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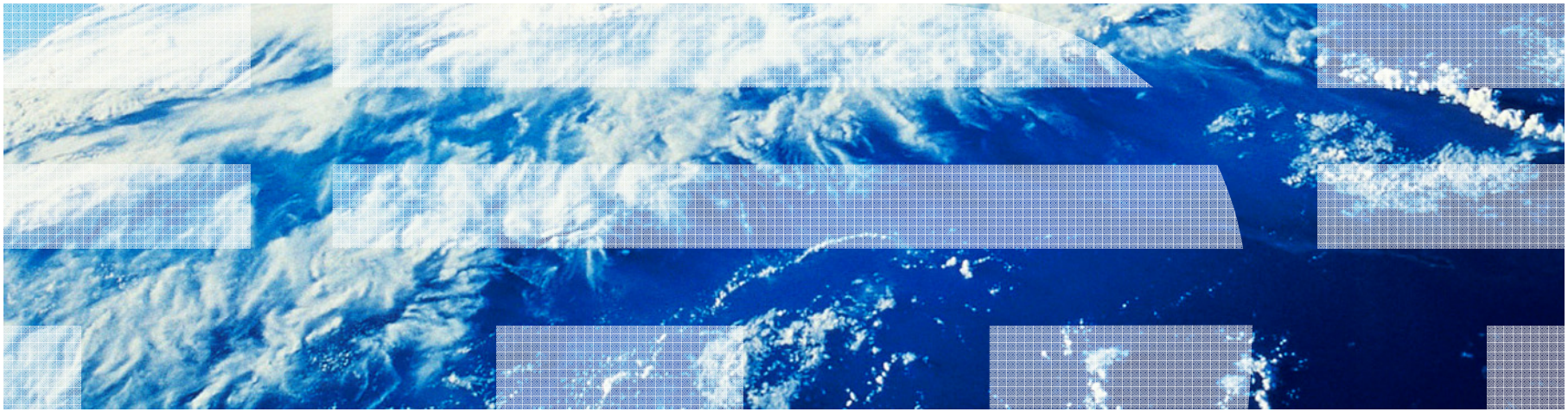
z/VM 6.2 Security Update



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Agenda

- Security-Relevant Updates to Current z/VM Releases
- RACF Updates for z/VM 6.2
- RACF Updates for Single System Image clustering (SSI) in z/VM 6.2

Security-Relevant Updates to z/VM

z/VM Security Certification Discussion

- IBM Statement of Direction: Common Criteria Evaluation of z/VM 6.1
  - Statement issued on 22 July 2010
  - **Pre-certification ID:** BSI-DSZ-CC-0752
  - Goal: OSPP-LS at EAL 4+

- Federal Information Protection Standards (FIPS)
  - z/VM 6.1 + PM43382 is evaluated for FIPS 197 (AES)
  - http://csrc.nist.gov/groups/STM/cavp/documents/aes/aesval.html#1873
  - Designed to conform to FIPS 140-2

- Help us understand your certification needs
  - Comments now, or contact offline

FIPS 140-2 Support for z/VM 6.1

- PM08418: Upgrade System SSL to z/OS R11
- VM64805: Add needed functions to LE
- VM64751: Upgrade Binder to z/OS R11
- PM10616: System SSL enablement of FIPS
- PM43382: System SSL Self-Defense

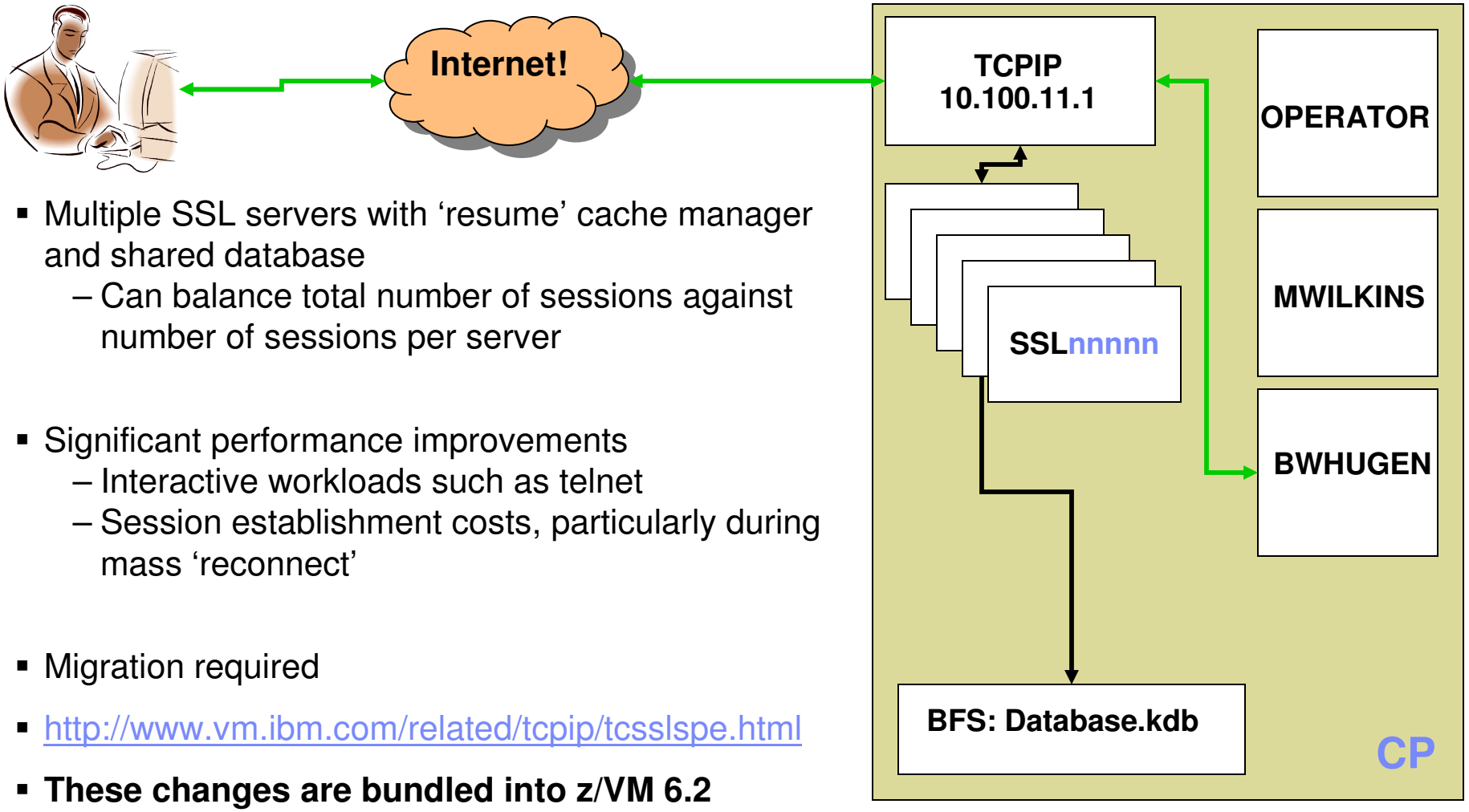
- Enablement of support: z/VM 6.1 can be configured to comply to Federal Information Protection Standard (FIPS) 140-2
  - Requisite cipher suites assure a level of cryptographic strength
  - Creation and validation of certificate database assures trust
  - Official evaluation in progress

- Changes to TCPIP, System SSL, the Binder, and the SSL Server are available for z/VM 6.1

- These changes are bundled in z/VM 6.2

SSL Server Reliability and Scalability

- PK97437: SSLADMIN, TCPRUN and Related Packaging Changes
- PK97438: SSLSERV Module Updates
- PK75662: TCPIP Module Updates



