482
    data_received and status_received 486
    return code values 483
  table symbols 487
state tables, half-duplex 496
  abbreviations 466
    conversation characteristics 466
    conversation queues 467
state tables, half-duplex *(continued)*
  abbreviations *(continued)*
    data_received and status_received 470
    return code values 468
  example of how to use 463
  table symbols 471
state transition 50
states, conversation
  additional CPI states 62
  description 50
  extracting 161
  full-duplex protected conversations (CPIRR) 495
  full-duplex protected conversations (X/Open) 496
  half-duplex protected conversations (CPIRR) 479
  half-duplex protected conversations (X/Open) 463, 480
  list 50
  possible values 412
  pseudonym 11
  table
    full-duplex 489
    half-duplex 472
  valid for resource recovery 63
status_received parameter 26
strings, character 421
subordinate program 61
superior program 61
sym_dest_name
  See symbolic destination name
symbolic destination name
  blank 22, 197
  defined 17
  example 67, 82, 86
  OS/2 considerations
sync point
  described 53
  logical unit of work 53
  sync point manager (SPM) 53
  transaction manager 53
sync_level characteristic 344
  OS/2 considerations
synchronization point
  See sync point
Systems Network Architecture
  network 14
  service transaction programs 499

T

T61String 418
take-backout notification
  responses to
    table 58
take-commit notification
  responses to
    table 58

Test_Request_To_Send_Received (CMTRTS) 353
TP definition on OS/2
TP names not supported on OS/2
TP profiles
  in MVS/ESA
TP-model application in VM/ESA 398
TP_name characteristic
  extract 188, 372
  Networking Services for Windows considerations
  OS/2 considerations
  set 347
TP_name_type field on OS/2
TP_name, defined 21
tpn tag in VM/ESA
transaction
  chained 59
  join
    explicit request 59
    implicit request 59
    responses, table 61
  unchained 59
transaction_control, chained or unchained 349
transition, state 50
tutorial information
  example flows 65—101
  terms and concepts 13—64
types of conversations 15

U

unchained transactions 59
user profile managment on OS/2
user-defined side information on OS/2
USER_CONTROL_DATA 498
user_field 329
user_field_list 356
userid tag in VM/ESA

V

validation of data reception 76
values
  integers 411
  pseudonym 11, 411
variables
  characteristics, table 412
  in VM/ESA extension routines 394
  integer values 412
  lengths 421
  OS/2 additions
  pseudonym 11
  types 421
  types and lengths, table 422
viewing conversation characteristics 32
VM/ESA
  conformance classes
VM/ESA *(continued)*
  documentation 406
  errors
  extension calls
    Extract_Conversation_LUWID (XCECL) 362
    Extract_Conversation_Security_User_ID (XCECSU) 364
    Extract_Conversation_Workunitid (XCECWU) 366
    Extract_Local_Fully_Qualified_LU_Name (XCELFQ) 368
    Extract_Remote_Fully_Qualified_LU_Name (XCERFQ) 370
    Extract_TP_Name (XCETPN) 372
    Identify_Resource_Manager (XCIDRM) 373
    Set_Client_Security_User_ID (XCSCUI) 377
    Set_Conversation_Security_Password (XCSCSP) 380, 397
    Set_Conversation_Security_Type (XCSCST) 382
    Set_Conversation_Security_User_ID (XCSCSU) 384, 397
    Signal_User_Event (XCSUE) 386
    Terminate_Resource_Manager (XCTRRM) 388
    Wait_on_Event (XCWOE) 389
  HELP Facility, using 406
  languages supported
  reference publications
VMCONINPUT system event (VM/ESA) 403
VMCPIC system event (VM/ESA) 403
VMLIB TXTLIB (VM/ESA)
  multitasking
    communications directory
    Coordinated Resource Recovery 366, 397
    work unit 366, 396

W

Wait_For_Completion (CMWCMP) 356
Wait_For_Conversation (CMWAIT) 359
work unit (CMS) 366, 396, 400

