IMS 12 Transaction Manager Enhancements and Connectivity

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Abstract

- IMS Version 12 adds many new capabilities to IMS in the transaction management and connectivity areas. This session will discuss the enhancements that affect OTMA, APPC, IMS Connect, and MSC. Topics include OTMA security and performance, the new command interface for IMS Connect, how to leverage the new IMS Connect trace records for problem determination, and even discuss how transaction expiration enhancements affect your IMS MQ Bridge interface. It will also explain how you can more easily send messages from one IMS to another using TCP/IP connections.
IMS TM Enhancements

- APPC and OTMA Shared Queues Enhancement
  - Removes the dependency on RRS for Synclevels None|Confirm
- APPC Enhancements
- OTMA Enhancements
- WMQ Message Expiry Support
- IMS Connect Enhancements
- IMS-IMS Connectivity
  - OTMA Support for Asynchronous IMS-IMS Communications
  - MSC TCP/IP Support
APPC and OTMA SQ Enhancement

• New capability that removes the dependency on RRS in a Shared Queues environment for
  • APPC synchronous conversations and OTMA CM1 (send-then-commit)
    Applies only to synclevel=None | Confirm
      • Synclevel=Syncpoint still requires RRS
  • Communications use XCF services
  • New options for the existing AOS= parameter in DFSDCxxx

• Benefit
  • Using XCF rather than RRS allows IMS to be the syncpoint manager
    • Enhances the performance of the commit processing by eliminating
      • RRS logging overhead
      • Potential RRS commit processing bottleneck
      • Overhead associated with communicating with an external syncpoint manager
APPC and OTMA SQ Enhancement …

- New options for the existing AOS= parameter in DFSDCxxx to request the use of XCF
  - AOS=B|S|X (N|Y|F)
    - Request the use of XCF for sync_levels NONE|CONFIRM
      - Multiple options control how sync_level SYNCPT is to be handled
  - New keyword in IMS DFSDCxxx proclib to request logging in the FE
    - AOSLOG=Y|N specifies whether or not the FE writes a 6701 log record for:
      - Response messages returned from the BE system via XCF
        - Applicable to all synclerels (NONE, CONFIRM and SYNCPT)
      - Error messages returned from the BE system via XCF
        - Applicable to all synclerels of (NONE, CONFIRM and SYNCPT)
    - /DIAGNOSE SET AOSLOG(ON|OFF)
      - Enhancement to the /DIAGNOSE command to control AOSLOG capture for events related to APPC and OTMA synchronous transactions in a shared queues environment
LU 6.2 Input/Output Edit Exit (DFSLUEE0) Enhancement

- A new return code (RC=2) for asynchronous conversation requests
  - Requests that an undeliverable message be dequeued
    - Previously, IMS would requeue the message

- Benefit
  - Greater control over undeliverable asynchronous output
OTMA Enhancement: DFS2082I for CM0

- CM1 (Send-then-Commit) transactions rely on DFS2082
  - To end the outstanding wait if the IMS transaction does not send IOPCB reply
- Conversion from the use of CM1 to CM0 (Commit-then-send)
  - For remote programs waiting for a reply
    - May result in a hang until timeout if there is no IOPCB reply
    - *Performance impact*

- Enhancement
  - A new commit-then-send (CM0) optional flag to request DFS2082
    - Specified on an input CM0 transaction message
      - Triggers OTMA to send the DFS2082 message if
        - The IMS application does not reply to the IOPCB
        - Nor message switches to another transaction
    - Does not apply if the transaction is a switched-to program in a program-program switch scenario
OTMA ACEE Reduction for Multiple OTMA Clients

• New capability that creates, shares and **caches** a **single** ACEE associated with a RACF userid
  - Shared across multiple OTMA member clients (TMEMBER)

• AND… a new maximum ACEE aging value during client-bid
  - 999999 seconds (11.5 days)
    - Previously 68 years
    - Range: 300 seconds to 999999 seconds
      - *If OTMA receives a value less than 300, the value is reset to 0 and OTMA will not refresh ACEEs*

• A cached ACEE has an aging value based on the OTMA member client with the lowest value
Challenge Addressed: Multiple ACEEs for the same User

