# z/VM: Making Your Life Easier with DirMaint

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*z/VM Development*


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# Agenda

- What is DirMaint and why would I want to use it?
- Overview of installation and configuration
- Integrating DirMaint and RACF
- Updating the user directory using DirMaint commands
- How DirMaint Operates in an SSI Cluster


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# What Is DirMaint?

- Directory Maintenance Facility for z/VM (DirMaint) is a priced program product used to help manage the z/VM User Directory
- Distributed pre-installed in a disabled state as part of z/VM system
- Consists of a set of commands corresponding to z/VM User Directory statements
- Allows general users to control portions of their directory not affecting their privileges or resources
- Allows system administrators to easily make updates to the directory


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# What is DirMaint?

- DirMaint runs as a CMS application on z/VM
- DirMaint's service processes are simplified by using VMSES/E
- Consists of multiple service virtual machines that run disconnected and unattended
- Menus/panels are available for the complex commands
- Online HELP is available for commands and messages
- Provides log files of directory transactions


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# Why do I need DirMaint?

- Minimizes the possibility of human error through an automated process of managing the directory
- Ensures the integrity of the directory with auditing and access control
- Automates disk allocation, deallocation, and copying
- Prevents new minidisk space from being inadvertently allocated over existing extents
- Works with external security managers (RACF, etc)
- Is installed and maintained using the z/VM maintenance process


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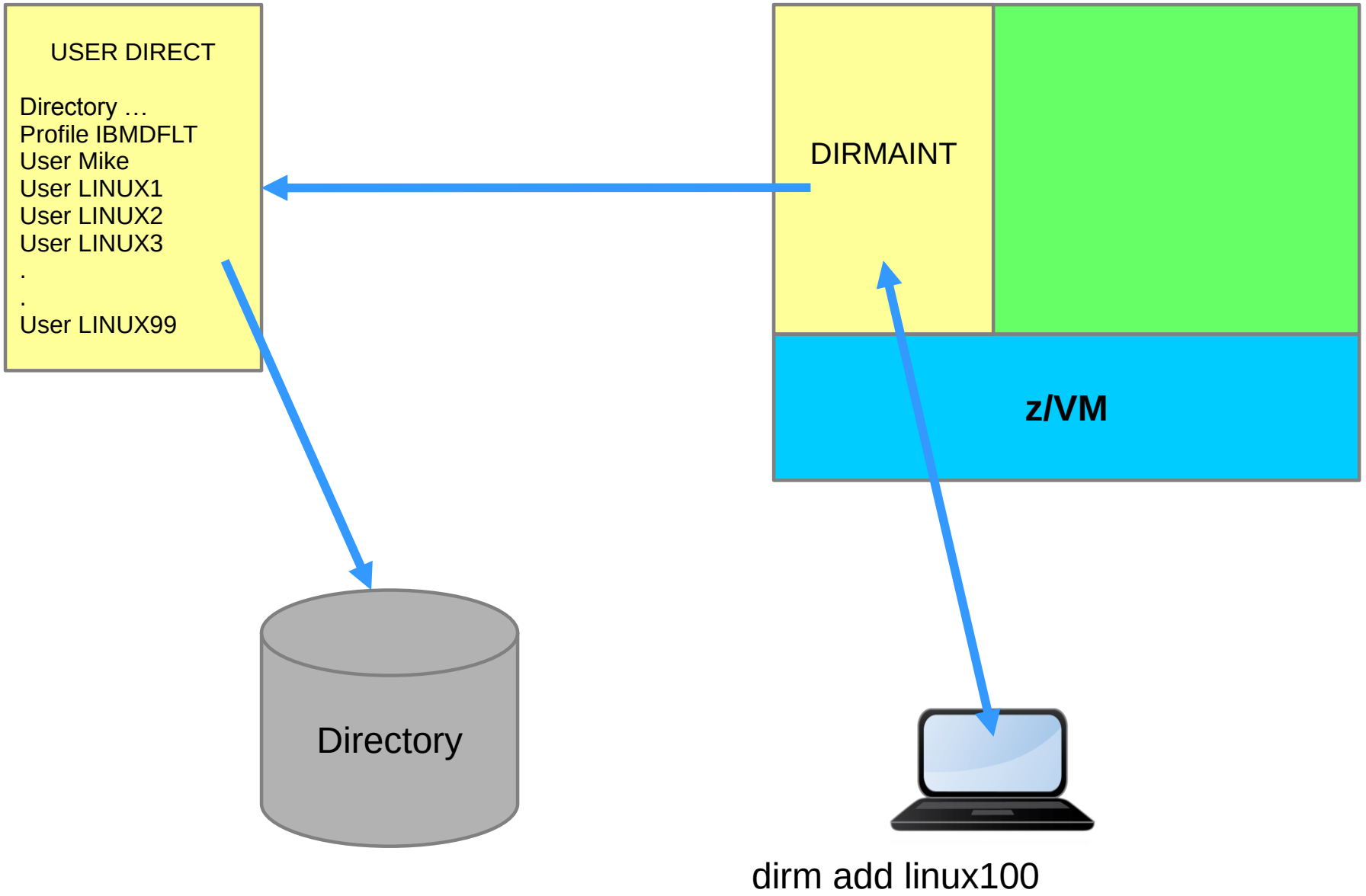
# How Does DirMaint Work?



