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Directory Maintenance Facility: An Update for z/VM 6.2



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Agenda

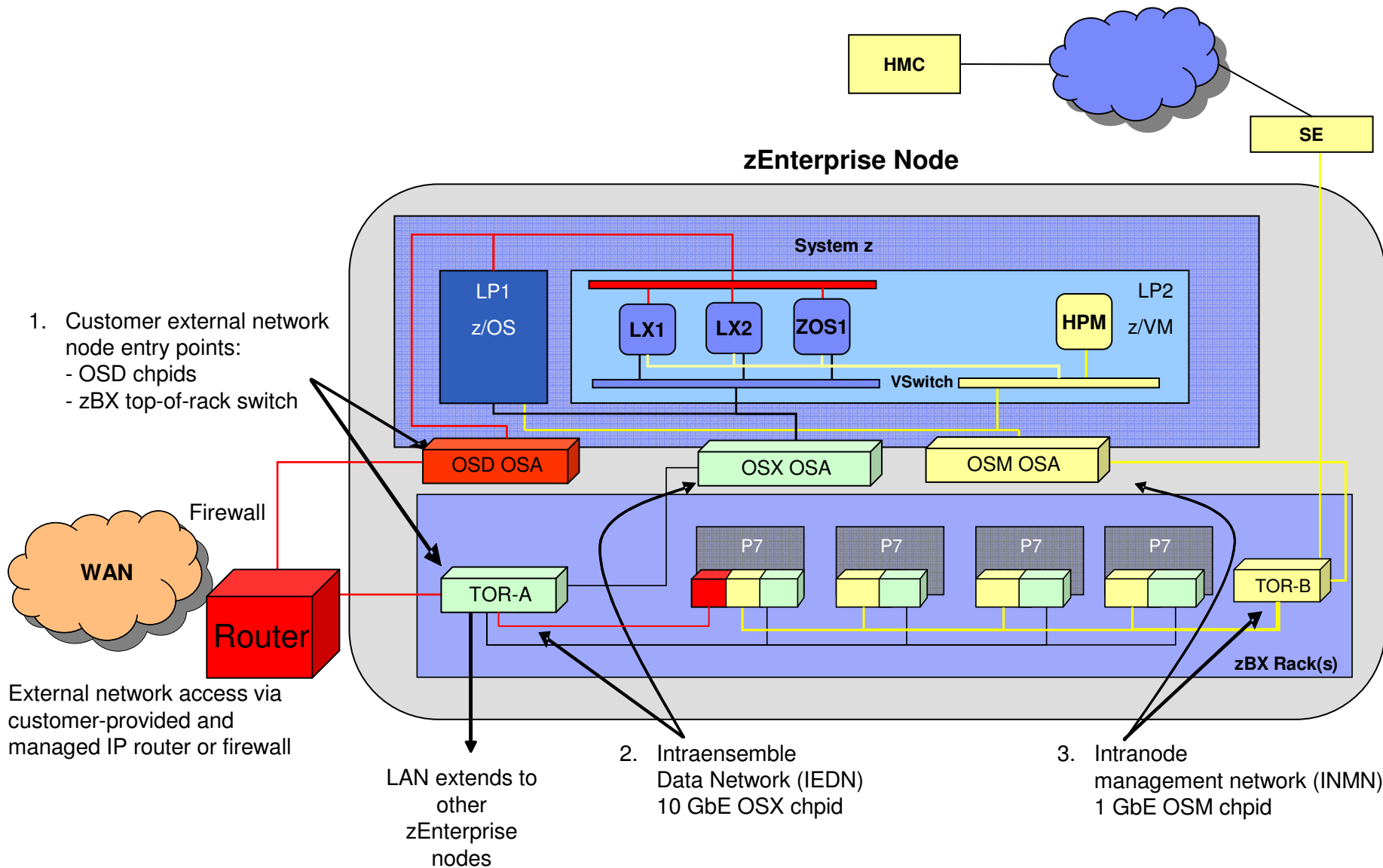
- **z/VM 6.1** - DirMaint Support for zEnterprise

- **z/VM 6.2** – DirMaint Support for z/VM Single System Image (SSI)
 - Single System Image Directories
 - How DirMaint Operates in a z/VM Single System Image
 - Support for New Directory Entry Types
 - Support for Other Directory Statements and Options
 - DASD Management

DirMaint Support for zEnterprise



z/VM 6.1: Support for zEnterprise



zEnterprise System Ensemble Management via zManager

- VM64822

- VM64904 *and* VM64917

- “SuperPTF” includes all service required for z/VM for:
 - z196 compatibility
 - zManager
 - <http://www.vm.ibm.com/service/vmrequirm.html>

- Enable zManager to performs system and virtual server management tasks
 - Virtual server configuration
 - Disk storage management
 - Virtual network management
 - Performance monitoring

- Virtual networks are really real...
 - IntraEnsemble Data Network – IEDN – OSX chpid type (you)
 - IntraNode Management Network – INMN – OSM chpid type (IBM)

- ...and really virtual
 - IEDN VSWITCH
 - z/VM guest access via dedicated OSX
 - INMN VSWITCH
 - Defined when SMAPI server is started

- Traditional network connections via OSD

zEnterprise in the context of z/VM DirMaint

- *A Directory Manager is required in an Ensemble*
 - DirMaint or a similar product

