



IBM Software Group

# IMS14 TM and MSC Message Routing/Control User Exit

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**DFSMSCE0**

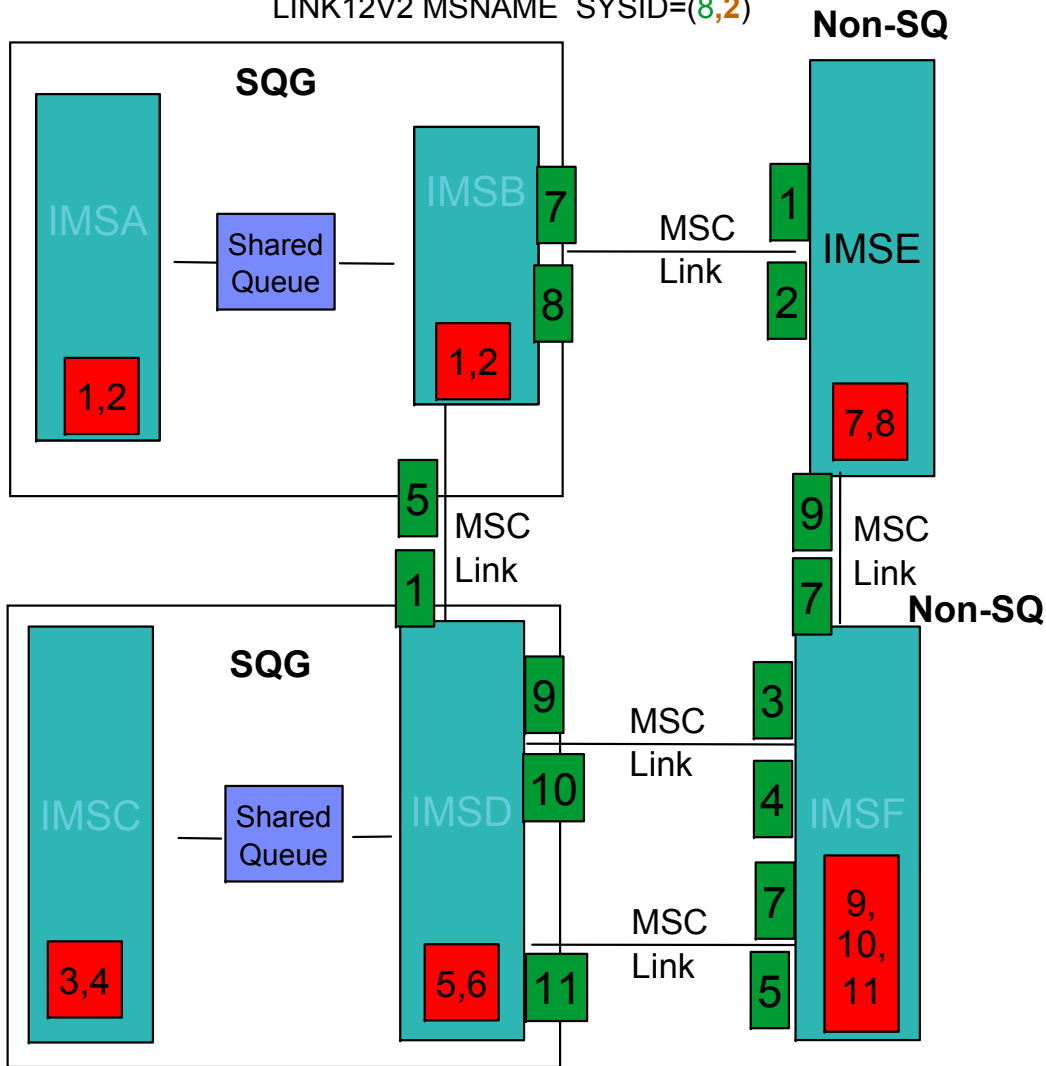


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# MSC Overview

## IMSB Example

TRANSACTION CODE=TRAN21V0, SYSID=(7,1)  
 LINK12V1 MSNAME SYSID=(7,1)  
 LINK12V2 MSNAME SYSID=(8,2)