X

XCECL (Extract_Conversation_LUWID) call on VM/ESA 362
XCECST (Extract_Conversation_Security_Type)
  AIX call
  OS/2 call
XCECWU (Extract_Conversation_Workunit_ID) call on VM/ESA 366
XCELFQ (Extract_Local_Fully_Qualified_LU_Name)
  VM/ESA call 368
XCERFQ (Extract_Remote_Fully_Qualified_LU_Name)
  VM/ESA call 370
XCETPN (Extract_TP_Name) call on VM/ESA 372

XCINCT (Initialize_Conv_For_TP)
  OS/2 call
XCMDSI (Delete_CPIC_Side_Information)
  OS/2 call
XCMESI (Extract_CPIC_Side_Information)
  OS/2 call
XCMSSI (Set_CPIC_Side_Information)
  OS/2 call
XCSCSP (Set_Conversation_Security_Password) 287
  AIX call
  OS/2 call
XCSCST (Set_Conversation_Security_Type)
  AIX call
  OS/2 call
XCSCSU (Set_Conversation_Security_User_ID)
  AIX call
  OS/2 call
XCSUE (Signal_User_Event) call on VM/ESA 386

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DSMMOM397I '.EDFLEDI' WAS IMBEDDED AT LINE 166 OF 'KBXL8SMI'
DSMMOM397I 'KBXL8SMI' WAS IMBEDDED AT LINE 247 OF 'KBXL8MST'
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XL8MST SCRIPT)
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DSMTB2451W TABLE SPLIT ON PAGE 522.
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X62)
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(Page 578 File: KBXL8C2)
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DSMMOM397I '.EDFAWRK' WAS IMBEDDED AT LINE 2 OF 'KBXL8C2'
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DSMMOM397I 'KBXL8SMI' WAS IMBEDDED AT LINE 247 OF 'KBXL8MST'
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DSMMOM397I 'KBXL8NDM' WAS IMBEDDED AT LINE 213 OF 'KBXL8MST'
+++EDF002W LI tag found outside List. (Page 268 File: KBXL8NDM)
DSMMOM397I '.EDF#CNTX' WAS IMBEDDED AT LINE 227 OF 'KBXL8NDM'
DSMMOM397I 'KBXL8NDM' WAS IMBEDDED AT LINE 213 OF 'KBXL8MST'
+++EDF113I DL ended by UL end tag. (Page 271 File: KBXL8NDM)
DSMMOM397I '.EDFELIST' WAS IMBEDDED AT LINE 467 OF 'KBXL8NDM'
DSMMOM397I 'KBXL8NDM' WAS IMBEDDED AT LINE 213 OF 'KBXL8MST'
+++EDF011W List end-tag found outside List and ignored. (Page 272 File: KBXL8NDM)
DSMMOM397I '.EDFELIST' WAS IMBEDDED AT LINE 532 OF 'KBXL8NDM'