- Support of new OSA types:
 - DIRMAINT NICDEF
 - DIRM ADD and REPLACE

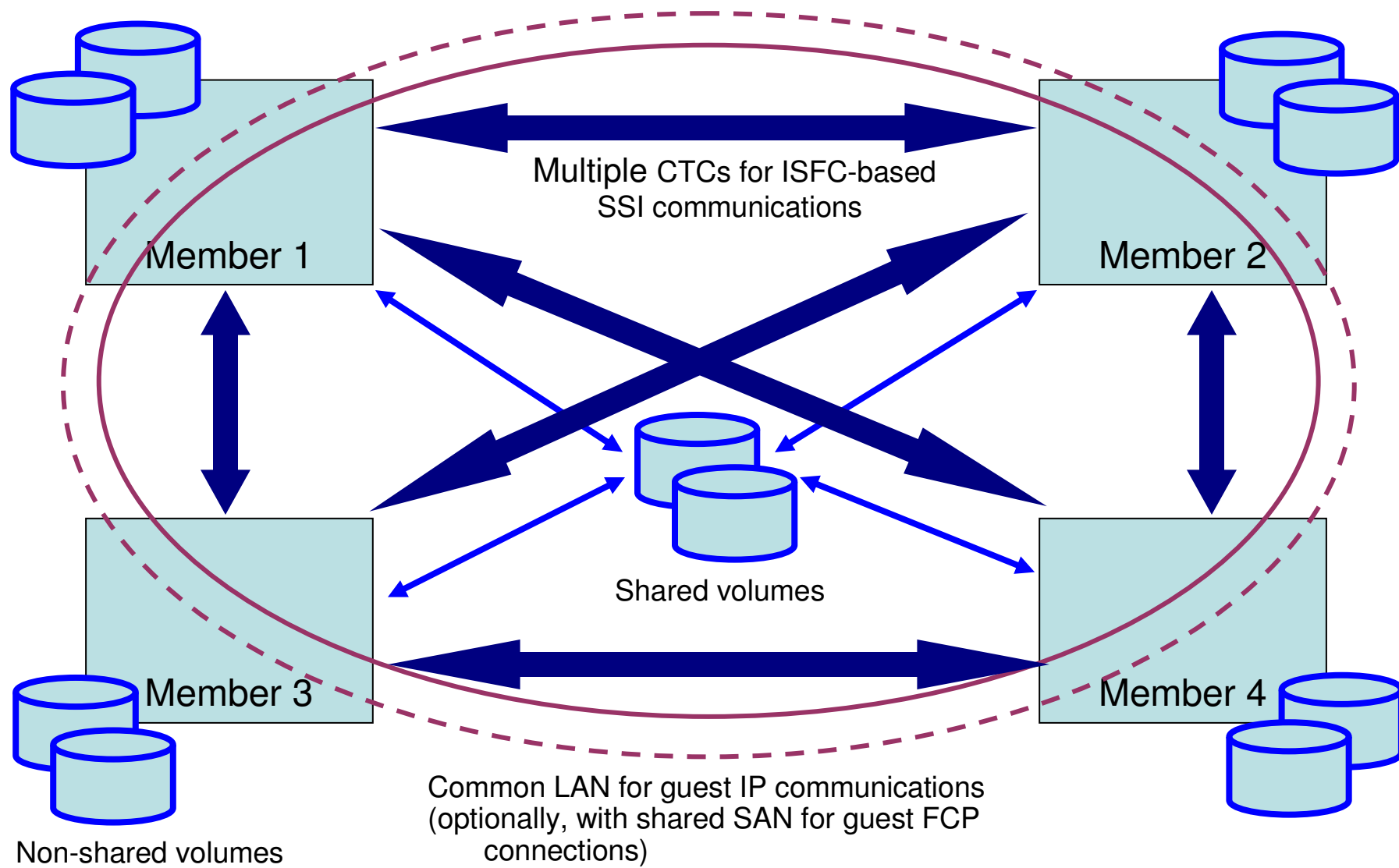
- Set up controllers for IEDN and INMN networks
 - Pre-defined controllers DTCENS1 and DTCENS2 for exclusive use by ensemble networks
 - DTCENS1 automatically creates a VSWITCH to provide SMAPI connectivity to INMN network

- Updates to configuration related to SMAPI worker machines
 - AUTHFOR CONTROL updates
 - ALLOW_ASUSER_NOPASS updates (on the 11F disk)

- *See chapter "Configuring z/VM for an Ensemble" in CP Planning and Administration manual*

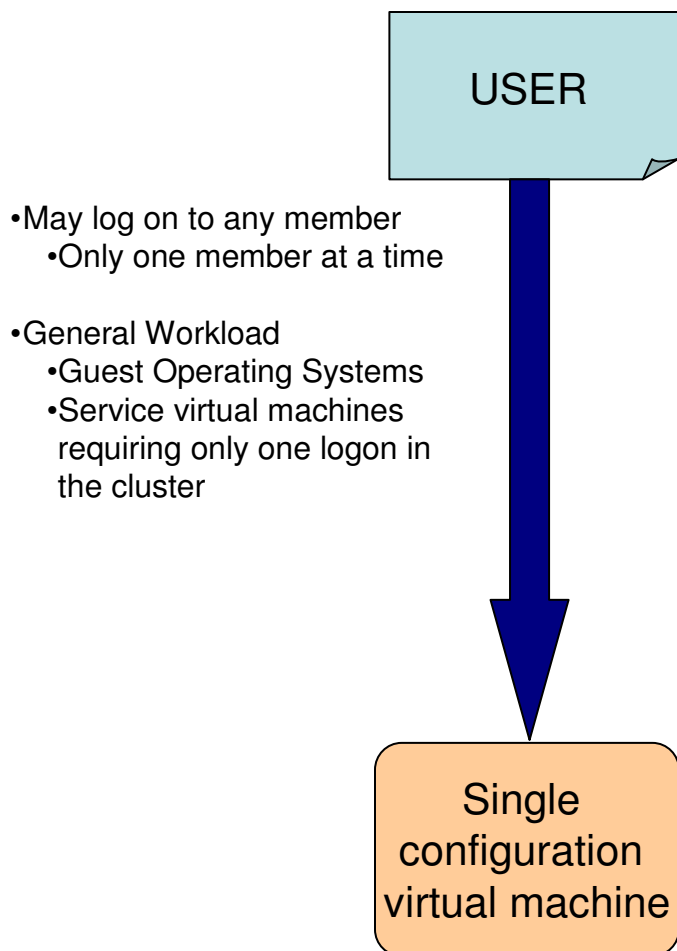
Single System Image Directories
-- a High-Level Overview

z/VM Single System Image clustering



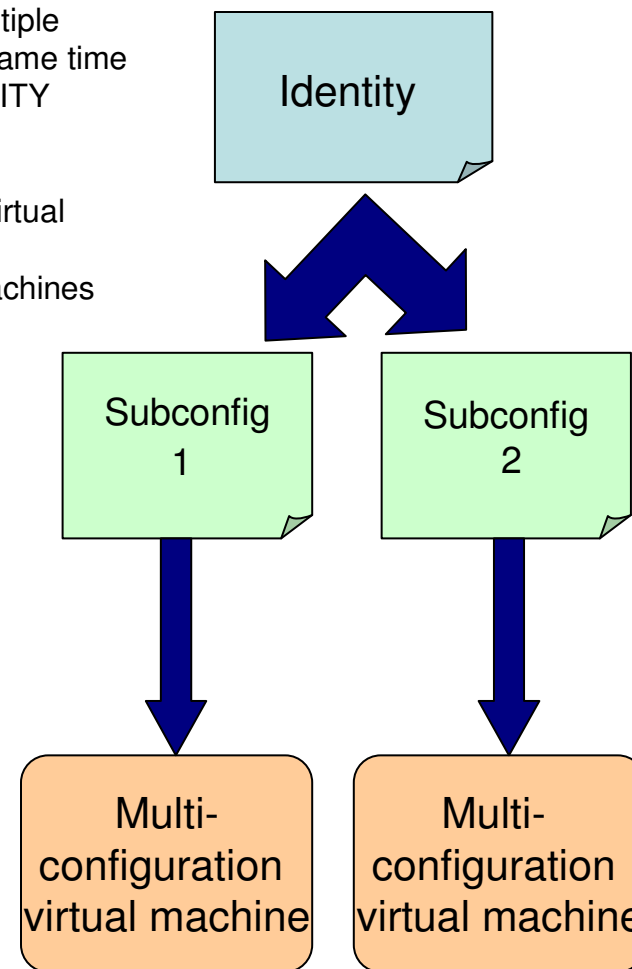
Shared Source Directory – Virtual Machine Definition Types

