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# Exploring OTMA Exits

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# Our Agenda for Today

- Two-Phase Destination Resolution Exits
- Input/output edit  exit
- Transaction Authorization Exit
- Command Authorization Exit
- Input Message Routing Exit
- Discardable Message Exit

# OTMA Exits for Two-Phase Destination Resolution Exits

- DFSYPRX0 exit
  - phase 1 prerouting process
  - performs an initial search for the output destination
- DFSYDRU0 exit
  - phase 2 destination resolution process
  - determines the final destination for an OTMA output message

# DFSYPRX0 (OTMA Pre-routing Exit)

- Provide a facility to allow you to determine and change destination of OTMA output messages
- Exit is optional
- Invocation
  - CHNG call to modifiable ALTPCB
  - ISRT call to static ALTPCB
    - allows asynchronous output to OTMA client
  - called when present in IMS RESLIB when input message was not from OTMA client
- Not Invoked
  - ISRT call to the IOPCB
  - ISRT call to an SMB or transaction
- In Shared Queues environment
  - same DFSYPRX0 must reside in both front-end and backend to send asynchronous output message to the correct destination

# OTMA FINDDEST PHASE 1 - PREROUTING

- Determine "Legacy Finddest" vs "OTMA Finddest"
  - IMS searches for an initial destination for an ALTPCB output message
  - Legacy Finddest - destination not OTMA, use existing Legacy finddest logic
  - OTMA Finddest - destination may be OTMA - then go to phase 2
- Default algorithm used when DFSYPRX0 is not available:

  If destination is system console or MTO
  Use legacy route to determine destination
  Else If input message originated from OTMA
  Use OTMA finddest (phase 2)
  Else
  Use Legacy finddest to determine destination

# OTMA FINDDEST PHASE 1 - PREROUTING

- When DFSYPRX0 is found in the IMS system
  - exit can override the default algorithm
  - can specify either legacy or the OTMA route regardless of input terminal (legacy or otma)
  - if input message is not from OTMA and exit specifies OTMA destination, then the exit must provide the OTMA client name
    - DFSYPRX0 return codes:

RC=0 : input message came from OTMA,destination is OTMA
or Non-OTMA input message ,output is not OTMA
RC=4: Non-OTMA input message, but destination is OTMA
(need to provide OTMA client name)
RC=8: message came from OTMA, but destination is not OTMA

# OTMA FINDDEST PHASE 1 - PREROUTING

- When DFSYPRX0 is found in the IMS system and apar PQ32402 installed
  - if input message is from OTMA then DFSYPRX0 exit can override the OTMA client name a different OTMA client name
  - Use OTMAMD=Y in the IMS PROCLIB member DFSPBxxx
  - DFSYPRX0 return codes would create 5 cases :

RC = 0 : Input is not OTMA;Output is not OTMA
RC = 4 : Input is not OTMA; Output is OTMA client
RC = 0 : Input is OTMA; Output is same OTMA client
RC = 4 : Input is OTMA; Output is new OTMA client
RC = 8 : Input is OTMA; Output is not OTMA

# OTMA FINDDEST PHASE 1 - PREROUTING

- DFSYPRX0 is not invoked if the destination is the system console, or the primary or secondary MTO
- DFSYPRX0 will be invoked if the destination is a transaction (SMB) and will not be located until phase 2 (destination resolution)

# DFSYDRU0 (OTMA Final Resolution user exit)

- DFSYDRU0 (default name) exit
- Exit is optional
- Name can be overridden
  - in DFSYDTxx
  - in CSQ6SYSP macro, the keyword OTMACON has the third positional parameter as the *DRUEXIT* name
    - required if MQSeries is to receive asynchronous output from an IMS application
    - MQ recommends naming scheme DRU0xxx where xxx is the name of your MQSeries system
  - DATASTORE statement on IMS Connect configuration file where *DRU* keyword enable you to specify the dest resolution exit name
  - via OTMA Callable Interface(CI) *otma-openx* function

