IMS Version 8 - Part II
Common Service Layer

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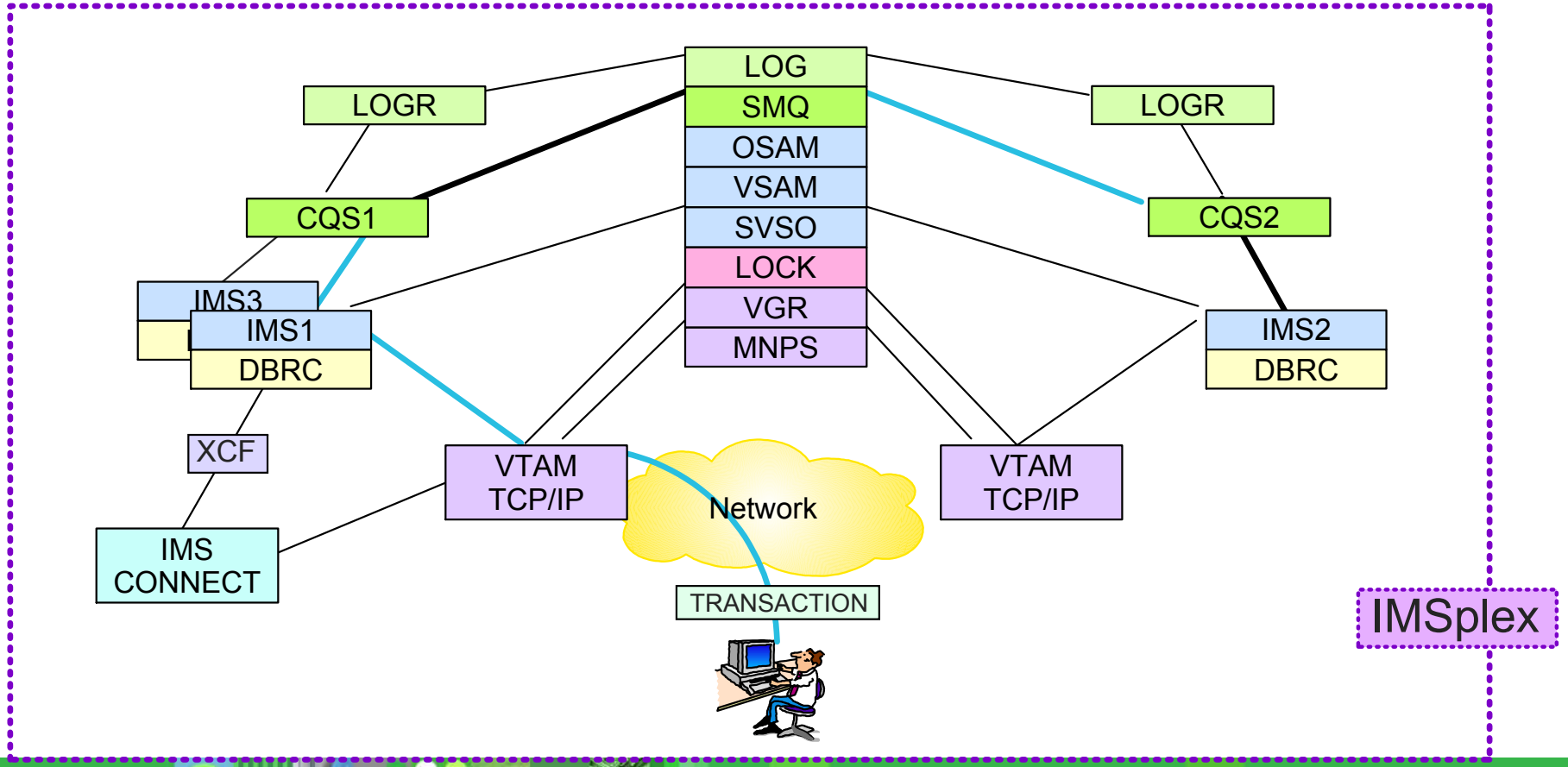
By the End of IMS V7