Traditional Definition

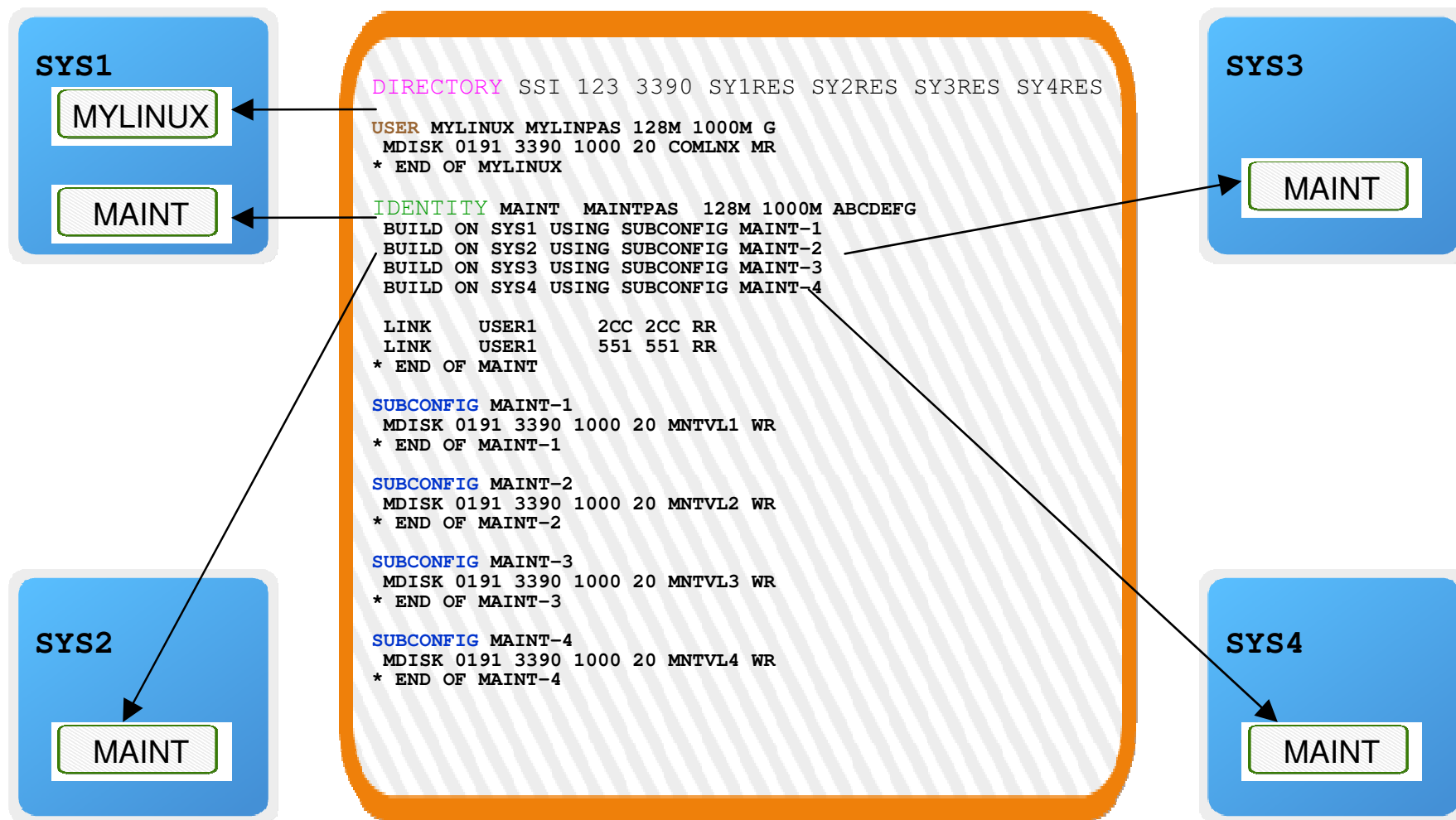


New Definition

- May log on to multiple members at the same time (known by IDENTITY statement)
- System support virtual machines
- Service virtual machines



New Directory Example



New Directory Layout

- IBM-supplied directory will be significantly different than previous releases
 - Both SSI and non-SSI installations
 - Directory for non-SSI installations will be in "SSI-ready" format
 - Facilitate future SSI deployment

- Many of the IBM-supplied userids will be “multiconfiguration virtual machines”