- Multiple SSL servers with 'resume' cache manager and shared database
  - Can balance total number of sessions against number of sessions per server
- Significant performance improvements
  - Interactive workloads such as telnet
  - Session establishment costs, particularly during mass 'reconnect'
- Migration required
- http://www.vm.ibm.com/related/tcpip/tcsslspe.html
- **These changes are bundled into z/VM 6.2**

z/VM SSL Client Certificate Support

- PM52716: Enable Client Certificate Authentication in z/VM SSL

- Expansion of SSL/TLS handshaking processes to include checking for a client-presented certificate
  - Dynamic TN3270 Support only
  - Certificate presented by client must match against data in the z/VM certificate database
  - New INTERNALCLIENTPARMS parameter: CLIENTCERTCHECK

- APAR available for z/VM 6.1 and z/VM 6.2

LDAP Support Updates

- **Upgrade to z/OS 1.11 ITDS in z/VM 6.1**
  - Support for password change logging
    - z/OS uses RACF certificate services
    - z/VM uses System SSL services
  - Password phrases can now be used in an ldap bind

- **Upgrade to z/OS 1.12 ITDS in z/VM 6.2**
  - RACF resource change-logging through LDAP
    - user, group, and general resource profiles
    - an open, remote method of change notification using only LDAP interfaces
    - an LDAP client can read the LDAP change log, detect updates to RACF users, groups, group membership, and general resources, and then retrieve RACF entries.
    - LDAP server must be configured to enable the SDBM backend.
  - Expanded password management
    - Expiry warnings
    - Interactively set new passwords

Crypto Support Updates

- APAR VM64656: **z/VM support for Crypto Express3 cards**
  - On the z10: z/VM 5.3, z/VM 5.4 and z/VM 6.1
  - On the z196: z/VM 5.4 and z/VM 6.1
  - Accelerator mode (CEX3A) and Coprocessor mode (CEX3C)

- APAR VM64793: **Protected Key CPACF for z/VM 5.4 and z/VM 6.1**
  - On both z10 and z196
  - Protection of key material when using CPACF, instead of Clear Key operations
    - Key does not exist outside of physical hardware
  - Not to be confused with Secure Key (for the Crypto Express cards)
  - Designed to increase throughput

- z/VM 6.2:
  - QUERY CRYPTO output changes

Security-Relevant Updates in RACF for z/VM 6.2

RACF Updates for z/VM 6.2

General Updates:

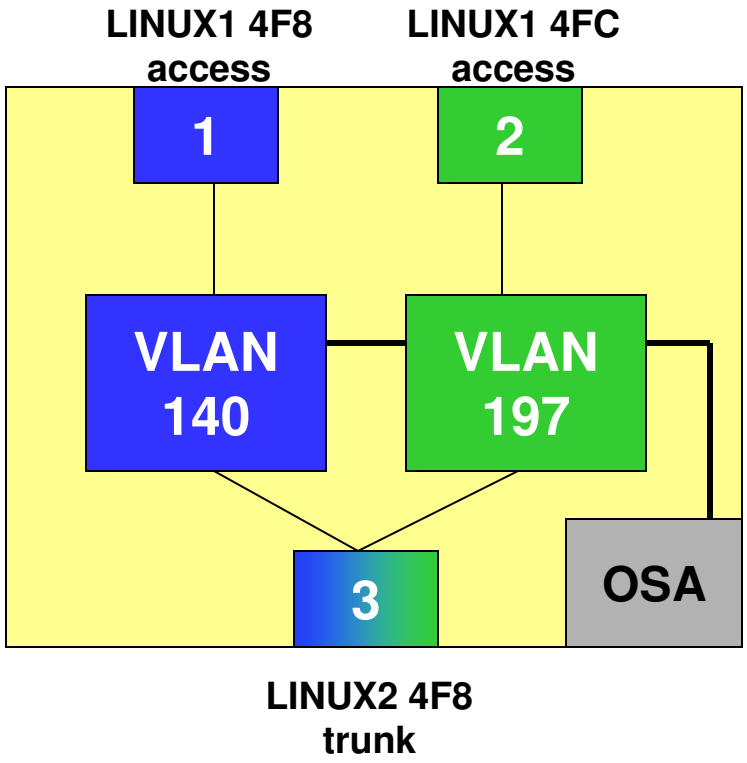
- High Level Assembler no longer required for most common customizations
- ALTER (MW) access for VMMDISK no longer conveys the ability to change the access list for the minidisk
- DBUnload requirement for T-Disk removed
  - Can use existing minidisk instead

RACF Updates for z/VM 6.2

- **User Attribute: PROTECTED**
  - Shields user access from being revoked due to
    - Logon failures
    - Inactivity or unsuccessful access attempts
    - Any method that uses a supplied password (logon, FTP …)
  - AUTOONLY service machines are a good candidate for this attribute
  - Specify “NOPASSWORD” and “NOPHRASE” on ADDUSER or ALTUSER:
    - `ALTUSER TCPIP10 NOPASSWORD NOPHRASE`
  - Any machine without a password or passphrase is Protected by default:
    - `ADDUSER BWHUGEN`
  - To remove the Protected attribute from a user, add a password or passphrase:
    - `ALTUSER BWHUGEN PHRASE('a_really!good_passw0rdp#r9$e,yo')`
  - Protected users can still be revoked through REVOKE

RACF Updates for z/VM 6.2

- **Multiple Access Ports per Guest**
  - Can now enable a guest with multiple unique access ports to the same VSWITCH
  - Associates NICs and VSWITCH ports (Switch not available on NICDEF)
  - Ports are associated with VLANs
  - Requires explicit CP enablement
    - `CP SET VSWITCH PORTNUMBER`
    - `CP SET VSWITCH VLANID`



- RACF Enablement is business-as-usual, authorizing by VLAN IDs instead of port numbers:

```
– RDEFINE VMLAN SYSTEM.SWITCH05 UACC(NONE)
– PERMIT SYSTEM.SWITCH05 CLASS(VMLAN) ID(LINUX1 LINUX2) ACCESS(UPDATE)
– RDEFINE VMLAN SYSTEM.SWITCH05.0140 UACC(NONE)
– PERMIT SYSTEM.SWITCH05.0140 CLASS(VMLAN) ID(LINUX1 LINUX2) ACCESS(UPDATE)
– RDEFINE VMLAN SYSTEM.SWITCH05.0197 UACC(NONE)
– PERMIT SYSTEM.SWITCH05.0197 CLASS(VMLAN) ID(LINUX1 LINUX2) ACCESS(UPDATE)
– ...
```

RACF Updates for z/VM 6.2

- **Protecting Real Devices**
  - Authorization checking based on the **VMDEV** class
    - Usual access levels (`NONE READ UPDATE CONTROL`) apply
  - Triggers when Connecting a real device to a virtual machine for exclusive use, or connecting a tape device to a virtual machine for shared use
    - `DEDICATE` statements in the User Directory
    - `ATTACH` command
    - `GIVE` command
- Define `RDEV.(rdevno).sysname` to VMDEV
  - `PERMIT RDEV.0456.* CLASS(VMDEV) ID(BWHUGEN) ACCESS(UPDATE)`
  - `SETROPTS CLASSACT(VMDEV)`
- Enable an appropriate event:
  - `RALTER VMXEVENT EVENTS1 ADDMEM(RDEVCTRL/NOCTL)`
  - `SETEVENT REFRESH EVENTS1`

RACF Updates for z/VM 6.2

RPIDIRCT updates:

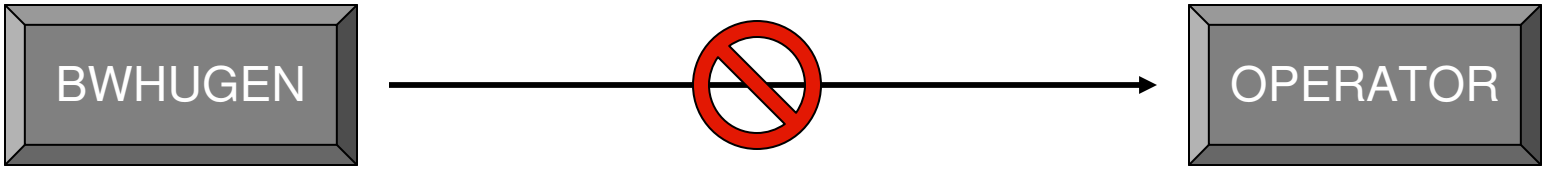
- Create VMLAN profiles from NICDEF statements
  - *Doesn't cover Multiple Access Ports (no NICDEF support)*
- Create VMDEV profiles from DEDICATE statements
- Recognize IDENTITY and SUBCONFIG definitions
- Passwords AUTOONLY, LBYONLY, and NOPASS cause user to be Protected
- Password NOLOG causes user to be revoked unless required for POSIX
  - POSIX users will be Protected

RACF Updates for z/VM 6.2

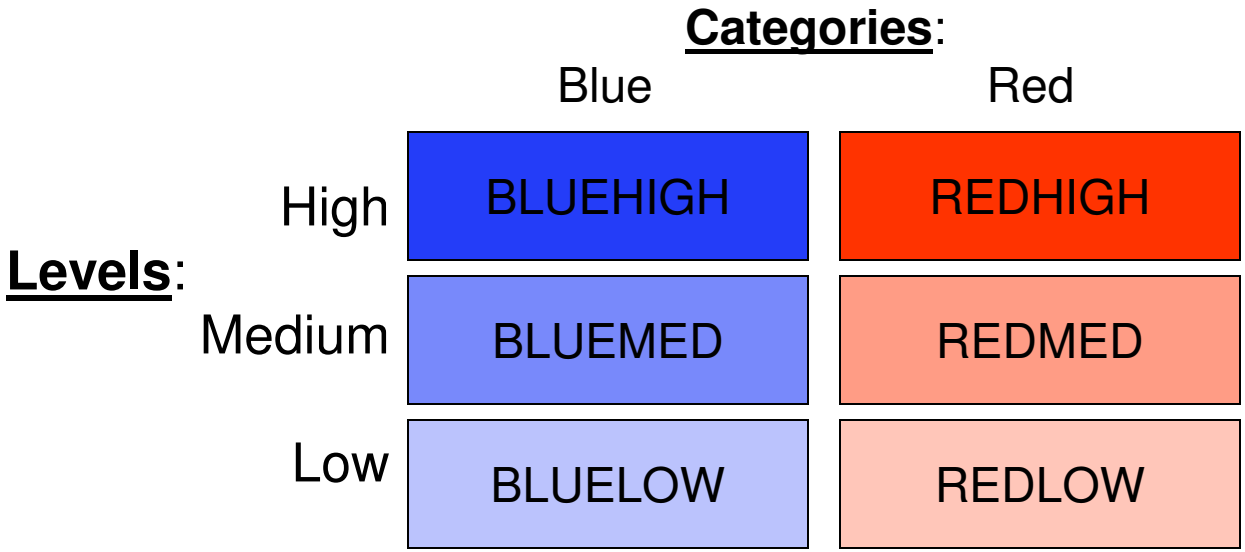
- **Enablement and Control of SECUSER and OBSERVER when Mandatory Access Controls (SECLABELs) are active**
  - CONSOLE OBSERVER (read-only)
  - SET OBSERVER (read-only)
  - CONSOLE SECUSER (read-write)
  - SET SECUSER (read-write)
  - CP SEND.G (read-write)
  - CP SEND.C (write-only)

- SECLABEL rules for read- and write-access apply:
  - "No read up, no write down."