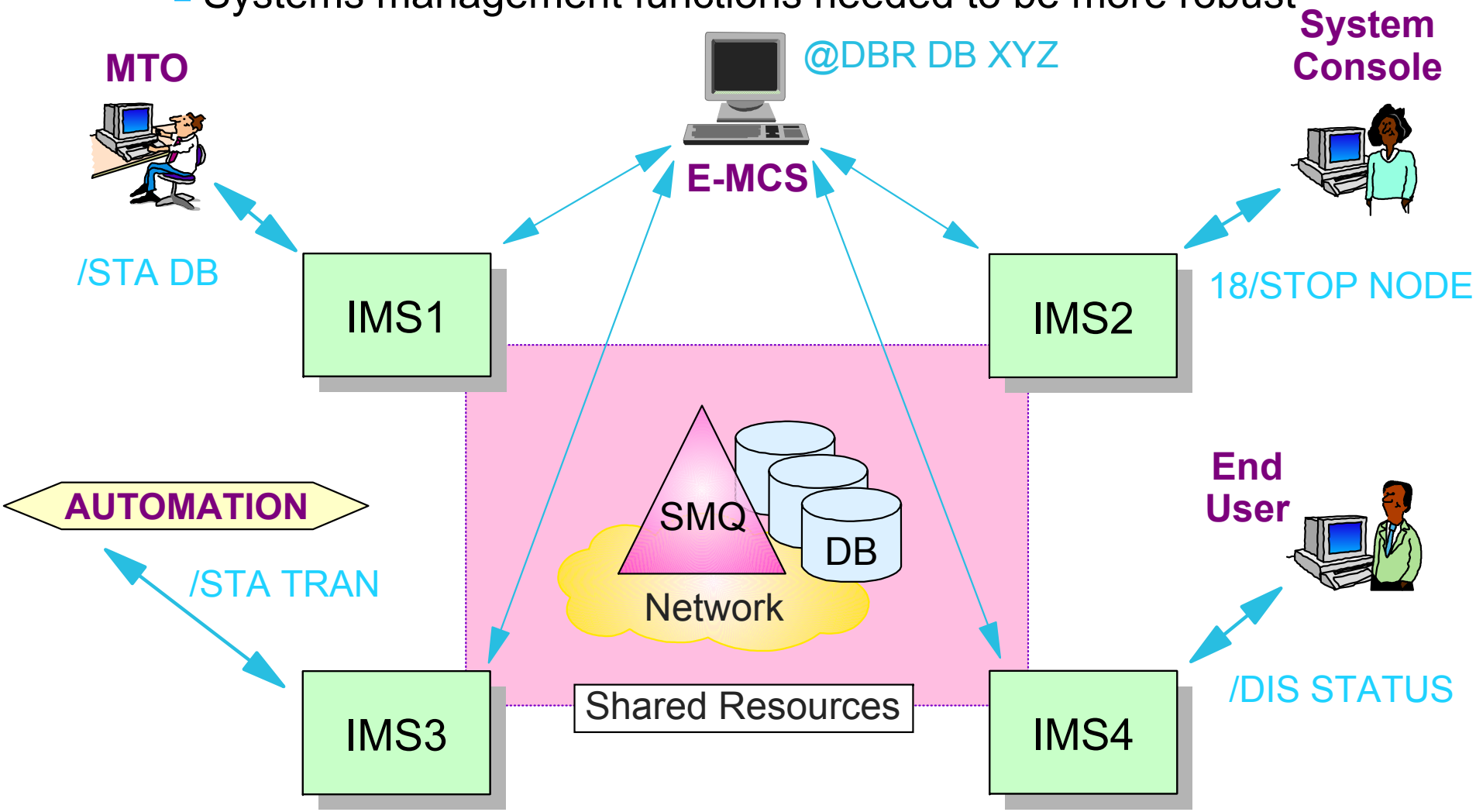
IMS had exploited many parallel sysplex functions to share resources in an IMSplex

- Data sharing, shared queues
- VTAM generic resources, multinode persistent sessions
- Automatic restart management, XCF communications



Managing Shared IMS Resources

- **But managing these resources became more difficult**
  - Systems management functions needed to be more robust



Better Systems Management Needed

Better resource management

- Address the management of terminals and users throughout an IMSplex
  - *Sysplex terminal management*
- Coordinate the online change process across all IMSplex members
  - *Global process management*
- Give exits the ability to determine terminal/user status globally
  - *Global callable services*

Better operations management

- Facilitate operational control of IMSplex members
  - *Single Point of Control*
  - *Global automation*

The IMSplex

Definition of an IMSplex

- An IMSplex is a set of IMS address spaces that are ***working together as a unit*** and are most likely running in a parallel sysplex with a *common service layer (CSL)*
  - Note: The IMSplex is not new, we're just now formalizing the term