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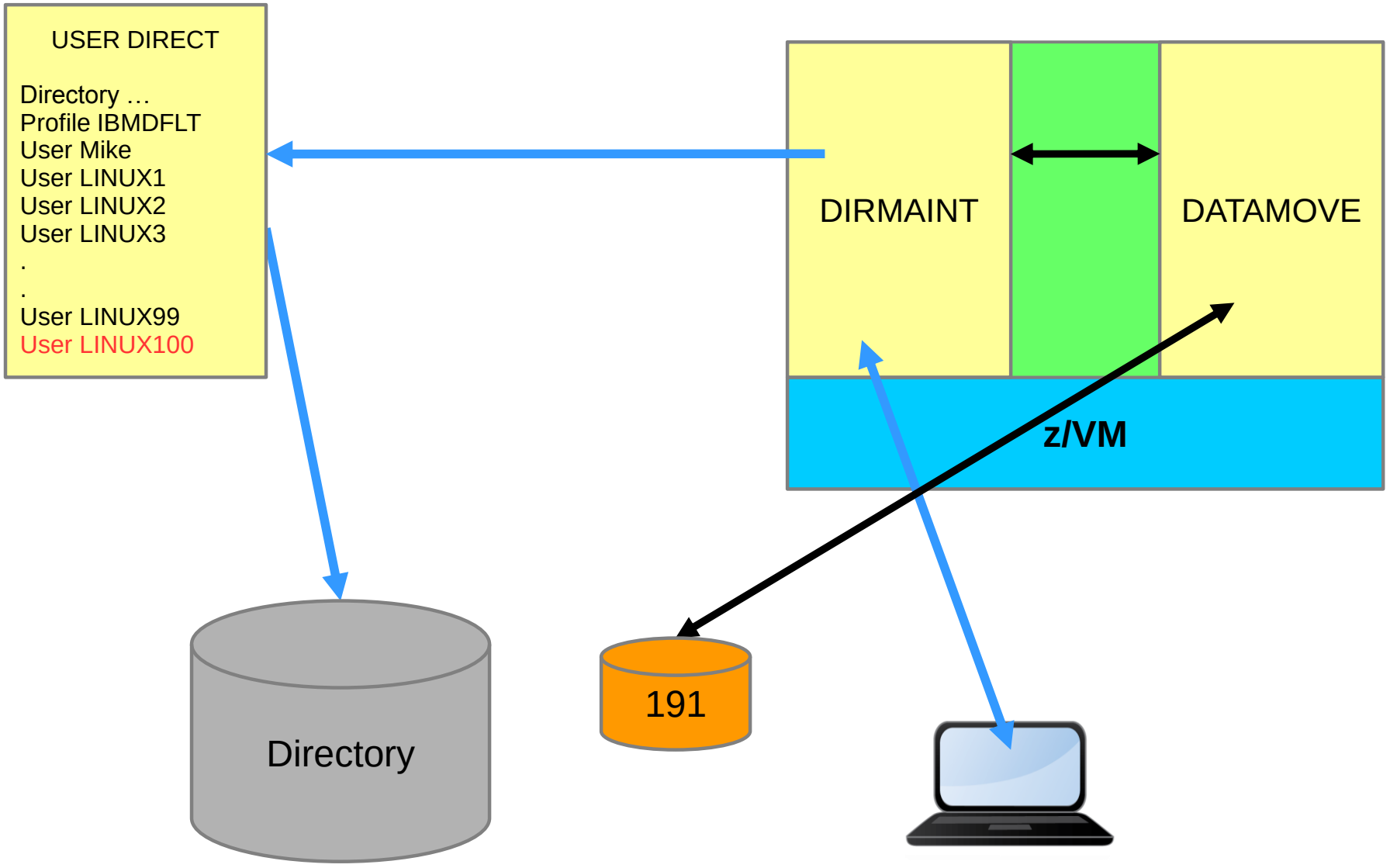
# How Does DirMaint Work?




dirm for linux100 amdisk 191



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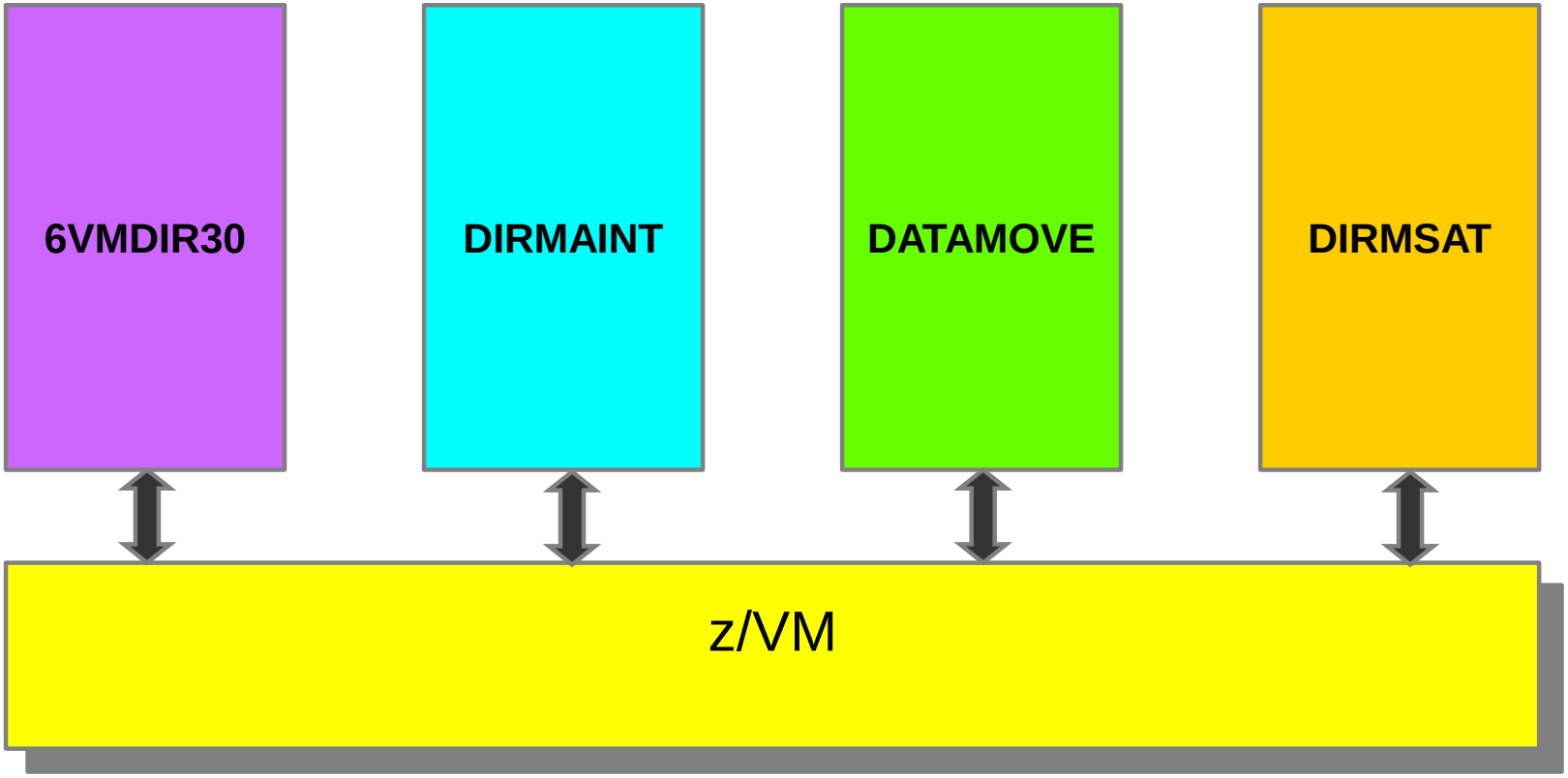
# DirMaint Service Virtual Machines



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# 6VMDIR30 DirMaint Service Machine

- DirMaint install and service user ID by default
- Owns all DASD space containing IBM-supplied DirMaint product code
- Contains customer tailored files and exit routines for the installation
- Owns disks containing local modifications to the product
- All disks are maintained using the VM installation and service tool, VMSES/E
- All other service machines must have access to the DirMaint Service machine code


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# DIRMAINT Virtual Service Machine

- Owns the CP source directory
- Receives transactions from authorized users
- Verifies that the transactions are valid
- Makes the appropriate updates to the source directory
- Controls allocation of DASD space to user virtual machines
- Allocates work among one or more DATAMOVE machines
- Monitors progress of the other service machines


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# DIRMAINT Virtual Service Machine

- In a multiple system cluster they notify satellite service machines whenever an update is made to the source directory
- Runs on any system in the cluster, but only on one system in the cluster at a time
- Maintains a duplicate copy of the source directory on a second disk


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# DATAMOVE Virtual Service Machine

- Formats newly allocated DASD space for the user with an optional user-specified minidisk label or block size.
- Formats a new extension to receive files from an existing disk, copies files from an existing disk to the new extent.
- Formats an old extension being deallocated again to prevent exposure of any residual data to the next user.