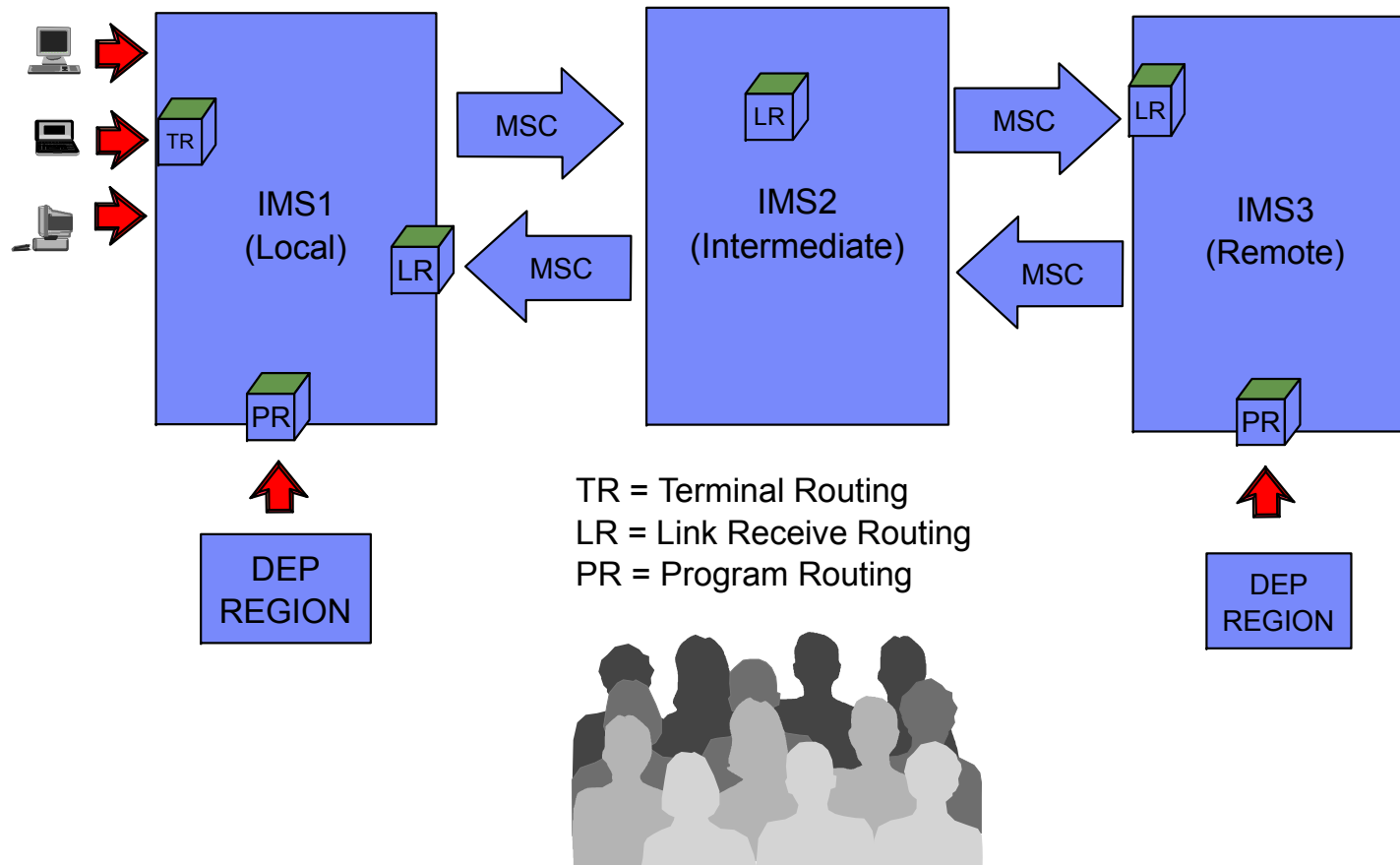
**Local SYSIDs**

- \* Uniquely owned within each IMS
- \* Become shared between IMSs in SQG
- \* Referenced by Remote IMSs
- \* Should be known by all IMSs within network
- \* Carried as source SYSID in messages
- \* Defined on TRANSACTION and MSNAME macros

**Remote SYSIDs**

- \* Not owned by IMS where it is specified
- \* Points to IMS where the SYSID exists as local
- \* Carried as destination SYSID in messages
- \* Defined on TRANSACTION and MSNAME macros