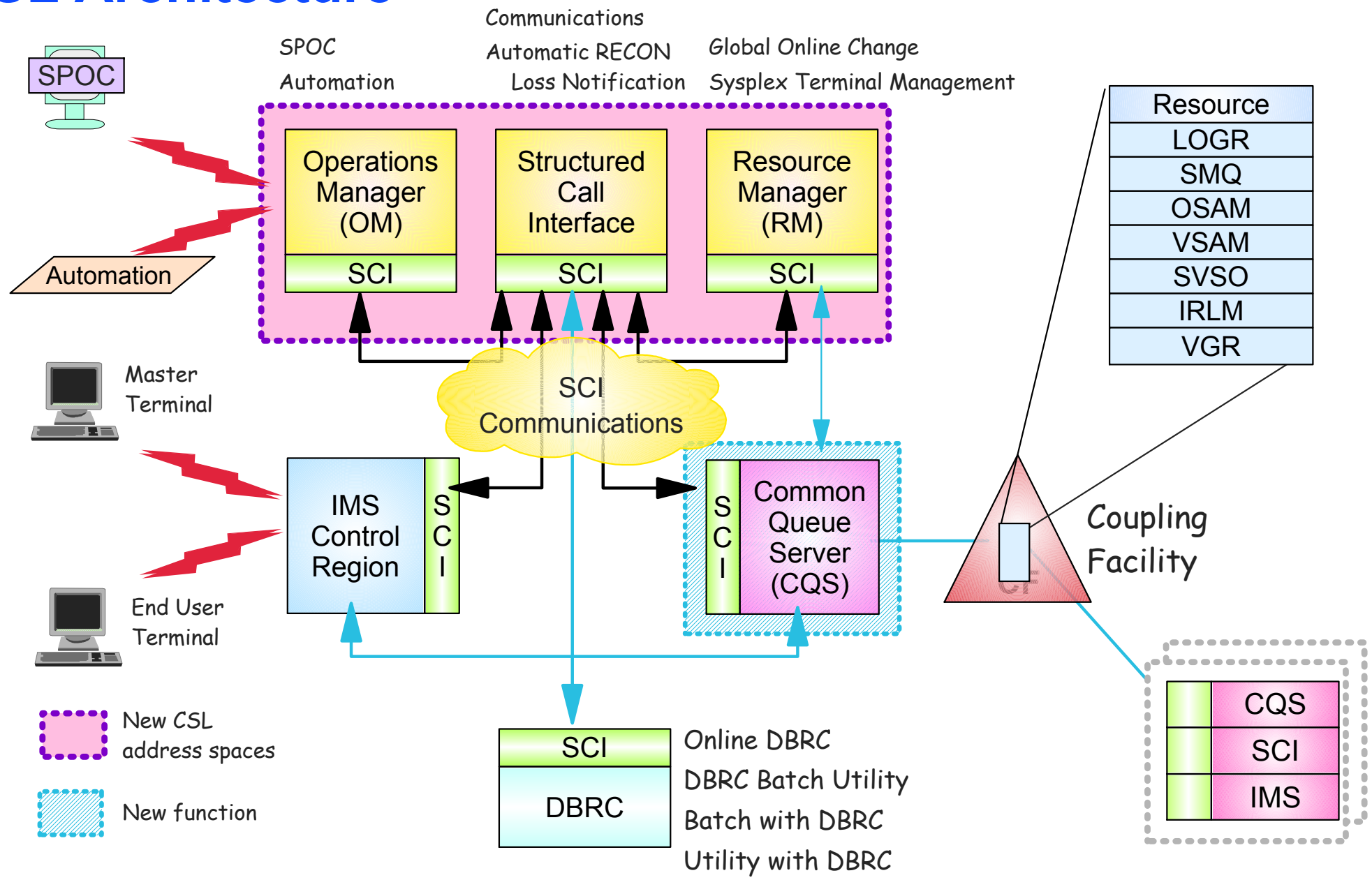
- Examples of an **IMSplex** include ...
  - A set of IMS control regions at the V6 and/or V7 and/or V8 level without a CSL that are data sharing or message queue sharing
  - A set of IMS control regions at the V6 and/or V7 level (no CSL) that are data sharing or message queue sharing with V8 with a CSL
  - A set of IMS control regions at the V8 level with a CSL that are data sharing or message queue sharing
  - A single IMS control region at the V8 level with a CSL
    - Parallel Sysplex not required

Common Service Layer (CSL)

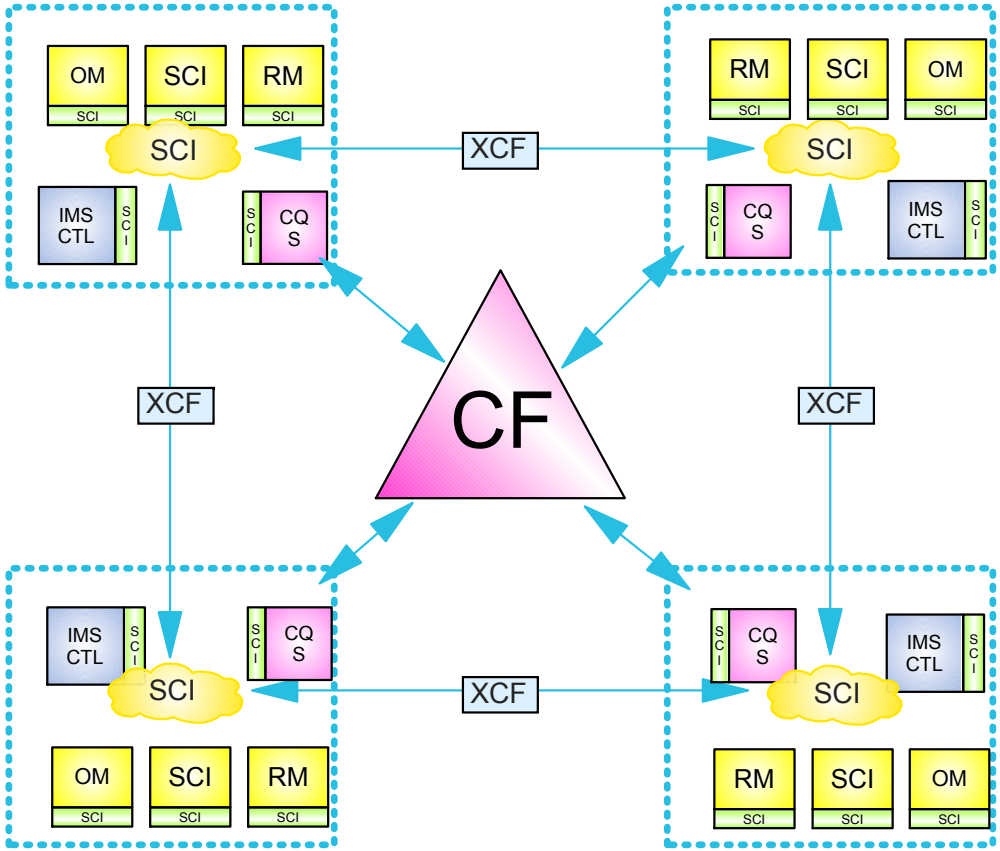
The next step in IMS architectural evolution