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# DIRMSAT Virtual Service Machine

- Allow synchronization of multiple object directories from a single source directory
- Responsible for manipulating object directory on systems other than the system the DIRMAINT server is on.
- Can have Multiple DIRMSAT servers all being used by one DIRMAINT server
- In an SSI cluster will additionally route DirMaint commands from users on its own system to the DIRMAINT machine and route command output files from DIRMAINT to the users on its system


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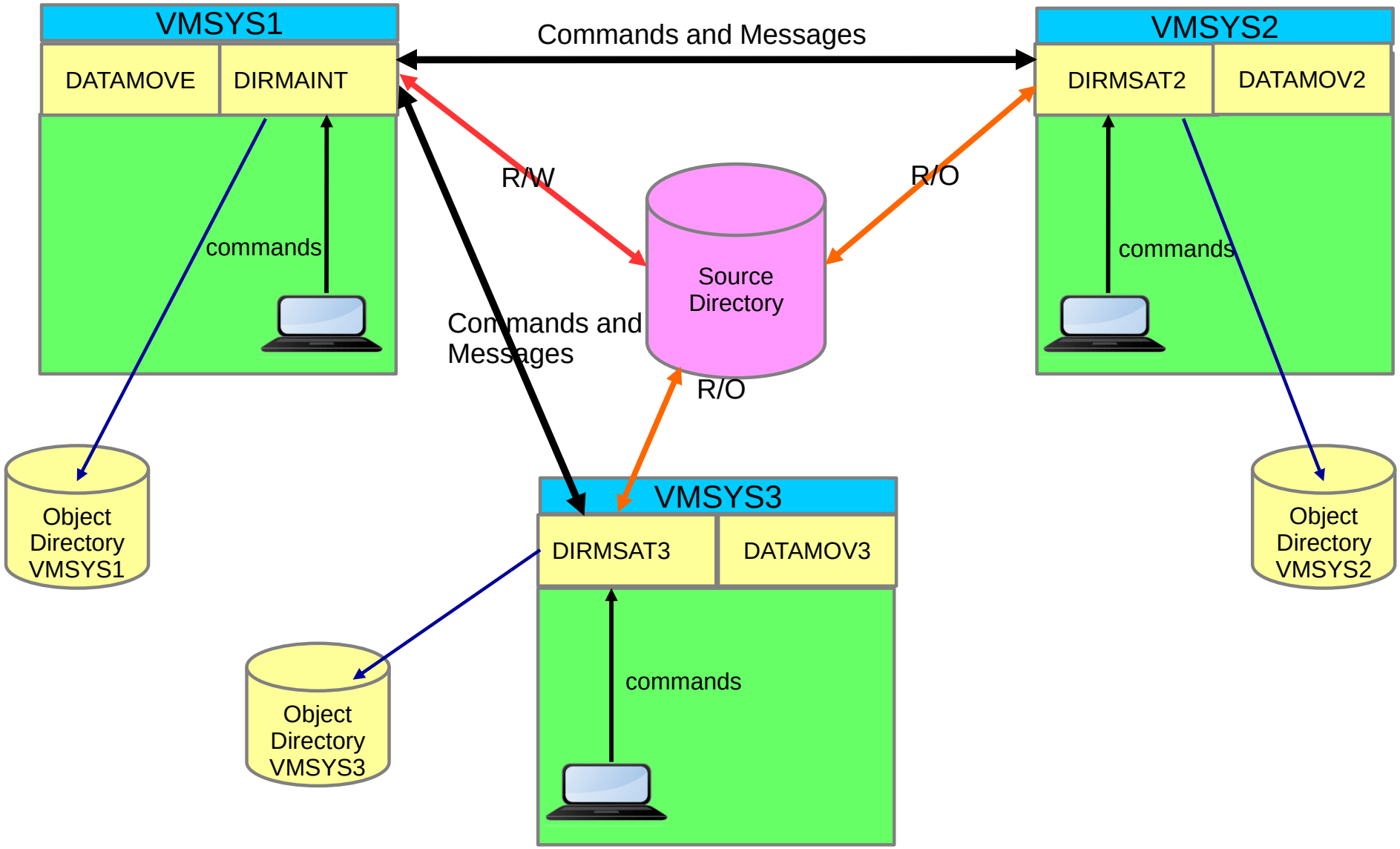
# How DirMaint Works in a Cluster



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# *Installation and Configuration*

# Installing DirMaint

- Fairly simple because DirMaint comes pre-installed with z/VM.

- Configuration files are needed to complete installation and tailor DirMaint to your system.

- Steps include:
  1) Enable DirMaint to indicate the product is liscensed.
  2) Update the initial service machine passwords
  3) Create and modify your configuration files
  4) Set up the EXTENT CONTROL file
  5) Copy your current version of the user directory into DirMaint
  6) Start DirMaint

For detailed installation information see:
Program Directory for Directory Maintenance Facility for z/VM


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# Configuring DirMaint

Important DirMaint Files:

- CONFIG DATADVH
- CONFIGnn DATADVH
- AUTHFOR CONTROL
- DATAMOVE DATADVH
- EXTENT CONTROL
- DEFAULTS DATADVH
- RPWLIST DATA

For additional information see:
Directory Maintenance Facility Tailoring and Administration Guide


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# CONFIG DATADVH

- Contains a large number of local customization options
- Allow DirMaint to work with an ESA, such as IBM's RACF
- Allow fine tuning for optimum performance in YOUR environment
- Enable or Disable optional capabilities

The format of the file is described within the file itself. It should be RECFM V, and must reside on the user interface disk(s).

Multiple CONFIG* DATADVH files are allowed and recommended.

The CONFIG DATADVH file is an IBM part that should never be modified.
Desired changes should be made in an override file.
An override file has a file name of CONFIG * and a file type of DATADVH.