DSMMOM397I 'KBXL8NDM' WAS IMBEDDED AT LINE 213 OF 'KBXL8MST'
+++EDF071E CONFIG macro ignored because no CONFIG CALLREF section is active. (Page 274 Fil
e: KBXL8NDM)
DSMMOM397I '.EDFCONFG' WAS IMBEDDED AT LINE 10 OF '.CONFIG'
DSMMOM397I '.CONFIG' WAS IMBEDDED AT LINE 681 OF 'KBXL8NDM'
DSMMOM397I 'KBXL8NDM' WAS IMBEDDED AT LINE 213 OF 'KBXL8MST'
+++EDF003W Missing EUL tag assumed before this H3 tag. (Page 312 File: KBXL8SMI)
DSMMOM397I '.EDF#RSTL' WAS IMBEDDED AT LINE 140 OF '.EDF#RSET'
DSMMOM397I '.EDF#RSET' WAS IMBEDDED AT LINE 60 OF '.EDF#HEAD'
DSMMOM397I '.EDF#HEAD' WAS IMBEDDED AT LINE 70 OF '.EDFHEAD3'
DSMMOM397I '.EDFHEAD3' WAS IMBEDDED AT LINE 390 OF '.EDFLEDI'
DSMMOM397I '.EDFLEDI' WAS IMBEDDED AT LINE 166 OF 'KBXL8SMI'
DSMMOM397I 'KBXL8SMI' WAS IMBEDDED AT LINE 247 OF 'KBXL8MST'
+++EDF003W Missing EDL tag assumed before this H3 tag. (Page 312 File: KBXL8SMI)
DSMMOM397I '.EDF#RSTL' WAS IMBEDDED AT LINE 140 OF '.EDF#RSET'
DSMMOM397I '.EDF#RSET' WAS IMBEDDED AT LINE 60 OF '.EDF#HEAD'
DSMMOM397I '.EDF#HEAD' WAS IMBEDDED AT LINE 70 OF '.EDFHEAD3'
DSMMOM397I '.EDFHEAD3' WAS IMBEDDED AT LINE 390 OF '.EDFLEDI'
DSMMOM397I '.EDFLEDI' WAS IMBEDDED AT LINE 166 OF 'KBXL8SMI'
DSMMOM397I 'KBXL8SMI' WAS IMBEDDED AT LINE 247 OF 'KBXL8MST'
+++EDF071E CONFIG macro ignored because no CONFIG REF section is active. (Page 406 File: KB
XL8MST SCRIPT)
DSMMOM397I '.EDFCONFG' WAS IMBEDDED AT LINE 10 OF '.CONFIG'
DSMMOM397I '.CONFIG' WAS IMBEDDED AT LINE 348 OF 'KBXL8MST'
+++EDF002W LI tag found outside List. (Page 468 File: KBXL8XST)
DSMMOM397I '.EDF#CNTX' WAS IMBEDDED AT LINE 559 OF 'KBXL8XST'
DSMMOM397I 'KBXL8XST' WAS IMBEDDED AT LINE 371 OF 'KBXL8MST'
+++EDF002W LI tag found outside List. (Page 468 File: KBXL8XST)
DSMMOM397I '.EDF#CNTX' WAS IMBEDDED AT LINE 560 OF 'KBXL8XST'
DSMMOM397I 'KBXL8XST' WAS IMBEDDED AT LINE 371 OF 'KBXL8MST'
+++EDF002W LI tag found outside List. (Page 468 File: KBXL8XST)
DSMMOM397I '.EDF#CNTX' WAS IMBEDDED AT LINE 561 OF 'KBXL8XST'