# OTMA FINDDEST PHASE 2 - Final Destination

- IMS determines or changes the destination of an ALT-PCB output message
- If OTMA route was specified during the prerouting process
  - Default algorithm when DFSYDRU0 does not exists in IMS system

If SMB is found
 Destination is the SMB
Else
 Destination is the OTMA TPIPE specified in the message

# OTMA FINDDEST PHASE 2 - Final Destination

- If OTMA route was specified during the prerouting process(cont'd)
  - when DFSYDRU0 does exist in IMS system

It can override the final destination when it is not a transaction(SMB).

it can create a new OTMA tpipe to send output message.

it can create a SYNC tpipe.Needed for MQSeries

# OTMA FINDDEST PHASE 2 - Final Destination

- DRU0 return codes:

RC=0: Destination is the original OTMA client tpipe.
RC=4: Destination is non-OTMA(legacy)
RC=8: Destination is a tpipe in a different client.
- client name will be provided
- the new client DRU0 exit will be invoked.
Note the this return code is only valid for the first DRU invoked.

RC=12: destination is invalid
- A1 status code returned on CHNG call

# OTMA FINDDEST PHASE 2 - Final Destination

- The DRU exit is located as follows
  - Use  the DRU exit name in the client-bid if provided, if the client is currently connected to IMS.
  - If not found, use the DRU name found in the client descriptor, if provided.
  - If not found, use the default DFSYDRU0 exit, if found.
  - If not found, not DRU will be used.

# OTMA FINDDEST PHASE 2 - Final Destination

- Some helpful hints
  - Use OTMAMD=Y in the IMS PROCLIB member DFSPBxxx to direct your OTMA message to a different DFSYDRU0 exit directly from DFSYPRX0 exit without rerouting it. (see apar *PQ32402*)
  - Use OTMASP=Y in the IMS PROCLIB member DFSPBxxx to always create SYNC TPIPE for the ALT-PCB output message.
  - The name of the DFSYDRU0 exit can be overridden by the user or an OTMA client
  - The SCD address is available in the input parameter for both exits
  - The address of the first segment of output message is not passed to the two user exits

# OTMA FINDDEST PHASE 2 - Final Destination

- DRU may add OTMA userdata
  - if the input terminal is legacy device , then no userdata will be present in the output OTMA message prefix unless added by DRU.
  - valid only for return code 0
- DRU may modify OTMA userdata
  - if the input terminal is OTMA, then userdata in the input message is copied to the output OTMA message prefix. This can then be modified by DRU.
  - valid only for return code 0.

# OTMA Exits for Two-Phase Destination Resolution

- DFSYPRX0 and DFSYDRU0 sample exits
  - IMS provided sample exits are not very useful
  - MQSeries sample exits found in Appendix B - *OS/390 SYSTEM Management Guide* are useful

# OTMA Exits for Two-Phase Destination Resolution

- Debugging Hints
  - Using OTMA OTMT trace
    Enabling using IMS command */TRACE SET ON TABLE OTMT.*
    Trace entries can be formatted using DFSERA10 Exit name DFSERA60 when logged or using IMS offline formatting dump.
  - Using IMS IPCS
    - OTMA (High Level)
    - MTE
    - MCB

# OTMA Exits for Two-Phase Destination Resolution

- Enhancement Apars
  - DFSYPRX0
  - DFSYDRU0

# OTMA Input/Output Exit

- DFSYIOE0: Input/output exit
  - Can modify length or data of a message segment
  - Can cancel a message segment
  - Can cancel a message
  - With IMS V6 apar PQ25881 installed / With IMS V7 apar
    - Input parameter list
      - provide address of OTMA message prefix control section
      - provide address of OTMA message prefix state data section
      - provide address of OTMA message prefix user data section
        Note: user data can be updated but the length remains the same
    - Output parameter list
      - allow IOPCB LTERM override on input
      - allow IOPCB MODNAME override name on input
      - allow IOPCB MODNAME override name on output
        Note: with apar PQ32402 installed

# OTMA Input/Output Exit

- DFSYIOE0: Input/output exit
  - Upon return to IMS

RC=0: IMS processing continues
RC=8: End processing fo this transaction
RC=12: Invalid destination

note: a logrec x'67D0' is cut with error code x'24' and the IMS application will receive status code AX.