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# CONFIG DATADVH

```
CONFIG   DATADVH  A2  V 80  Trunc=72 Size=1633 Line=134 Col=1 Alt=0
====>
      |...+....1....+....2....+....3....+....4....+....5....+....6....+....7.>
  134    RUNMODE=                          TESTING | OPERATIONAL
  135    SRCUPDATE=                        NOP     | DISABLED
  136    ONLINE=                           OFFLINE | SCHED         | IMMED
  137    UPDATE_IN_PLACE=                  YES     | NO
  138    ONLINE_VIA_DELTA=                 ON      | OFF
  139    WRK_UNIT_ONLINE=                  NO      | YES
  140    WRK_UNIT_DIAG84=                  NO      | YES
  141    WRK_UNIT_CLEANUP=                 ERASE   | RENAME
   142 // DIRECTXA_OPTIONS=                <MIXED <NOMIXMSG>> <&SYSRES +VMRES
      143    DIRECTXA_OPTIONS=
    144    DEFAULT_DIRECT_ACTION=           UNCONDITIONAL | CONDITIONAL
```

REMEMBER: Never modify this file!
You need to create override configuration files!



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# CONFIGxx DATADVH

```
 CONFIG99   DATADVH  A2  V 80  Trunc=72 Size=80 Line=4 Col=1 Alt=0
====>
      |...+....1....+....2....+....3....+....4....+....5....+....6....+....7.>
    4    RUNMODE=OPERATIONAL
    5    SRCUPDATE=NOP
    6    ONLINE=IMMED
    7    UPDATE_IN_PLACE=NO
    8 /  DISK_CLEANUP=YES
    9    CYL0_BLK0_CLEANUP=YES
   10    EXTENT_CHECK=ON
   11    DATAMOVE_MACHINE=DATAMOVE * *
   12    SATELLITE_SERVER=DIRMSAT *
   13    DVHDXD_FLASHCOPY_BEHAVIOR=0
   14 * * * End of File * * *
```

Order in which multiple CONFIG* DATADVH files are searched is significant.

- Searched in reverse alphabetical order: CONFIG99 before CONFIG0, CONFIG0 before CONFIGZZ, CONFIGZZ before CONFIGA, and CONFIGA before CONFIG.
- Two (or more) occurrences of the same file name, only the first one is used



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# AUTHFOR CONTROL

Contains a list of user ID's who are authorized to act for other user ID's

```
 AUTHFOR  CONTROL  E1  V 80  Trunc=80 Size=35 Line=0 Col=1 Alt=0
====>

      |...+....1....+....2....+....3....+....4....+....5....+....
    0 * * * Top of File * * *
    1 *TARGETID ORIGUSER ORIGNODE CMDL CMDSETS
    2  ALL DIRADMIN *                 140A ADGHMOPS
    3  ALL DIRADMIN *                 150A ADGHMOPS
    4  ALL DIRADMIN DVHTEST1 140A ADGHMOPS
    5  ALL DIRADMIN DVHTEST1 150A ADGHMOPS
    6  ALL DIRADMIN DVHTEST2 140A ADGHMOPS
    7  ALL DIRADMIN DVHTEST2 150A ADGHMOPS
    8  ALL DIRADMIN DVHTEST3 140A ADGHMOPS
    9  ALL DIRADMIN DVHTEST3 150A ADGHMOPS
   10  ALL DIRADMIN DVHTEST4 140A ADGHMOPS
   11  ALL DIRADMIN DVHTEST4 150A ADGHMOPS
   12  ALL DIRADMIN DVHTEST5 140A ADGHMOPS
```

**This file is CASE SENSITIVE!**
**You MUST include entries for 140A and 150A**



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# AUTHFOR CONTROL

## IBM Default Defined Command Sets

**A** Non-DASD user directory Administrator commands.
**D** DASD management user directory administrator commands.
**G** General user commands.
**H** Help Desk commands. Allows looking at things without allowing them to be changed.
**M** Monitoring commands. Allows use of MDAUDIT, PWGEN, PWMON, and SETPW commands,
**O** Operational support commands, such as BACKUP, NOTAPE, or SHUTDOWN
**P** Commands needed by automated administration Programs, such as: CLAS, DFSMS, DSO, IPF, NV/AS, RACF.
**S** Commands needed by the DirMaint owner and Support programmer.
**Z** Commands needed by the DirMaint service machines to communicate with each other.


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# DATAMOVE DATADVH

Controls time-driven events in the virtual machine

```
DATAMOVE DATADVH  C2  V 80  Trunc=80 Size=10 Line=0 Col=1 Alt=0
====>

     |...+....1....+....2....+....3....+....4....+....5....+....6....+....7.
   0 * * * Top of File * * *
   1 ==/==/== 00:00:05 00/00/00 CMS EXEC DVHNDAY
   2 ==/==/== 00:01:00 00/00/00 CMS EXEC DVHDAILY
   3 ==/==/== +01:00:0 00/00/00 CMS EXEC DVHOURLY
   4 ==/==/== 23:59:00 00/00/00 CP SLEEP 2 MIN
   5 * The following entry  will cause the DATAMOVE server to wake up every
   6 * 30 minutes and review the DVHDMCTL QUEUE file for any pending work
   7 * which can be processed.  30 minutes is a sample time only.  The
   8 * interval should be adjusted to best meet the performance and
   9 * usability characteristics for your system.
  10 ==/==/== +00:30:0 00/00/00 DMVCTL WAKEUP
  11 * * * End of File * * *
```



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# EXTENT CONTROL

Defines volumes being used for minidisk allocation

```
 EXTENT   CONTROL  A1  V 80  Trunc=72 Size=46 Line=21 Col=1 Alt=0
====>
   20 :REGIONS.
   21 *RegionId VolSer  Regstart  RegEnd Dev-type <---comments------
   22 DVHRES    DVHRES         0     2   3390-100 FOR CP DIRECTORY
   23 DVHRES    DVHRES        29    29   3390-100 FOR SYSMAINT 193
   24 DVHSYS    DVHSYS         1    99   3390-100 FOR SYSTEM DISKS
   25 DVHVOL    DVHVOL         1     4   3390-100 FOR DIRMAINT CODE
   26 DVHUVA    DVHUVA         1    74   3390-100 FOR USER DATA
   27 DVHUVB    DVHUVB         1    74   3390-100 FOR USER DATA
   28 :END.
   29 :GROUPS.
   30 *GroupName RegionList
   31 DVHUV     DVHUVA DVHUVB
   32 :END.
   33 :EXCLUDE.
   34 *VMUSERID VDEV <---COMMENTS-------------------------------------
   35 DATAMOVE 05F0
   36 DATAMOVE 05FF
   37 :END.
```

You must use 4 digit address on exclude statements and you must exclude all of the fullpack minidisks on your system.