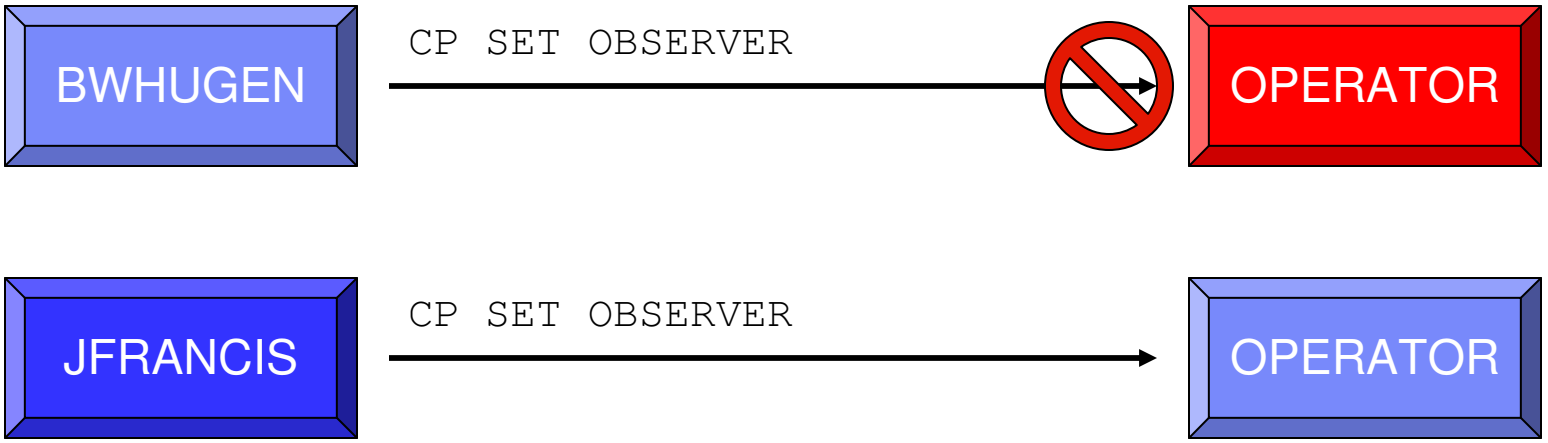
RACF Updates for z/VM 6.2

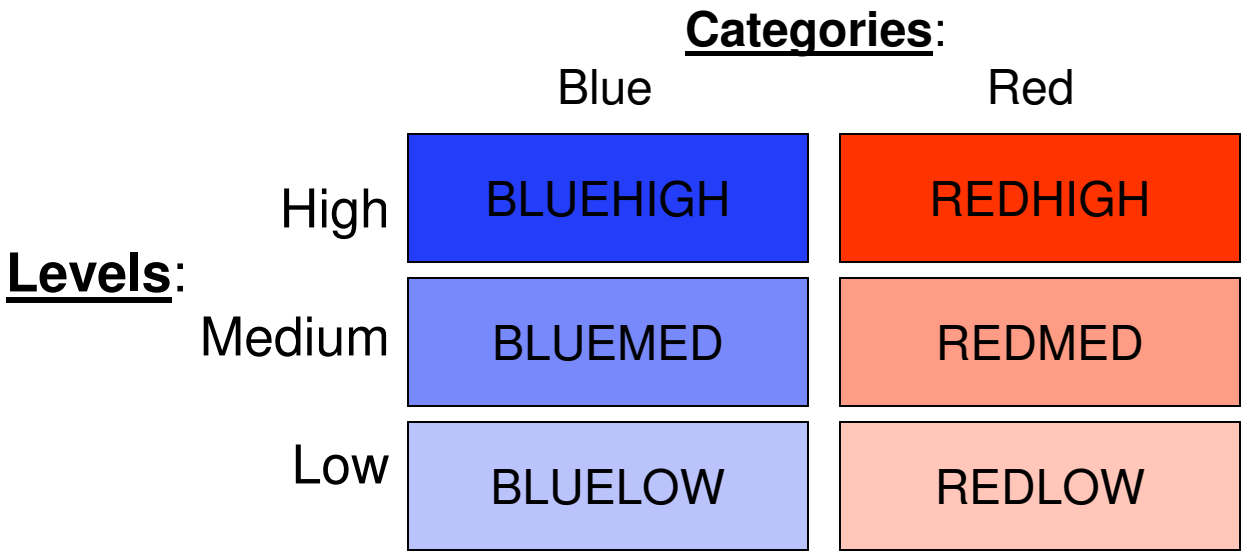


<SET SERVER Command>



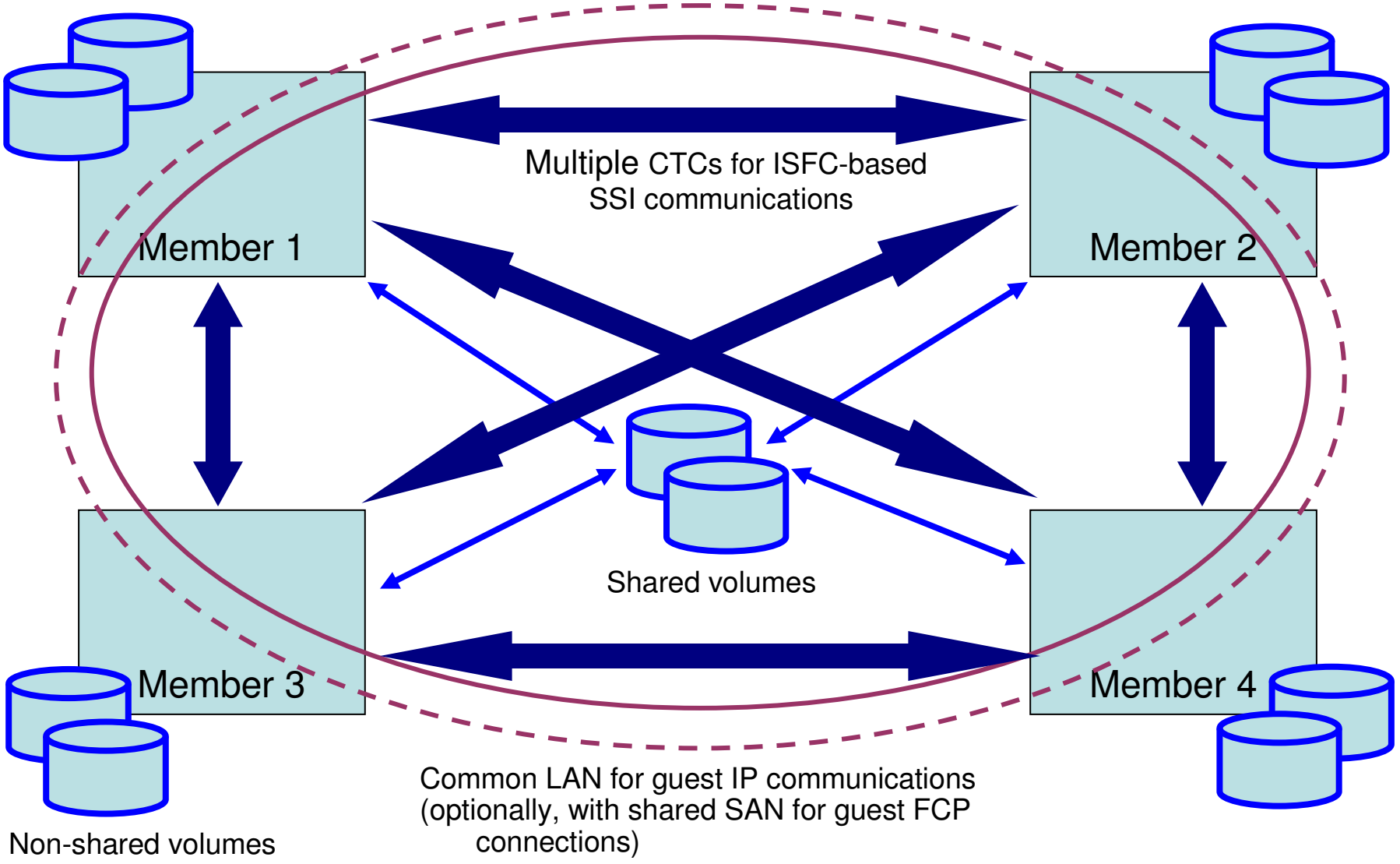
RACF Updates for z/VM 6.2





RACF In A
Single System Image Cluster

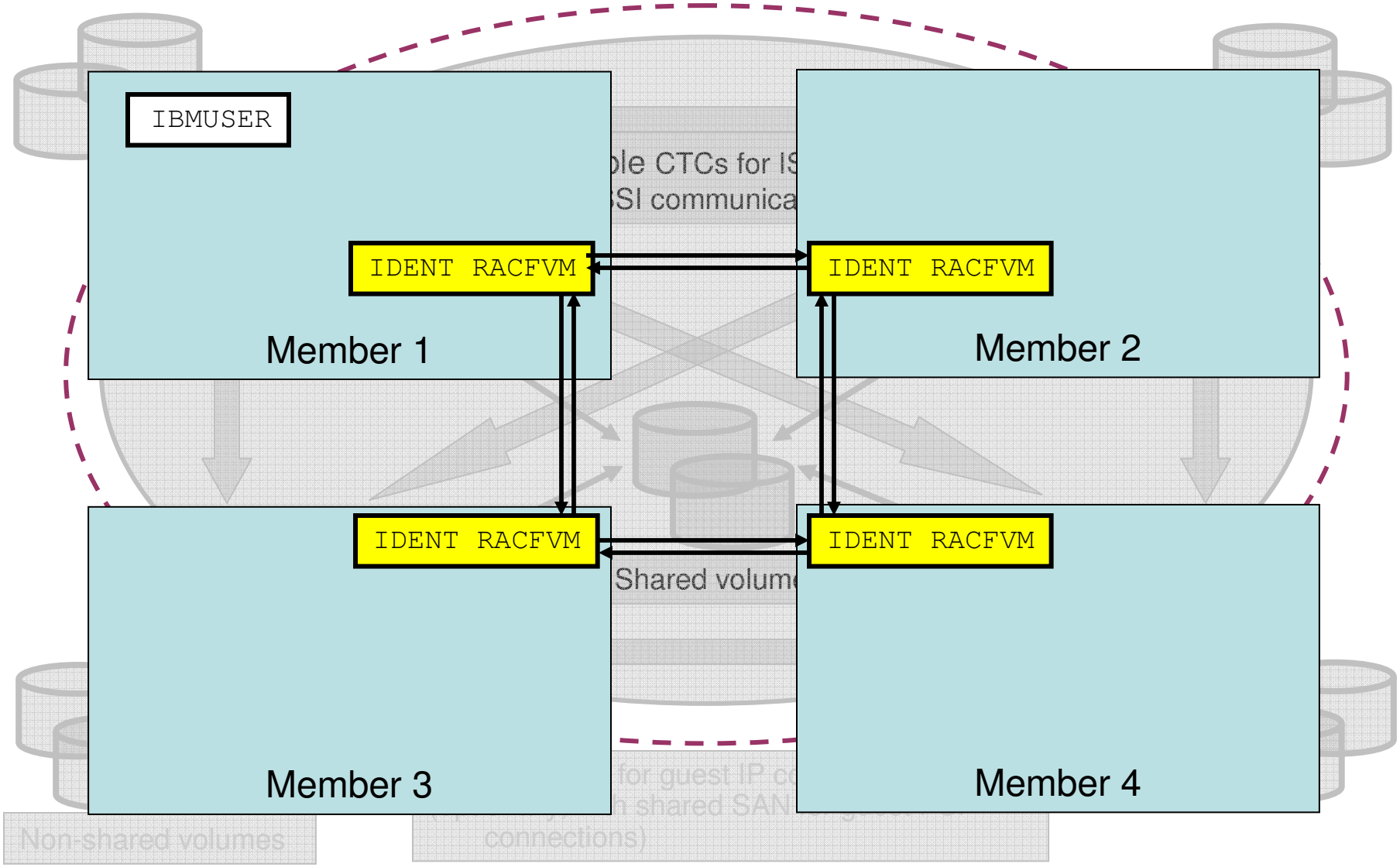
z/VM SSI Cluster



RACF in a Single System Image Cluster

- When installed in an SSI, RACF creates *a single security context* for the cluster
  - Shared database and definitions
  - Handshaking of RACFVM instances
  - Cluster-aware auditing
- RACF for SSI is for the entire cluster, it's not something you can enable one step at a time.
- RPIDIRCT has been updated to handle both single-configuration and multi-configuration virtual machines
- The virtual machines have been modified to operate both in and out of an SSI …

RACF Virtual Machines in an SSI cluster



RACF Virtual Machines in an SSI cluster

Handshaking and Command Propagation

- Each RACF server in the SSI must provide the same consistent security context.