DSMMOM397I 'KBXL8XST' WAS IMBEDDED AT LINE 371 OF 'KBXL8MST'
+++EDF011W List end-tag found outside List and ignored. (Page 468 File: KBXL8XST)
DSMMOM397I '.EDFELIST' WAS IMBEDDED AT LINE 564 OF 'KBXL8XST'
DSMMOM397I 'KBXL8XST' WAS IMBEDDED AT LINE 371 OF 'KBXL8MST'
+++EDF074W Revision for REFID=D1 out of sequence - EREV tag ignored. (Page 472 File: KBXL8
XST)
DSMMOM397I '.EDFERVBR' WAS IMBEDDED AT LINE 6802 OF 'KBXL8XST'
DSMMOM397I 'KBXL8XST' WAS IMBEDDED AT LINE 371 OF 'KBXL8MST'
+++EDF074W Revision for REFID=D1 out of sequence - EREV tag ignored. (Page 472 File: KBXL8
XST)
DSMMOM397I '.EDFERVBR' WAS IMBEDDED AT LINE 7820 OF 'KBXL8XST'
DSMMOM397I 'KBXL8XST' WAS IMBEDDED AT LINE 371 OF 'KBXL8MST'
DSMTB2451W TABLE SPLIT ON PAGE 520.
DSMMOM397I '.EDFETABL' WAS IMBEDDED AT LINE 3455 OF 'KBXL8X62'
DSMMOM397I 'KBXL8X62' WAS IMBEDDED AT LINE 374 OF 'KBXL8MST'
+++EDF074W Revision for REFID=D1 out of sequence - EREV tag ignored. (Page 521 File: KBXL8
X62)
DSMMOM397I '.EDFERVBR' WAS IMBEDDED AT LINE 3456 OF 'KBXL8X62'
DSMMOM397I 'KBXL8X62' WAS IMBEDDED AT LINE 374 OF 'KBXL8MST'
+++EDF030W ARTWORK REFID=KBXL8C2 does not match any ID on ARTDEF or OVERLAY tag.
(Page 576 File: KBXL8C2)
DSMMOM397I '.EDF@RFID' WAS IMBEDDED AT LINE 50 OF '.EDFAWRK'
DSMMOM397I '.EDFAWRK' WAS IMBEDDED AT LINE 2 OF 'KBXL8C2'
DSMMOM397I 'KBXL8C2' WAS IMBEDDED AT LINE 187 OF 'EDFPRF40'
DSMBEG323I STARTING PASS 4 OF 4.
+++EDF009W Duplicate ID SID1794 was ignored on IH1 tag. (Page ii File: KBXL8IND)
DSMMOM397I '.EDF@ID' WAS IMBEDDED AT LINE 60 OF '.EDF@IDI'
DSMMOM397I '.EDF@IDI' WAS IMBEDDED AT LINE 150 OF '.EDFIHD1'
DSMMOM397I '.EDFIHD1' WAS IMBEDDED AT LINE 122 OF 'KBXL8IND'
DSMMOM397I 'KBXL8IND' WAS IMBEDDED AT LINE 89 OF 'KBXL8MST'
DSMCSE574E INVALID CHARACTER IN SYMBOL NAME.
DSMMOM395I '.EDF@IDI' LINE 200: .se I1@&@id.(1) 'CMSMID (Set_Mapped_Initialization_Data
DSMMOM397I '.EDF@IDI' WAS IMBEDDED AT LINE 150 OF '.EDFIHD1'