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# DEFAULTS DATADVH

## Default Device Capacity Control File

```
 DEFAULTS DATADVH  D2  V 80  Trunc=80 Size=88 Line=33 Col=1 Alt=0
====>
   32
*****************************************************************
   33 -----------------------------------  33   line(s) not displayed
   56   3380-01        885
   57   3380-02       1770
   58   3380-03       2655
   59   3380-459      1459
   60   3380           885
   61   3380C          885
   62   3390-01       1113
   63   3390-02       2226
   64   3390-03       3339
   65   3390-09      10017
   66   3390-084      1084
   67   3390-100       100
   68   3390-151      2226
   69   3390-153      4365
   70   3390-568      1568
```



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# RPWLIST DATA

List of logon passwords that are not allowed to be used on your system

```
 RPWLIST  DATA    C1  F 80  Trunc=80 Size=35 Line=0 Col=1 Alt=0
====>

      |...+....1....+....2....+....3....+....4....+....5....+....
    0 * * * Top of File * * *
    1 APE      ***************************************************
    2 CAT      *              Restricted password list
    3 COW      *
    4 DOG      * Format Rules:
    5 DUCK     * 1) RPWLIST DATA must be fixed record length with
    6 PIG      *    a record length of at least 8.
    7 RABBIT   * 2) Each password must start in column 1.
    8 SHARK    * 3) Columns 1-8 must contain restricted passwords only.
    9 SNAKE    * 4) Each line must contain only one password.
   10 TIGER    * 5) Column 9 must contain a blank.
   11 WHALE    * 6) Columns 10-80 may be used for comments
   12 ZEBRA    ***************************************************
```



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# *Integrating DirMaint and RACF*

# DirMaint and RACF

When setup and configured, DirMaint calls the RACF Connector function to issue RACF commands for updates associated with certain DirMaint commands.

- User creation/deletion
- Password management
- POSIX segment management
- ACI group management
- Permission requests for facilities that require additional CP/RACF privileges
- Discrete resource profile creation/deletion

For DirMaint to be able to issue RACF commands and control RACF functions, it must be given either a group_SPECIAL or SPECIAL attribute.



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# CONFIGRC DATADVH

## Override file for RACF-specific configuration entries

```
CONFIGRC DATADVH  A2  V 80  Trunc=72 Size=15 Line=0 Col=1 Alt=0
===>
     |...+....1....+....2....+....3....+....4....+....5....+....6....+....7.>
   0 * * * Top of File * * *
   1 USE_RACF= YES ALL  /*!Use default IBM-supplied RACF Connector          *
   2 USE_RACF= NO  DVHRUN EXEC
   3 /*!-----------------------------------------------------------------*
   4 /*! Command handler for LOGONBY Change related commands.             *
   5 /*!-----------------------------------------------------------------*
   6 /USE_RACF= YES DVHRLB   EXEC
   7 /USE_RACF= NO  DVHRLB   EXEC
   8 /*!-----------------------------------------------------------------*
   9 RACF_ADDUSER_DEFAULTS=                  UACC(NONE)
  10 RACF_DISK_OWNER_ACCESS=                 ACC(ALTER)
  11 RACF_RDEFINE_VMPOSIX_POSIXOPT.QUERYDB=  UACC(READ)
  12 RACF_RDEFINE_VMPOSIX_POSIXOPT.SETIDS=   UACC(NONE)
  13 RACF_RDEFINE_SURROGAT_DEFAULTS=         UACC(NONE) AUDIT(FAILURES(READ))
  14 RACF_RDEFINE_VMBATCH_DEFAULTS=          UACC(NONE) AUDIT(FAILURES(READ))
  15 RACF_RDEFINE_VMRDR_DEFAULTS=            UACC(NONE) AUDIT(FAILURES(READ))
  16 RACF_RDEFINE_VMMDISK_DEFAULTS=          UACC(NONE) AUDIT(FAILURES(READ))
```



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# *DirMaint Commands*

# DirMaint Command Syntax

The general format of a DirMaint command is:

**DIRMaint [ prefix ] command [ cmd_options ]**

Where:

**DIRMaint** is the name of the DIRMAINT EXEC

**prefix** is an optional keyword along with any required operands

**command** is the DirMaint command

**cmd_options** are any options that are passed to the command

Example: DIRM for linux1 get



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# DirMaint Help

====> DIRM HELP

( Place your cursor on the item of interest and press <enter> )

====> DIRM HELP Add
( You can use command abbreviations – DIRM HELP A )

====> DIRM HELP DVH1093

For additional information see:

Directory Maintenance Facility Commands Reference GC24-6188-04
Directory Maintenance Facility Messages GC24-6189-03


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# DirMaint Menu for GET

```
-----------------------------------------------DirMaint GET-----------------------------------------------

Retrieve a copy of a user or profile directory entry.


Optionally select one of the following:
        _ LOCK    (default)
        _ NOLOCK

Updated directory entries can be restored to the directory
Using the REPLACE operand.




5741-A07 (c) Copyright IBM Corporation 1979, 2011.
   1= Help     2= Prefix Operands      3= Quit     5=Submit      12=Cursor
====>
                                                                  Macro-read 1 File
```



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# DirMaint Menu for Prefix Operands

```
-----------------------------------------DirMaint Prefix Operands-----------------------------------------

Fill in the Prefix Operand values to be updated:

   FORUSER    ===>        Affected Source Directory Entry
   ATNODE     ===>        System Affinity for CSE Cluster
   ASUSER     ===>        Authority Check Against This Id
   BYUSER     ===>        Password Validation Id
   TOSYS      ===>        Remote System Name
   MULTIUSER ===>         Source Directory Entry Pattern
   Administrator Password, if required.
   PRESET    ===>
Optionally select one of the following:
     _ NODIRECTXA
       RETURNVIA  _ MESSAGES  _ RDRFILE

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  1= Help     3= Quit     5= Update     12= Cursor
====>
                                                    Macro-read 1 File
```



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# Useful DirMaint Commands

```
SEND      Request a copy of a DirMaint control file
FILE      Add or replace a DirMaint control file
RLDCode   Cause DirMaint to reload its operating procedures
RLDExtn   Cause DirMaint to reload its CONFIG* DATADVH file
Add       Add a new user or profile directory entry
REView    Review a user or profile directory entry
AMDisk    Add a new minidisk
DEDicate  Add or delete an existing dedicate statement
DMDisk    Remove a minidisk
LOGONBY   Allow users to access different IDs with their password
Mdisk     Change the access mode and passwords for minidisks
STorage   Change logon storage size
SETOptn   Add, change, or delete CP options
CLAss     Change CP class for a directory entry
SPEcial   Add or delete an existing special statement
TMDisk    Transfer minidisk from one user ID to another
GET       Retrieve a user's directory entry for update
REPLACE   Replace an user's directory entry
```