- New *address spaces* built on Base Primitive Environment
  - *Structured Call Interface (SCI)*
    - IMSplex member registration
    - Communications between IMSplex members
  - *Operations Manager (OM)*
    - IMSplex-wide command entry and response
  - *Resource Manager (RM)*
    - Global resource and process management
    - VTAM terminal/user status recovery
- Enables new systems management *functions* in IMSplex
  - *Sysplex Terminal Management (STM)*
    - Uses SCI and RM
  - *Single point of control (SPOC) and user-provided automation (AOP)*
    - Uses SCI and OM
  - *Coordinated Online Change (Global Online Change)*
    - Uses SCI, OM, and RM

CSL Architecture



IMSplex Configuration



- Resource List Structure
- LOGR List Structures
- SMQ List Structures
- OSAM Cache Structure
- VSAM Cache Structure
- Shared VSO Cache Structures
- IRLM Lock Structure
- VGR List Structure

- In an IMSplex
  - All members share the same CF structures
  - Intra-IMSplex communications is implemented by SCI using XCF across OS images

IMS V8 Highlights

CSL Components

- Structured Call Interface
- Operations Manager
- Resource Manager
- Resource Structure

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CSL Components (SCI)

SCI address space

- Provides for standardized intra-IMSplex *communications* between members of an IMSplex
- Provides *security authorization* for IMSplex membership
- Provides SCI *services to registered members*

Stuctured call interface services

- Used by SCI clients to
  - Register/deregister as member of IMSplex
  - Communicate with other members
- SCI client issues CSL macros to request SCI services
  - Documented in *CSL Guide and Reference* manual

SCI configuration

- One SCI address space is *required on each OS/390 or z/OS image* with IMSplex members

Structured Call Interface (SCI)

IMSplex address spaces register with SCI

- CSL address spaces
  - Operations Manager (OM)
  - Resource Manager (RM)
- Common Queue Server (CQS)
- IMS
  - DB/DC, DBCTL, DCCTL, FDBR
- Automated Operator Programs (AOP)
- DBRC
  - Online DBRC address space
  - DBRC utility (DSPURX00)
  - Batch with DBRC=Y
  - DLI Utilities with DBRC=Y
- Other
  - CSL (SCI) interface is documented
  - May be accessed by user or vendor programs

Registrants may abend if SCI not available when required.

CSL Highlights

Automatic RECON loss notification

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Automatic RECON Loss Notification

RECON reconfiguration with previous IMS Releases

- When IMS subsystem detects bad RECON, it begins reconfiguration process
  - Copies good RECON to spare
  - IMS V7 writes message identifying subsystems with RECONs open
- To create new spare bad RECON must be deleted and redefined
  - cannot delete/define RECON data set until ALL DBRC instances have closed and deallocated it
  - DBRC will not close and deallocate until it knows
  - DBRC doesn't know until next access
    - May be long time for batch or utilities using DBRC

ARLN ...

Automatic RECON Loss Notification (ARLN)

- *Option* in IMS V8 to make reconfiguration by other systems immediate and automatic

DBRC instances join IMSplex

- Register with SCI
  - IMSPLEX=plexname execution parameter
  - DSPSCIX0 exit
- All DBRC types supported
  - Online DBRC, DBRC batch utility (DFSURX00), Batch w/DBRC, IMS DB utility w/DBRC
- IMSplex name stored in RECON header
  - All DBRCs using same RECONs register using same IMSplex name

ARLN ...

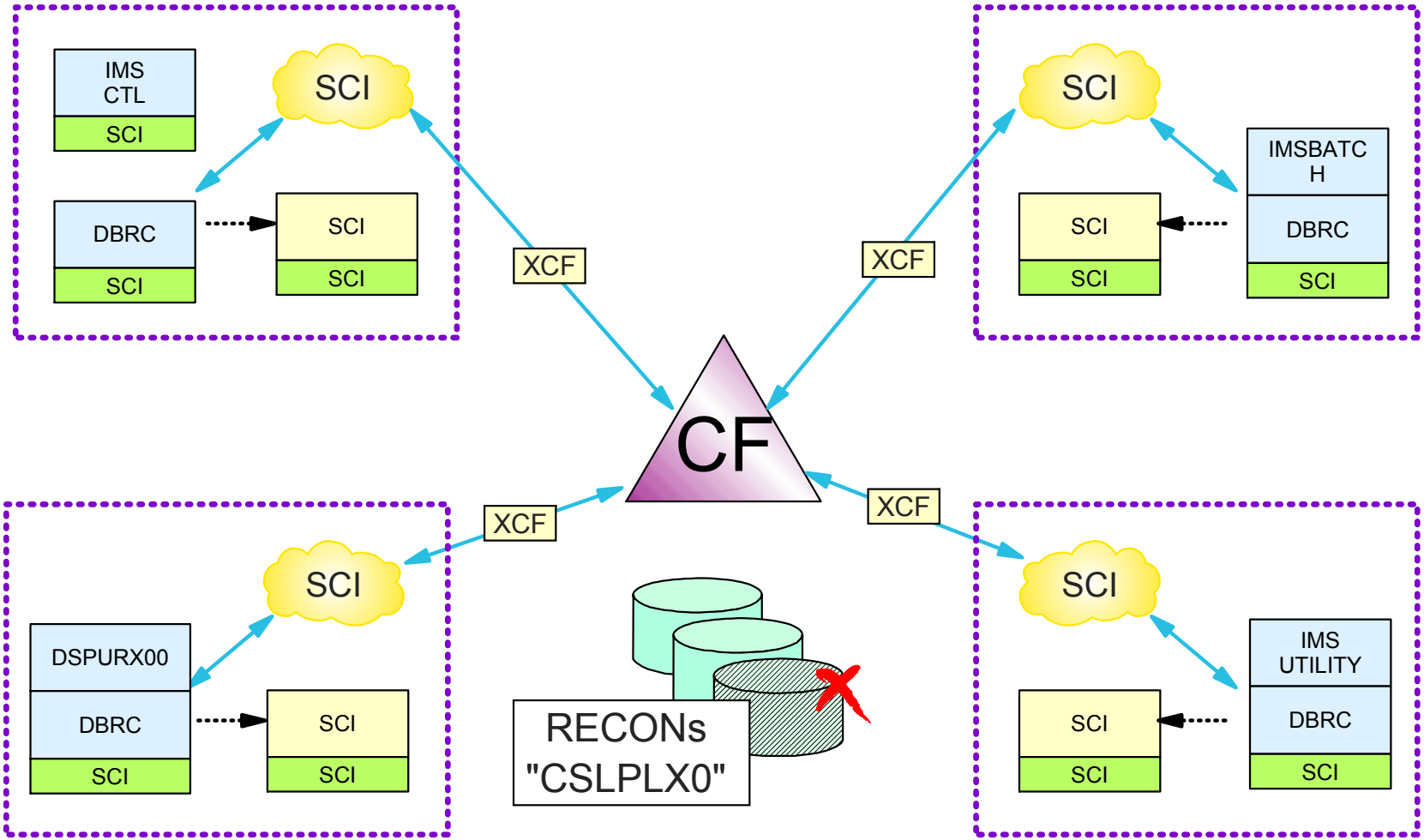
The Structured Call Interface (SCI) is required

