

E55

IMS Version 8 Sysplex Terminal Management

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Sept. 30 - Oct. 3, 2002

Abstract

This presentation looks at *Sysplex Terminal Management* IMS's exploitation of the Resource Management infrastructure provided by Version 8 when using the Common Service Layer (CSL) with a Resource Manager and a Resource Structure.

Resource Management

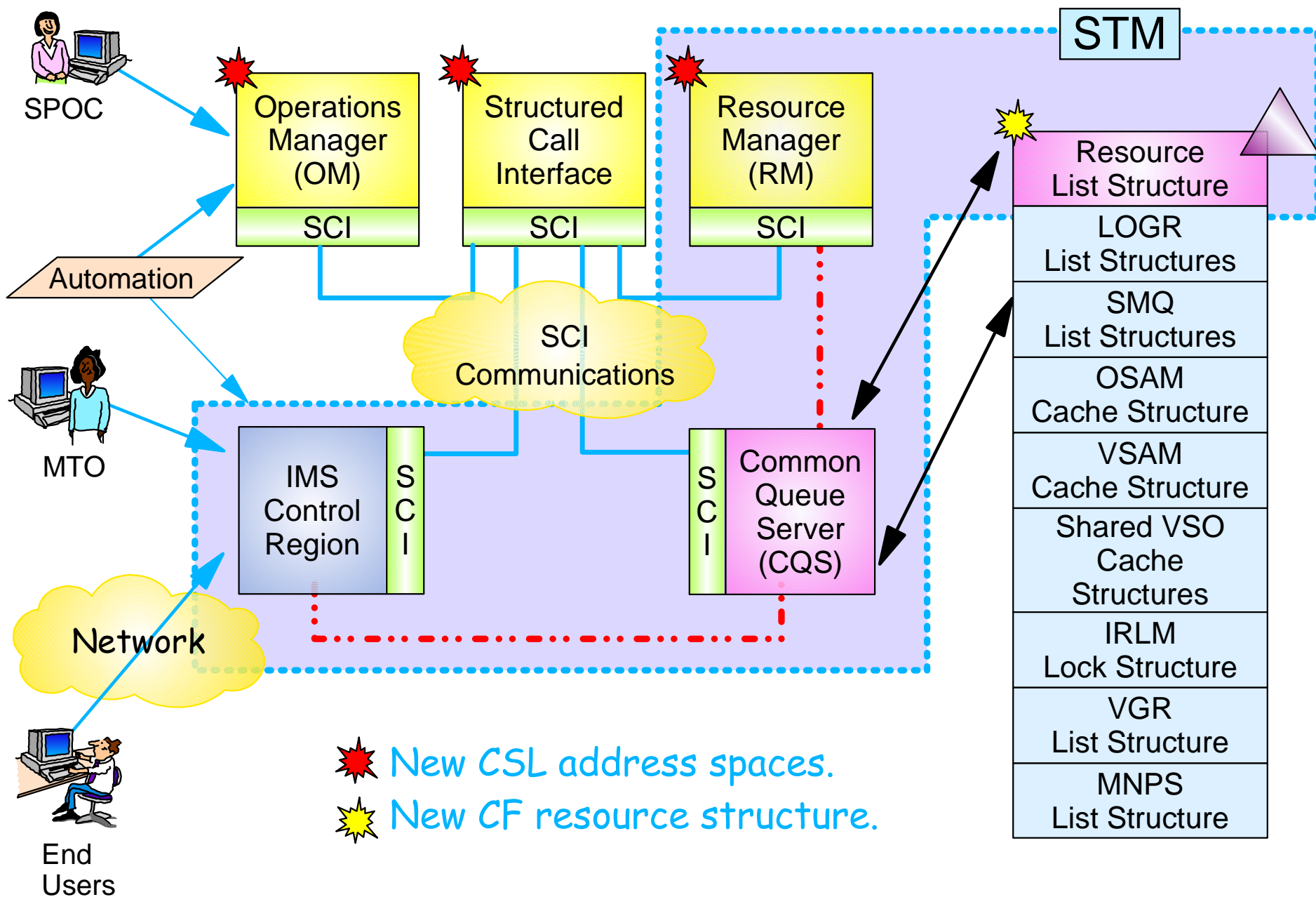
Resources

**Resource Management
Infrastructure**

**Sysplex Terminal
Managment (STM)**



RM Infrastructure

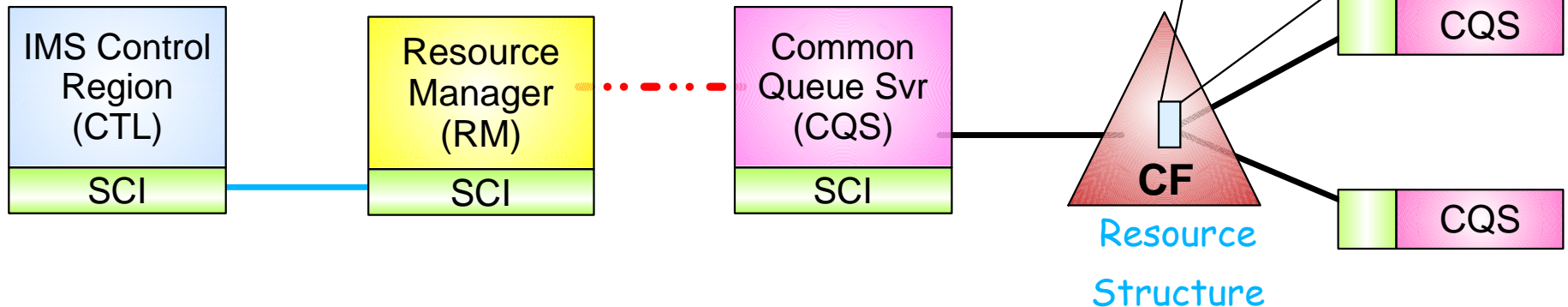


IMS, RM, CQS, and the Structure

- ⚡ IMS uses RM to manage resource information
- ⚡ RM uses CQS to manage resource structure
- ⚡ The resource structure contains information about IMS and IMSplex resources
- ⚡ IMS and RM communicate using SCI services
- ⚡ RM and CQS communicate using CQS services
- ⚡ CQS uses XES services to access structure



Resource
LOGR
SMQ
OSAM
VSAM
SVSO
IRLM
VGR



CF structure limit raised from 255 to 512 in OS/390 2.9

Resource Structure

Resource structure contains global resource information for uniquely named resources

- ▶ Transactions
- ▶ Nodes, lterms, msnames, APPC descriptors, users, userids
- ▶ Global processes
- ▶ IMSplex local and global information

Resource structure is optional

- ▶ If no resource structure defined
 - Terminal/user resource status saved locally; cannot be shared
 - *Sysplex terminal management disabled*
- ▶ Resource structure not required for global online change
 - Structure will be used if available

One resource structure may be defined per IMSplex

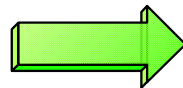
- ▶ Add to CFRM policy; activate policy
- ▶ Tell CQS and RM the name of the structure

RM Structure List Entry

Resource structure list entries identify the resource and provide resource status information about the resource.

List Headers

Resource List Structure
Transactions
Lterms
Msnames
Users
Nodes
Userids
Processes
.....



List Entry

List Entry Controls LISTNUM ENTRYID(LEID) ENTRYKEY VERSION	4 12 16 8
Adjunct Area Owner Recoverable Status 1 Reserved	8 24 32
Data Entry 0 or more data elements Recoverable Status 2	512 <61k

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

Sysplex terminal management requires the resource manager, a resource structure, and shared queues

- ▶ Resource names and status saved in resource structure
- ▶ Shared by all IMSs in IMSplex

Without a resource structure, user can opt for ...

- ▶ Local status recovery
 - Same as pre-V8
- ▶ No status recovery
 - New function in V8

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 *terminal and user resource status recovery* across IMSplex
 - Resume significant status on another IMS after failure
 - Reduce need for IMS-managed VGR affinity
- ▶ Enable *global callable services*
 - User exits can access terminal and user information across IMSplex

STM Terms and Concepts

Resource

- ▶ VTAM terminal and user
 - Static/dynamic
- ▶ Transaction
 - Static/dynamic/CPI-C