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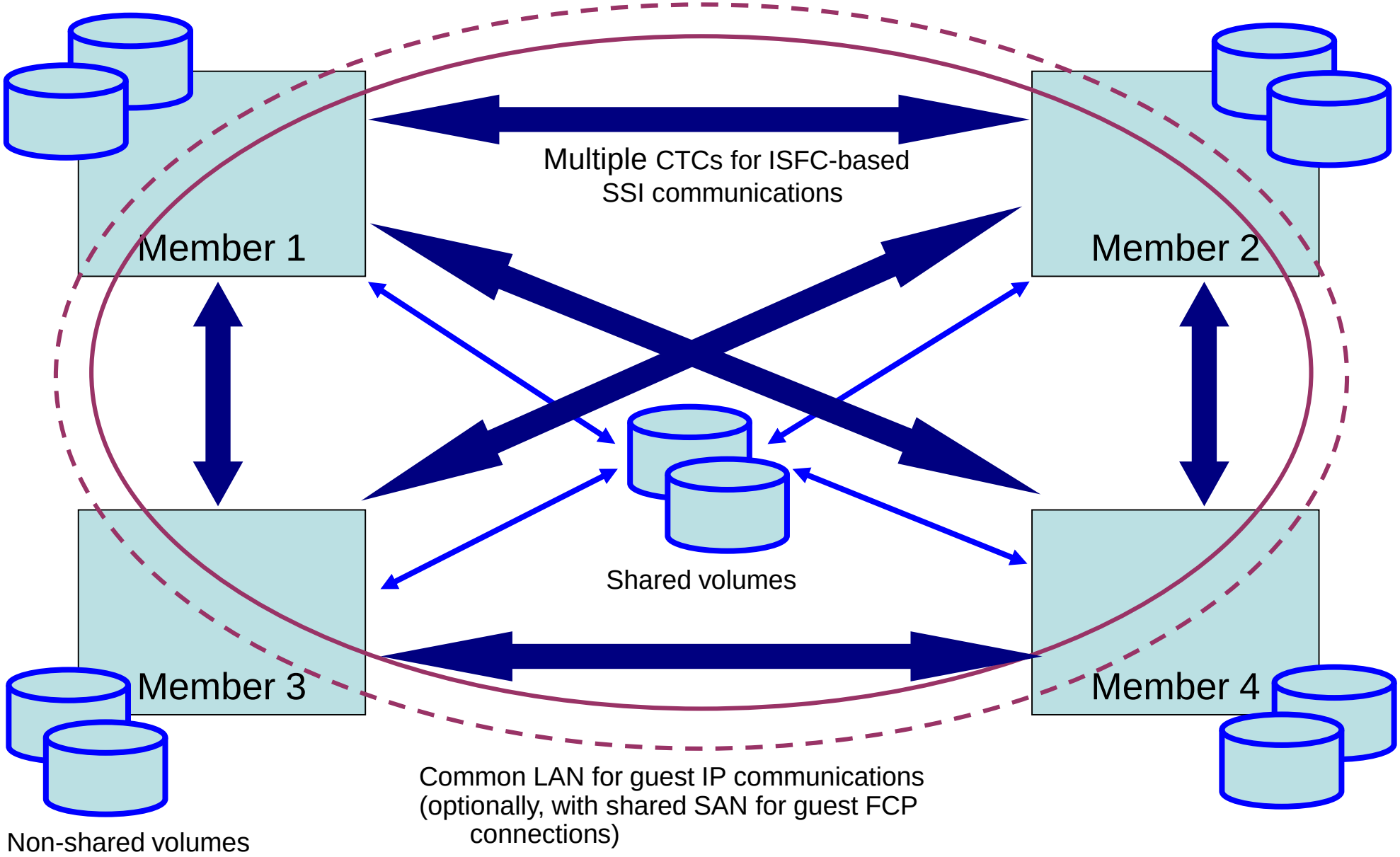
# How DirMaint Operates in a Single System Image Cluster

# z/VM Single System Image Clustering



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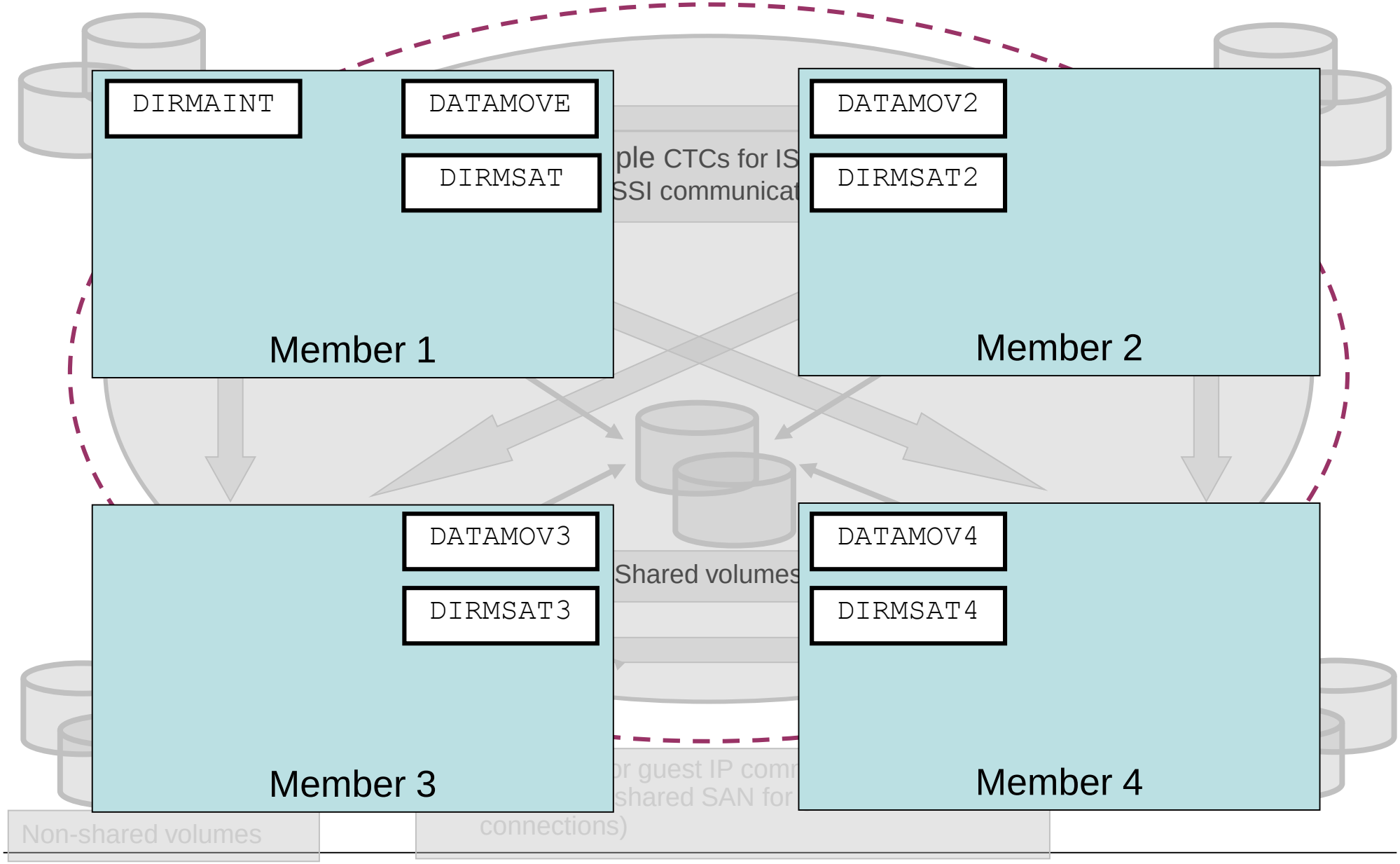
# DirMaint Virtual Machines in an SSI Cluster