- Commands that create broader changes need to be propagated across the cluster
  - SETROPTS
  - RVARY
  - SETEVENT
- RACF will suppress “extra” messages and marshal output when executing “remotely.”
- Locking done to ensure RVARY submissions are handled sequentially
- RACF command sessions don't support command propagation so in an SSI the commands SETROPTS, RVARY, and SETEVENT will be rejected with message:
  - `RPITMP0021E 'command-name' RACF COMMAND MUST BE ISSUED WITH RAC IN A SSI`
- RAC command, ISPF panels, and R_Admin API (used by LDAP) are interfaces which support command propagation

RACF Virtual Machines in an SSI cluster

Handshaking and Command propagation

- The propagated commands output from each RACF server on each system is bracketed by the lines:
  - `OUTPUT FROM <racfname> ON SYSTEM <ssinode>`
  - `END OF OUTPUT`

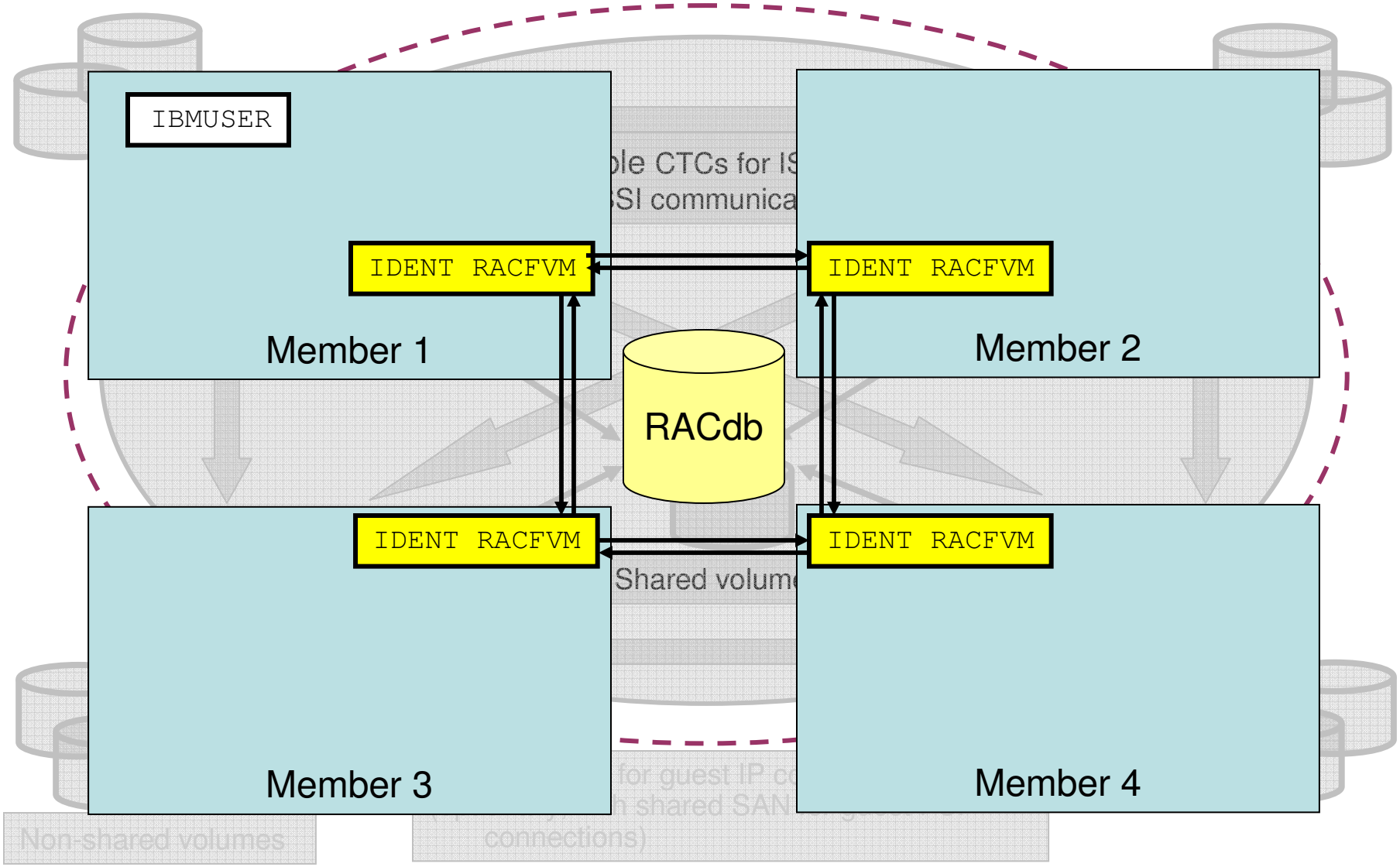
- SETROPTS and RVARY commands will be propagated in non-SSI multi-server environments.