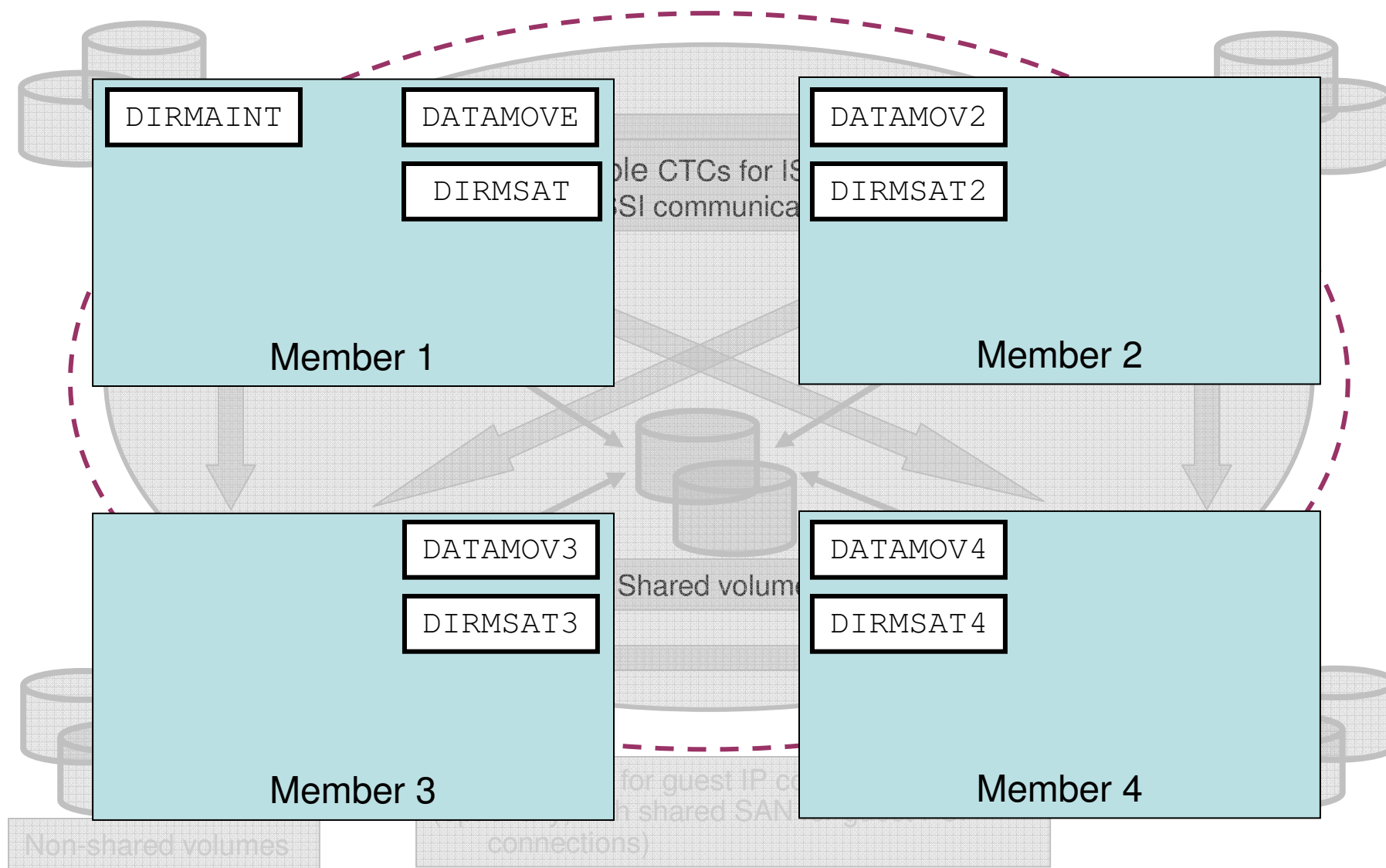
- Determine if any of your users should be defined as multiconfiguration virtual machines
 - Most will be single-configuration virtual machines
 - Userids defined on `SYSTEM_USERIDS` statements will usually be multiconfiguration virtual machines

- Merge your user definitions into the IBM-supplied directory

How DirMaint Operates In a Single System Image Cluster



DirMaint Virtual Machines in an SSI Cluster



Satellite Server Function

Object Directory Synchronization

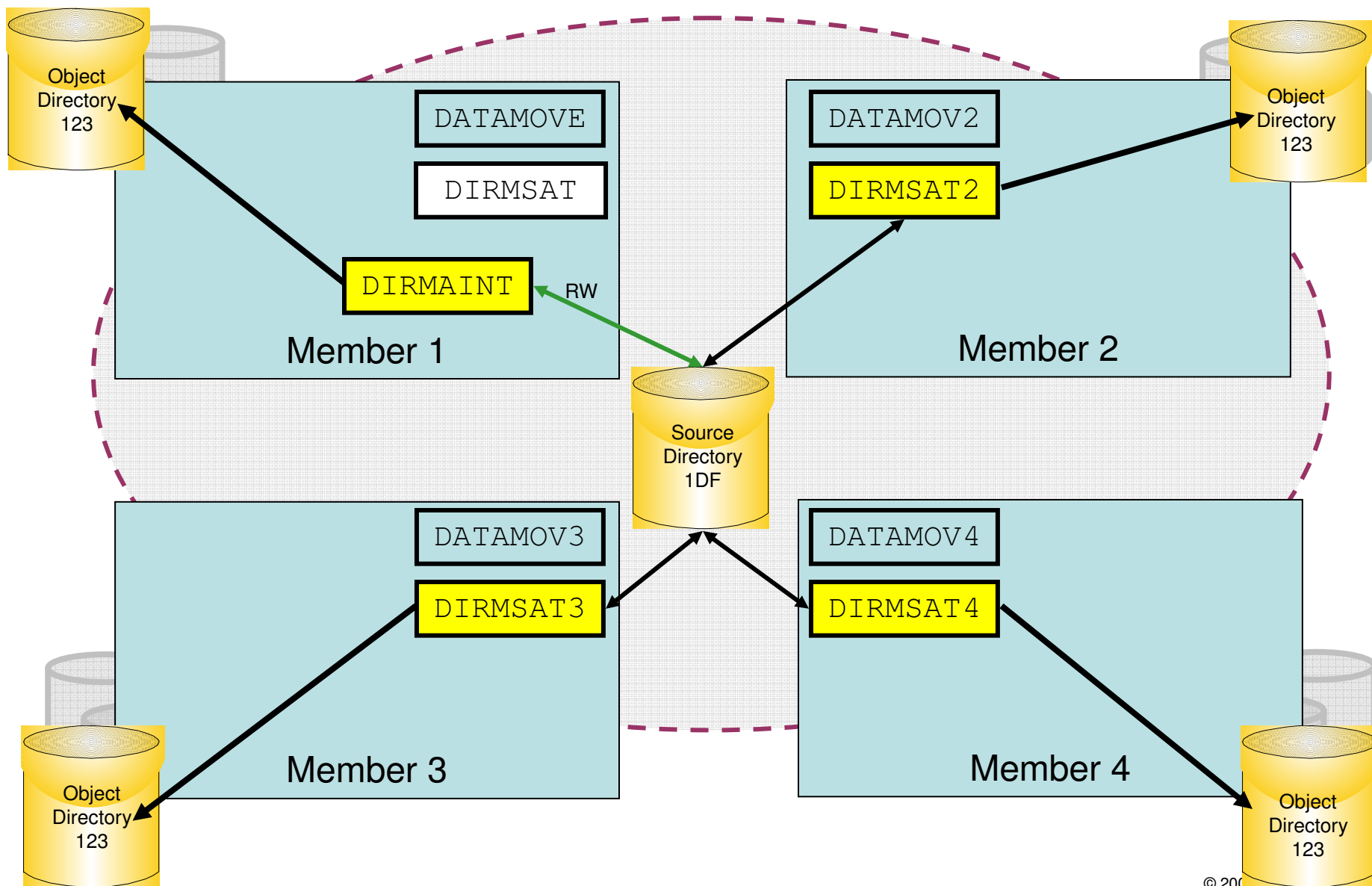
- Configure DIRMSATs using SATELLITE_SERVER= statement

– Example

```
SATELLITE_SERVER= DIRMSAT1 MEMBER1
SATELLITE_SERVER= DIRMSAT2 MEMBER2
SATELLITE_SERVER= DIRMSAT3 MEMBER3
SATELLITE_SERVER= DIRMSAT4 MEMBER4
```