# Pictorial View of Today's MSC Routing Exits



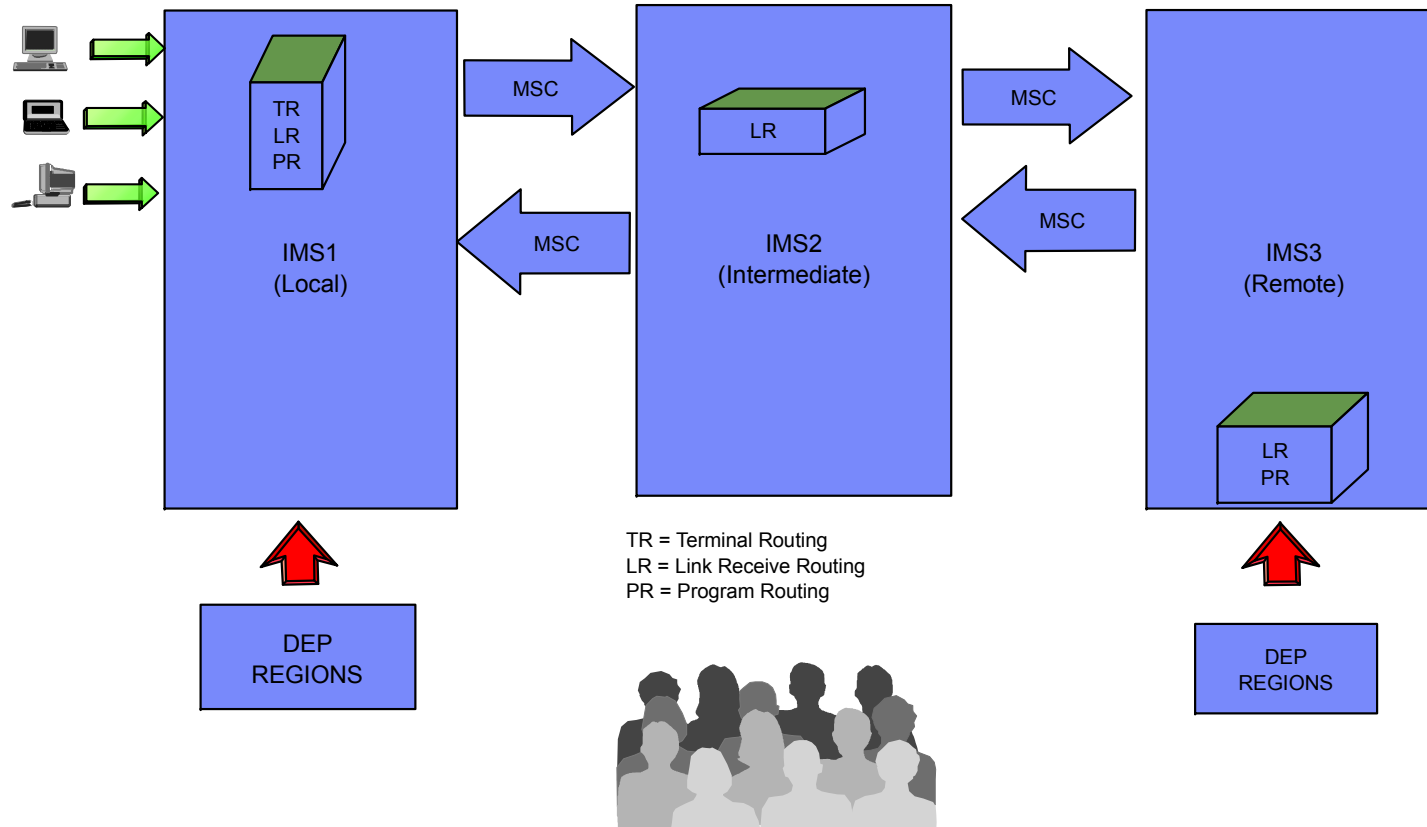
## MSC Routing Exits Today

- **MSC Routing Exits in IMS 6.1**

- – 3 Independent Exits (Terminal/Input Message, Link Receive, and Program Routing)
  - Originally written for a few specific MSC routing needs
  - Does not receive control for all user messages (many restrictions)
  - We gradually expanded exit capabilities, one need at a time
  - Each exit has a different interface (Register, Parameter)
  - No means of communicating between the exits
  - Some exits reside in IMS nucleus (Link Receive and Program Routing), harder to change
  - Not easy to add additional support without affecting existing user exits
  - Weak infrastructure (ie: No callable services, user save sets, or work area, limited routing information)
  - Serviceability not very good



# Pictorial View of New TM/MSR Routing Exit



## New TM/ MSC Routing Exit

- ● **Highlights of New Consolidated MSC Routing Exit for IMS 7.1**
  - One standalone module with entry point for each point of control
  - IMS calls exit if entry point is selected
  - Exit called at IMS Init and Term and for all User messages destined to a transaction, LTERM, or MSC Link
  - One parameter Interface
  - Exit passed 6 Save sets and 512 byte Work Area
  - More routing information
    - Destination and Source names and SYSIDs
    - Destination and Source MSNAMES
    - SYSID Table
    - IMSID of calling IMS
  - IMS Environment Flags (MSC, Shared Queues)



## New TM/MSC Routing Exit (continued)

### ● Highlights (Continued)

- Caller Flags to indicate which entry point is being called
- Exit Supported in Non-MSD Environment
- Exit may request user prefix to attach to the message
  - User prefix presented to exit if one exists
- User macros for mapping parameter area and selecting entry points
- Sample Exit demonstrating all Routing Capabilities
- User Exit allowed to Reject Any Message

Officially being called:

TM and MSC Message Routing and Control User Exit

**DFSMSCE0**



## Terminal Routing Enhancements



- **Exit called for messages from Terminals In Preset Destination Mode (REQ61897)**
- **Exit called for ISC Messages including Destination set in FMH5 or FMH6 (REQ61897)**
- **Exit called for Front End Switch Messages (REQ55871)**
- **Allow input message to be rejected with a IMS message (DFS2175) or user (DFSUxxxx)**





## Link Receive Routing Exit Enhancements

- **Allow Link Receive Exit to Override Local LTERM names and destination SYSID (REQ60374)**
- **Exit called for Intermediate messages**
- **Exit called for response messages (currently cannot route response messages)**
- **Exit may Override Direct Routing Messages and Queue directly to LTERM or Transaction Destination**
  - Requirement for Shared Queues but supported in non-SQ too



## Program Routing Exit Enhancements

- **Call Exit at First Segment Insert of a New Message Including Inserts to Non Modifiable and I/O PCB's (REQ22752)**
- **Reroute Direct Routed Messages**
  - Override the MSNAME of the destination and return the message to the source IMS where the MSNAME destination is applied) (REQ55329)
  - Override Direct Routing Messages and Queue directly to LTERM or Transaction Destination in the message segment (PQ13065)
    - Requirement for Shared Queues but supported in non-SQ too
- **Allow override of the PCB Destination Name (REQ56846 and REQ67525) - Allowed for all ALT PCB's (including non-modifiable) but not I/O PCB**



## Program Routing Exit Enhancements (continued)

■

- **Call Exit for conversation transactions**
- **Call Exit for non-message driven BMP's and MPP's that have not issued a message GU call**
- **Call exit in non-MSD environments**
- **Allow User to set Status Code to reject message, currently, only A1, Expand to include A4, E1, E2, and E3 status codes. (REQ58688).**
- **Allow Exit to request Application Pseudo Abend (U3303)**



## Miscellaneous Enhancements

- ● **Allow Exit to Attach User Data to a Message (REQ40194)**
  - Customers may request User Prefix up to 512 bytes
    - Prefix code is 8E, placed in numerical sequence in IMS Extended Prefix Area
    - Stays with message wherever it is sent
    - Propagated to response message, pgm-to-pgm switches
    - Transparent to Application program and Terminal operator
    - Passed to Terminal, Link Receive, Program Routing Exits (currently)
  - IMS Internal Prefix for IMS Tools Products (Currently Workload Router)
    - Prefix code is 8F (IMS will coordinate usage)
    - Same rules as Customer Prefix