Resource type consistency

- ▶ For message destinations

Resource name uniqueness

- ▶ Single active resource
- ▶ Single signon enforcable

Resource status

- ▶ Non-recoverable
- ▶ Recoverable
- ▶ Significant

Significant status

- ▶ Command
- ▶ End-user

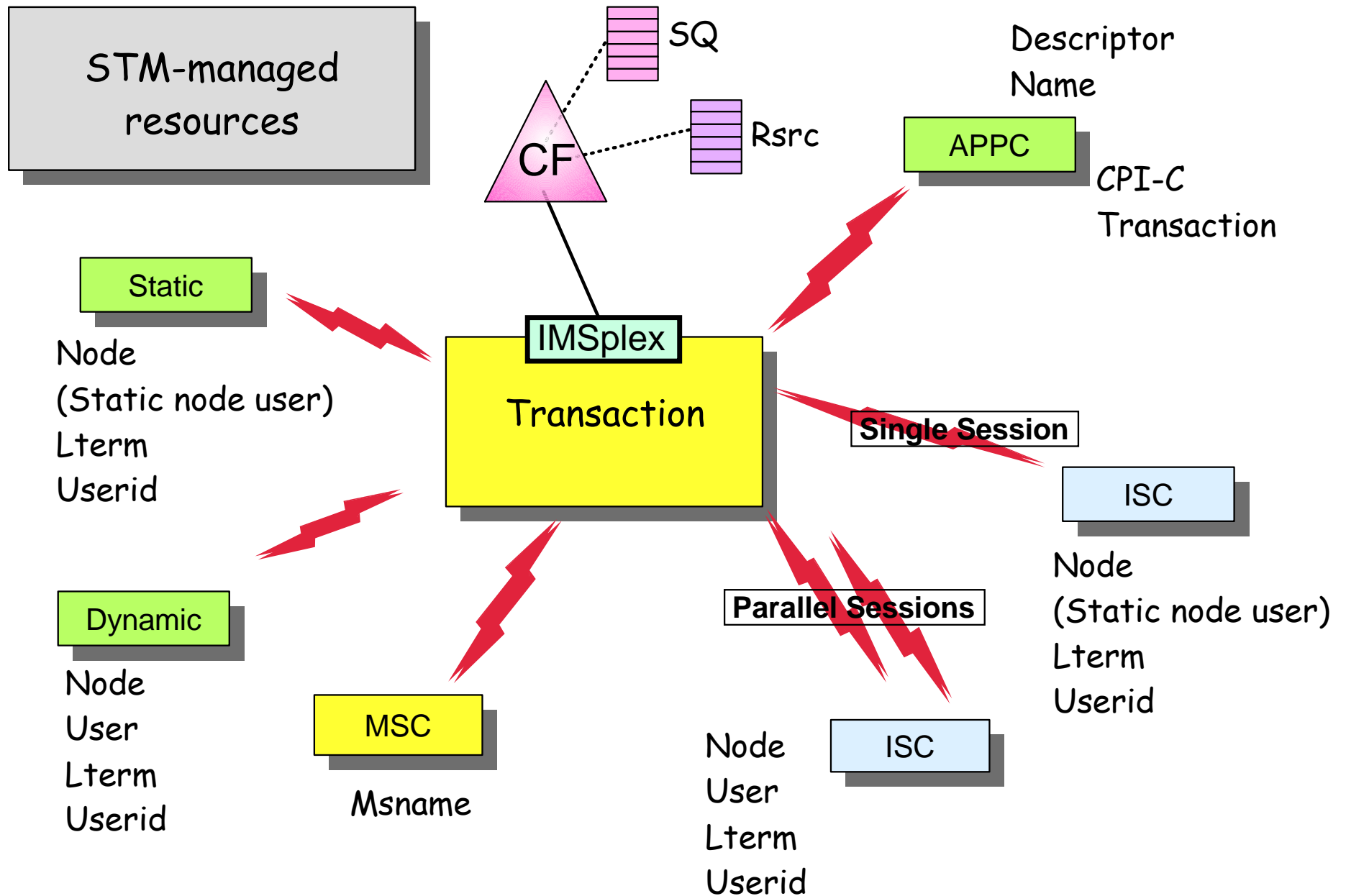
Status recovery mode

- ▶ Global
 - Recover anywhere
- ▶ Local
 - Recover on local only
- ▶ None
 - Not recoverable

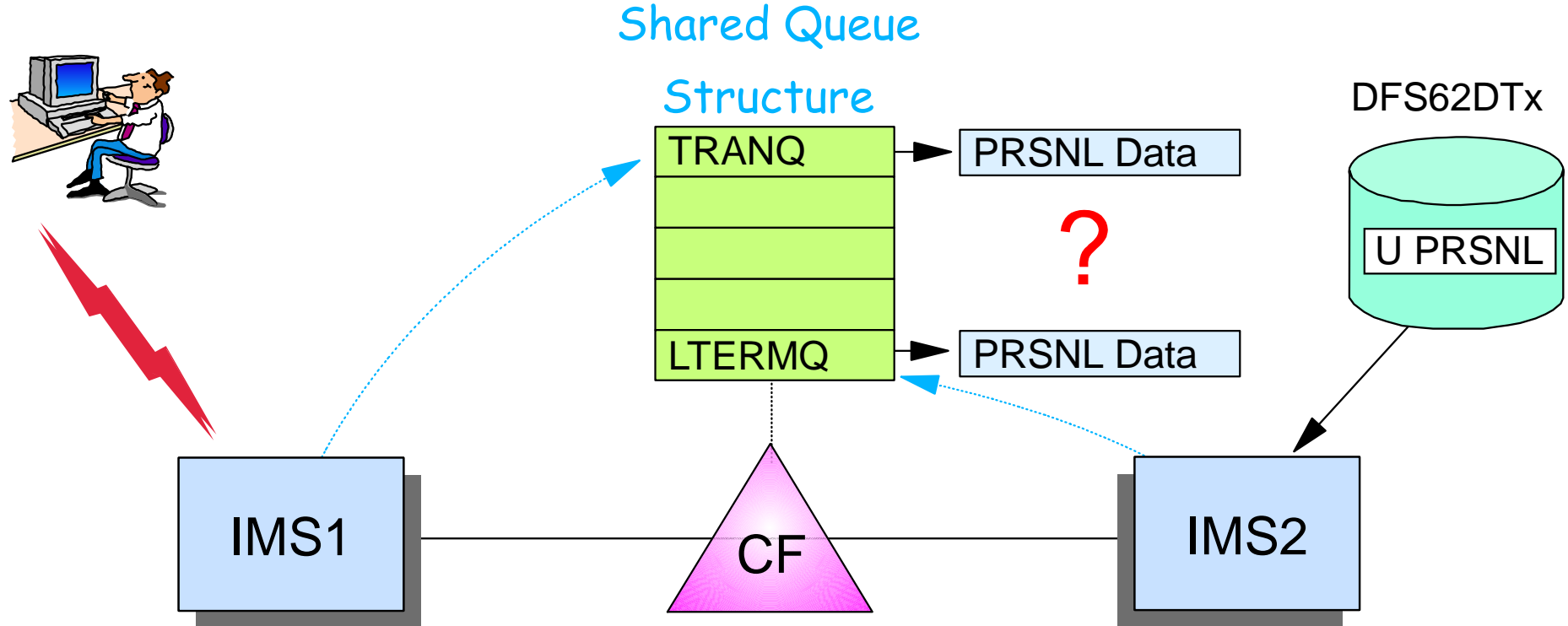
Ownership and Affinities

- ▶ Resource ownership
- ▶ RM affinity
- ▶ VGR affinity

STM Resources



Resource Type Consistency



APPLCTN ...
TRANSACTION PRSNL

IMS1 will queue message
with destination PRSNL to
Transaction Queue.

CHNG PRSNL

IMS2 will queue message
with destination PRSNL to
Lterm Queue.

Resource Type Consistency ...

STM 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 APPC descriptor PRSNL

Applies to message destinations

- ▶ Transaction names - static and CPI-C
- ▶ Lterm names - static and dynamic
- ▶ Msnames
- ▶ APPC descriptor (lterm) names

These are all Shared Queue destination names. !

Does not apply to

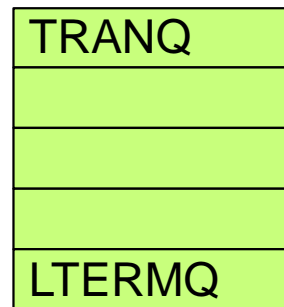
- ▶ Nodes, users, userids
- ▶ These are not message queue "destinations"
 - For example, OK to have node name and lterm name the same

Resource Type Consistency ...



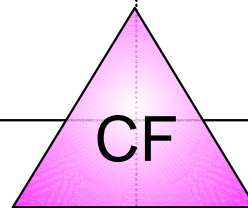
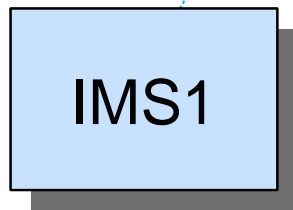
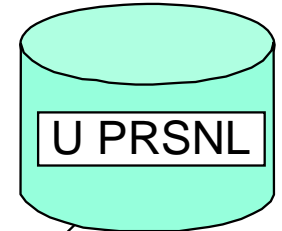
Shared Queue

Structure



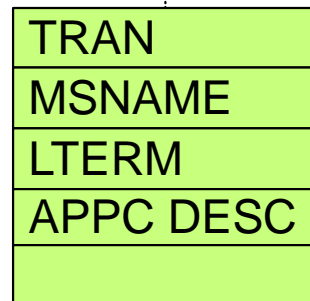
PRSNL Data

DFS62DTx



APPLCTN ...
TRANSACTION PRSNL

IMS1 will create PRSNL Transaction entry in Resource Structure during IMS initialization.



PRSNL

~~PRSNL~~

Resource Structure

IMS2 will prevent creation of APPC descriptor for PRSNL since it is already defined as a transaction on the resource structure.

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

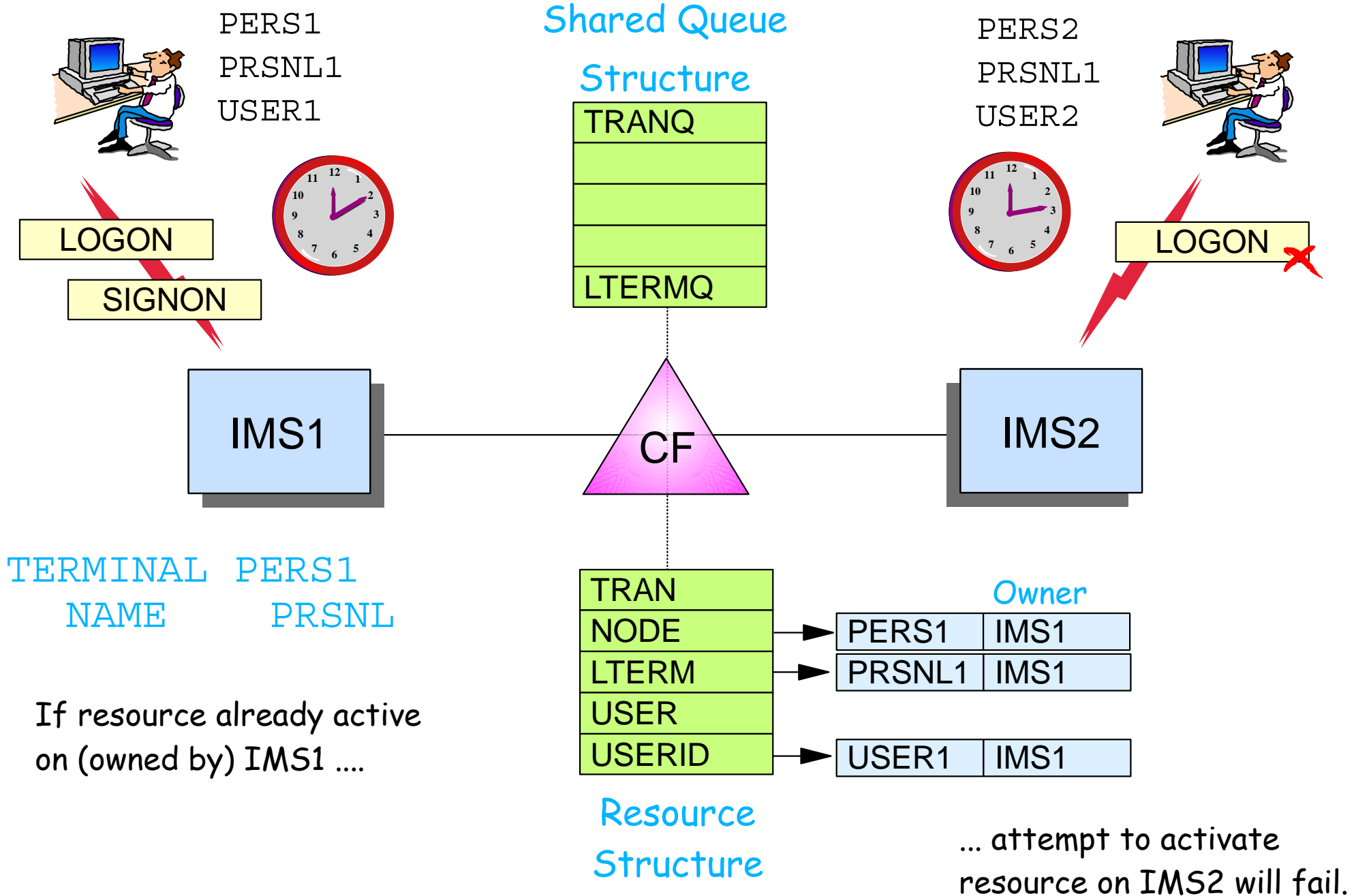
Applies to

- ▶ Single session VTAM Nodes, static and ETO Users, Lterms
- ▶ Userids
 - Only if single signon requested (SGN \neq M)

Does not apply to

- ▶ Transactions
- ▶ Parallel session VTAM nodes
- ▶ Msnames
- ▶ APPC descriptor names
- ▶ Userids if SGN=M

Resource Name Uniqueness ...