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# Satellite Server Function

**Object Directory Synchronization**

- Configure DIRMSATs using SATELLITE_SERVER= statement
  - Example

```
SATELLITE_SERVER= DIRMSAT  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
- Define DIRMSAT machines on all nodes in case location of DIRMAINT machine changes
- New configuration file: CONFIGSS DATADVH



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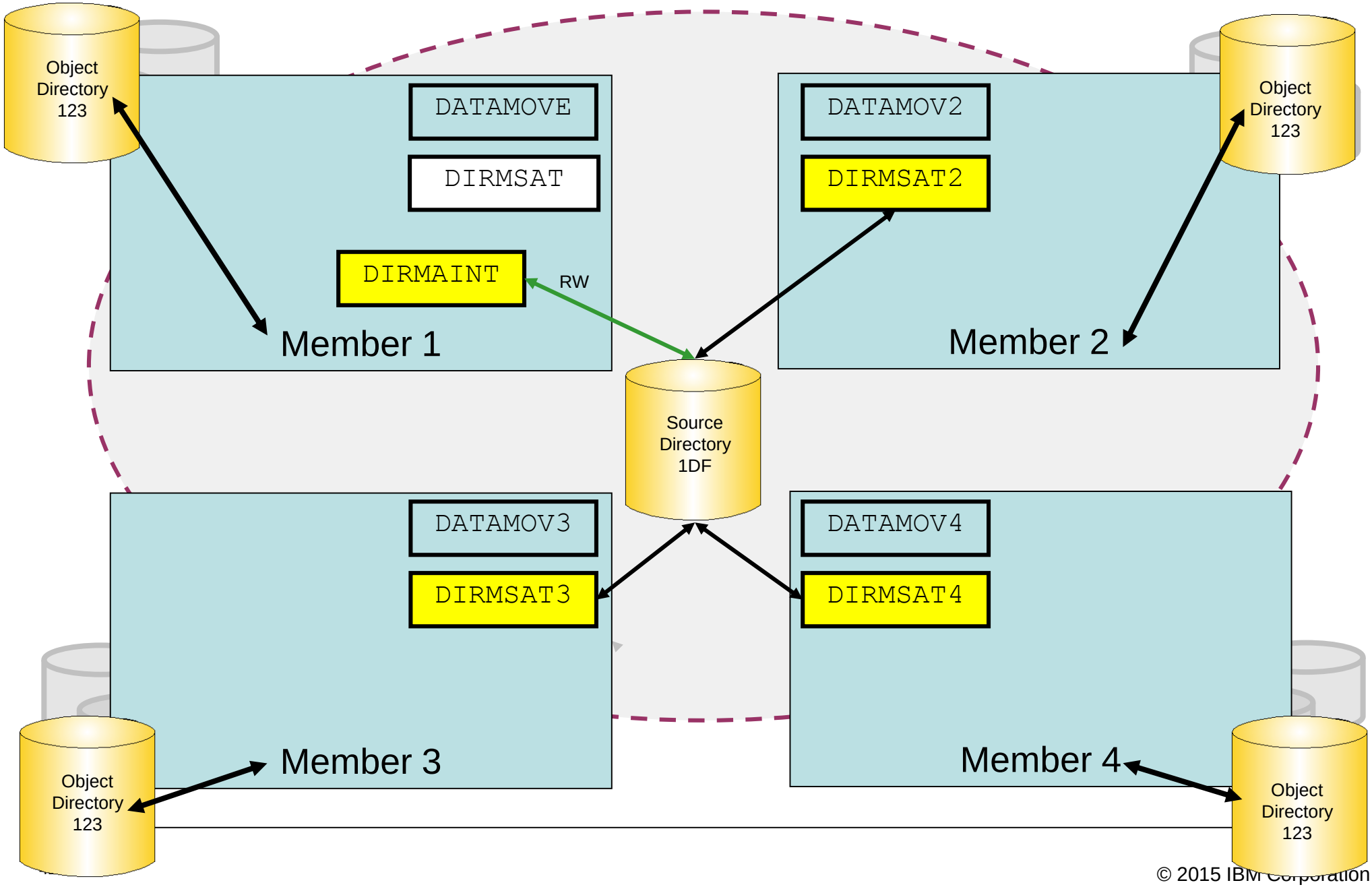
# Satellite Server Function

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# 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



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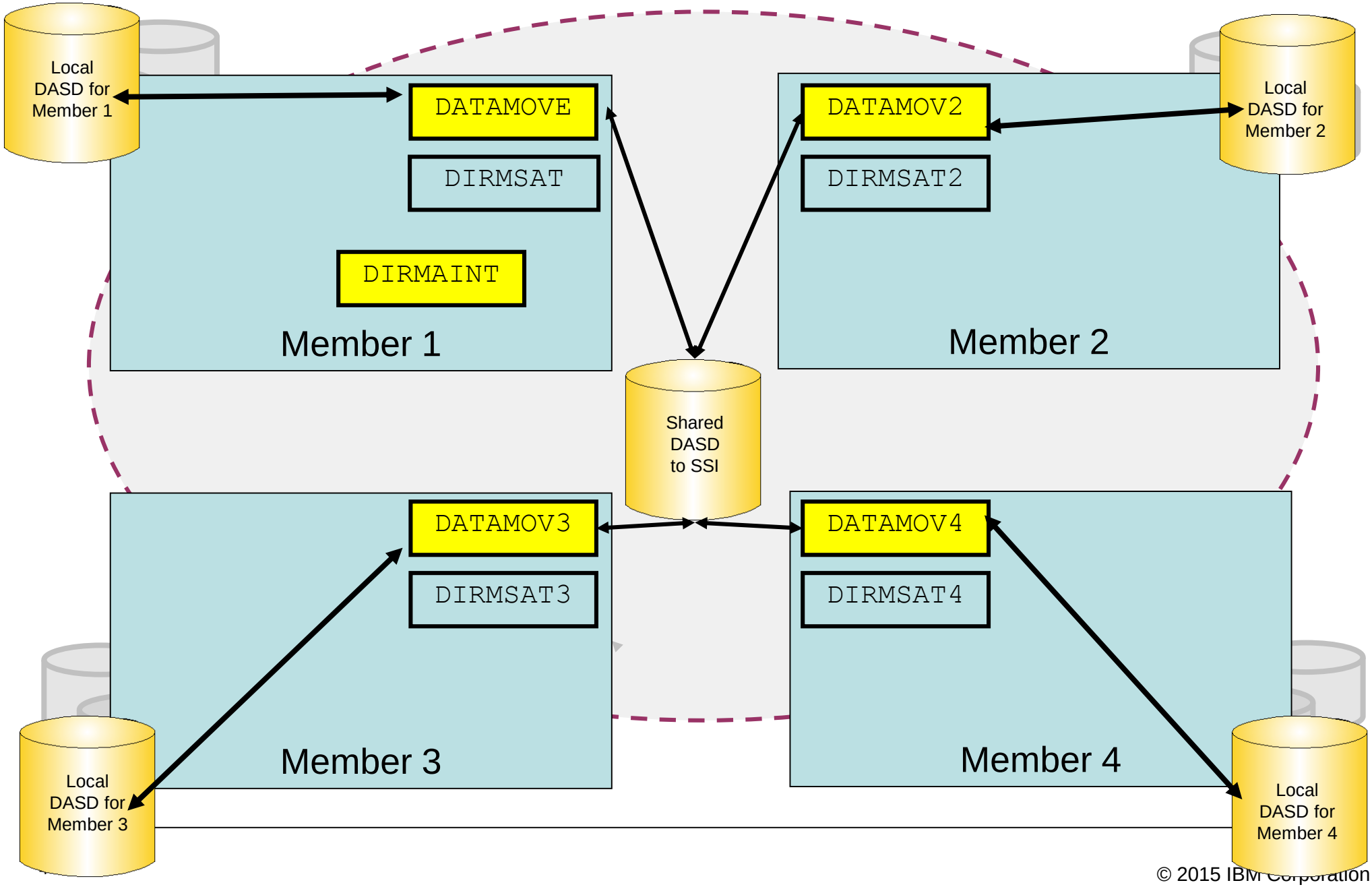
# DATAMOVE Function

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# DATAMOVE Function

**DATAMOVE Selection**

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