- To join IMSplex
- To communicate between DBRCs
  - DBRC initiating reconfiguration notifies other DBRC members of IMSplex (using SCI)
  - Other DBRCs invoke reconfiguration process immediately
    - Eliminates wait for next access to RECONs

ARLN ...

DBRC with SCI

- Only DBRC needs to register with SCI



IMS V8 Highlights

CSL Components

- Structured Call Interface
- Operations Manager
- Resource Manager
- Resource Structure

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CSL Components (OM)

Operations Manager (OM)

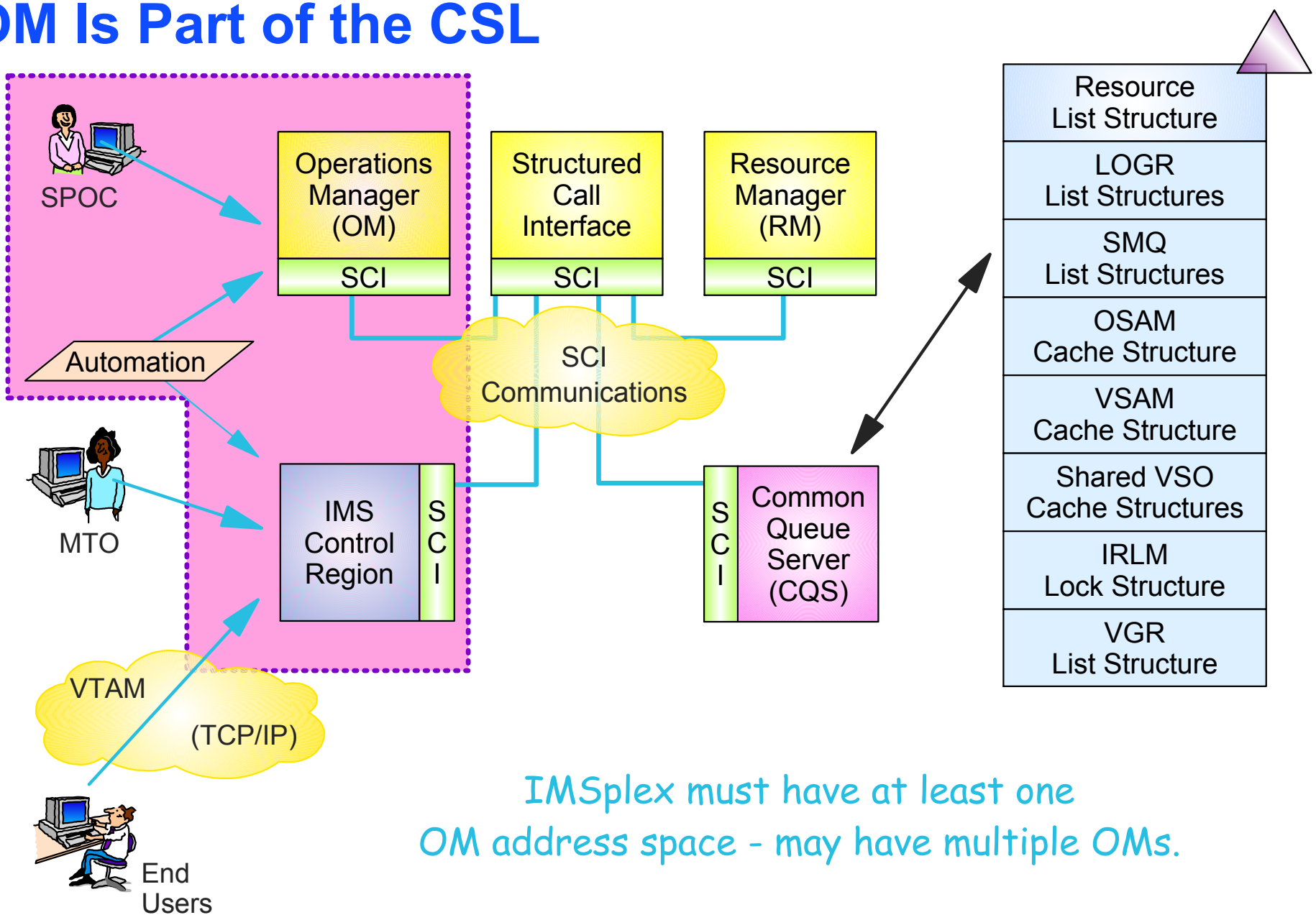
- Provides an API supporting *common point of command entry*
  - Focal point for operations management and automation
  - Command responses from multiple IMSs are consolidated
- Provides the following services to members and clients of an IMSplex
  - *Provide an API* for IMS commands submitted from outside IMS
    - Classic IMS commands (/cmd ...)
    - *New IMSplex commands (QRY, INIT, TERM, DEL, UPD)*
  - *Command registration* to support any command processing client
    - Clients tell OM which commands it can process
  - *Command security*
    - Perform authorization within OM - before sending to IMS
    - RACF or user-written command security exit
  - *Route commands* to IMSplex members registered for the command
  - *Consolidate command responses* from individual IMSplex members into a single response to present to the command originator