- More storage
- More RACF calls to create an instance of an ACEE
- Possible security exposure if a change has to be made to a user profile
  • Different versions of the ACEE based on which OTMA client is used

Solution
Single ACEE cache
Benefits of OTMA ACEE Enhancements

• Cached ACEEs
  • Reduce the system storage requirements while providing better security and performance
    • Only one copy of the ACEE instead of multiple per OTMA client
      • Reduced storage usage
      • Reduced security exposure
      • Improved performance
  • Provide consistency
    • Same security result regardless of which OTMA client is used
  • Lower maximum ACEE aging value
    • Triggers faster ACEE cache refresh
      • Reduces security exposure, e.g., userid is revoked or access permissions are changed
V11 Transaction Expiration SPE

- IMS Transaction Expiration SPE

- APARs PM05984 (IMS10) / PM05985 (V11)

- Sends DFS3688I message instead of DFS555I or DFS2224I message for transaction expiration during application GU phase

  **DFS3688I** Transaction aaaaaaaaa expired: EXPRTIME=nnnnnn, ELAPSE=ssssss
  
  Tmember xxxxx  Tpipe xxxx

- Enhancement only affects **OTMA** messages
  - Expired non-OTMA messages already receive DFS3688I
    - PK86426/UK47070 (V11) – non-OTMA transaction expiration is V11 only
      
      **DFS3688I** Transaction aaaaaaaaa expired: EXPRTIME=nnnnnnn, ELAPSE=ssssss
MQ Message Expiration

- Extension of the WebSphere MQ (WMQ) Message Expiry facility to include the IMS transaction expiration function (WMQ 7.01)
  - A new service parameter
    - CSQ6SYSP SERVICE = 0000000001 or also specified through the SET SYSTEM SERVICE(0000000001) command

- Used in conjunction with other queue manager service parameters
  - e.g. if queue manager already uses service parm 0040 then setting the new service would result in 0040000001

- Provides toleration of an OTMA NACK_FOR_TRANS_EXPIRED response from IMS through the OTMA support
  - Leverages WMQ expiry processing as if the message had expired prior to sending the message to OTMA
MQ Message Expiration …

- User-Specified Expiry time (message-level)
  - A value is passed to IMS if an MQ message expiry time (MQMD.Expiry) exists for the message AND the service parameter is set
- *Value is in 10ths of a second*
- *The residual expiry time for the message is built into the OTMA interface*
  - *MQ expiry time minus the time that was spent in the MQ queues*

From the remote application perspective (business as usual):
- The MQPUT application will be unaware of an expiry unless it specifies a Report option which can
  - > include the generation of an expiry report which will be sent to the specified reply-to queue,
  - > passing the remaining expiry interval from a request message to a response message,
  - > or just discarding the expired message.
Migration and Benefits

• DFS3688I
  • Applications/users will see a DFS3688I message instead of DFS555I/DFS2224I when an input message is discarded in GU Phase

• WMQ support
  • When Enabled
    • WMQ applications may need to be coded to expect either a DFS3688I messages or a NAK with OTMA sense code x’0034’ for message expiry in IMS

• Benefits
  • Extends IMS transaction expiration function to WMQ
  • Standardizes the message (DFS3688I) that is sent out to remote clients when the transaction input message has expired
New Type-2 Commands for IMS Connect

- New Type-2 commands for IMS Connect resources
  - QUERY IMSCON
  - UPDATE IMSCON

- Conform to the IMS command structure using the OM API
  - Processed by OM clients, e.g., TSO SPOC, REXX SPOC API, Batch SPOC, IMS Control Center, etc.

- Can coexist with the previous WTOR and z/OS Modify commands
  - No changes to the existing command functionality
The Environment

- New command environment for IMS Connect
QUERY IMSCON TYPE(type) NAME(name1, name2,...) FILTER(filter) SHOW(attribute(s))