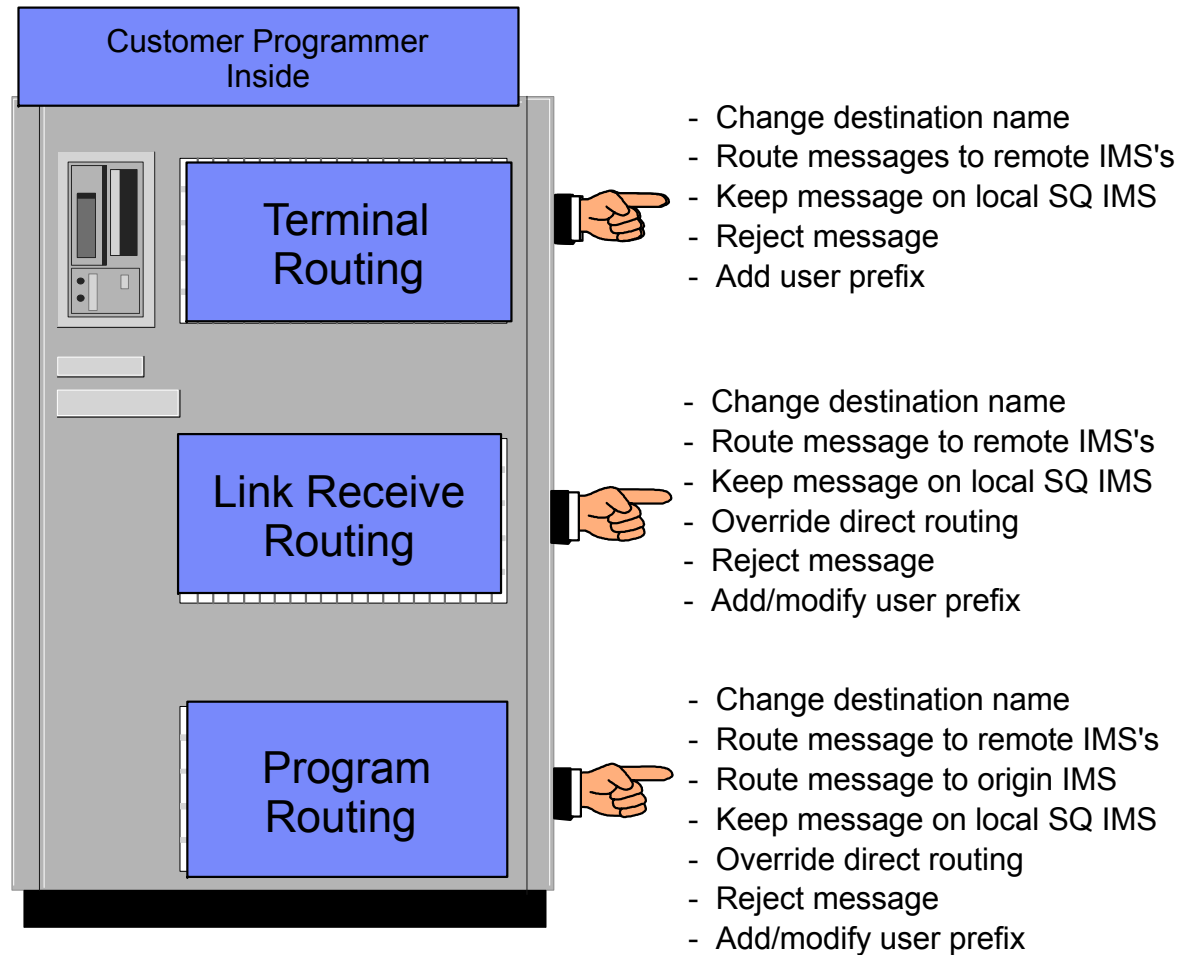
## Miscellaneous Enhancements (continued)



- **Consistent message handling across all routing exits to reduce administrative overhead (REQ71666)**
  - Consolidate Exits
  - Common parameter interface for all entry points
  - All User messages supported across all exits
- **Exit may Request Transaction Process Locally in a Shared Queues Environment**



# What the Exit Lets You Do (summary)



All User Transaction Oriented Messages Passed to the Exit



## DFSMSCVT Macro for Selecting Entry Points

- - **DFSMSCVT FUNC=VECTOR,ENTRYP=**

- IMS Start/Shutdown entry points

- INIT - Exit called at IMS Initialization
      - TERM - Exit called at IMS Termination

- Terminal Routing Entry Points

- TRBTAM - Called for Input Messages from BTAM type input messages (ie: any input terminal message not VTAM, APPC, or OTMA)
      - TRVTAM - Called for messages from VTAM terminals including ISC and Front End Switch messages
      - TRAPPC - Called for APPC Input messages except CIPIC
      - TROTMA - Called for OTMA Input messages



## DFSMSCVT Macro (continued)



### ● DFSMSCVT (continued)

- Link Receive Entry Points
  - LRTRAN - Message is destined to a Local Transaction
  - LRLTERM - Message is destined to a Local LTERM
  - LRDIR - Message is a Local Direct Routed Message
  - LRINT - Message is an Intermediate MSC Message (ie: Destined to another IMS)
- Program Routing Entry Points
  - PRCHNG - Application Program Issued a CHNG Call
  - PRISRT - Application Program Issued First Insert Call for a New Message





## DFSMSCEP Macro for User Parameter List



- **Maps the Entry Parameters to the Exit**
  - Main Section common to all entries (MSCEMAIN/MSCEPARAM)
  - Initialization/Termination section (MSINPARAM)
    - MSINPARAM = Yes, MSTEPARM=Yes
  - Terminal Routing Section (MSTRPARAM)
    - MSTRPARAM=Yes
  - Link Receive Routing Section (MSLRPARAM)
    - MSLRPARAM=Yes
  - Program Routing Section (MSPRPARAM)
    - MSPRPARAM=Yes



## DFSMSCSV (Save) and DFSMSCLV (Leave) macros

### ● DFSMSCSV

- Save macro similar to CHANGEID (much less options)
- – Needed for formal means of connecting to the vector table specified in the DFSMSCVT macro (exit entry points)
- CHANGED being copywrited and can't use in sample exits