Resource Status

Non-recoverable status

- ▶ Status not recovered across logoff+logon, or IMS restart
- ▶ Exists in local control blocks only while resource is active
 - Status deleted/refreshed when resource becomes inactive
- ▶ Examples
 - Test mode, preset destination mode
 - Full function response mode

Recoverable status

- ▶ Status may be recovered across signoff, logoff, or restart
- ▶ Status saved in resource structure and/or local control blocks
- ▶ Recovered if resource not deleted
 - Deleted if no significant status
- ▶ Examples
 - Stopped, exclusive, MFS test, ...
 - Conversational, fast path, STSN

Significant Status

Significant status

- ▶ Recoverable terminal or user status that prevents deletion of resource at signoff, logoff, or IMS restart
- ▶ Command significant status
 - Terminal or user status normally set via command
 - Always maintained globally if RM structure is used
- ▶ End-user significant status
 - Work-related terminal or user status
 - Maintained locally, globally, or not at all depending on Status Recovery Mode

Non-significant status

- ▶ Any other terminal or user status
- ▶ If recoverable
 - Maintained same place as end-user significant status
- ▶ May or may not be recovered
 - Does not prevent deletion but may be recovered if other significant status prevents deletion

Significant Status ...

Command significant status

- ▶ VTAM terminal or user *status normally set by command*
 - /TEST MFS (node, user)
 - /STOP (node, user, lterm)
 - /EXCLUSIVE (node, user)
 - /TRACE (node)
 - /CHANGE USER AUTOLOGON SAVE (user)
 - /ASSIGN LTERM|USER xxx TO yyy SAVE (lterm)

- ▶ Command significant status *always kept globally if ...*
 - RM structure used

- ▶ Command significant status *also kept locally if ...*
 - Resource is active on local system, or
 - Resource is inactive but end-user status is kept locally, or
 - Trace status exists locally for a node

Significant Status ...

End-user (e-u) significant status (nodes and users)

- ▶ Work-related status
 - Conversation (active and held)
 - Fast path response mode
 - STSN sequence numbers (last input and output)
- ▶ May be kept globally or locally
 - Depends on Status Recovery Mode (SRM)

If a resource has significant status at session termination or ETO user signoff

- ▶ Resource will not be deleted
 - Unless SRM=NONE or RCVYxxxx=NO (status recovery not wanted)
- ▶ If resource not deleted
 - Recoverable status will be recovered at next logon, signon, or restart
 - Not all recoverable status is significant status

Status Recovery Mode

Status recovery mode (SRM) applies to e-u status

- ▶ Defines scope of end-user status recovery for terminal/user resource
 - Command significant status always globally recoverable when using RM structure; locally recoverable if not
- ▶ **GLOBAL**
 - Recoverable status kept in RM structure
 - Available from any IMS in IMSplex
 - Status restored at next logon/signon to any IMS
 - Copied to local control blocks when resource becomes active
- ▶ **LOCAL**
 - Recoverable status kept in local control blocks and log records
 - System default if not using RM, RM structure, and SQ
 - Status restored at next logon/signon only if logging on to same IMS
- ▶ **NONE**
 - Recoverable status kept locally while resource active
 - Deleted at signoff, logoff, or IMS restart

Status Recovery Mode ...

System default can be overridden for each IMS

- ▶ Parameter in DFSDCxxx

SRMDEF=GLOBAL | LOCAL | NONE

- Global requires RM, RM structure, and shared queues
- Local (or none) requires neither

System default can be overridden for

each terminal or user

- ▶ For *all static and all STSN terminals*
 - SRM set at terminal *logon* based on SRM default
 - Can be overridden by DFSLGNX0 if no end-user status at logon
- ▶ For *dynamic non-STSN terminals*
 - SRM set at user *signon* based on SRM default
 - Can be overridden by user descriptor or DFSSGNX0 if no end-user status at signon

End-user Status Recoverability

When SRM is Global or Local

- ▶ Recoverability can be set for each type of end-user status
- ▶ Parameter in DFSDCxxx
 - Conversation
 - Applies to conversational status only - messages are still recoverable

RCVYCONV=YES | NO

- STSN
 - Applies to STSN sequence numbers only - messages are still recoverable

RCVYSTSN=YES | NO

- Fast Path
 - Applies to both Fast Path status and messages

RCVYFP=YES | NO

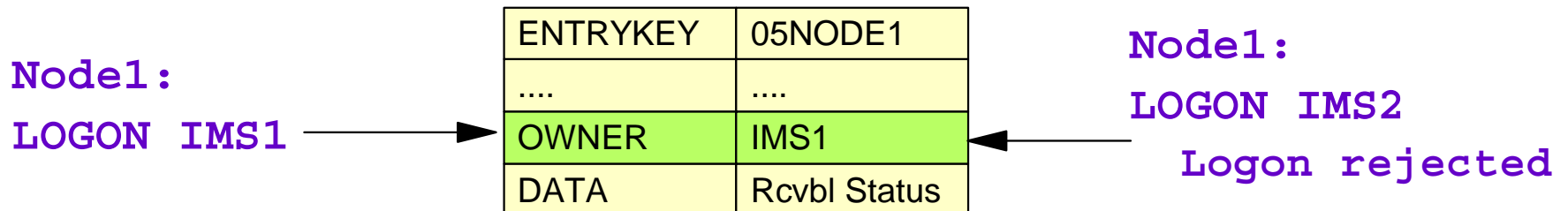
Ownership and RM Affinity

Applies to nodes, users, and userids

- ▶ When resource becomes active in any IMS
 - Resource entry created on RM structure
 - Userid created only if $SGN \neq M$
 - Resource is owned by that IMS
 - Resource entry in structure contains imsid (owner)
 - ISC parallel session nodes and users do not set ownership
 - Prevents owned resource from logging/signing on to IMS2 while still owned by IMS1

RM Affinity

- ▶ Another term for ownership (nodes and users)
 - Means terminal/user should return to same IMS to resume status



VTAM Generic Resources

IMS V8 (z/OS V1R2 and later)

- ▶ VTAM supports session-level affinity
 - IMS sets the affinity level (IMS or VTAM) during session initiation for every session, including ISC
 - VTAM now supports ISC affinity management
 - GRAFFIN= keyword is ignored
 - Still honored for OS/390
- ▶ VTAM-managed is set for ...
 - Static terminals with SRM=GLOBAL|NONE
 - Static and dynamic STSN terminals (ISC, SLUP, FINANCE) with SRM=GLOBAL|NONE
 - Dynamic non-STSN terminals with any SRM, including LOCAL
- ▶ IMS-managed is set for ...
 - Static terminals with SRM=LOCAL
 - STSN terminals with SRM=LOCAL

VTAM Generic Resource support for APPC is provided by APPC - not IMS.

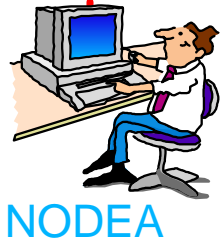
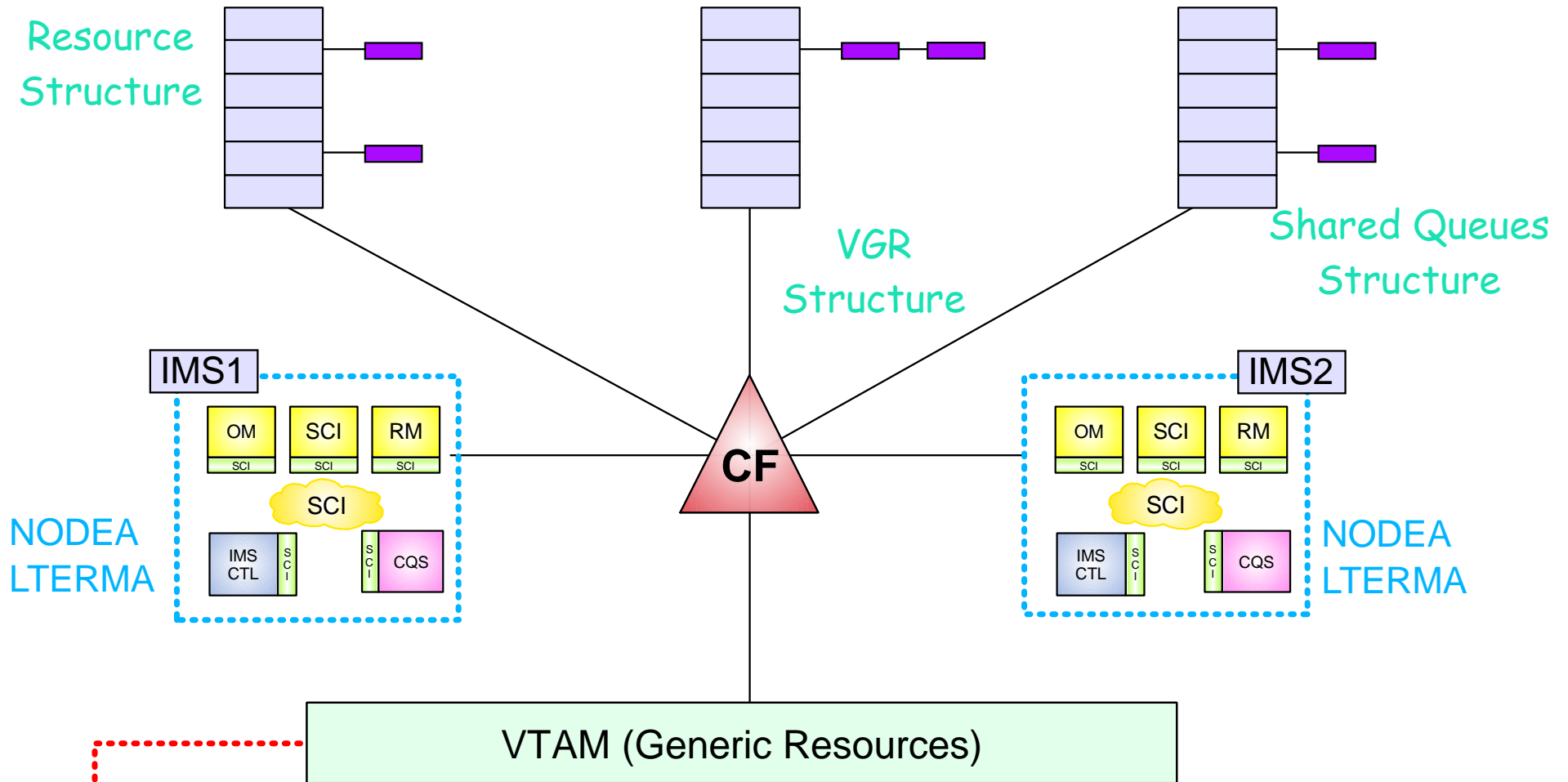
Examples of Status Recovery