- **TYPE** = Type of resource in IMS Connect
  - ALIAS - aliases of associated ODBMs (VIEWIA)
  - CLIENT – active IMS Connect clients (no equivalent – information in VIEWPORT)
  - CONFIG – IMS Connect status and activity (VIEWHWS)
  - DATASTORE – datastores or IMS systems (VIEWDS)
  - IMSPLEX – information about the IMSPLEX (VIEWIP)
  - LINK – MSC logical link (no equivalent)
  - MSC - MSC physical link (VIEWMSC - new for IMS to IMS TCP/IP Communications)
  - ODBM – ODBMs and associated IMS aliases (VIEWOD)
  - PORT – TCPIP port and associated clients (VIEWPORT)
  - RMTIMSCON - remote IMS Connect and associated send clients (VIEWRMT - new for IMS to IMS TCP/IP Communications)
  - SENDCLNT – send clients (no equivalent - new for IMS to IMS TCP/IP Communications)
  - UOR - display unit of recovery identifier (VIEWUOR)
UPDATE

UPDATE  IMSCON  TYPE(type)  NAME(name1, name2,...)
START(condition1,condition2,...)  STOP(condition1,condition2,...)
SET(condition1,condition2,...)

• TYPE = Type of resource in IMS Connect
  • ALIAS – IMS aliases and associated ODBMs (STARTIA,STOPIA)
  • CLIENT – TCPIP clients (STOPCLNT)
  • CONFIG – IMS Connect configuration status and activity (CLOSEHWS,
    SETOAUTO, SETPWMC, SETRACF, SETRRS, RECORDER, SETUID)
  • CONVERTER – Refresh XML converters (REFRESH – new IMS Connect enhancement)
  • DATASTORE – update datastore status (OPENDS,STARTDS, STOPDS)
  • IMSPLEX – update connection to the IMSplex (OPENIP,STARTIP,STOPIP)
  • LINK – MSC logical link (STOPLINK - new for IMS to IMS TCP/IP Communications)
  • MSC - MSC physical link (STARTMSC/STOPMSC - new for IMS to IMS TCP/IP Communications)
  • ODBM – ODBMs and associated IMS aliases (STARTOD/STOPOD)
  • PORT – TCPIP port and associated clients (OPENPORT/STOPPORT)
  • RACFUID – update RACF userid caching (REFRESH – new IMS Connect enhancements)
  • RMTIMSCON - remote IMS Connect and associated send clients (STARTMRT/STOPRMT - new
    for IMS to IMS TCP/IP Communications)
  • SENDCLNT – send clients (STOPSCLN – new for IMS to IMS TCP/IP Communications)
XML Converter Refresh

- New Command to refresh an XML converter file that is already in use

```
UPDATE IMSCON TYPE(CONVERTER)...
xx,REFRESH CONVERTER NAME(cvtrname)
F hws,UPDATE CONVERTER NAME(cvtrname) OPTION(REFRESH)
```

- Supported by all command interfaces: Type-2, WTOR, z/OS Modify

- Converter files continue to be:
  - Generated using RDz
  - Loaded by IMS Connect from STEPLIB/JOBLIB/LNKLST

- Benefit
  - More timely ability to change and implement converter files
    - Without requiring an IMS Connect restart
New IMS Connect Recorder Trace Records

- New level of tracing adds records for TCP/IP and XCF sends/receives
  - ICONTR – TCP/IP Receive
  - ICONTS – TCP/IP Send
  - ICONIR – IMS OTMA Receive
  - ICONIS – IMS OTMA Send
- Requires the use of the BPE External Trace support introduced in IMS 11
  - Due to the amount of data that can be produced
- Requires tracing to be set to LEVEL(HIGH)
- Benefit
  - Additional trace points provide the ability to capture client errors for improved problem determination and analysis
  - The use of BPE external tracing allows large amounts of data to be captured
New IMS Connect Recorder Trace Records ...

F HWS1,UPDATE TRACETABLE NAME(RCTR) OWNER(HWS) **LEVEL(HIGH)** EXTERNAL(YES)

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**Diagram:**

1. ICONTR – Receive from TCP/IP
2. ICONRC – User Msg Exit Receive
3. ICONIS – Send to IMS
4. ICONIR – Receive from IMS
5. ICONSN – User Msg Exit XMIT
6. ICONTS – TCP/IP Send to Client

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No ICONIS/ICONIR support for the SCI interface (type-2 commands and ODBM)
IMS Connect - RACF Return Codes

• Previously, IMS Connect returned RSM RC=08 RSN=40 for any and all security violations
  • No indication of specific reason,
    • E.g. invalid userid, incorrect password, password expired, etc.