### ● DFSMSCLV

- Leave macro for returning to IMS. Similar to LEAVE
- LEAVE macro copywrited too.

```
DFSMSCSV NAME=DFSMSCE0-&DFSLEV-&SYSDATE-&SYSTIME,BASE=R12,  
AMODE=31,RMODE=ANY,CSECTNM=DFSMSCE0,LINKAGE=NO,  
BRANCH=YES,VECTOR=MSCVTABLE
```

```
DFSMSCLV LINKAGE=YES,RC=NO
```



## DFSMSCE0 Sample User Exit

- ● **DFSMSCE0**

- Contains samples of 'ALL' routing options
- DFSMSCVT macro using all entry points
- DFSMSCEP User Parm List
- Explains module entry interface
- Figures showing message flows in various IMS environments (ie: single IMS, MSC environment, shared queues, etc.)
- Information to convert from the old exits (DFSCMTR0/DFSNPRT0, DFSCMLR0, DFSCMPR0)
- Cross reference chart for IMS SCD to MSC SCD fields (ie: MSC fields moved from ISCD to DFSMSCD)



## Migration Considerations

- - **No capabilities have been removed, only new capabilities added and many restrictions removed**
  - **Can mix and match old exits and new exit in 7.1**
    - If any DFSMSCE0 terminal routing entry is coded (ie: TRBTAM, TRVTAM, TRAPPC, TROTMA), then DFSCMTR0 or DFSNPRT0 will not be called
    - If any DFSMSCE0 link receive entry is coded (ie: LRTRAN, LRLTERM, LRDIR, LRINT), then DFSCMLR0 or DFSCMLR1 will not be called
    - If and DFSMSCE0 program routing entry is coded (ie: PRCHNG, PRISRT), then DFSCMPR0 will not be called



## Migration Considerations (continued)

- **Support for DFSCMTR0, DFSNPRT0, DFSCMLR0/DFSCMLR1, DFSCMPR0 to be removed in next IMS release**
- **MSC fields in SCD (ISCD macro) moved to MSC SCD (DFSMSCD macro) - see DFSMSCE0 sample exit for list**
- **User Prefix not passed to old exits**
- **Once user prefix added to message it follows the message wherever it goes, including IMS 5.1 and 6.1 systems via MSC links, and IMS 6.1 shared queues systems in the same shared queue group (SQG).**
  - Need PQ22079 (5.1) or PQ21571 (6.1) to correct prefix propagation problem
  - Need to consider sizes of short/large message queue buffers if using user prefixes (see MSGQUEUE macro in IMS installation Guide)
- **User Prefix will not be lost in down level systems. It will be presented to DFSMSCE0 exit if message returns**

## Diagnostics

- ● **DFS070 Unable to Route Message, RC=xyyy**
  - Logged for all IMS detected or user exit errors
  - X=IMS module/exit-entry-point that detected the error
  - YYY=unique reason for error
  - 6701-MSCE Log Record will be logged
  - Reason codes (RC) documented in DFSKEYRC macro and will be documented in diagnostic guide
- **Double Word Exit Trace Flags in All IMS Messages**
  - Identifies exit called (TR, LR, or PR)
  - Identifies routing options selected by exit
  - Label MSGTFLG in QLOGMSGP macro



## Diagnostics (continued)

- **TRACE SET ON/OFF EXIT DFSMSCE0 (parms)**
  - Parms =  
(ALL|TRBT|TRVT|TR62|TROT|LRTR|LRLT|LRDI|LRIN|PRCH|PRIS)
  - Can Trace all exit entry points or selected ones
    - 6701-MSEA when exit called
    - 6701-MSEB when exit returns to IMS
  - Can be used in conjunction with other IMS traces (ie: Node trace, transaction trace, etc)
  - DFS081 Trace Exit Command Unsuccessful RC=xyyy
    - X=IMS module that detected the error
    - yyy=unique reason for error
    - Portion of command OK is executed (friendly)
- **/DISPLAY Trace Exit**
  - Displays which traces are ON/OFF or N/A