Operations Manager - API

OM provides an API for

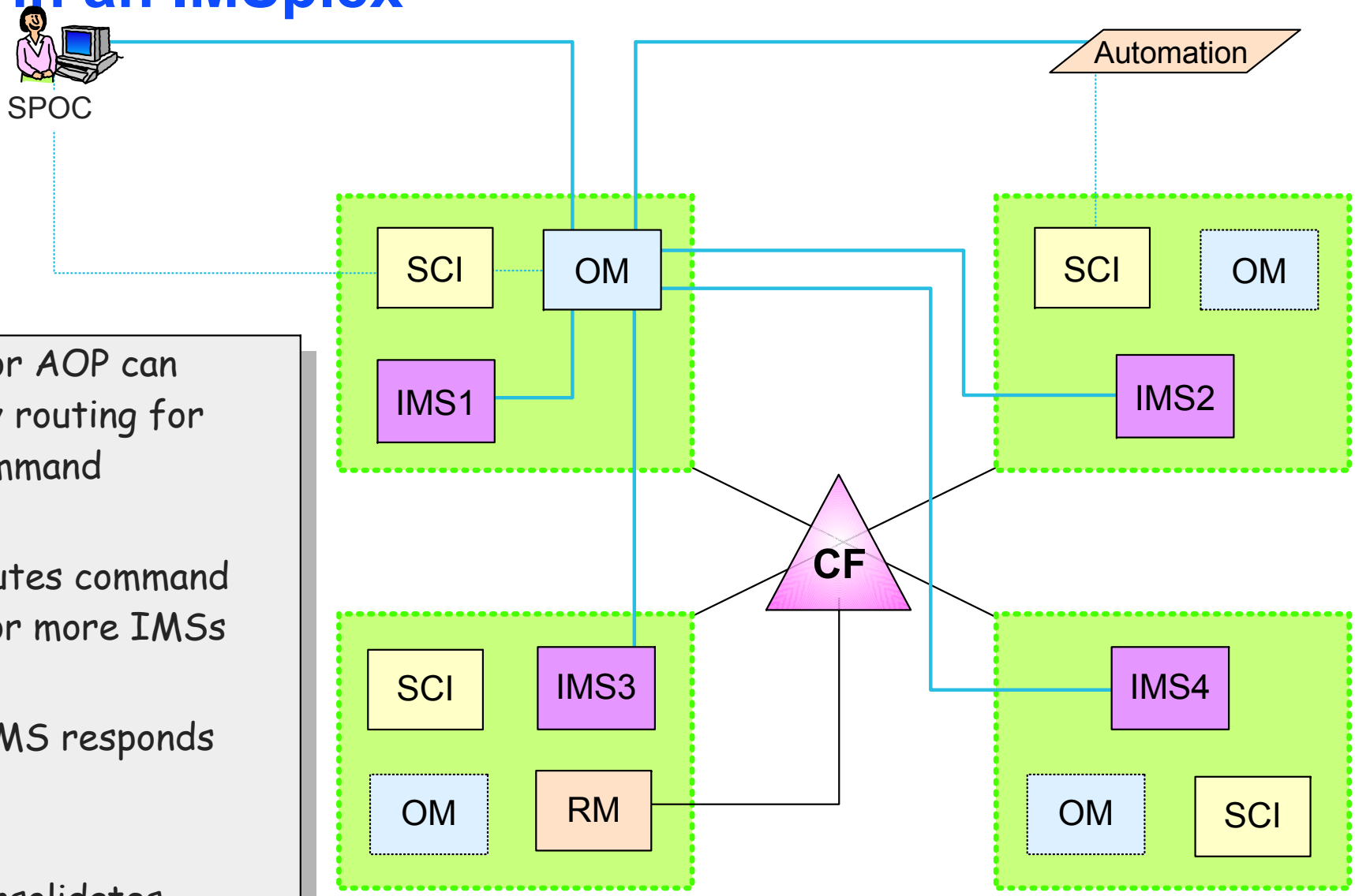
- Command processing (CP) clients
  - Clients which process commands entered from other address spaces
  - registers it's commands
  - IMS is a command processing client
- Automated operations (AO) clients
  - Clients through which commands are entered to OM and then to the command processing client
    - SPOC
    - DB2 Control Center
    - an Automation program such as a NetView EXEC
- All OM services are invoked by CSLOMxxx macros
  - Macro coding and use is described in *CSL Guide and Reference*

OM Is Part of the CSL



IMSplex must have at least one OM address space - may have multiple OMs.