RACF Virtual Machines in an SSI cluster

Propagation of MAC cache purge

- Purge initiated by specific operands instead of **any** SETROPTS command:
  - RACLIST REFRESH of SECLABEL class
  - Activating or inactivating VMMAC class
  - LOGOPTIONS auditing of VMMAC class
  - Any MLS change
  - MLQUIET
  - MLACTIVE(WARNING)
  - SECLABELAUDIT

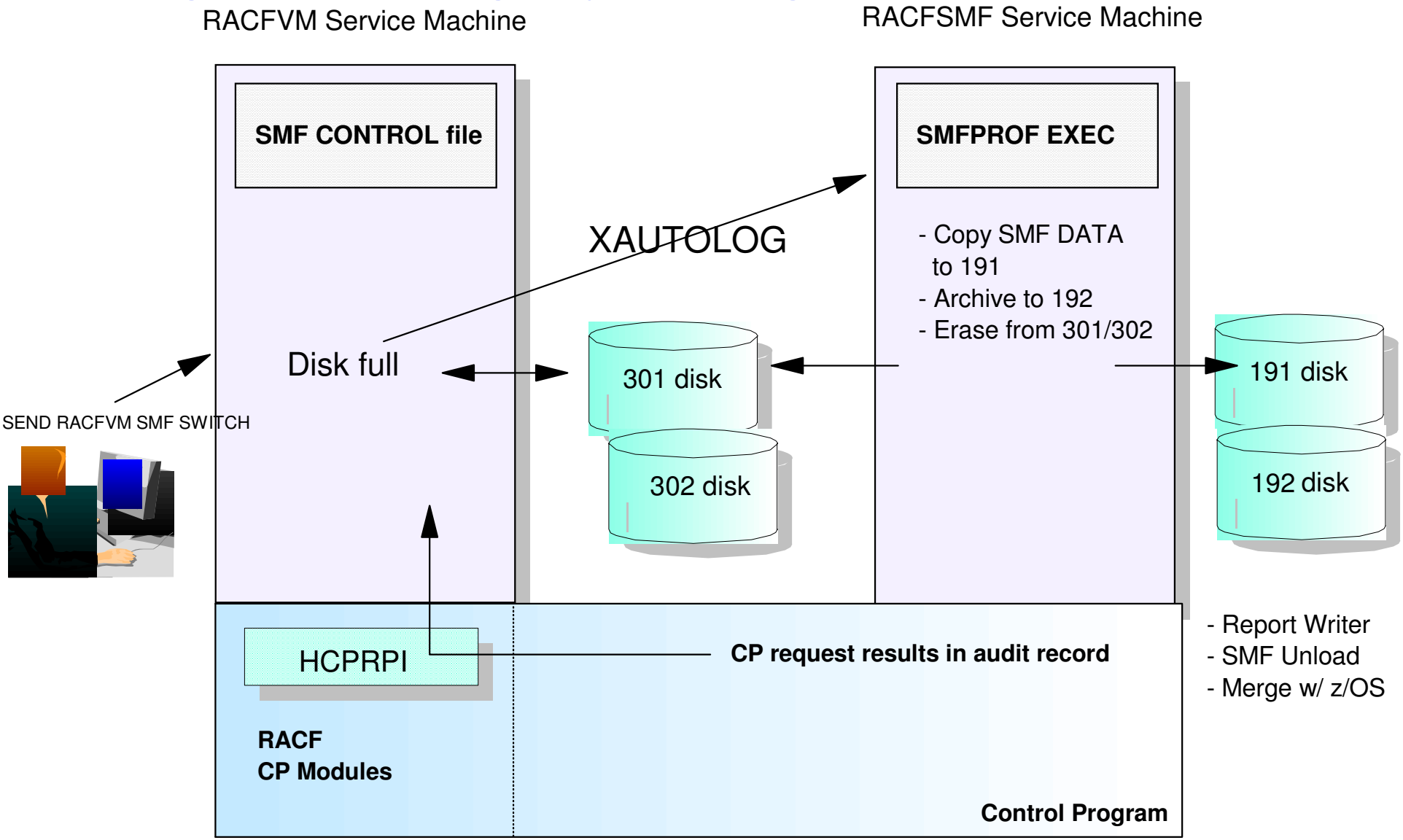
The RACF Database in an SSI



The RACF Database in an SSI

- All RACF servers in SSI must **share** the same RACF database
  - Databases are shareable today
  - Maintain a single security context; no confusion in security policy
- RACF database in SSI must be fullpack minidisk, must support reserve/release and can't be an FBA device
  - Full-pack 3390s for both the primary (200) and backup (300)
  - RDEVICE statements for each in the System Configuration file
  - Minidisk caching is automatically turned off
- Database synchronization
  - When a member joins, CP+RACF will ensure that the joining server has identical database datasets to those being used and active in the SSI
  - Automatic propagation of RVARY commands

Auditing RACF in a Single System Image cluster



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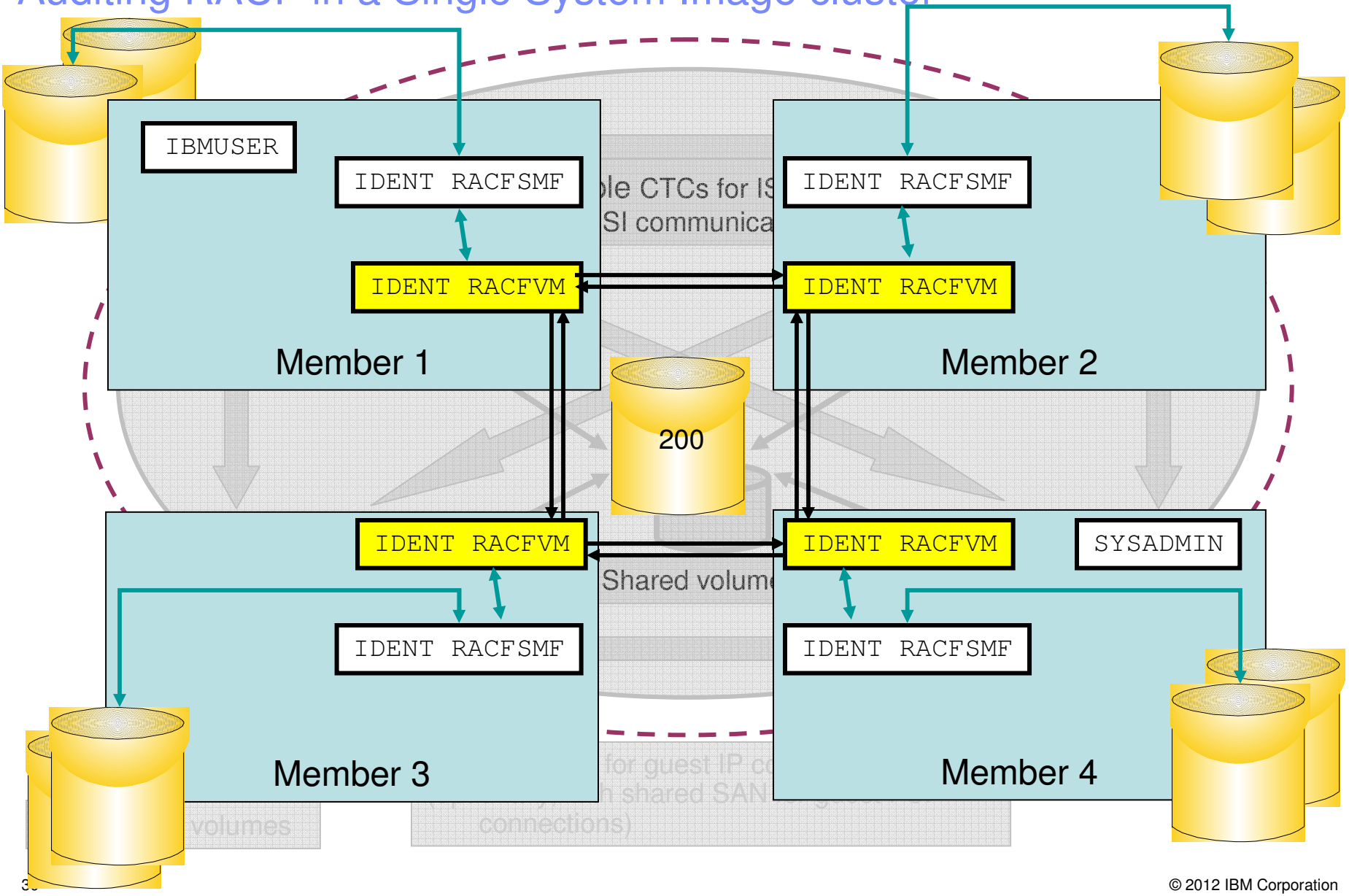