## Future Considerations

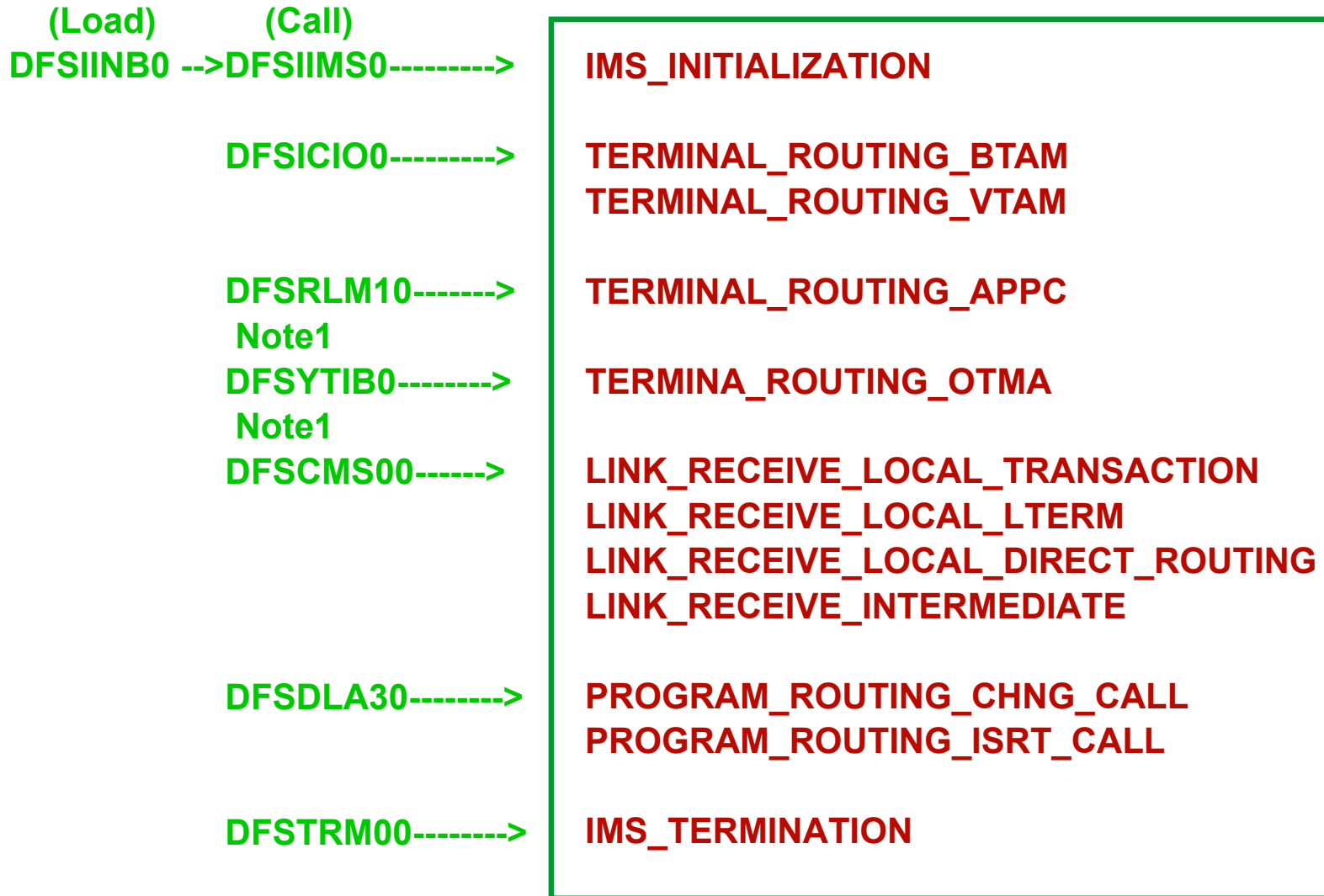
- **Remove old Exit Support in Next IMS Release**
  - – DFSCMTR0 - Terminal Routing
  - DFSNPRT0 - Input Message Routing
  - DFSCMLR0/DFSCMLR1 - Link Receive Routing
  - DFSCMPR0 - Program Routing
- **Future Points of Control will be New Entry Points**
  - Request for MSC Link Send Exit
  - Request to Control Routing Messages to Selected IMS in Shared Queues Environment
- **Pass User Prefix to other Exits ie: Transaction Authorization (DFSCTRN0), Transaction Input Edit (DFSCSMB0), Security (DFSCTSE0), etc.**
- **More Routing Information?**
  - Send us your requirements





# Loading and Calling DFSMSCE0

## DFSMSCE0



# Exit Trace - Terminal Routing - DFSICIO0 sample

**/Trace Set On Exit DFSMSCE0 TRBT or TRVT**

**/Trace Set On Node** <sup>or</sup> **L3270C Module All Level 3**

## DFSICIO0

6701 Records

**D 04 - Receive Data**  
**A 01 - Process Segment**  
**FMT2 - Call MFS**  
**FMT3 - MFS Returns**  
**MSEA - Call DFSMSCE0**  
**MSEB - DFSMSCE0 Returns**

**01 Input Log Record**

**FMT6 - MFS Cleanup**  
**A 03 - What Next**

6701-MSEA and MSEB Record Content

**DFSMSCEB**

**MSG SEG**



# Exit Trace - Terminal Routing - APPC and OTMA sample

**/Trace Set On Exit DFSMSCE0 TR62**

**or**

**/Trace Set On Exit DFSMSCE0 TROT**

**or**

**/Trace Set On LUNAME xxxxxxxx or TPIPE  
xxxxxxx**

**DFSRLM10 (APPC)**

**DFSYTIB0 (OTMA)**

**6701 Records**

**6701-MSEA and MSEB Record Content**

**DFSMSCEB**

**MSEA - Call  
DFSMSCE0  
MSEB - DFSMSCE0  
Returns**

**01 Input Log Record**

# Exit Trace - Program Routing - DFSDLA30 sample

**/Trace Set On Exit DFSMSCE0 PRCH or PRIS**

**/Trace Set On Transaction APOL12 (or PROGRAM APOL1)**

## **DFSDLA30**

### **6701 Records**

LA3A - Get Unique  
LA3B - DFSDLA30 exit  
LA3A - CHNG call  
MSEA - Call DFSMSCE0  
MSEB - DFSMSCE0 Returns  
LA3B - DFSDLA30 exit  
LA3A - ISRT call  
MSEA - Call DFSMSCE0  
MSEB - DFSMSCE0 Returns  
LA3B - DFSDLA30 Returns  
Sync Point  
03 Output Log Record

### **6701-MSEA and MSEB Record Content**

**DFSMSCEB**

**PCB**

**MSG PREF**

**MSG SEG**



## Exit Trace - Link Receive Routing - DFSCMS00 sample

**/Trace Set On Exit DFSCMSCE0 LRTR, LRLT, LRDR or LRIN**

**/Trace Set On Link ~~10~~ Module All Level 3**

**DFSCMS00**

6701 Records

**DM04 - Receive Data**  
**AM01 - Process Segment**  
**MSEA - Call DFSCMSCE0**  
**MSEB - DFSCMSCE0**  
**Returns**

**01 Input Log Record**

**AM03 - What Next**

6701-MSEA and MSEB Record Content

**DFSCMSCEB**

**MSG PREF**

**MSG SEG**



# DFSMSCEB Control Block

## Why:

**Type 4 User Exit Support, Standard Parameter List, and Robust Serviceability Requires lots of space to store things.**

### Major parts by offset

#### ● **Routing Exit Interface Block**

- 0000 - DFSMSCEB Eyecatcher
- 0008 - Trace Entry Point
  - (ie: TRVT, LRIN, PRIS, etc)
- 000C - ITASK ECB Address
- 0020 - DFSMSCEP User Parm List
- 00F0 - IBWORK (User 512 byte work area)
- 02F0 - SXPL (Standard User Exit Parm List)
- 0310 - MSCEISAVE (6 user save sets)
- 04C0 - MSEBPFTR (DFSCFEZ0 Trace area)
- 0554 - Internal Work areas for calling routines
- 05AC - End (1452 bytes)