• With IMS 12, enhancements to RACF Return Codes:
  • In the Request Status Message (RSM) for RYO and the IMS SOAP Gateway
    • RSM_RACFRC
  • In the OTMA User Data section for the IMS TM Resource Adapter
    • OMUSR_RACF_R
    • New IMS Connect Protocol level indicates support
      • OMUSR_PROLEV = OMUSR_PR03

• Benefit
  • Improved explanation and understanding of security violation
IMS Connect – RACF Userid Caching

• Existing IMS Connect security with RACF=Y
  • Limited caching of RACF Utoken
    • Consecutive requests on a persistent socket with the same Userid/Password/Group
• IMS 12 enhancement with RACF=Y
  • Common cache for userids across ALL sessions and ALL ports
    • HWSCFG HWS statement: UIDCACHE={N|Y} , UIDAGE=aging_value

xx, VIEWHWS

HWSC0001I   HWS ID=HWS1   RACF=Y   PSWDMC=R
HWSC0001I   UIDCACHE=Y   UIDAGE=300
HWSC0001I   MAXSOC=2000   TIMEOUT=6000
HWSC0001I   NUMSOC=6   WARNSOC=80%   WARNING=5%
HWSC0001I   RRS=Y   STATUS=ACTIVE
HWSC0001I   VERSION=V12   IP-ADDRESS=009.030.218.050
HWSC0001I   SUPER MEMBER NAME= CM0 ACK TOQ=
HWSC0001I   ADAPTER=Y
CM0 ACK NoWait for RYO Clients

- Existing protocol for Roll Your Own (RYO) clients requires
  - CM0 Send-Receive interactions to receive a timeout notification after ACK/NAK
    - Receive and timeout flow adds unnecessary overhead to the client application
- New option of NoWait on ACK or NAK
  - Indicates the remote client will not issue subsequent receive

<table>
<thead>
<tr>
<th>Previous CM0 send-receive flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Send request</td>
</tr>
<tr>
<td>Receive response</td>
</tr>
<tr>
<td>Send ACK</td>
</tr>
<tr>
<td>Receive T/O</td>
</tr>
</tbody>
</table>

<table>
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<th>New CM0 send-receive flow</th>
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</thead>
<tbody>
<tr>
<td>Send request</td>
</tr>
<tr>
<td>Receive response</td>
</tr>
<tr>
<td>Send ACK NoWait</td>
</tr>
</tbody>
</table>

- Benefit
  - Greater efficiency and simplified interaction
    - Eliminates need for extra send after an ACK/NAK
Partial Read Status

• New **READ** client status
  • The message has been received by IMS Connect but is not yet considered a complete input message
    • Should be transient but can be an indicator of a problem
    • Affects VIEWPORT, VIEWHWS, QUERY MEMBER, QUERY PORT, QUERY IMSCON command output

• Benefit
  • Facilitates the detection of a remote application programming error
    • Invalid length specification of an input message
IMS Connect User Exit Load Modules

- IMS Connect ships load modules for User Exits
  - HWSUNIT0, HWSJAVA0, HWSSMPL0, HWSSMPL1
    - Previously, working samples were provided but always had to be assembled and bound
      - *Even if no changes were made to the provided source samples*

- Benefit
  - Eases installation and maintenance processing if the user exits are to be used unchanged
IMS to IMS TCP/IP Connectivity

- Enhancements to leverage TCP/IP networks for communications between IMS systems for:
  - **OTMA Support for Asynchronous IMS-IMS Communications**
    - Uses one-way message communications (ALTPCB)
  - TCP/IP-Type Physical Links (MSC)
    - Request and response message communications
      - *IMS Connect processes both the request and response messages as one-way asynchronous messages*
Asynchronous IMS-IMS TCP/IP Support

- TCP/IP connections between the local and remote IMS systems
  - Are managed by IMS Connect to IMS Connect communications
    - Without having to write client code or invoke additional gateways
    - The goal is simplification and ease of use

Example:

<table>
<thead>
<tr>
<th>Existing Method</th>
<th>New Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMS1</td>
<td>IMS Connect1</td>
</tr>
<tr>
<td>ISRT ALTPCB</td>
<td>XCF</td>
</tr>
<tr>
<td>Descriptor ICON1</td>
<td>OTMA</td>
</tr>
<tr>
<td>OTMA</td>
<td>OTMA</td>
</tr>
</tbody>
</table>

| IMS1 | IMS Connect1 | IMS Connect2 | IMS2 |
| ISRT ALTPCB | XCF | TCP/IP | XCF |
| Descriptor ICON1 | OTMA | OTMA | OTMA |
Asynchronous IMS-IMS TCP/IP Support …

- **OTMA**
  - Sends OTMA remote ALTPCB messages to IMS Connect using new destination information
    - OTMA destination descriptors or DFSYDRU0 exit Routine
- **IMS Connect**
  - Receives OTMA ALTPCB messages from a local IMS and sends them to the remote IMS Connect for processing in the remote IMS
    - Enhanced IMS Connect configuration specifications

ALTPCB destination is resolved using an OTMA Destination Descriptor or the DFSYDRU0 exit

IMS Connect configurations defines the connection to the remote Partner
### OTMA Support – Message Flow Details

**IMS Application**
- Issues CHNG call to set the destination name (descriptor)
  - IMS resolves this destination using an OTMA destination descriptor by the same name or through DFSYDRU0 specifications
- Issues ISRT ALTPCB to send the message to a remote IMS

**OTMA**
- Using information from either the descriptor or exit
  - Sends the message to the local IMS Connect from a regular TPIPE queue
  - Builds the OTMA header
- Waits for ACK/NAK
  - TPIPE queue is in a new **WAIT_R** status during this wait
IMS Connect Configurations

**IMS1**

App

ISRT

ALTPCB

**TMEMBER/ TPIPE**

WAIT_R

**ICON1**

HWS=(ID=ICON1,XIBAREA=100,RACF=N)

TCPIP=(HOSTNAME=TCP/IP,PORTID=(8888),

...)

DATASTORE=(ID=IMS1,GROUP=XCFGRP1,MEMBER=ICON1,

TMEMBER=IMS1,DRU=HWSYDRU0,APPL=APPLID1)

RMTIMSCON=(ID=ICON2,HOSTNAME=ICON2.IBM.COM,

PORT=9999,AUTOCONN=N,PERSISTENT=Y,

IDLETO=60000,RESVSOC=10,USERID=USER01,

APPL=APPL01)

**SendOnly with ACK**

LLLL|IRM|LLZZ|TRANABC |DATA

HWS=(ID=ICON2,XIBAREA=100,RACF=Y)

TCP/IP=(HOSTNAME=TCP/IP,PORT=(9999),

MAXSOC=50,TIMEOUT=5000,EXIT=(HWSSML0,HWSSML1)

DATASTORE=(ID=IMS2,GROUP=XCFGRP1,MEMBER=ICON2,

TMEMBER=IMS2,DRU=HWSYDRU0,APPL=APPLID1)

**ICON2**

**TCP/IP**

**XCF**

**Descriptors or DFSYDRU0 exit**

D DESC1

TMEMBER=ICON1

RMTIMSCON=ICON2

RMTIMS=IMS2

RMTTRAN=TRANABC

USERID=USERXYZ

**SHARE in Atlanta 2012**
And finally … the Return ACK / NAK

IMS2 performs transaction authorization, if necessary, and ACKs or NAKs the message.
Usage and Benefits

• Usage
  • IMS applications: ISRT ALTPCB
  • IMS environment: destination descriptor or a DFSYDRU0 exit routine
  • IMS Connect: configuration specifications

• Benefits
  • Supports TCPIP communications to invoke transactions between IMS systems without having to create or maintain a separate gateway solution
    • IMS-provided and supported solution
MSC TCP/IP

• Support for MSC communications across a TCP/IP network

• A new physical link MSPLINK TYPE=TCPIPI

  • Provides a mechanism to
    • Take advantage of TCP/IP networks
    • Complement or backup existing SNA/VTAM links
    • Take advantage of potentially higher bandwidths

  • Supports operational compatibility with other link types (CTC, MTM, VTAM)
    • Starting, stopping, updating, displaying, and assigning resources

• Only between IMS 12 systems
MSC TCP/IP …

- MSC TCP/IP leverages IMS Connect and the Common Service Layer
  - IMS Connect sends/receives messages via the TCP/IP network
    - IMS Connect manages the TCP/IP communications
    - IMS MSC manages the message processing
  - CSL provides the Structured Call Interface (SCI) for communications between IMS components including IMS Connect
    - Each IMS and its local MSC-routing IMS Connect system must be part of the same IMSplex
      - `IMSPLEX=plexname` parameter in the Common Layer Section of the `DFSDFxxx` of IMS proclib
    - The Operations Manager (OM) is not required but recommended
      - For type-2 command support
MSC TCP/IP ...