DSMMOM397I '.EDFIHD1' WAS IMBEDDED AT LINE 122 OF 'KBXL8IND'
DSMMOM397I 'KBXL8IND' WAS IMBEDDED AT LINE 89 OF 'KBXL8MST'
DSMCSE574E INVALID CHARACTER IN SYMBOL NAME.
DSMMOM395I '.EDF@IDI' LINE 220: .se IC#&@id '1
DSMMOM397I '.EDF@IDI' WAS IMBEDDED AT LINE 150 OF '.EDFIHD1'
DSMMOM397I '.EDFIHD1' WAS IMBEDDED AT LINE 122 OF 'KBXL8IND'
DSMMOM397I 'KBXL8IND' WAS IMBEDDED AT LINE 89 OF 'KBXL8MST'
+++EDF074W Revision for REFID=D1 out of sequence - EREV tag ignored. (Page 6 File: KBXL8CI
N)
DSMMOM397I '.EDFERVBR' WAS IMBEDDED AT LINE 157 OF 'KBXL8CIN'
DSMMOM397I 'KBXL8CIN' WAS IMBEDDED AT LINE 110 OF 'KBXL8MST'
+++EDF224E Unknown REFID 'KEYTPC' for IREF tag. (Page 110 File: KBXL8CRL)
DSMMOM397I '.EDFIREF' WAS IMBEDDED AT LINE 1775 OF 'KBXL8CRL'
DSMMOM397I 'KBXL8CRL' WAS IMBEDDED AT LINE 126 OF 'KBXL8MST'
+++EDF224E Unknown REFID 'EDBMPA' for IREF tag. (Page 226 File: KBXL8CVM)
DSMMOM397I '.EDFIREF' WAS IMBEDDED AT LINE 40 OF 'KBXL8CVM'
DSMMOM397I 'KBXL8CVM' WAS IMBEDDED AT LINE 201 OF 'KBXL8MST'
+++EDF003W Missing EUL tag assumed before this H3 tag. (Page 234 File: KBXL8CVM)
DSMMOM397I '.EDF#RSTL' WAS IMBEDDED AT LINE 140 OF '.EDF#RSET'
DSMMOM397I '.EDF#RSET' WAS IMBEDDED AT LINE 60 OF '.EDF#HEAD'
DSMMOM397I '.EDF#HEAD' WAS IMBEDDED AT LINE 70 OF '.EDFHEAD3'
DSMMOM397I '.EDFHEAD3' WAS IMBEDDED AT LINE 390 OF '.EDFLEDI'
DSMMOM397I '.EDFLEDI' WAS IMBEDDED AT LINE 679 OF 'KBXL8CVM'
DSMMOM397I 'KBXL8CVM' WAS IMBEDDED AT LINE 201 OF 'KBXL8MST'
+++EDF071E CONFIG macro ignored because no CONFIG CALLREF section is active. (Page 238 Fil
e: KBXL8CVM)
DSMMOM397I '.EDFCONFG' WAS IMBEDDED AT LINE 10 OF '.CONFIG'
DSMMOM397I '.CONFIG' WAS IMBEDDED AT LINE 965 OF 'KBXL8CVM'
DSMMOM397I 'KBXL8CVM' WAS IMBEDDED AT LINE 201 OF 'KBXL8MST'
+++EDF002W DT tag found outside DL. (Page 267 File: KBXL8NDM)
DSMMOM397I '.EDF#CNTX' WAS IMBEDDED AT LINE 180 OF 'KBXL8NDM'
DSMMOM397I 'KBXL8NDM' WAS IMBEDDED AT LINE 213 OF 'KBXL8MST'
+++EDF002W LI tag found outside List. (Page 268 File: KBXL8NDM)