Status Recovery Mode

- ★ GLOBAL
- ★ LOCAL
- ★ NONE

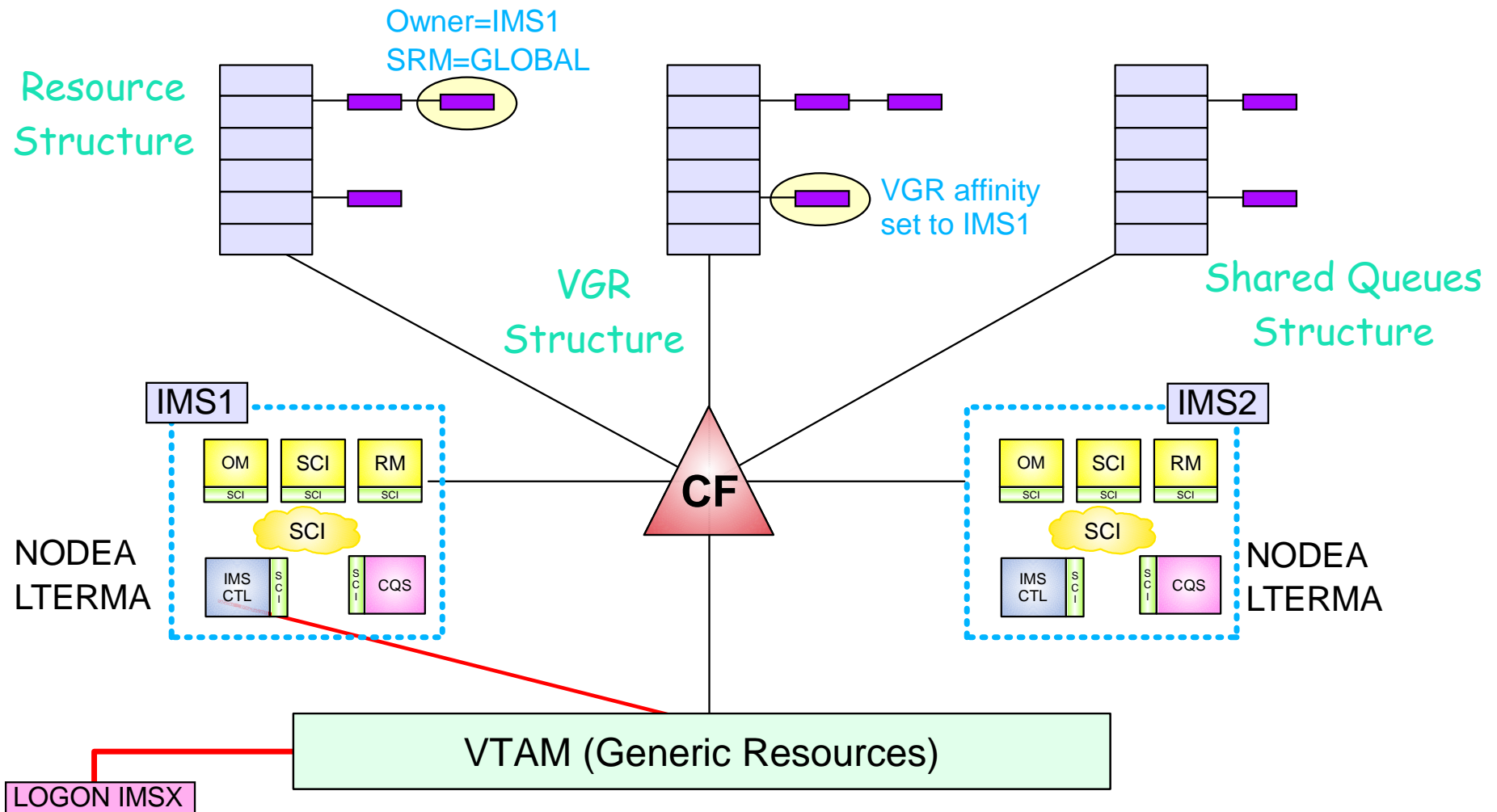


Status Recovery



- ★ Two IMSs in z/OS 1.2 IMSplex (IMS1 and IMS2)
- ★ Both have NodeA and LtermA defined
- ★ VTAM generic resources enabled (GRSNAME=IMSX)

Status Recovery - SRM=GLOBAL

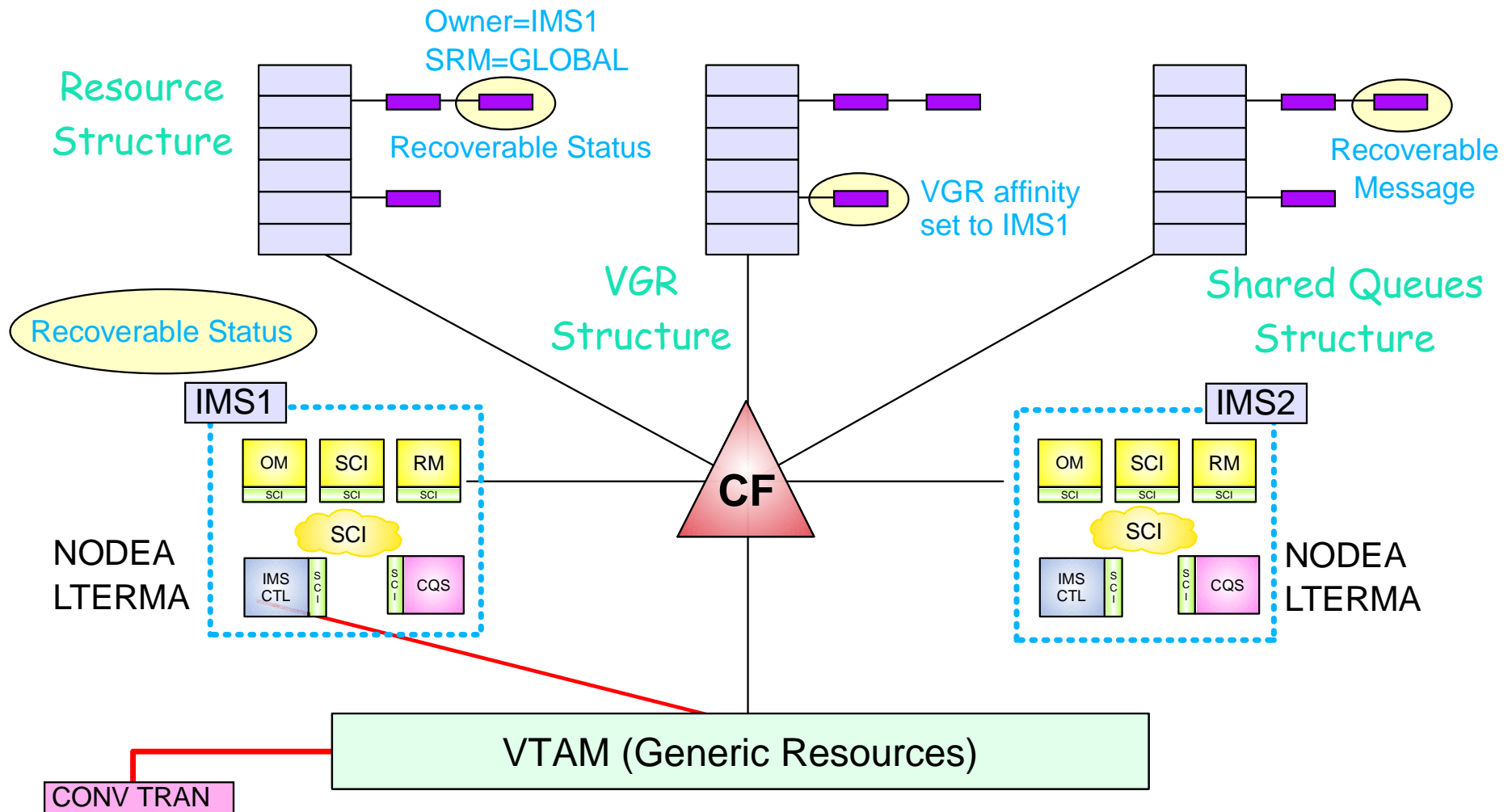


SRM=GLOBAL

- ★ End-user logs on using generic logon IMSX
- ★ VTAM routes logon to IMS1; sets VGR affinity to IMS1
- ★ IMS1 sets VGR affinity management to IMS
- ★ IMS1 sets SRM=GLOBAL; RCVYCONV=YES
- ★ Resource entries created: Owner=IMS1, SRM=GLOBAL