# Transaction Authorization Exit

- DFSCTRN0
  - Not an OTMA exit
  - Perform transaction authorization
  - Invoke depending on OTMA Security Level
    - NONE
      - set by
        IMS command /SECURE OTMA NONE
        OTMASE=N (set in DFSPBxxx in IMS PROCLIB)
      - RACF will not be called for initial transaction
      - DFSCTRN0 is called if it exists and may reject the transaction
      - RACF may be called for CHNG calls unless apars PQ02865 and PQ33602 are installed

# Transaction Authorization Exit

- DFSCTRN0
  - Invoke depending on OTMA Security Level
    - PROFILE
      - set by
        IMS command /SECURE OTMA PROFILE
        OTMASE=P (set in DFSPBxxx in IMS PROCLIB)
      - transaction authorization is set by OTMA message prefix
        SECURITY DATA section of client-bid.
        - NONE,*CHECK*,FULL (defaults to CHECK if not specified)
      - DFSCTRN0
        - Called for 'N' or none
        - Will be called for 'C' or 'F' (CHECK or FULL) if RACF return code indicated that userid is authorized or no RACF profile found
        - called for program-to-program switches (CHNG call)
        - called for DL/1 Authorization (AUTH) calls

# Transaction Authorization Exit

- DFSCTRN0
  - Invoke depending on OTMA Security Level
    - CHECK
      - set by
        IMS command /SECURE OTMA CHECK
        OTMASE=C (set in DFSPBxxx in IMS PROCLIB)
      - RACF is called and the TIMS | GIMS resource classes are used
      - DFSCTRN0
        - called after successful RACF return code returned
        - called if no transaction profile exists
        - called for program-to-program switches (CHNG call)
        - called for DL/1 Authorization (AUTH) calls
        - NOT called when RACF rejected the transaction

# Transaction Authorization Exit

- DFSCTRN0
  - Invoke depending on OTMA Security Level
    - FULL
      - OTMA security DEFAULT
      - set by
        IMS command /SECURE OTMA FULL
        OTMASE=F (set in DFSPBxxx in IMS PROCLIB)
      - RACF is called and the TIMS | GIMS resource classes are used
      - DFSCTRN0
        - called after successful RACF return code returned
        - called if no transaction profile exists
        - called for program-to-program switches (CHNG)
        - called for DL/1 Authorization (AUTH) calls
        - NOT called when RACF reject the transaction

# Transaction Authorization Exit

- DFSCTRN0
  - exit is included in the IMS system by specifying TYPE=TRANEXIT on the SECURITY macro in IMS stage1 gen
  - Upon return to IMS

RC=0: Accept transaction
RC=4: The transaction is not protected
RC=8: User is not authorized

# Command Authorization Exit

- DFSCCMD0: Command Authorization Exit
  - Not an OTMA exit
  - Called when IMS command input is from OTMA client
  - Can reject or authorize command within IMS
    - even when RACF has rejected or permitted the operation
  - Has access to the command buffer and can parse out critical keywords to dtermine if the command should be allowed

# Command Authorization Exit

- DFSCCMD0: Command Authorization Exit
  - Invoke depending on OTMA security level
    - NONE
      - set by
        /SECURE OTMA NONE
        OTMASE=N (set in DFSPBxxxx member in IMS PROCLIB)
      - OTMA clients allowed only the default set of commands namely
        /BRO,/LOCK,/LOG,/RDISPLAY,/UNLOCK
      - DFSCCMD0 will be called

# Command Authorization Exit

- DFSCCMD0: Command Authorization Exit
  - Invoke depending on OTMA security level
    - PROFILE
      - /SECURE OTMA PROFILE
        OTMASE=P (set in DFSPBxxxx member in IMS PROCLIB)
      - Uses RACF CIMS | DIMS if command profile exists
      - Uses default security if OTMA message prefix Security Data Section security flag is 'N' or an invalid value set
      - DFSCCMD0 will be called