DSMMOM397I '.EDF#CNTX' WAS IMBEDDED AT LINE 227 OF 'KBXL8NDM'
DSMMOM397I 'KBXL8NDM' WAS IMBEDDED AT LINE 213 OF 'KBXL8MST'
+++EDF113I DL ended by UL end tag. (Page 271 File: KBXL8NDM)
DSMMOM397I '.EDFELIST' WAS IMBEDDED AT LINE 467 OF 'KBXL8NDM'
DSMMOM397I 'KBXL8NDM' WAS IMBEDDED AT LINE 213 OF 'KBXL8MST'
+++EDF011W List end-tag found outside List and ignored. (Page 272 File: KBXL8NDM)
DSMMOM397I '.EDFELIST' WAS IMBEDDED AT LINE 532 OF 'KBXL8NDM'
DSMMOM397I 'KBXL8NDM' WAS IMBEDDED AT LINE 213 OF 'KBXL8MST'
+++EDF071E CONFIG macro ignored because no CONFIG CALLREF section is active. (Page 274 Fil
e: KBXL8NDM)
DSMMOM397I '.EDFCONFG' WAS IMBEDDED AT LINE 10 OF '.CONFIG'
DSMMOM397I '.CONFIG' WAS IMBEDDED AT LINE 681 OF 'KBXL8NDM'
DSMMOM397I 'KBXL8NDM' WAS IMBEDDED AT LINE 213 OF 'KBXL8MST'
+++EDF224E Unknown REFID 'MIDCC8' for IREF tag. (Page 311 File: KBXL8SMI)
DSMMOM397I '.EDFIREF' WAS IMBEDDED AT LINE 40 OF 'KBXL8SMI'
DSMMOM397I 'KBXL8SMI' WAS IMBEDDED AT LINE 247 OF 'KBXL8MST'
+++EDF003W Missing EUL tag assumed before this H3 tag. (Page 312 File: KBXL8SMI)
DSMMOM397I '.EDF#RSTL' WAS IMBEDDED AT LINE 140 OF '.EDF#RSET'
DSMMOM397I '.EDF#RSET' WAS IMBEDDED AT LINE 60 OF '.EDF#HEAD'
DSMMOM397I '.EDF#HEAD' WAS IMBEDDED AT LINE 70 OF '.EDFHEAD3'
DSMMOM397I '.EDFHEAD3' WAS IMBEDDED AT LINE 390 OF '.EDFLEDI'
DSMMOM397I '.EDFLEDI' WAS IMBEDDED AT LINE 166 OF 'KBXL8SMI'
DSMMOM397I 'KBXL8SMI' WAS IMBEDDED AT LINE 247 OF 'KBXL8MST'
+++EDF003W Missing EDL tag assumed before this H3 tag. (Page 312 File: KBXL8SMI)
DSMMOM397I '.EDF#RSTL' WAS IMBEDDED AT LINE 140 OF '.EDF#RSET'
DSMMOM397I '.EDF#RSET' WAS IMBEDDED AT LINE 60 OF '.EDF#HEAD'
DSMMOM397I '.EDF#HEAD' WAS IMBEDDED AT LINE 70 OF '.EDFHEAD3'
DSMMOM397I '.EDFHEAD3' WAS IMBEDDED AT LINE 390 OF '.EDFLEDI'
DSMMOM397I '.EDFLEDI' WAS IMBEDDED AT LINE 166 OF 'KBXL8SMI'
DSMMOM397I 'KBXL8SMI' WAS IMBEDDED AT LINE 247 OF 'KBXL8MST'
+++EDF071E CONFIG macro ignored because no CONFIG REF section is active. (Page 406 File: KB
XL8MST SCRIPT)