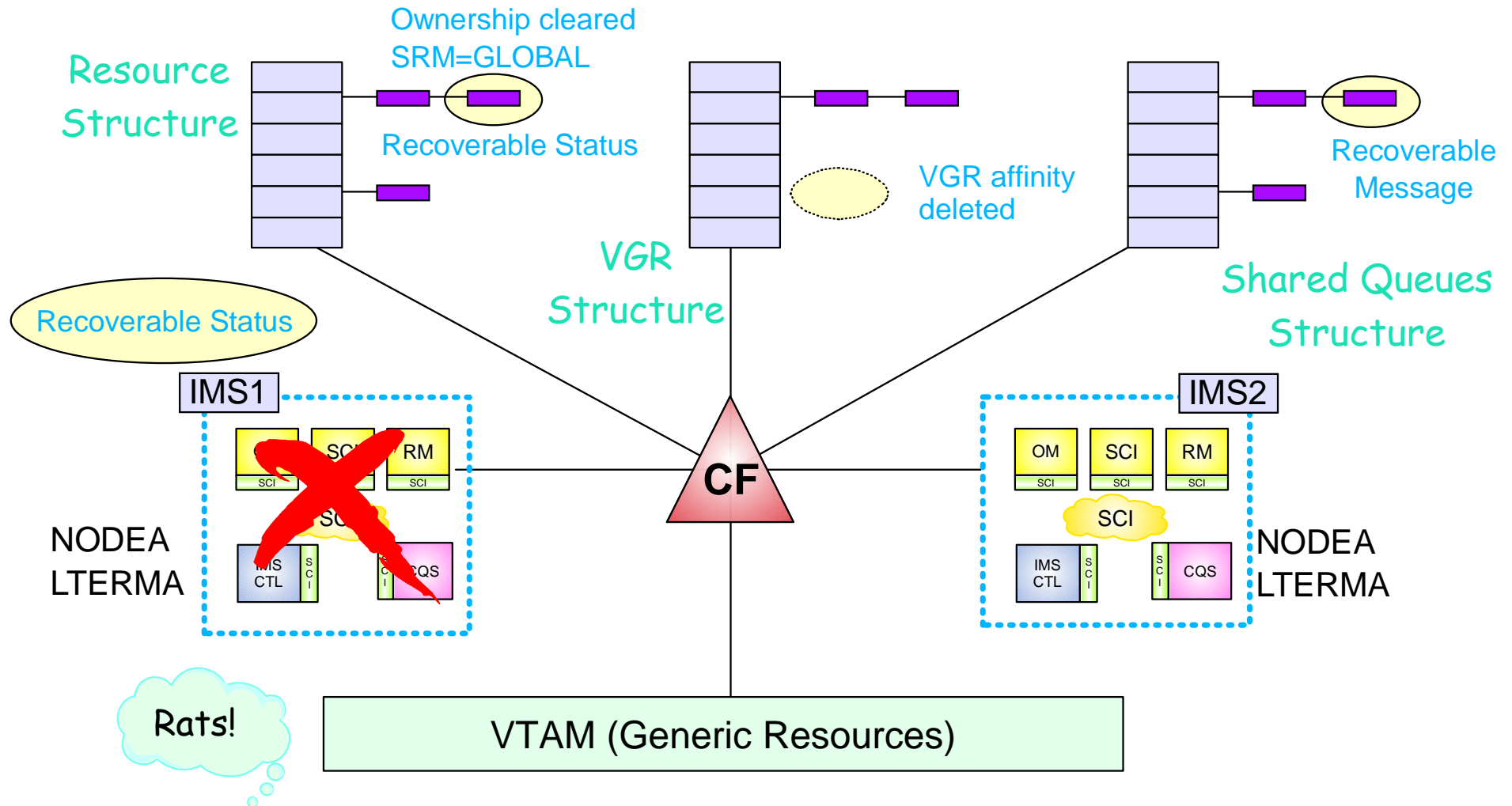
Status Recovery - SRM=GLOBAL ...



SRM=GLOBAL

- ★ User enters conversational transaction
- ★ IMS1 creates local CCB
- ★ IMS1 queues SPA+MSG on SQ
- ★ IMS1 updates user resource with Conversational status

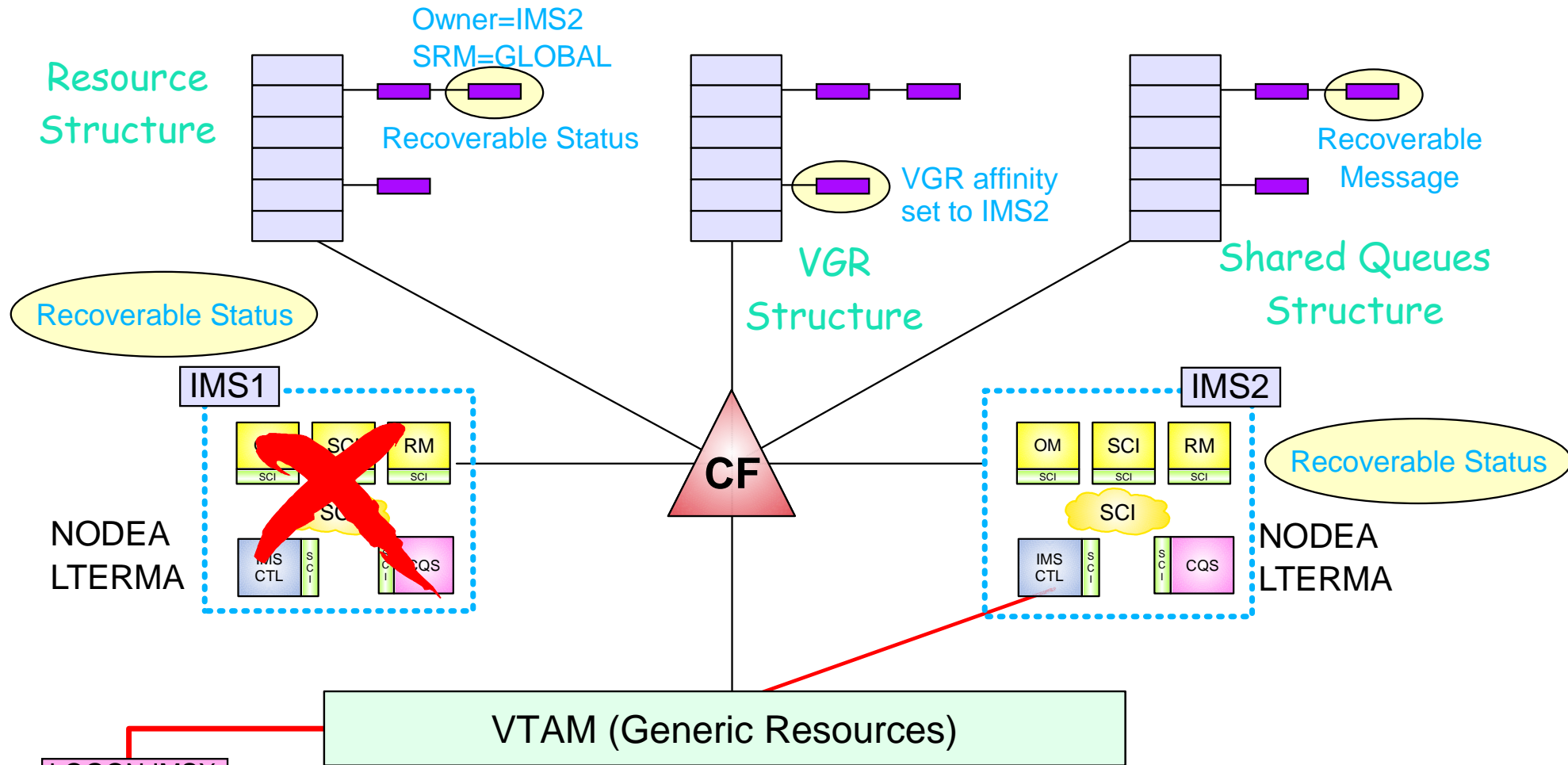
Status Recovery - SRM=GLOBAL ...



SRM=GLOBAL

- ★ IMS1 fails; IMS2 queries structure for IMS1 entries
- ★ IMS2 does not delete resource entry (in conversation)
- ★ IMS2 clears ownership (SRM=GLOBAL)
- ★ VTAM deletes VGR affinity
- ★ SPA+MSG still on SQ

Status Recovery - SRM=GLOBAL ...