OM in an IMSplex



SPOC or AOP can specify routing for any command

OM routes command to one or more IMSs

Each IMS responds to OM

OM consolidates responses for SPOC

Additional OM address spaces are optional.

OM - Command Support

Commands

- New IMSPlex commands
- Classic IMS commands
- Command entry and response
- Command Security

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New IMSPlex Commands

- **INIT (INITiate process)**
  - INIT OLC - starts a global online change (G-OLC) process
- **TERM (TERMinate process)**
  - TERM OLC - stops a global online change that is in progress
- **UPD (UPDate resource)**
  - UPD LE - updates dynamic LE runtime options
  - UPD TRAN - updates selected TRAN attributes
- **DEL (DELete resource)**
  - DEL LE - deletes dynamic runtime LE options

New IMSPlex Commands ...

QRY (QueRY resource)

- QRY IMSPLEX - returns information about one or more members of the IMSplex
- QRY MEMBER - returns status and attributes of the IMS members in the IMSplex
- QRY LE - returns runtime LE options
- QRY OLC - returns OLC library and resource information
- QRY TRAN - returns TRAN info similar to /DIS TRAN
- QRY STRUCTURE - returns structure information of the RM resource structure

UPD / QRY TRAN Example

```
UPD  TRAN  NAME(PART)  SCOPE(ALL)  STOP(Q,SCHD)
       START(TRACE)  SET(CLASS(4))
```

```
TRANCODE   MBRNAME CC
PART       IMS1       0
PART       IMS2       0
PART       IMS3       0
```

Actual response is in XML format. Formatting for display is the responsibility of the command originator.

```
QRY  TRAN  NAME(PART)  SHOW(CLASS,STATUS)
```

```
TRANCODE   MBRNAME CC    CLS   STATUS
PART       IMS1       0     4     STOQ,STOSCHD,TRA
PART       IMS2       ...
```

Command Entry and Response

For commands entered through OM API

- AO client specifies
  - Command text
  - Routing information
    - Any or all IMSs
  - Wait time
    - How long should OM wait for IMS to respond?
- Target IMSs (one is selected as *master* by OM)
  - Execute command locally
  - Master IMS processes commands with global scope
  - Respond to OM in *XML format*
- OM will consolidate responses from all target IMSs
  - Sends consolidated response to AO client
  - Negative reply if any IMS does not respond within WAIT interval
- AO client
  - Formats XML response for viewing -or-
  - Sends XML response to network client

OM Command Security

- **Depends on CMDSEC value in OM initialization Proclib member (DFSOIxxx) for Type 1 and Type 2 commands**
  - CMDSEC = R | E | A | N
    - QRY requires READ access
    - UPD, INIT, TRM, and DEL require UPDATE access
- **In (new) IMS Proclib member DFSCGxxx**
  - Should OM entered Type 1 commands be authorized by IMS?
    - CMDSEC=R|E|A|**N**

Exploiting the OM API

TSO SPOC

- Provided with IMS V8

REXX EXEC

- Sample exec using OM API

IMS Control Center

- Part of DB2 UDB Administrative Client

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IMS V8 Highlights

CSL Components

- Structured Call Interface
- Operations Manager
- Resource Manager
- Resource Structure

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CSL Components (RM)

Resource Manager (RM)

- *Provides infrastructure* for managing global resources and IMSplex-wide processes

- *Maintains global resource information* for clients using a Resource Structure in the Coupling Facility
  - IMSplex global and local member information
  - Resource names and types
  - Terminal and user status
  - Global process status

- Resource structure is optional
  - If resource structure not defined
    - Only one RM per IMSplex
    - Sysplex terminal management not enabled

CSL Components (RM) ...

RM clients

- IMS control region
  - To provide *sysplex terminal management* functions
    - Resource type consistency across IMSplex
    - Resource name uniqueness across IMSplex
    - Restore terminal and user status when switching IMSs (e.g. restore conversation on new IMS after an IMS failure)
  - To *coordinate global online change*
    - With OM and IMS, coordinates OLC across IMSplex
  - To expand functionality of IMS exits
    - *Global callable services* of IMSplex-wide status
- Vendors?

CLS Highlights

Sysplex Terminal Management

- Resource type consistency
- Resouce name uniqueness
- Resource status recovery

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Sysplex Terminal Management ...