- IMS to IMS Connect functionality
  - Isolates TCP/IP from the IMS Control Region
    - Uses the existing IMS Connect TCP/IP support
  - Provides a new MSC driver as well as TCP/IP driver for MSC
  - Supports communication with IMS via the Structured Call Interface (SCI)
Example: Configuration Definitions

**IMS1**

- **MSPLINK**
  - **Type** = TCPIP
  - **NAME** = IMS2
  - **LCLICON** = ICON1
  - **LCLPLKID** = MSC12
  - **BUSIZE** = 8192
  - **SESSION** = 2

- **MSLINK**
  - **PARTNER** = AB
  - **MSNAME**
    - **SYSID** = (2,1)

**IMS2**

- **MSPLINK**
  - **Type** = TCPIP
  - **NAME** = IMS1
  - **LCLICON** = ICON2
  - **LCLPLKID** = MSC21
  - **BUSIZE** = 8192
  - **SESSION** = 2

- **MSLINK**
  - **PARTNER** = AB
  - **MSNAME**
    - **SYSID** = (1,2)

**HWSCFG01**:

- **MSC**
  - (LCLPLKID = MSC12,
    RMTPLKID = MSC21,
    LCLIMS = IMS1,
    RMTIMS = IMS2,
    IMSPLEX = (MEMBER = ICON1, TMEMBER = PLEX1),
    RMTIMSCON = (CONNECT2))

- **RMTIMSCON**
  - (ID = CONNECT2,
    HOSTNAME = ICON2.IBM.COM,
    PORT = 9999,
    RESVSOC = 2)

**HWSCFG02**:

- **MSC**
  - (LCLPLKID = MSC21,
    RMTPLKID = MSC12,
    LCLIMS = IMS2,
    RMTIMS = IMS1,
    IMSPLEX = (MEMBER = ICON2, TMEMBER = PLEX2),
    RMTIMSCON = (CONNECT1))

- **RMTIMSCON**
  - (ID = CONNECT1,
    HOSTNAME = ICON1.IBM.COM,
    PORT = 9999,
    RESVSOC = 2)
Enhanced I/O Statistics

- Enhanced Query MSLINK Show (Statistics)
  - Added elapsed times for SCIs, ICONs, and TCPIP
    - I/O statistics reported in SCI, ICON, and TCP/IP elapsed times
  - SendIO_Times
    - Tot_SCI_SendIO_Time, Tot_ICON_SendIO_Time, Tot_TCPIP_SendIO_Time ...
    - Hi_SCI_SendIO_Time, Hi_ICON_SendIO_Time, Hi_TCPIP_SendIO_Time ...
    - Low_SCI_SendIO_Time, Low_ICON_SendIO_Time, Low_TCPIP_SendIO_Time ...
  - ReceiveIO_Times
    - Tot_SCI_RecIO_Time, Tot_ICON_RecIO_Time, Tot_TCPIP_RecIO_Time...
    - Hi_SCI_RecIO_Time, Hi_ICON_RecIO_Time, Hi_TCPIP_RecIO_Time...
    - Low_SCI_RecIO_Time, Low_ICON_RecIO_Time, Low_TCPIP_RecIO_Time...
MSC TCP/IP - Benefits

- **Benefits**
  - Takes advantage of TCP/IP networks for MSC
    - Can potentially provide for a higher MSC bandwidth
  - Supports different configurations
    - Coexistence with or backup of VTAM/SNA links
    - Increases availability
      - *Logical links can be moved between VTAM and TCPIP*
    - Flexibility
Summary

- IMS 12 continues to enhance:
  - APPC
  - OTMA
  - IMS Connect

- And introduces new ways to support
  - IMS-IMS Communications