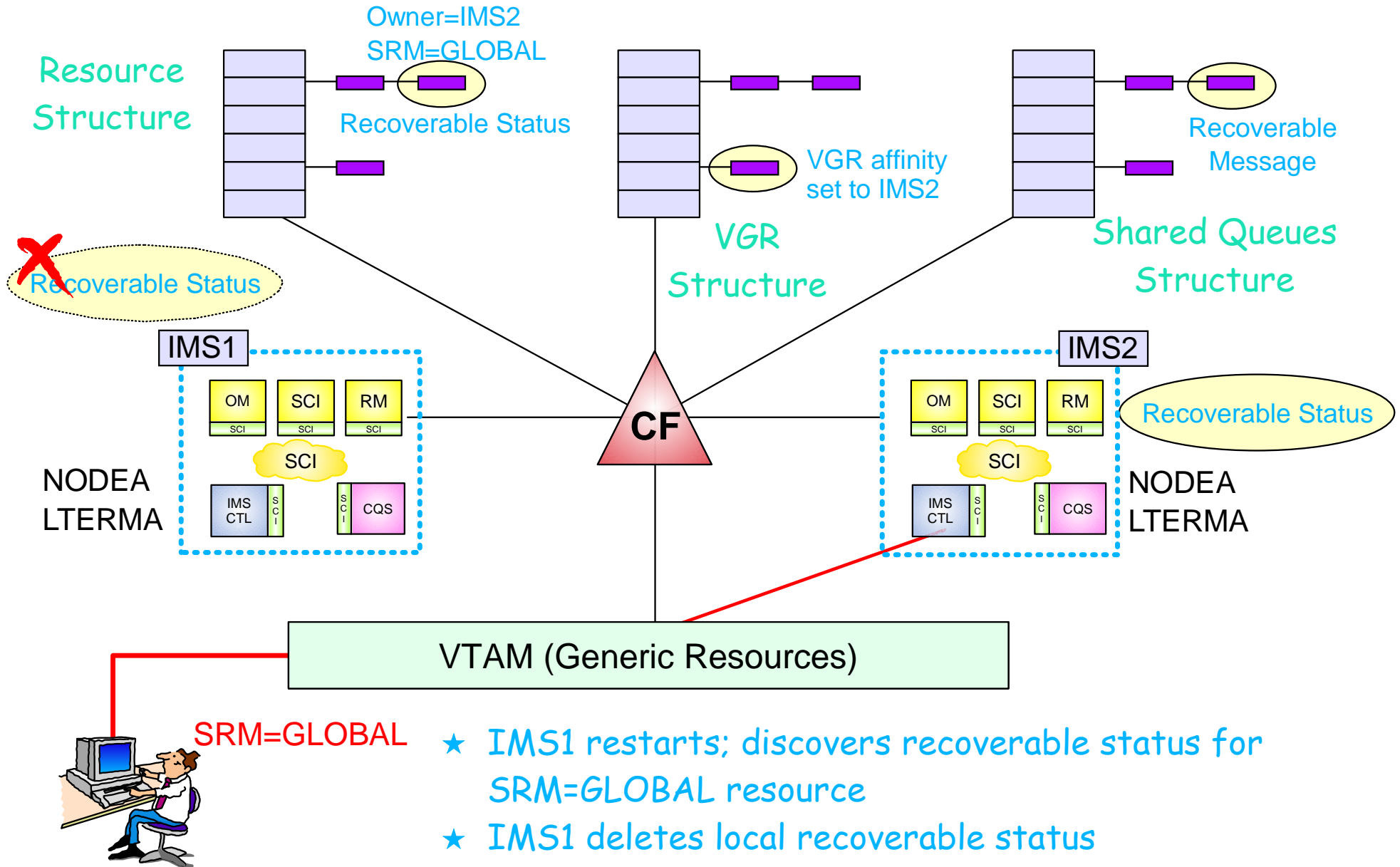
LOGON IMSX

SRM=GLOBAL

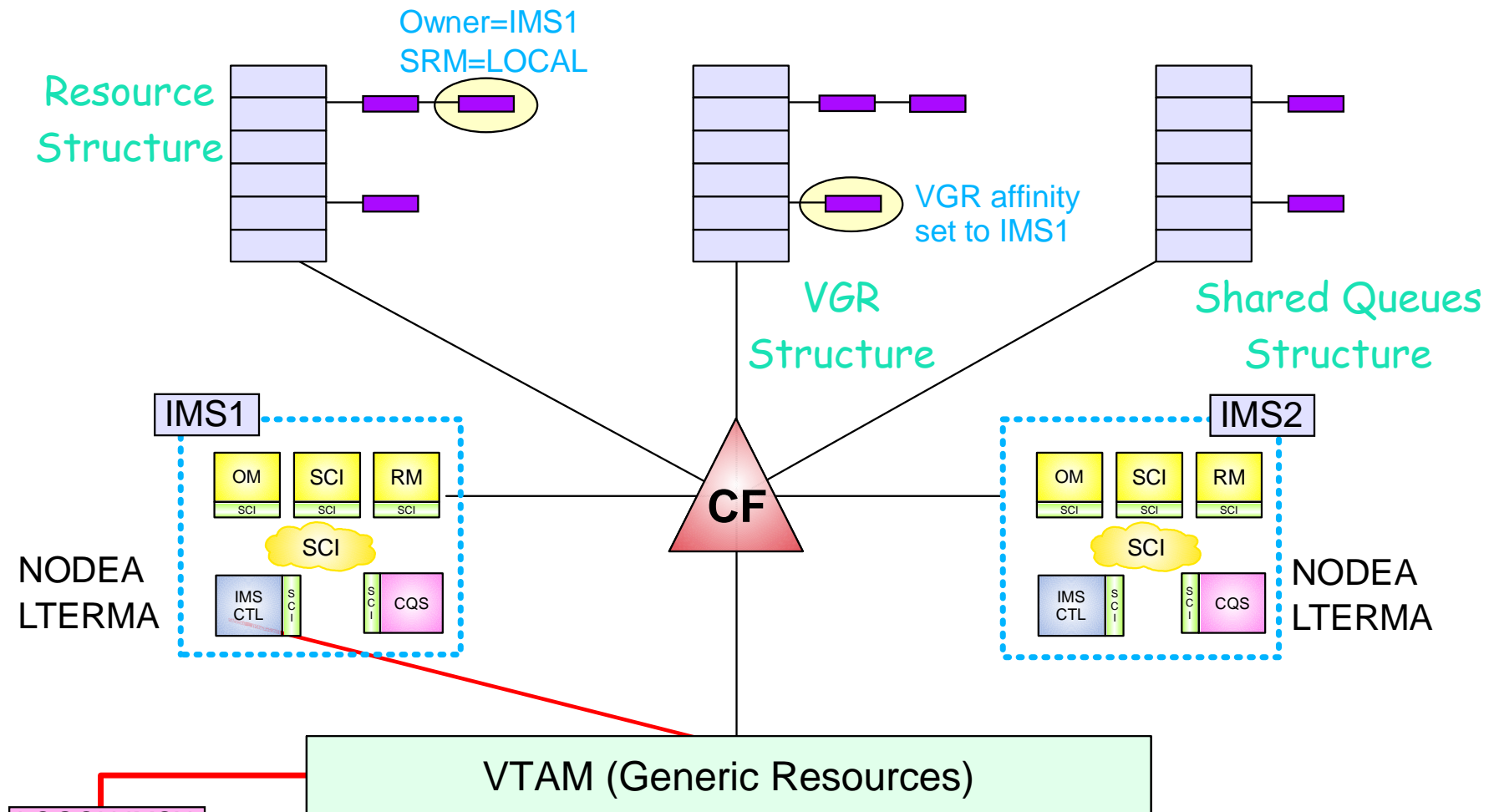


- ★ End-user logs on using generic logon IMSX
- ★ VTAM routes logon to IMS2; sets VGR affinity to IMS2
- ★ IMS2 sets ownership to IMS2
- ★ IMS2 recovers conversation from Resource Structure and Shared Queue Structure

Status Recovery - SRM=GLOBAL ...



Status Recovery - SRM=LOCAL

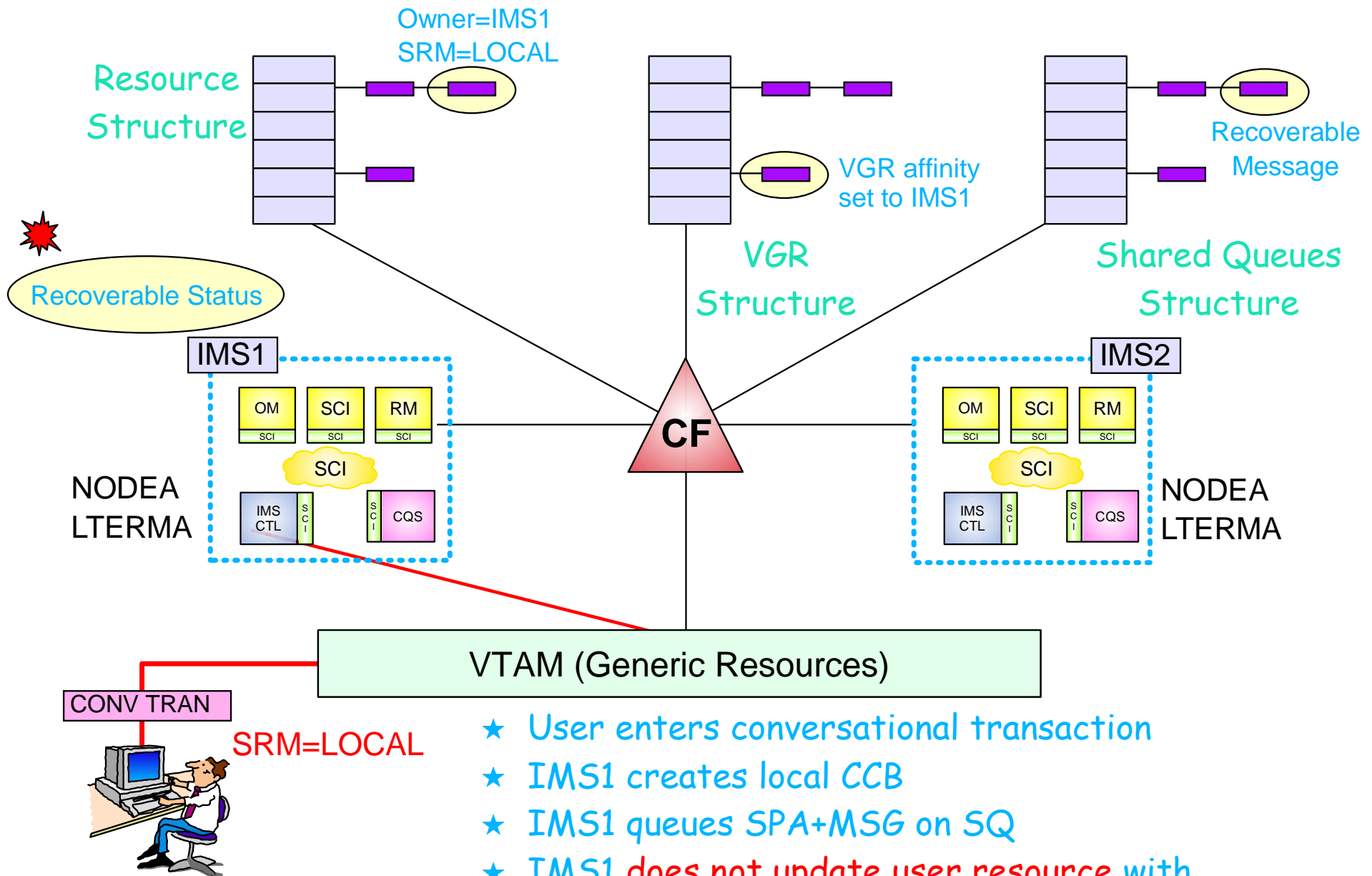


SRM=LOCAL

- ★ End-user logs on using generic logon IMSX
- ★ VTAM routes logon to IMS1; sets VGR affinity to IMS1
- ★ IMS1 sets VGR affinity management to IMS
- ★ IMS1 sets SRM=LOCAL
- ★ Resource entries created: Owner=IMS1, SRM=LOCAL