Auditing RACF in a Single System Image cluster

- RACFVM is a multiconfiguration virtual machine
  - Shared RACF database
  - All other disks are local – including 301 and 302 for auditing
  - Separate SMF CONTROL files operating against a single security context
- RACFSMF is also multiconfiguration virtual machine
  - Separate 191 and 192 disks
  - Separate SMFPROF EXEC files
- Auditing automation should account for this disparity to gather all pertinent audit records

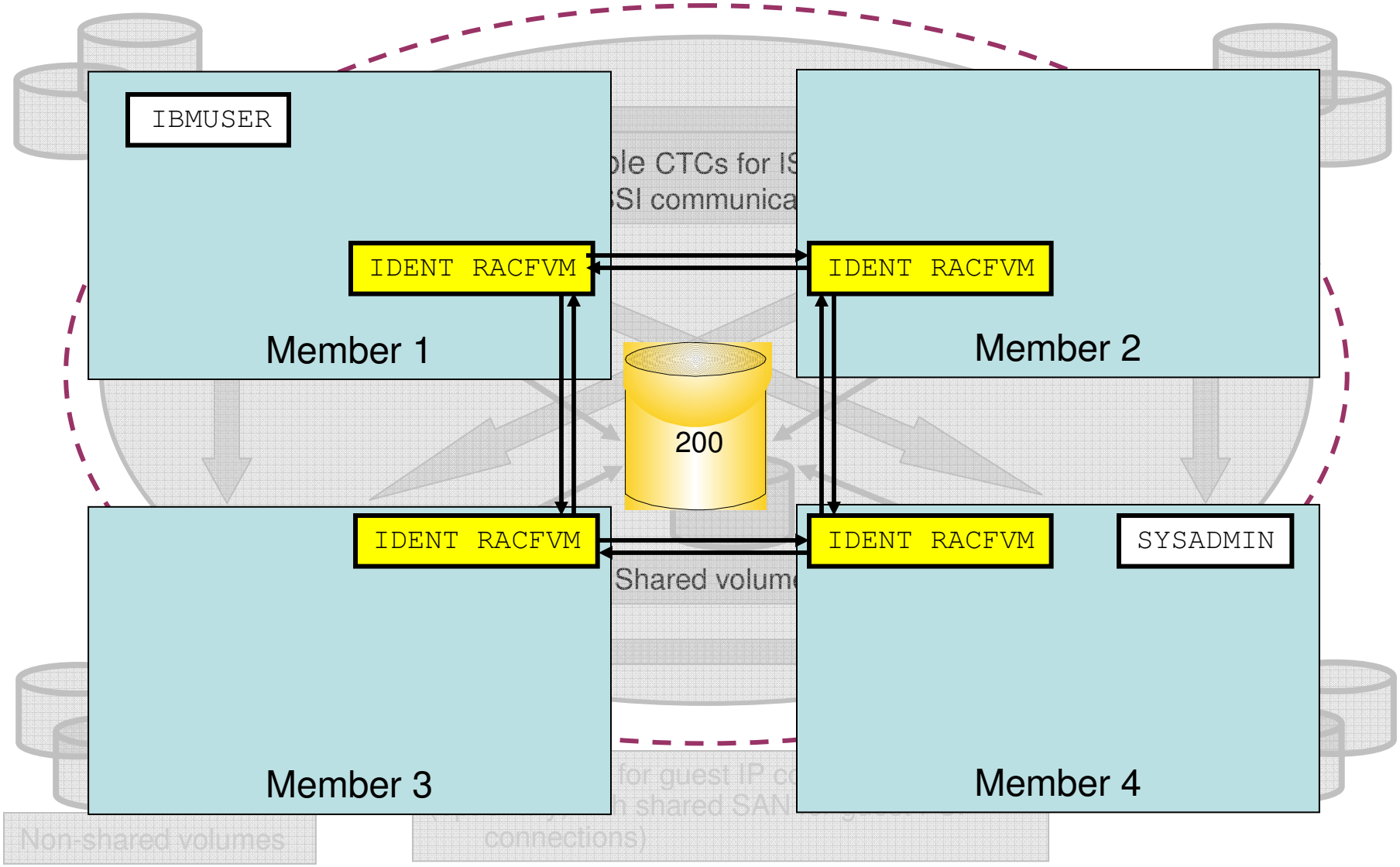
Auditing RACF in a Single System Image cluster

- In the case of some commands – the AT command in particular – auditing records will appear on the destination system
  - AT_LOGON
  - AT_FROM
  - AT_LOGOFF

- Auditing distinguishes between local and remote nodes in a cluster, even when sharing the same security context
  - Controlled commands are the same
  - Auditing requisites are the same
  - Events are the same

  …. But the systems are distinct, from the point of view of a virtual machine “in the know”

RACF and Live Guest Relocation



RACF and Live Guest Relocation

Live Guest Relocation

- `VMRELOCATE MOVE USER` *`userid`* `TO` *`sysid`*
  - Class B command

- RACF cleans up a user's presence on the source system, and prepares for the target system for the relocate-logon of the user

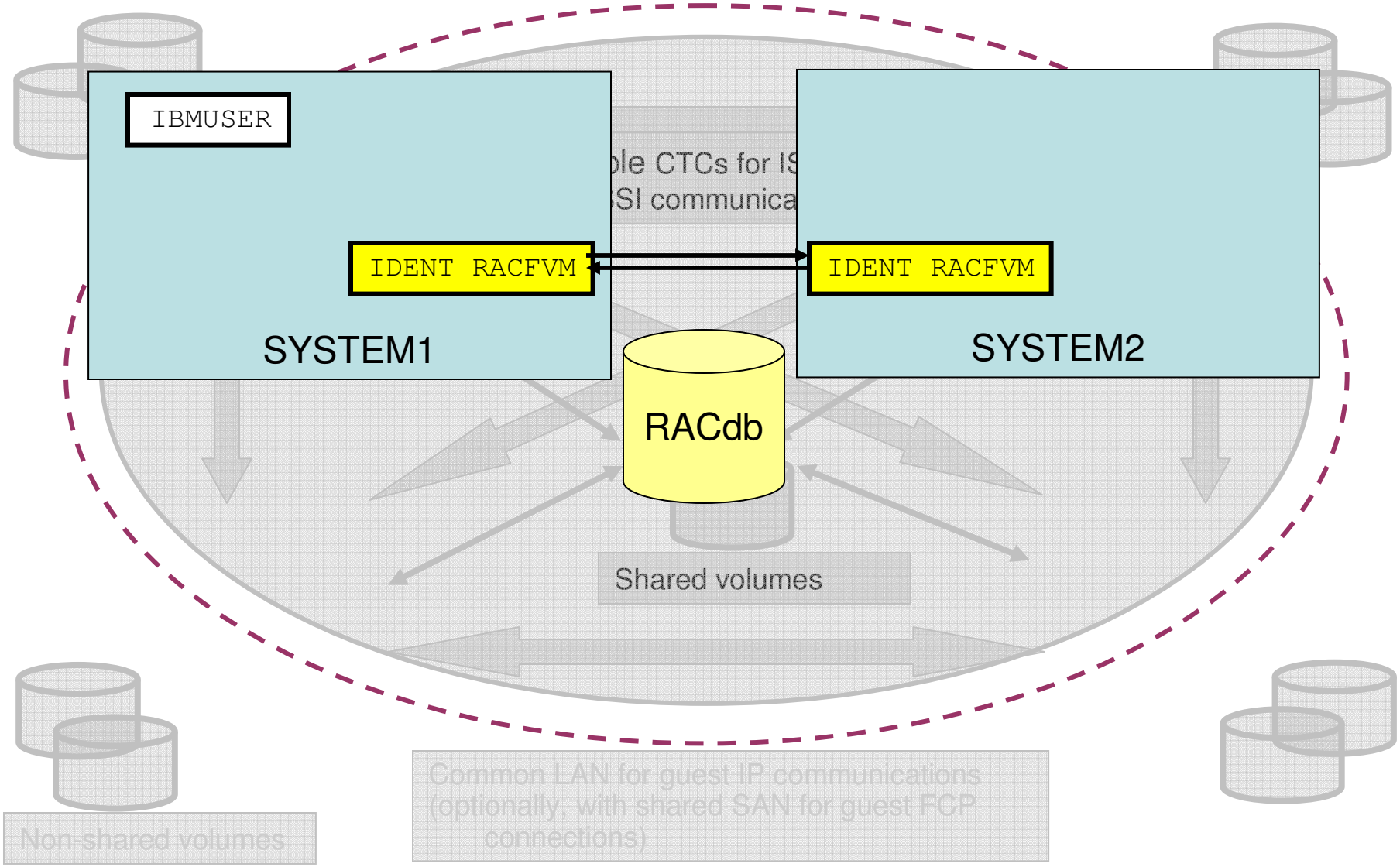
- Generate LOGOFF/LOGON auditing events on source/target system, to note the transition