Sysplex terminal management objectives

- Enforce global *resource type consistency*
  - Prevent naming inconsistencies between IMSs
- Enforce global *resource name uniqueness*
  - Prevent multiple logon / signon within the IMSplex
- Enable global *terminal and user resource status recovery*
  - Resume significant status on another IMS after failure
    - Conversation, fast path response, STSN sequence numbers
    - Command status (e.g., stopped, assigned, ...)
  - Reduce need for IMS-managed VGR affinity
- Enable *global callable services*
  - User exits can access terminal and user information across IMSplex

Sysplex Terminal Management

- **Enables improved systems management in an IMSplex by sharing resource status information**
  - Applies to ***VTAM*** terminal and user resources
    - BTAM and OTMA resources not supported
- **Global resource sharing requires the resource manager, a resource structure, and shared queues**
  - Resource names and status saved in structure
  - Shared by all IMSs in IMSplex
- **Without a resource structure, user can opt for ...**
  - Local status recovery
  - No status recovery

Resource Type Consistency

- **Prevents the same *resource name* from being used for different message destination *resource types***
  - For example, don't allow IMS1 to define transaction PRSNL and IMS2 to define Lterm PRSNL
- **Applies to *message destinations***
  - *Transaction names - static, dynamic, and CPI-C*
  - *Lterm names*
  - *Msnames*
  - *APPC descriptor (lterm) names*
- **Does not apply to**
  - Nodes, users, userids
  - These are not message queue "destinations"
    - For example, OK to have node name and lterm name the same

These are all Shared Queue destination names. !

Resource Name Uniqueness

- **STM prevents some resource types from being active in more than one IMS**
  - These resources are *owned* by one IMS while active
    - Ownership maintained in structure
- **Applies to**
  - *Single session VTAM Nodes, (ETO) Users, Lterms*
  - *Userids*
    - Only if single signon requested by first IMS to join IMSplex
- **Does not apply to**
  - Transactions
  - Parallel session VTAM nodes
  - Msnames
  - APPC descriptor names
  - Userids if SGN=M

Resource Status Recovery

With RM and Resource structure STM is activated

- When session terminates, IMS will not delete entry if it has ...
  - End-user significant status
    - Conversation, fast path response mode, STSN
  - Command significant status
    - STOP, EXC, TEST MFS, TRACE
    - ASSIGN or CHANGE USER with SAVE keyword
- When session is reestablished, with any IMS in such a Plex
  - status will be reestablished

Resource Status Recovery

New IMS parameters in DFSDCxxx proclib member

- STM, SRM and RCVYxxx to overwrite system defaults for a *specific IMS*
  - STM=YES I NO
  - SRMDEF=GLOBAL I LOCAL I NONE
  - RCVYCONV=YES I NO
  - RCVSTSTN=YES I NO
  - RCVFP=YES I NO

- These defaults can again be overwritten *on a session basis* by
  - Logon Exit (DFSLGNX0) - all but dynamic STSN
  - Signon Exit (DFSSGNX0) dynamic non STSN

CSL Highlights

Global Online Change

- Enabling G-OLC
- Executing G-OLC
- G-OLC commands

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Enabling Global Online Change

Global OLC enabled by DFSCGxxx Proclib member

- Requires CSL environment
  - Resource structure not required, but useful

- DFSCGxxx
  - OLC=GLOBAL | LOCAL
    - Not all IMSs in IMSplex have to participate in Global OLC
  - OLCSTAT=OLCSTAT data set name
    - OLCSTAT data set replaces MODSTAT
    - All IMSs with OLC=GLOBAL must use same OLCSTAT data set
    - IMSs with OLC=LOCAL continue to use MODSTAT
  - NORSCCC=(MODBLKS,ACBLIB,FORMAT)
    - Turns OFF online change data set name consistency checking for these data sets
    - Unless turned off, all IMSs must use same OLC data sets

Enabling Global Online Change ...

OLCSTAT data set

- Must be initialized with Global OLC Utility (DFSUOLC0)
  - Sets initial OLC library suffixes (A or B)
- Header record
  - Current active library suffixes (A or B)
  - Modify ID of last successful G-OLC
  - Type of last successful G-OLC
  - G-OLC in progress flag
- IMS record
  - One for each IMS with OLC=GLOBAL
  - Created as each IMS cold starts
  - Deleted if IMS shutdown with /CHE FREEZE LEAVEPLEX
  - Deleted if IMS "misses" a global online change
    - May require cold start

Executing Global Online Change

INITIATE OLC PHASE(PREPARE) TYPE(ALL|...)

- Command entered only through OM interface
- All IMSs execute PREPARE phase
  - Stop queuing; drain queues

INITIATE OLC PHASE(COMMIT)

- All IMSs execute commit phase 1
  - Stop scheduling
- All IMSs execute commit phase 2
  - Switch libraries and resume scheduling
- All IMSs execute commit phase 3
  - Cleanup

Resource Manager coordinates all Prepare and Commit processing

TERMINATE OLC

- must be entered if prepare or commit phase 1 fails

Global Online Change Status

QUERY MEMBER TYPE(IMS) SHOW(ALL)

- Displays current OLC status of each IMS

```
Response for: QUERY MEMBER TYPE(IMS) SHOW(ALL)

MbrName     CC TYPE   STATUS              LclAttr LclStat
IMS1         0 IMS    OLCPREPC,OLCMSTR
IMS1         0 IMS                        GBLOLC  OLCCMT1C
IMS2         0 IMS                        GBLOLC  OLCCMT1C
IMS3         0 IMS                        GBLOLC  OLCPREPC
IMS4         0 IMS                        LCLOLC
```

/DIS MODIFY shows local status

- OLC libraries
- Work in progress
- Resources to be added, changed, and deleted

IMS V8 Part III Review

CSL

- ★ Summary
- ★ Migration

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CSL Architecture