# Command Authorization Exit

- DFSCCMD0: Command Authorization Exit
  - Invoke depending on OTMA security level
    - CHECK
      - /SECURE OTMA CHECK
        OTMASE=C (set in DFSPBxxxx member in IMS PROCLIB)
      - Uses RACF CIMS | DIMS if command profile exists
        (note: userid is required for RACF command authorization)
      - Command is authorized if no command profile exists
      - DFSCCMD0 will be called if it exists after return from RACF

# Command Authorization Exit

- DFSCCMD0: Command Authorization Exit
  - Invoke depending on OTMA security level
    - FULL
      - /SECURE OTMA FULL
        OTMASE=C (set in DFSPBxxxx member in IMS PROCLIB)
        default level at startup
      - Uses RACF CIMS | DIMS if command profile exists
        (note: userid is required for RACF command authorization)
      - Command is authorized if no command profile exists
      - DFSCCMD0 will be called if it exists after return from RACF

# Command Authorization Exit

- DFSCCMD0: Command Authorization Exit
  - Input parameter list includes address of the CLB, SCD, user table, CTB, USERID, CVB and the RACF return code
  - Upon return to IMS:

RC=0: USER/TERMINAL/APPLICATION is Authorized to issue command

RC>0: USER/TERMINAL/APPLICATION is not Authorized to issue command

RC<0; USER/TERMINAL/APPLICATION is not Authorized, The specified user message is sent to the terminal

# Input Message Routing Exit

- DFSNPRT0: Input Message Routing Exit
  - Not an OTMA exit
  - Allows you to change the destination name(TRANSACTION or LTERM) immediately after IMS received the message from input device or application
  - Contents of input parameter list

At offset +8 x'00000008' message originated from OTMA client

At offset +12 address of OTMA first message segment

At offset +24 address of a field that contains two-8 byte names. The first is the TPIPE name and the second is destination override name.

At offset +28 address of the clent OTMA member name that sent the message

# Non-Discardable Message Exit

- DFSNDMX0: Non-discardable Message Exit
  - Not an OTMA exit
  - Invoked for transactions that cause an application to abend and where the input message would be discarded by IMS
  - not invoked  when the transaction is re-enqueued (i.e abendu0129)
  - ability to use IMS Callable Services Routines

# Non-Discardable Message Exit

- DFSNDMX0: Non-discardable Message Exit
  - Upon return to IMS
    - When Register 15 is set to zeros
      - IMS proceeds as if this exit has not been called
      - IMS might delete the message depeding on the type of application abend
      - IMS issues DFS555I message to the original terminal and master terminal.
      - IMS issues DFS554I message to the master terminal

# Non-Discardable Message Exit

- DFSNDMX0: Non-discardable Message Exit
  - Upon return to IMS
    - When Register 15 is set to 4
      - IMS deletes input message from the System
      - IMS issues DFS555I message to the original terminal and master terminal.
      - IMS issues DFS554I message to the master terminal

# Non-Discardable Message Exit

- DFSNDMX0: Non-discardable Message Exit
  - Upon return to IMS
    - When Register 15 is set to 8
      - IMS queues the input message to the suspend queue
      - IMS issues DFS555I message to the original terminal and master terminal.
      - IMS issues DFS554I message to the master terminal

# Non-Discardable Message Exit

- DFSNDMX0: Non-discardable Message Exit
  - Upon return to IMS
    - When Register 15 is set to 12
      - IMS queues the input message to the normal processing queue of the transaction that was being processed when application failed.
      - IMS USTOPs  the transaction unless directed to do otherwise
      - IMS issues DFS554I message to the master terminal