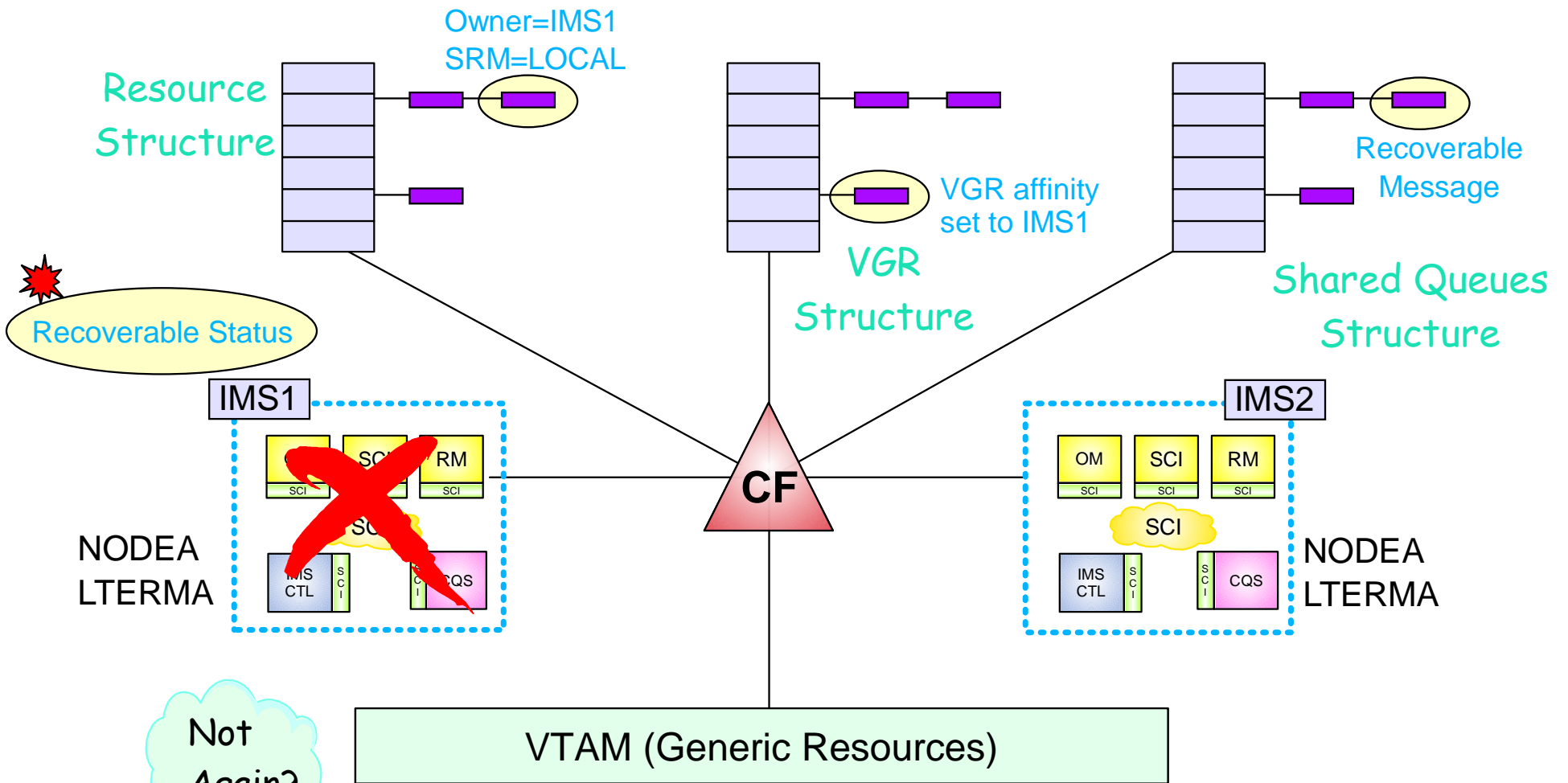


Status Recovery - SRM=LOCAL



- ★ User enters conversational transaction
- ★ IMS1 creates local CCB
- ★ IMS1 queues SPA+MSG on SQ
- ★ IMS1 does not update user resource with Conversational status (status maintained locally)

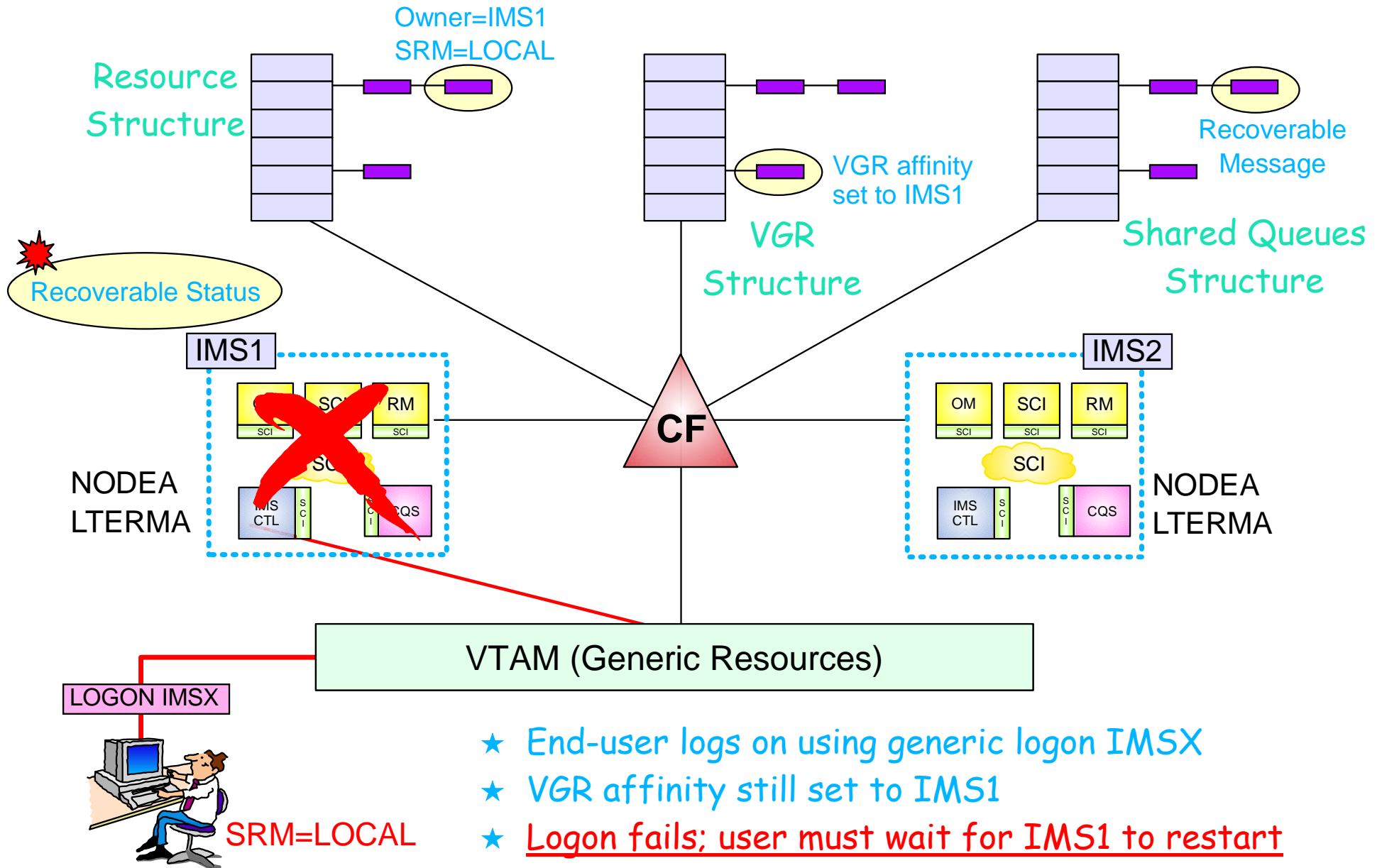
Status Recovery - SRM=LOCAL ...



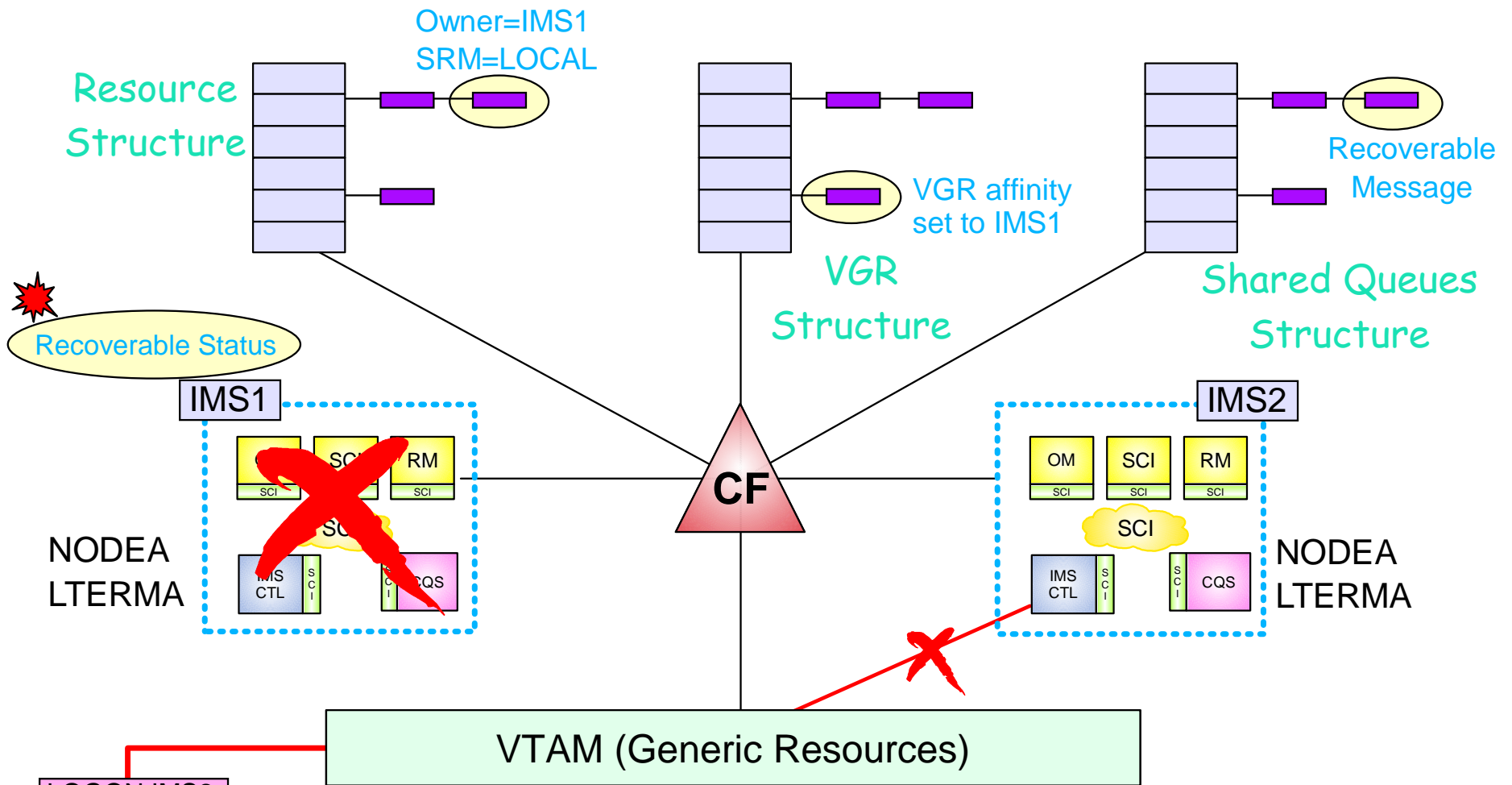
SRM=LOCAL

- ★ IMS1 fails; IMS2 queries structure for IMS1 entries
- ★ IMS2 does not delete resource entry (SRM=LOCAL)
- ★ IMS2 does not clear ownership (SRM=LOCAL)
- ★ VTAM does not delete VGR affinity

Status Recovery - SRM=LOCAL ...