DSMMOM397I '.EDFCONFG' WAS IMBEDDED AT LINE 10 OF '.CONFIG'
DSMMOM397I '.CONFIG' WAS IMBEDDED AT LINE 348 OF 'KBXL8MST'
+++EDF002W LI tag found outside List. (Page 468 File: KBXL8XST)
DSMMOM397I '.EDF#CNTX' WAS IMBEDDED AT LINE 559 OF 'KBXL8XST'
DSMMOM397I 'KBXL8XST' WAS IMBEDDED AT LINE 371 OF 'KBXL8MST'
+++EDF002W LI tag found outside List. (Page 468 File: KBXL8XST)
DSMMOM397I '.EDF#CNTX' WAS IMBEDDED AT LINE 560 OF 'KBXL8XST'
DSMMOM397I 'KBXL8XST' WAS IMBEDDED AT LINE 371 OF 'KBXL8MST'
+++EDF002W LI tag found outside List. (Page 468 File: KBXL8XST)
DSMMOM397I '.EDF#CNTX' WAS IMBEDDED AT LINE 561 OF 'KBXL8XST'
DSMMOM397I 'KBXL8XST' WAS IMBEDDED AT LINE 371 OF 'KBXL8MST'
+++EDF011W List end-tag found outside List and ignored. (Page 468 File: KBXL8XST)
DSMMOM397I '.EDFELIST' WAS IMBEDDED AT LINE 564 OF 'KBXL8XST'
DSMMOM397I 'KBXL8XST' WAS IMBEDDED AT LINE 371 OF 'KBXL8MST'
+++EDF074W Revision for REFID=D1 out of sequence - EREV tag ignored. (Page 472 File: KBXL8
XST)
DSMMOM397I '.EDFERVBR' WAS IMBEDDED AT LINE 6802 OF 'KBXL8XST'
DSMMOM397I 'KBXL8XST' WAS IMBEDDED AT LINE 371 OF 'KBXL8MST'
+++EDF074W Revision for REFID=D1 out of sequence - EREV tag ignored. (Page 472 File: KBXL8
XST)
DSMMOM397I '.EDFERVBR' WAS IMBEDDED AT LINE 7820 OF 'KBXL8XST'
DSMMOM397I 'KBXL8XST' WAS IMBEDDED AT LINE 371 OF 'KBXL8MST'
+++EDF224E Unknown REFID 'MAP215' for IREF tag. (Page 497 File: KBXL8X62)
DSMMOM397I '.EDFIREF' WAS IMBEDDED AT LINE 37 OF 'KBXL8X62'
DSMMOM397I 'KBXL8X62' WAS IMBEDDED AT LINE 374 OF 'KBXL8MST'
+++EDF224E Unknown REFID 'OSIMP' for IREF tag. (Page 507 File: KBXL8X62)
DSMMOM397I '.EDFIREF' WAS IMBEDDED AT LINE 1708 OF 'KBXL8X62'
DSMMOM397I 'KBXL8X62' WAS IMBEDDED AT LINE 374 OF 'KBXL8MST'
+++EDF224E Unknown REFID 'OSI215' for IREF tag. (Page 507 File: KBXL8X62)
DSMMOM397I '.EDFIREF' WAS IMBEDDED AT LINE 1741 OF 'KBXL8X62'
DSMMOM397I 'KBXL8X62' WAS IMBEDDED AT LINE 374 OF 'KBXL8MST'
DSMTB2451W TABLE SPLIT ON PAGE 520.
DSMMOM397I '.EDFETABL' WAS IMBEDDED AT LINE 3455 OF 'KBXL8X62'
DSMMOM397I 'KBXL8X62' WAS IMBEDDED AT LINE 374 OF 'KBXL8MST'
+++EDF074W Revision for REFID=D1 out of sequence - EREV tag ignored. (Page 521 File: KBXL8
X62)
DSMMOM397I '.EDFERVBR' WAS IMBEDDED AT LINE 3456 OF 'KBXL8X62'
DSMMOM397I 'KBXL8X62' WAS IMBEDDED AT LINE 374 OF 'KBXL8MST'
+++EDF224E Unknown REFID 'MPHD215' for IREF tag. (Page 522 File: KBXL8X62)
DSMMOM397I '.EDFIREF' WAS IMBEDDED AT LINE 3460 OF 'KBXL8X62'
DSMMOM397I 'KBXL8X62' WAS IMBEDDED AT LINE 374 OF 'KBXL8MST'
+++EDF224E Unknown REFID 'OSI2FDM' for IREF tag. (Page 527 File: KBXL8X62)
DSMMOM397I '.EDFIREF' WAS IMBEDDED AT LINE 4052 OF 'KBXL8X62'
DSMMOM397I 'KBXL8X62' WAS IMBEDDED AT LINE 374 OF 'KBXL8MST'
+++EDF224E Unknown REFID 'OSI3FDM' for IREF tag. (Page 527 File: KBXL8X62)
DSMMOM397I '.EDFIREF' WAS IMBEDDED AT LINE 4053 OF 'KBXL8X62'
DSMMOM397I 'KBXL8X62' WAS IMBEDDED AT LINE 374 OF 'KBXL8MST'
+++EDF224E Unknown REFID 'OSI4FDM' for IREF tag. (Page 527 File: KBXL8X62)
DSMMOM397I '.EDFIREF' WAS IMBEDDED AT LINE 4054 OF 'KBXL8X62'
DSMMOM397I 'KBXL8X62' WAS IMBEDDED AT LINE 374 OF 'KBXL8MST'
+++EDF030W ARTWORK REFID=KBXL8C2 does not match any ID on ARTDEF or OVERLAY tag.
(Page 594 File: KBXL8C2)
DSMMOM397I '.EDF@RFID' WAS IMBEDDED AT LINE 50 OF '.EDFAWRK'
DSMMOM397I '.EDFAWRK' WAS IMBEDDED AT LINE 2 OF 'KBXL8C2'
DSMMOM397I 'KBXL8C2' WAS IMBEDDED AT LINE 187 OF 'EDFPRF40'
+++EDF258W Cross references were not resolved. Check cross-reference listing to find problems. (Pag
e 594 File: KBXL8MST SCRIPT)
DSMMOM397I '.EDF#END' WAS IMBEDDED AT LINE 187 OF 'EDFPRF40'