# DFSMSCEB Control Block (continued)

## Where Defined (DFSCBT00)

- 
- **MSEB DFSCBTS TYPE=MSEB,SP=0, BLKLEN=MSCEBLNG,COMP=YES**

## How to Get and Release

DFSBCB FUNC=GET,  
BLK=MSEB

DFSBCB FUNC=REL,  
BLK=MSEB

## Where Used

DFSIIIMS0 (IMS Init) and  
DFSTRM00 (IMS Term)  
Get before call exit,  
Release when return from exit.

DFSICIO0 (BTAM/VTAM),  
DFSRLM10 (APPC),  
DFSYTIB0 (OTMA)  
Get for each message before  
call exit,  
Release when done with  
message (BTAM,VTAM), when  
TIB freed (APPC, OTMA).

DFSCMS00 (MSC)  
Get one at link startup,  
Release when link stopped

DFSDLA30 (Appl Program)  
Get one at first CHNG or ISRT  
call that calls exit,  
Release at sync point.



# DFSMSCEC - Interface Macro to the Exit

## Interface Macro to call the Exit

### DFSICIO0 (BTAM/VTAM)

```

DFSMSCEC FUNC=MSTR,
  PARM=(R3),
  INIT=YES,
  TRFLAG1=MSCEBFL1,
  DEST=MSCEBDEST,
  SRCE=MSCEBSRCE,
  SIDT=(R8),
  ECB=(R9),
  SCD=(R11),
  SEG=(R2),
  BRANCH=YES
    
```

### DFSCMS00 (MSC)

```

DFSMSCEC FUNC=MSLR,
  PARM=(R4),
  LRFLAG1=MSCEBFL1,
  SIDT=(R5),
  SEG=(R8),
  ECB=(R9),
  SCD=(R11),
  INIT=YES,
  DMSN=MSCEBDMSN,
  DSID=MSCEBDSID,
  SMSN=MSCEBSMSN,
  SSID=MSCEBSSID,
  DEST=MSCEBDEST,
  SRCE=MSCEBSRCE,
  UPR=MSCEBUPR,
  IPR=MSCEBIPR,
  BRANCH=YES
    
```

### DFSDLA30 (PGM)

```

DFSMSCEC FUNC=MSPR,
  PRFLAG1=D_MSCEFL1,
  PARM=(R4),
  SIDT=(R5),
  ECB=(R9),
  SCD=(R11),
  INIT=YES,
  DEST=D_MSCEDEST,
  SRCE=D_MSCESRCE,
  SEG=D_MSCESEG,
  UPR=MSCEBUPR,
  IPR=MSCEBIPR,
  DMSN=D_MSCEDMSN,
  SMSN=D_MSCESMSN,
  DSID=D_MSCEDSID,
  SSID=D_MSCESSID,
  BRANCH=YES
    
```