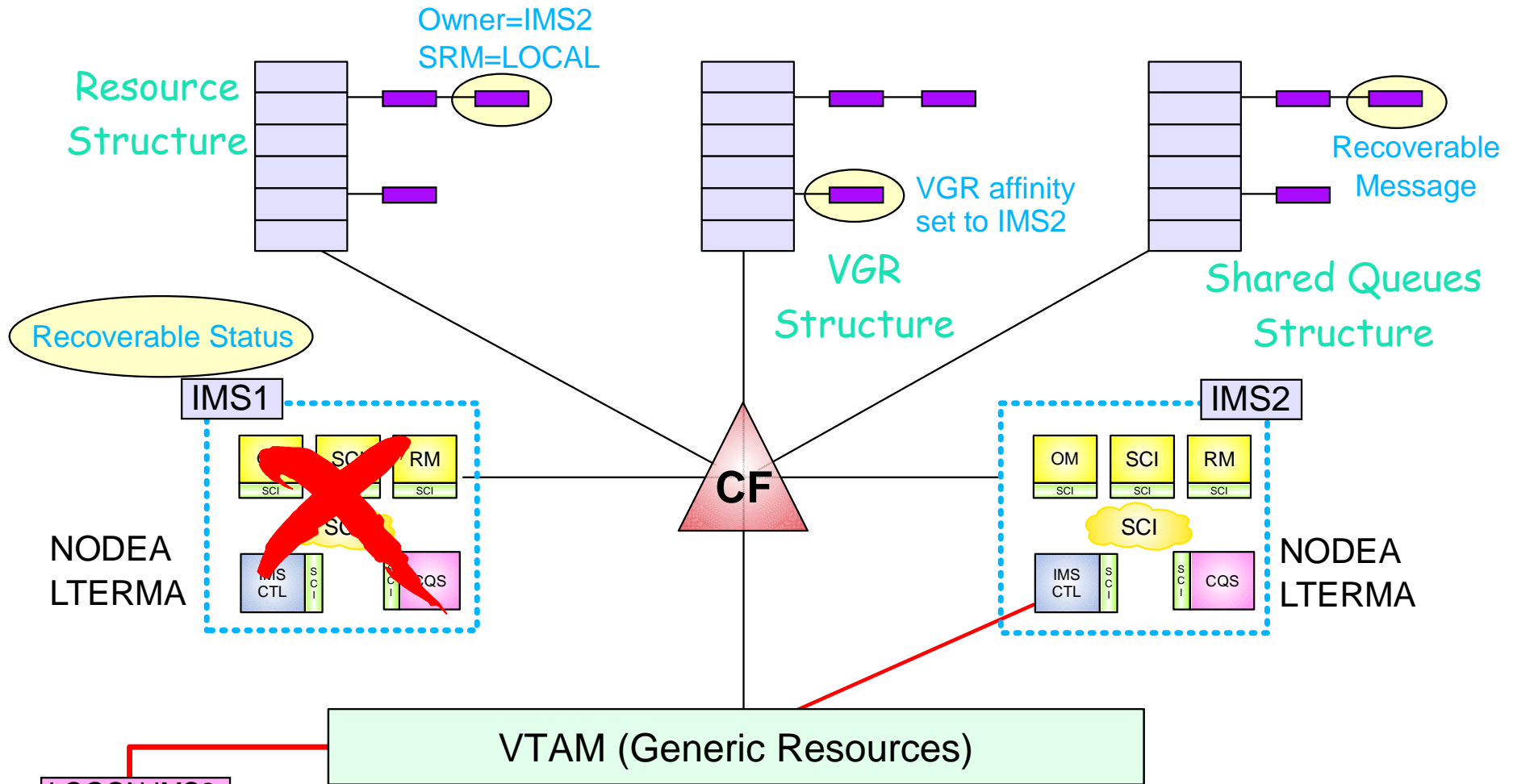


Status Recovery - SRM=LOCAL ...



- ★ If end-user logs on directly to IMS2
- ★ IMS2 checks resource entry for NODERMA
- ★ Logon rejected (NODERMA owned by IMS1)
- ★ User must wait for IMS1 to restart
- ★ Logon exit can "steal" node (status is not recoverable)

Status Recovery - SRM=LOCAL ...



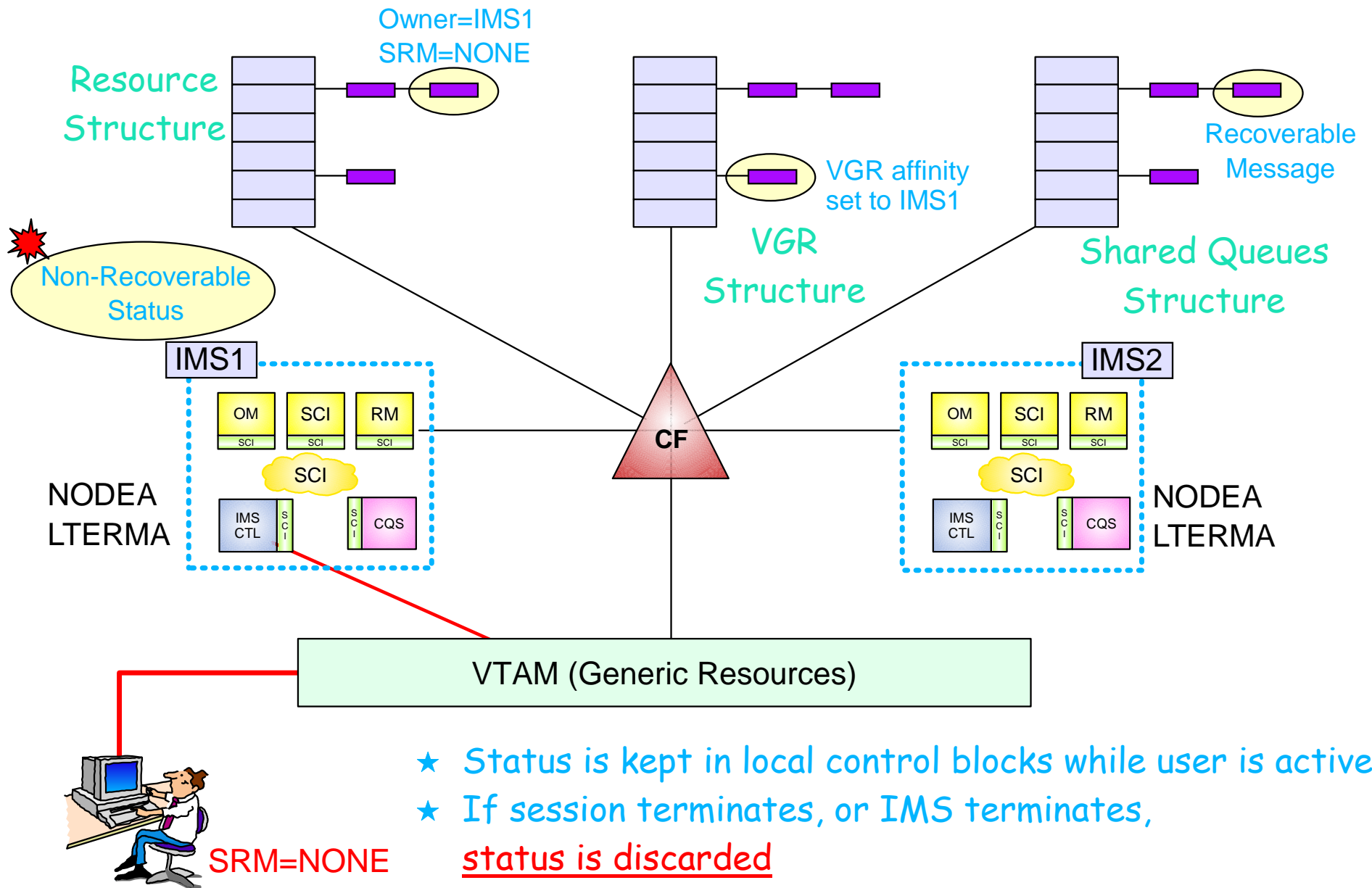
LOGON IMS2



SRM=LOCAL

- ★ If IMS2 Logon Exit steals node, logon accepted, status is non-recoverable
- ★ IMS1 will delete status when it is restarted (IMS1 no longer "owner")

Status Recovery - SRM=NONE



Global Callable Services

IMS exits can invoke callable control block services

- ▶ FIND or SCAN returns address of IMS control block

In IMS V8, callable services has "global" implications for nodes, users, and lterms

- ▶ If STM is not enabled (no resource structure)
 - No change
- ▶ If STM is enabled
 - If resource is owned by local system
 - Local control block returned
 - If resource not owned by local system but exists on structure
 - "Hidden (dummy) control block" returned with global status
 - Same format as "real" control block but limited information
- ▶ New flag in function specific parameter list
 - Local - return local control blocks only
 - Global - return "hidden" control blocks if no local status - default

Sysplex Terminal Management

Sysplex terminal management is an IMS function which exploits the CSL infrastructure to provide ...

- ▶ **Resource type consistency**
 - Prevent naming inconsistencies between IMSs
- ▶ **Resource name uniqueness**
 - Prevent multiple logons / signons within the IMSplex
- ▶ **Terminal and user resource status recovery** across IMSplex
 - Resume end-user and command significant status on another IMS after failure
- ▶ **Global callable services**
 - User exits can access terminal and user information across IMSplex

STM requires

- ▶ CSL with resource structure
- ▶ Shared queues