- RACF perspective of relocate events:
  - User data is created for *userid* on *sysid* with all the above
  - User resources are allocated on sysid
  - Associated authorization calls are approved without a RACF check
  - Relocate-logon is requested for *userid* on *sysid* when the inbound relocation is complete

Migrating to RACF in an SSI

- **Recommendations:**
  - If you don't have an ESM, get one.
  - Line up the shared DASD required for the database; remember that this needs to be a fullpack minidisk!
  - If you're converting one or more ESM-controlled systems into an SSI:

Migrating to SSI: RACF Considerations



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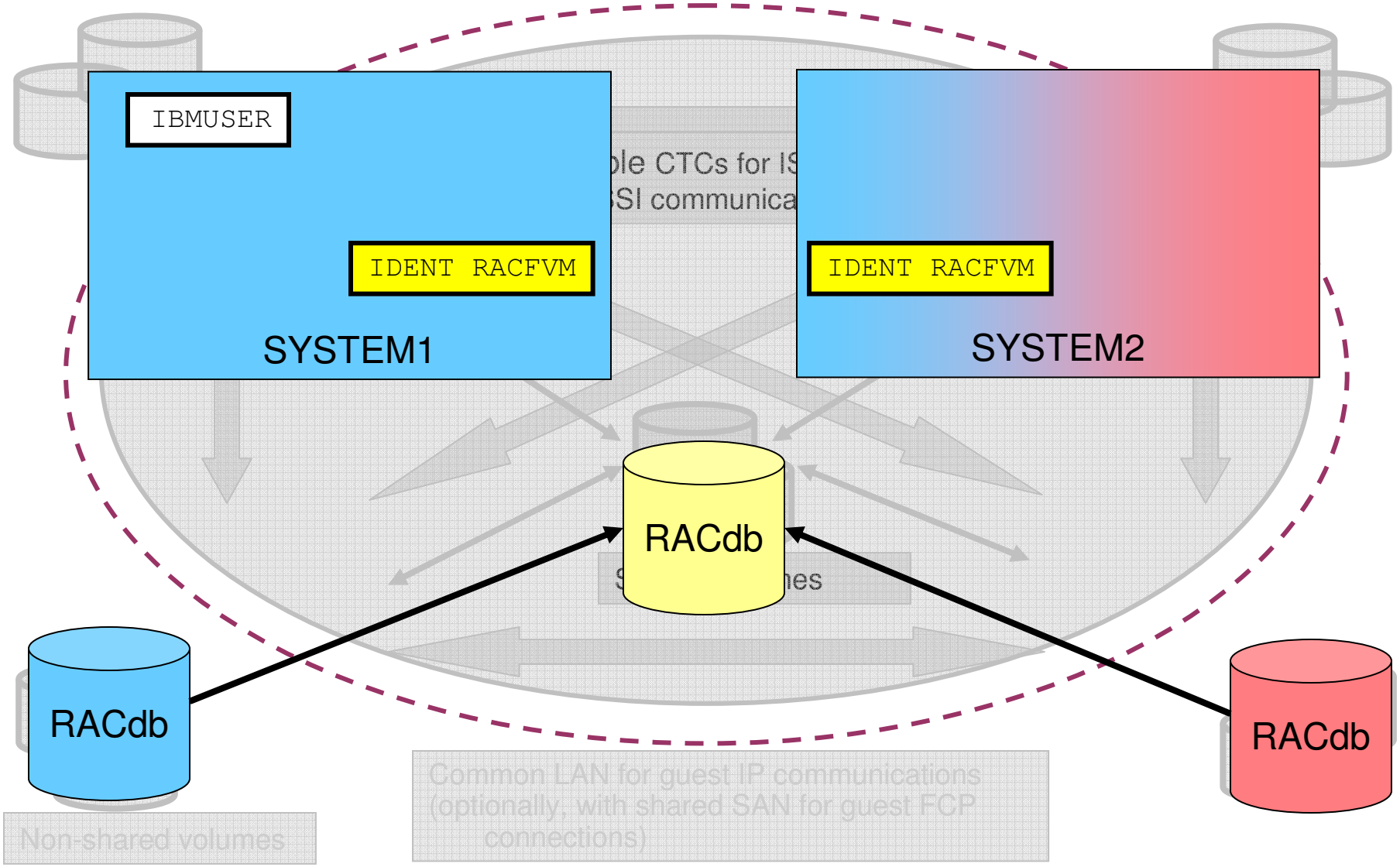
    - Migrate your "master" system to 6.2 in a non-SSI format
    - Convert associated resource profiles to 6.2 format, using RPIDIRCT as necessary
    - Take the steps to enable SSI; turn on RACFVM as part of the outlined process
  - If you're converting two (or more) distinct ESM-controlled systems to an SSI

Migrating to SSI: RACF Considerations



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    - Take the steps to enable SSI; turn on RACFVM as part of the outlined process
  - If you're converting two (or more) distinct ESM-controlled systems to an SSI
    - You will need to merge the databases
    - You may want to consider which of your 2+ systems has the most complex security context before choosing which one is the "master" system
    - After one system is enabled, make directory and RACF database updates for the secondary system

Summary

- Certification work continues
- Improvements continue to enhance base z/VM security
- RACF has been adapted to handle the Single System Image clustering technology
- z/VM continues to secure the road to Smarter Computing

For more information …

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- Mail: bwhugen at us dot ibm dot com

On the web:

- z/VM Security resources: http://www.VM.ibm.com/security
- z/VM Secure Configuration Guide: http://publibz.boulder.ibm.com/epubs/pdf/hcss0b30.pdf
- System z Security: http://www.ibm.com/systems/z/advantages/security/
- Redbook: z/VM Security, SG24-7471
- http://www.vm.ibm.com/related/tcpip/vmsslinf.html -- SSL Information and Walk-through

Back-up Slides

IBM Statement of Direction:

Common Criteria for z/VM 6.1

- IBM issued a Statement of Direction on 22 July 2010:

  "IBM intends to evaluate z/VM V6.1 with the RACF Security Server optional feature, including labeled security, for conformance to the Operating System Protection Profile (OSPP) of the Common Criteria standard for IT security, ISO/IEC 15408, at Evaluation Assurance Level 4 (EAL4+)."

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