# DFSMSCEC - (Continued)

## Interface Macro to call the Exit

### DFS6LUS2 (APPC, OTMA)

### DFSIIIMS0 (Initialization)

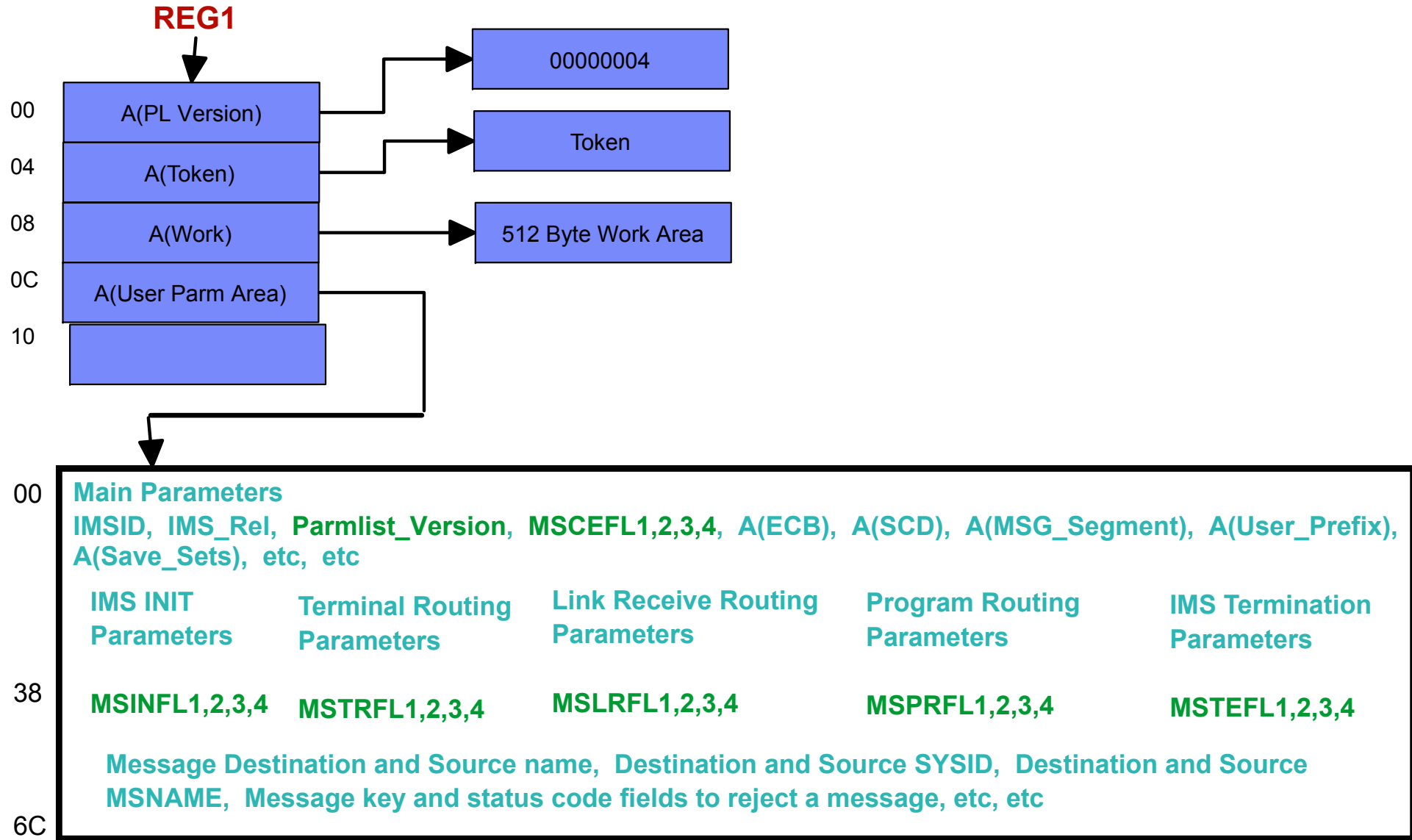
### DFSTRM00 (Termination)

```
DFSMSCEC FUNC(MSTR),  
  Init(YES)  
  Asmscd(Addr(Scd_Plas))  
  Ecb(Addr(Ecb_Plas))  
  Trflag1(Mscebfl1)  
  Dest(Mscebdest)  
  Srce(Mscebsrce)  
  Lunm(Lunm_Ptr)  
  Msgr(Msgr_Ptr)  
  Sidt(Mscdsid)  
  Retcode_Intf(Local_Rc)  
  Retcode_Exit(Exit_Rc);
```

```
DFSMSCEC FUNC(MSIN),  
  PARM=(R6),  
  INIT=YES,  
  ECB=(R9),  
  SIDT=(R2),  
  ICFLAG1=MSCEBFL1,  
  SCD=(R11)
```

```
DFSMSCEC FUNC(MSTE),  
  PARM=(R6),  
  INIT=YES,  
  ECB=(R9),  
  SIDT=(R2),  
  TCFLAG1=MSCEBFL1,  
  SCD=(R11)
```

# User Exit Parameter List (Register 1)



## Message DFS070 Routing Errors

**DFS070 UNABLE TO ROUTE MESSAGE RSN=xyyy (I: sss/name, D: sss/name)**

**xx = IMS module that detected the error**

- 00 = Unknown module or DFSMSCEC requestor**
- 01 = DC Communication Manager (DFSICIO0)**
- 02 = LU 6.2 Receive LU Manager (DFSRLM10)**
- 03 = OTMA Receive LU Manager (DFSYTIB0)**
- 04 = DC Call Handler (DFSDLA30)**
- 05 = MSC Analyzer (DFSCMS00)**
- 06 = /FORMAT Command Processor (DFSICLK0)**
- 08 = IMS Termination (DFSTRM00)**
- 10 = IMS Initialization (DFSIINB0)**

**yy = Reason for error**

- 02 = Exit requested 2 user prefixes  
through**
- 52 = The call to enqueue the message failed.**

**Note: The IMS Diagnostic Guide and Reference macro DFSKEYRC contains a list and explanation of all the DFS070 reason codes.**



## 6701-MSCE Routing Error Log Record

- Produced for DFS070 routing type errors
- Logged with or without exit trace
- ● Similar in format to the node, MSC link, transaction trace and other error log trace records (such as 6701-CVCT (VTAM) and 6701-MSS1 (MSC)).
- Contains the DFSMSCEB control block as well as many of the other ITASK control blocks (ie: PST, CLB, LLB).
- Field MSEBERSN in the DFSMSCEB contains the message key and reason code for the error.
  - ie: 0070 0046 equals,
    - x0046 = decimal 0070 message key = DFS070
    - x007D = decimal 0125 = Reason code
    - 01 = DFSICIO0 detected the error
    - 25 = user exit rerouted MSG to invalid MSNAME (Field MSTRDMSN in the DFSMSCEP user exit parameter list)
  - Refer to the DFSKEYRC macro for the latest list of the DFS070 reason codes.

## DFSKEYRC Macro

- **Contains Reason codes, explanation, and diagnostics for keyed messages**
  - - DFSCLMR0 Keyed messages, R1=0xxxyzzz
      - xxx = Reason code (1 to 4095)
      - y = Append flag
      - zzz = Message Key
    - ie: R1=007D0046 = DFS070 UNABLE TO ROUTE MESSAGE RSN=0125
- **Can Be used for reason codes for all keyed messages. Currently used by,**
  - DFS070 UNABLE TO ROUTE MESSAGE RSN=xxyy
  - DFS081 TRACE EXIT COMMAND UNSUCCESSFUL RSN=xxyy
  - DFS2175 MESSAGE CANCELED BY ROUTING EXIT ROUTINE RSN=xxyy
- **Reason Codes also in IMS Diagnostic Guide**



## Future MSC enhancements

- Bandwidth
- New Links
  - ▶ TCP/IP
  - ▶ SCI/XCF
- Dynamic MSC