- Run DIRMAINT machine on one node in SSI
- Run DIRMSAT machines on all other nodes to synchronize object directory changes
 - ONLINE= {IMMED | scheduled | OFFLINE}
- Define DIRMSAT machines on all nodes in case location of DIRMAINT machine changes
- New configuration file: **CONFIGSS DATADVH**

DirMaint Virtual Machines in an SSI Cluster



Satellite Server Function

Spool File Relay

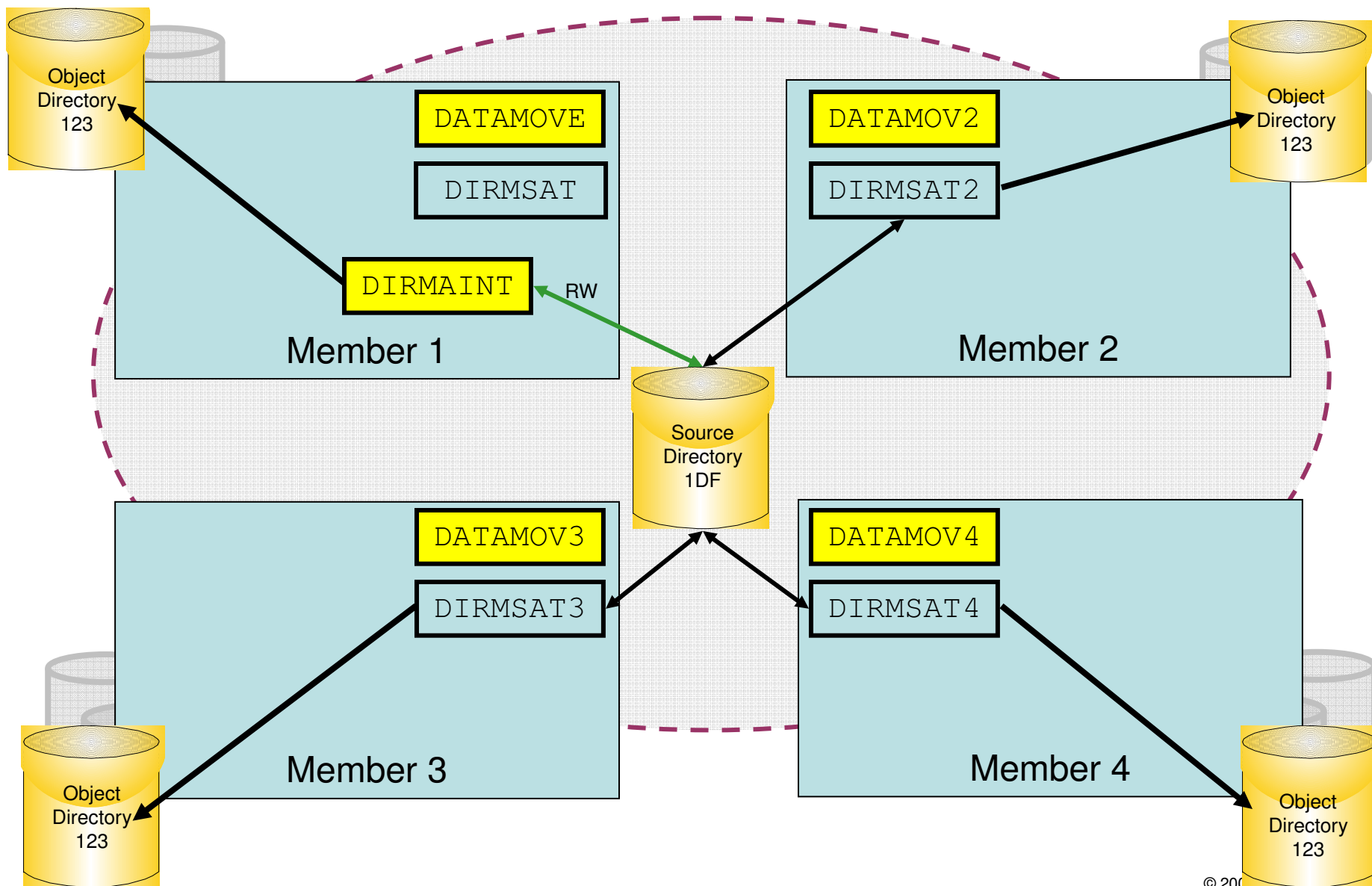
- Automatic Routes
 - No need for FROM= routing statements in configuration file
- DIRMAINT machine creates SATRELAY DATADVH file
 - First record either 'SSI' or 'NONSSI'
 - All subsequent records contain user id and node id of satellite server which is in same SSI as DIRMAINT machine
- DIRM command uses SATRELAY DATADVH to find satellite server to route commands through
- DIRMAINT machine uses SATRELAY DATADVH to find satellite server to route output through

Satellite Server Function

Spool File Relay

- RSCS required in CSE environment to route DIRM command output to users on remote nodes in respect to DIRMAINT machine
- SSI will not require customer to purchase RSCS
- In SSI, DIRMSAT machines configured on remote nodes will be used to relay DIRM commands to DIRMAINT machine
- DIRM command output will then be relayed back to user on remote node through same DIRMSAT machine

DirMaint Virtual Machines in an SSI Cluster



DATAMOVE

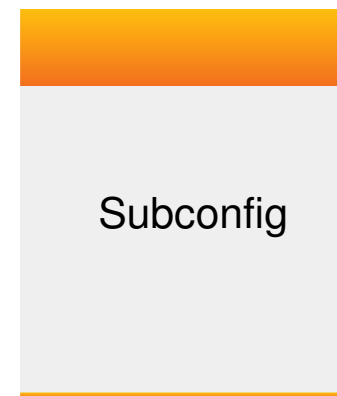
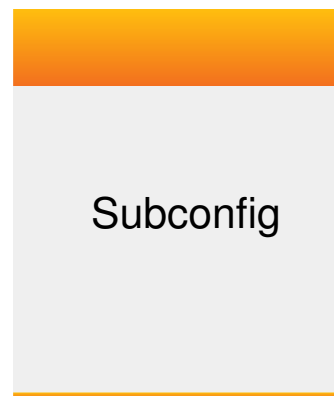
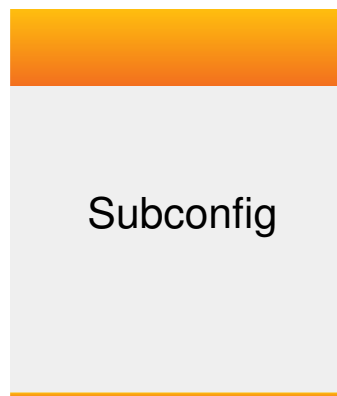
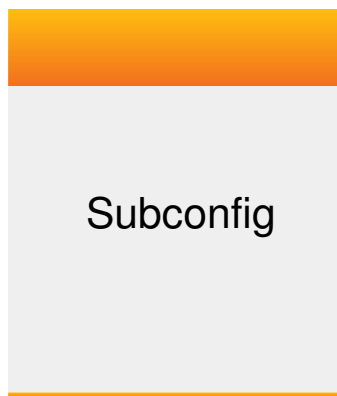
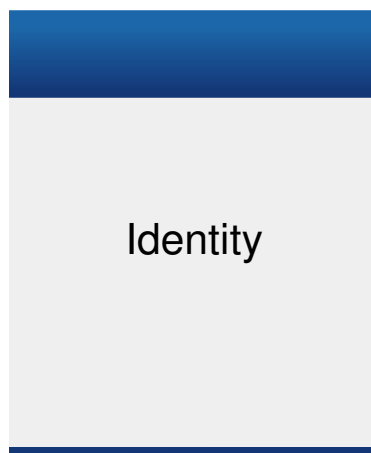
DATAMOVE Selection