# Non-Discardable Message Exit

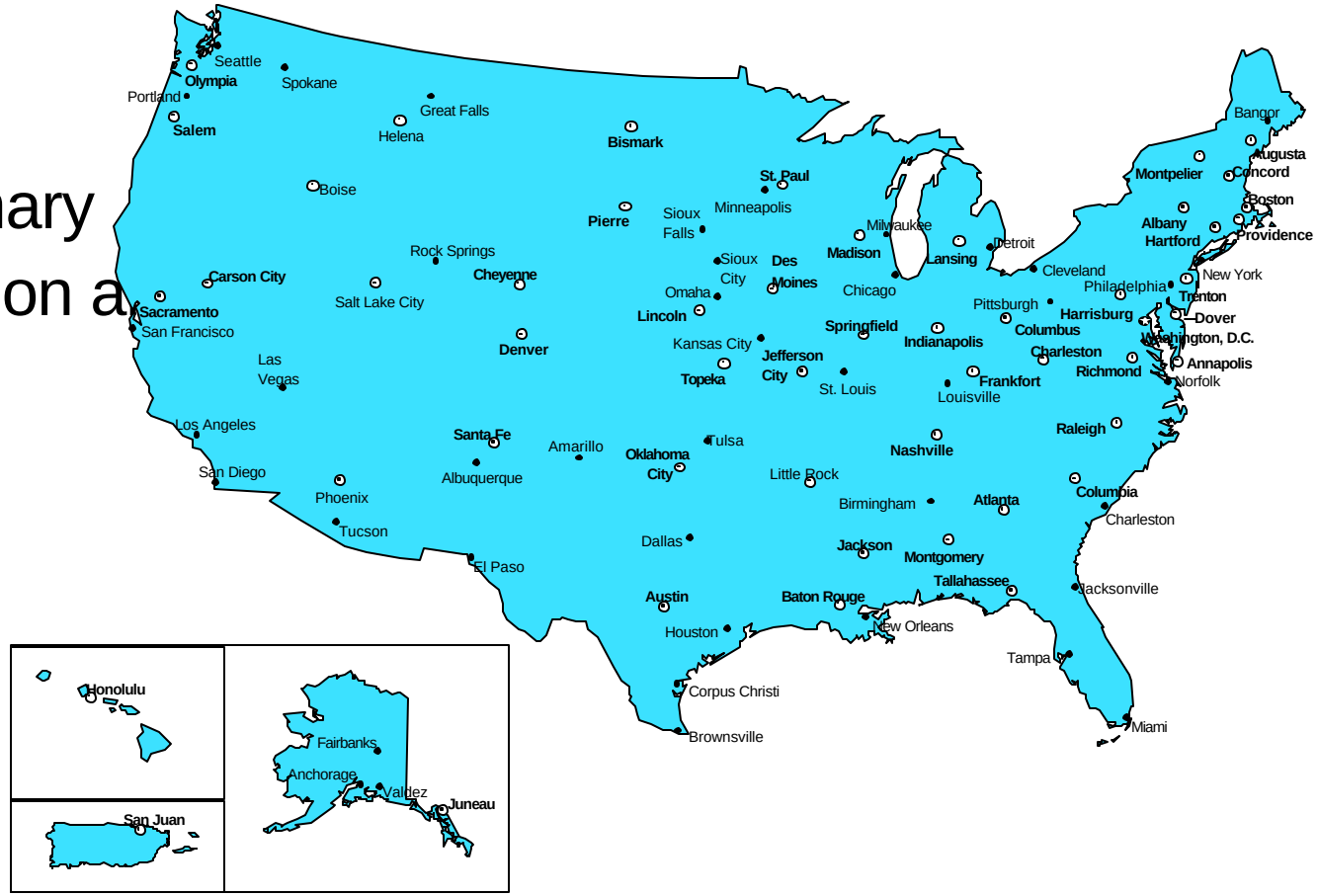
- DFSNDMX0: Non-discardable Message Exit
  - Upon return to IMS
    - When Register 15 is set to 16
      - IMS queues the input message to an alternate destination and placing a valid destination name in the NDMDEST field of the NDM interface block.
      - Specify OTMA TPIPE name or name meamingful to OTMA exit routines (i.e DFSYDRU0,DFSYPRX0,DFSYIOE0)
      - IMS issues DFS554I message to the master terminal

# Non-Discardable Message Exit

- DFSNDMX0: Non-discardable Message Exit
  - Notable APARS

# IMS OTMA User Exits

- Summary
- Question a



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