- SYSAFFIN operand on DATAMOVE_MACHINE= statement is ignored in SSI and should be configured as '*'
 - Example

```
DATAMOVE_MACHINE= DATAMOV1 MEMBER1 *
```

```
DATAMOVE_MACHINE= DATAMOV2 MEMBER2 *
```
- ATnode prefix used to select DATAMOVE machine configured for specific node
 - DIRM FOR IDENT1 AT MEMBER2 DMDISK 991 CLEAN
- When ATnode not specified, DATAMOVE machine selected by system node associated with SUBCONFIG on BUILD statement
- New configuration file: **CONFIGSS DATADVH**

Support For New Directory Entry Types



Support For New Directory Entry Types

IDENTITY Entry Type

- Treated same as previous entry types (USER/PROFILE)
 - Specify IDENTITY identifier in FOR prefix
 - Example

```
DIRM FOR MAINT GET NOLOCK
```
 - Add using DIRM ADD
 - Replace using DIRM REPLACE
 - Delete using DIRM PURGE
 - Lock using DIRM LOCK
 - Unlock using DIRM UNLOCK

Support For New Directory Entry Types

SUBCONFIG Entry Type

- Treated same as previous entry types (USER/PROFILE)
 - Specify SUBCONFIG identifier in FOR prefix
 - Example

```
DIRM FOR MAINT-1 GET NOLOCK
```
 - Add using DIRM ADD
 - Replace using DIRM REPLACE
 - Delete using DIRM PURGE
 - Lock using DIRM LOCK
 - Unlock using DIRM UNLOCK
- IDENTITY and SUBCONFIG treated as separate entries

Updated Command: DIRMAINT ADD

Adding a Multiconfiguration Virtual Machine

1) DIRM ADD NEWIDENT or DIRM ADD NEWIDENT LIKE IDPROTO

- Do not specify BUILD statements in supplied NEWIDENT DIRECT or IDPROTO PROTODIR

2) DIRM ADD NEW-1 BUILD ON MEMBER1 IN NEWIDENT

- DirMaint adds BUILD statement to IDENTITY entry based on BUILD operand
- DirMaint adds new SUBCONFIG entry based on NEW-1 DIRECT

3) DIRM ADD NEW-2 LIKE NEW-1 BUILD ON MEMBER2 IN NEWIDENT

- DirMaint adds BUILD statement to IDENTITY entry based on BUILD operand
- DirMaint adds new SUBCONFIG entry based on existing NEW-1 SUBCONFIG entry
- If NEW-1 PROTODIR exists, DirMaint adds new SUBCONFIG based on PROTODIR

Updated Command: DIRMAINT REPLACE

- **No changes to command syntax**
- *Cannot change entry type* using DIRM REPLACE (e.g., USER to IDENT, IDENT to USER)
- *Cannot have multiple entry types* in one entry
- *Cannot remove BUILD statement*
 - Would leave orphaned SUBCONFIG
 - Must delete SUBCONFIG entry using DIRM PURGE

Updated Command: DIRMAINT PURGE

- **No changes to command syntax**

- When deleting a SUBCONFIG entry, DirMaint will remove associated BUILD statement from IDENTITY entry

- When deleting an IDENTITY entry, DirMaint will remove all related SUBCONFIG entries (no orphan policy)
 - IDENTITY password changed to NOLOG at beginning of processing
 - Spawns additional DIRM PURGE commands for each SUBCONFIG
 - IDENTITY is deleted only after last SUBCONFIG is removed

- DIRM PURGE CLEAN processing for new entry types is the same as that for USER entry types

Support For New Directory Entry Types

Authorization for Multi-Configuration Virtual Machines

- IDENTITY will automatically be authorized to handle its associated SUBCONFIGs.
- Define IDENTITY id in AUTHFOR CONTROL just like existing USER id
 -DIRM SEND, DIRM FILE
- IDENTITY id is sent to DIRMAINT server for authorization
- SUBCONFIG id is not used for authorization.

Support For New Directory Entry Types

Other DirMaint Operands

- DIRM ATnode prefix
 - DIRM FOR *ident_entry* AT *ssi_member* MAXSTOR 256M
 - Change will be made to SUBCONFIG specified on BUILD statement associated with *ssi_member*

- DIRM FOR *ident_entry* REVIEW
 - Shows SUBCONFIG entry associated with each BUILD statement

- DIRM USER NOPASS
 - Masks passwords for IDENTITY entries

- Minor changes to other existing commands
 - Reject use of command with inappropriate entry type
 - Provide existing exits with new directory entry type (IDENTITY or SUBCONFIG)

Support For New Directory Entry Types

Support for IDENTITY Pools

- Change DIRM POOL command to support IDENTITY entry type
- Change DIRM ADD to allow POOL statement processing for IDENTITY entry type
- Cluster-format directory entry changes
 - Use POOLPART keyword on LOAD statement

- *Note that a POOL of Multiconfiguration Virtual Machines cannot support SUBCONFIG entries!*

Support For New Directory Entry Types

RACF Connector Changes

- Change USER_CHANGE_NOTIFICATION_EXIT (DVHXUN)
 - Allow RACF updates for IDENTITY entries
 - Ignore SUBCONFIG entries (No RACF updates)

Support For Other Directory Statements and Options



Support for Other Directory Statements and Options

DIRECTORY (SSI option)

▪ Why It's Here:

- The DIRECTORY statement can now indicate whether the source directory is SSI-ready or structured for non-SSI operations
- The DIRECTORY statement can now tolerate up to four (4) volsers

▪ What Was Added:

- Change DIRM DIRECTORY operand to support new SSI option and up to 4 volsers
 - Update parser, fullscreen menu, and command handler
- With SSI option, only one DIRECTORY statement allowed
 - **New error message** when attempting to add more than one DIRECTORY statement when SSI option used
- Examples
 - DIRM DIRECTORY DELETE 2
 - DIRM DIRECTORY CHANGE 1 SSI 123 3390 DVHRS1 DVHRS2

New Commands: DIRMAINT SSI and DIRMAINT UNDOSSI

DIRM SSI

```
>>--DIRMaint--+-----+---SSI--SSI_node-----><
      '-- Prefix keywords --'
```

- Change SSI-Ready format directory to SSI-Enabled
 - Updates DIRECTORY statement with SSI option
 - Changes all BUILD ON * statements to BUILD ON *ssi_node*

DIRM UNDOSSI

```
>>--DIRMaint--+-----+---UNDOSSI--SSI_node-><
      '-- Prefix keywords --'
```

- Rolls back changes made by DIRM SSI operand
 - Removes SSI option from DIRECTORY statement
 - Changes all BUILD ON *ssi_node* statements to BUILD ON *
 - Directory must have only one BUILD statement per IDENT and system node on BUILD statement must equal *ssi_node*

Support for Other Directory Statements and Options

GLOBALOPTS (CHPIDVirtualization Option)

- Why It's Here: globally enables single-path CHPID Virtualization for all USERS, IDENTs, and PROFILES in the User Directory

- **What Was Changed:**
- Change DIRM GLOBALOptS operand to support new CHPIDVirtualization operands
 - Update parser, fullscreen menu and command handler
- CHPIDV ONE – single path chpid virtualization is active
- CHPIDV OFF – chpid virtualization is not active

- **Examples**
 - DIRM GLOBALOPTS CHPIDV ONE
 - DIRM GLOBALOPTS CHPIDV OFF
 - DIRM GLOBALOPTS CHPIDV DELETE

Support for Other Directory Statements and Options

OPTION (CHPIDVirtualization)

- **Why It's Here:** enables single-path CHPID Virtualization for a virtual machine, so that CHPID paths aren't lost during relocation. Required as a part of Guest Mobility.

- **What Was Changed:**
 - Change **DIRM OPTION** operand to support deleting CHPIDV option
 - Update parser and fullscreen menu
 - Change **DIRM SETOPTN** operand to support adding, changing and deleting CHPIDV option
 - Update parser and fullscreen menu
 - Examples
 - DIRM OPTION DELETE CHPIDV
 - DIRM FOR USER1 SETOPTN ADD CHPIDV ONE
 - DIRM FOR USER1 SETOPTN CHANGE CHPIDV OFF
 - DIRM FOR USER1 SETOPTN DELETE CHPIDV

- Note that these OPTIONS override the GLOBALOPTS version.

Support for Other Directory Statements and Options

VMRELOCATE

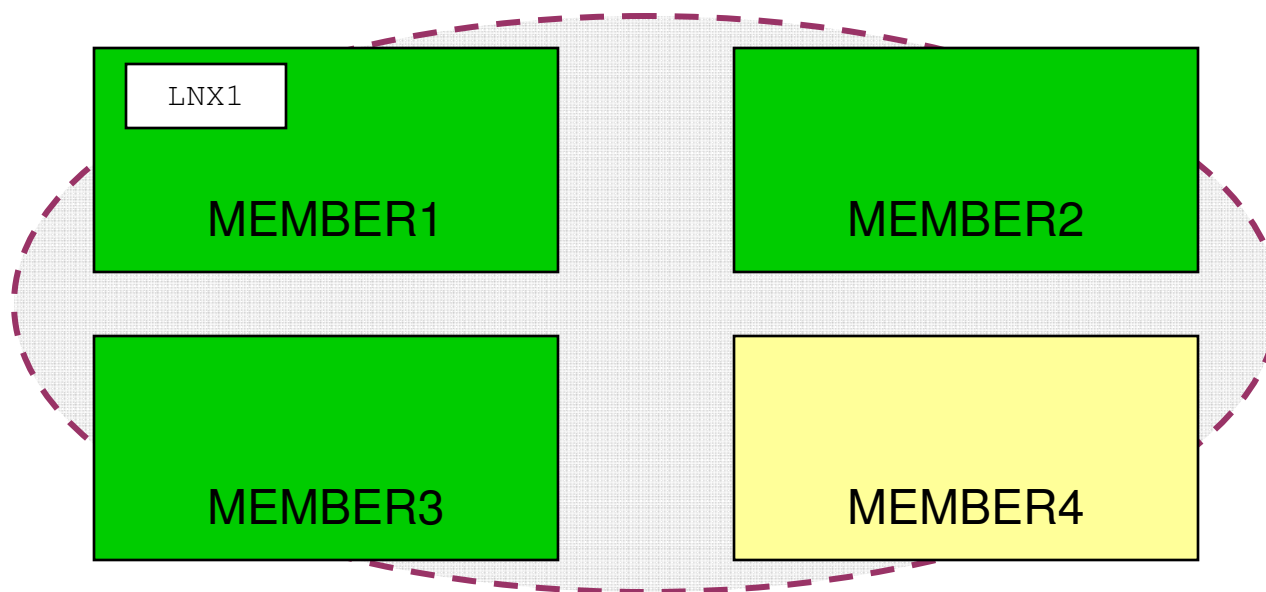
- **Why It's Here:** a new directory statement, VMRELOCATE, deals with the enablement of guest mobility and relocation domains for that particular userid.

* USER DIRECTORY

```
USER LNX1 J8675309 128M 256M G
* Sample User for DirMaint Presentation
VMRELOCATE ON DOMAIN SSI
```

* System Configuration File

```
RELOCATION_DOMAIN BLUE MEMBER1 MEMBER3
RELOCATION_DOMAIN GREEN MEMBER1 MEMBER3
MEMBER4
```



Support for Other Directory Statements and Options

VMRELOCATE

▪ What Was Added:

- Add new VMRELOCATE operand to allow querying, adding, changing and deleting VMRELOCATE statement in USER or PROFILE entry
 - Update parser and add fullscreen menu and command handler
 - Update 150CMDS DATADVH and DIRECTXA DATADVH files
- Define VMRELOCATE operands:
 - ON – enables relocation (default if ON or OFF not specified)
 - OFF – disables relocation
 - DOMAIN – defines the relocation domain (defaults to entire SSI)
- Examples
 - DIRM FOR USER1 VMRELOCATE ON DOMAIN PROD
 - DIRM FOR USER1 VMRELOCATE OFF
 - DIRM FOR USER1 VMRELOCATE DOMAIN SSI

DASD Management



DASD Management

SUBCONFIG MDISK Cloning

- Configure new :SSI_VOLUMES. section in EXTENT CONTROL file
- Use DIRM ADD *new_sub* LIKE *existing_sub* BUILD ON ...
- DirMaint will copy MDISK statements from existing SUBCONFIG into new SUBCONFIG, replacing the old volser with that specified in :SSI_VOLUMES.
- Disk copy is not done by DirMaint
 - Use DDR to copy entire volume of minidisks

DASD Management

SUBCONFIG MDISK Cloning

New :SSI_VOLUMES. Section in Extent Control File

- Place sets of DASD volumes into Volume Families
- Specify *volume_family ssi_member volser*
- Example

```
:SSI_VOLUMES.  
* Family      Member  Volser  
  RESIDENCE   VM1     RES1  
  RESIDENCE   VM2     RES2  
  RESIDENCE   VM3     RES3  
  RESIDENCE   VM4     RES4  
:END.
```

- DIRM ADD Processing
 - Finds volume family of existing MDISK using MDISK volser and member name associated with existing SUBCONFIG
 - Finds same volume family associated with member name of new SUBCONFIG and fetches new volser
- In order for DirMaint to provide extent checking, must still define volume in :REGIONS. section of EXTENT CONTROL file

DASD Management

DIRM DIRMAP Changes

- Extended to provide information regarding minidisks with local scope
- Local disk owner shown as IDENTITY id
- Exclude SYSAFFIN column in USER MDISKMAP report
- New SUBCONFIG and MEMBER columns at end of line in USER MDISKMAP and USER LINKMAP reports

DASD Management

DIRM DIRMAP USER MDISKMAP

```

USER          DIRECT      Map of Minidisks      13:36:25      20100513
-----
Volser        Type  Ownerid  Addr  Start      End      Length      Flags  Subconfig  Member
-----
DVHGCS        3390
              GCS     0443     1      24      24      GCS1     DVHTEST1
              GCS     0443     1      24      24      GCS2     DVHTEST2
              GCS     0443     1      24      24      GCS3     DVHTEST3
              GCS     0443     1      24      24      GCS4     DVHTEST4
              GCS     0595     25      25      1      GCS1     DVHTEST1
              GCS     0595     25      25      1      GCS2     DVHTEST2
              GCS     0595     25      25      1      GCS3     DVHTEST3
              GCS     0595     25      25      1      GCS4     DVHTEST4
DVHRES        3390  MAINT    0123     0      28      29      MAINT1    DVHTEST1
              MAINT    0123     0      28      29      MAINT2    DVHTEST2
              MAINT    0123     0      28      29      MAINT3    DVHTEST3
              MAINT    0123     0      28      29      MAINT4    DVHTEST4
  
```

DASD Management

DIRM DIRMAP USER LINKMAP

USER DIRECT Map of Links 13:37:35 20100513

Ownerid	Addr	Linkid	Addr	Mode	SysAffin	Volser	Type	Start	End	Length	Subconfig	Member
GCS	0595	RSCS	0595	RR	*	DVHGCS	3390	25	25	1	GCS1	DVHTEST1
GCS	0595	RSCS	0595	RR	*	DVHGCS	3390	25	25	1	GCS2	DVHTEST2
GCS	0595	RSCS	0595	RR	*	DVHGCS	3390	25	25	1	GCS3	DVHTEST3
GCS	0595	RSCS	0595	RR	*	DVHGCS	3390	25	25	1	GCS4	DVHTEST4
MAINT	0123	DIRMAINT	0123	MW	*	DVHRES	3390	0	28	29	MAINT1	DVHTEST1
		DIRMSAT1	0123	MW	*							
MAINT	0123	DIRMSAT2	0123	MW	*	DVHRES	3390	0	28	29	MAINT2	DVHTEST2

DASD Management

DIRM USEDEXT Changes

- Extended to provide information regarding minidisks with local scope
- Local disk owner shown as IDENTITY id
- Replace SYSAFFIN column with SSI Node

DASD Management

ALLVOLS USEDEXT

OwnerUid	VDev	SSINODE	Type	Start	Size	VOLSER	Notes
GCS	0443	DVHTEST3	3390-100	1	24	DVHGCS	
GCS	0443	DVHTEST4	3390-100	1	24	DVHGCS	Shared
GCS	0595	DVHTEST3	3390-100	25	1	DVHGCS	
GCS	0595	DVHTEST4	3390-100	25	1	DVHGCS	Shared
GCS	0191	DVHTEST3	3390-100	26	1	DVHGCS	
GCS	0191	DVHTEST4	3390-100	26	1	DVHGCS	Shared
RACFVM	0305	*	3390-100	27	68	DVHGCS	
MAINT	0123	DVHTEST3	3390-100	0	29	DVHRES	
MAINT	0123	DVHTEST4	3390-100	0	29	DVHRES	Shared

DASD Management

ALLREGS USEDEXT										
DASD USEDEXT REGION *										
GROUP	REGION	VOLUME	START	SIZE	(END)	OWNER	ADDR	SSI	NODE	NOTES
*	DVHRS1	DVHRS1	0	29	28	MAINT	0123	DVHTEST1		
*	DVHRS2	DVHRS2	0	29	28	MAINT	0123	DVHTEST2		
*	DVHGC1	DVHGC1	1	24	24	GCS	0443	DVHTEST1		
*	DVHGC2	DVHGC2	1	24	24	GCS	0443	DVHTEST2		

For more information ...

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 - Mail: [bwhugen at us dot ibm dot com](mailto:bwhugen@us.ibm.com)

- **Written Resources:**
 - z/VM Webpage: <http://www.vm.ibm.com/>
 - Manuals:
 - *z/VM Directory Maintenance Facility Tailoring And Administration Guide*
 - *z/VM Directory Maintenance Facility Commands Reference*
 - *z/VM Directory Maintenance Facility Messages*

With special thanks to:

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- John Franciscovich (z/VM Development: CP)



Dank u

Dutch

Merci

French

Спасибо

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Gracias

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Tack så mycket

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Hindi

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Obrigado

Brazilian
Portuguese

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Chinese

Dankon

Esperanto

Thank You

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German

Tak

Danish

Grazie

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நன்றி

Tamil

děkuji

Czech

ขอบคุณ

Thai

go raibh maith agat

Gaelic

Backup Slides



Debugging

Problem: I've added a user to the directory, but on MEMBER2 I cannot log on, as "the user does not exist in the CP directory."

Discussion: DIRMAINT updates the object directory on satellite members after the "local" object directory is updated. If a satellite machine (like DIRMSAT2) is not running disconnected, the object directory on MEMBER2 may not have been updated.

Or, if MEMBER2 was DOWN when the object directories were updated, MEMBER2 may be out of synch.

Commands to know:

- DIRMAINT SATELLITE GETCONSOLE * retrieve console data for sat machines
- DIRMAINT DIRECT * update the object directory