```
DATAMOVE_MACHINE= DATAMOVE 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



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# 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



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# DirMaint Support Added for SSI

- Prefix Keywords and Commands updated to handle IDENTITY/SUBCONFIG
- Authorization using IDENTITY (SUBCONFIG is not used)
- RACF Connector changed to allow updates for IDENTITY (SUBCONFIG entries ignored)
- GLOBALOPTS adds CHPIDVirtualization Option
- SETOPTN support for CHPIDV
- DIRECTORY SSI option to indicate if the source directory is SSI-enabled. With the SSI option only one DIRECTORY statement is allowed but can specify up to 4 volsers.


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# 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*



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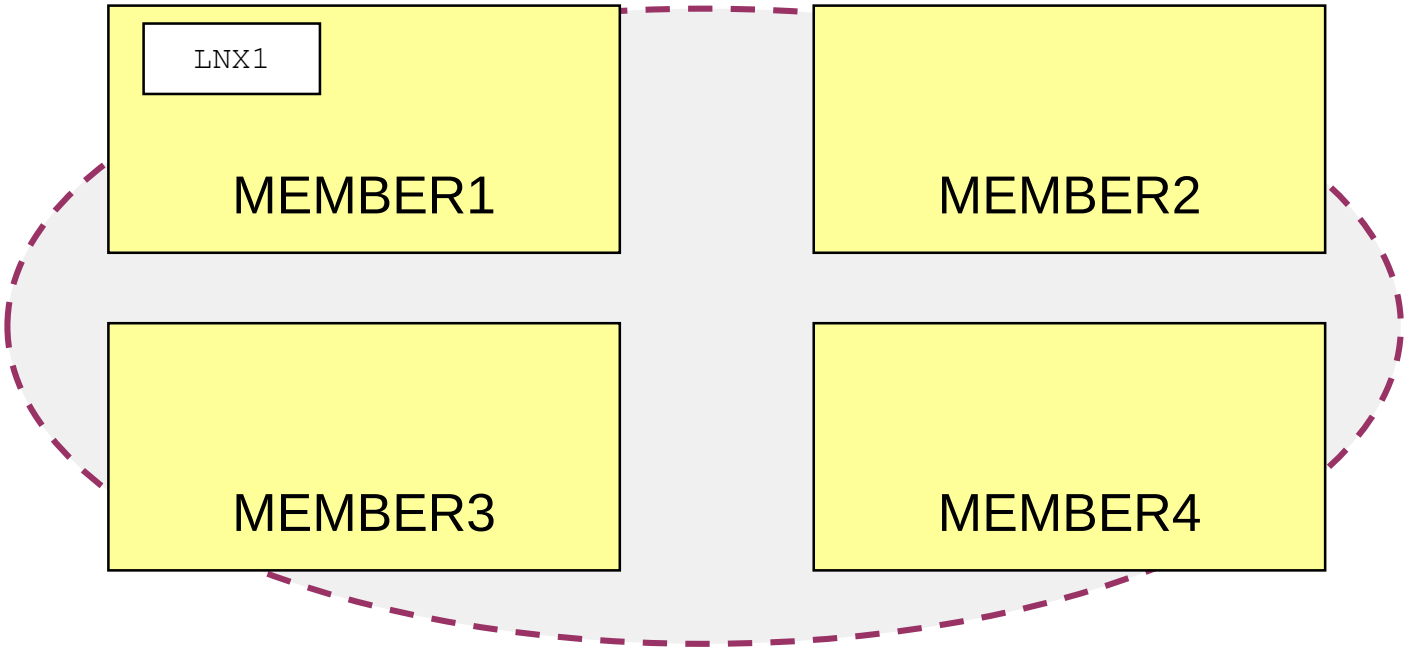
# VMRELOCATE

- **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 J0675309 128M 256M G
* Sample User for DirMaint Presentation
VMRELOCATE DOMAIN ON SCIT
```

```
/* System Configuration File */
RELOCATION_DOMAIN BLUE MEMBER1 MEMBER3
RELOCATION_DOMAIN GREEN MEMBER1 MEMBER3 MEMBER4
```



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# 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`


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# Why choose DirMaint?

- Easy to install and service
- Improves efficiency
- Customizable
- Updates are logged
- Access is controlled
- Automated directory management minimizes error


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# QUESTIONS???



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# For More Information:

**References:**

- **Program Directory for Directory Maintenance Facility for z/VM**
- **z/VM Directory Maintenance Facility Tailoring and Administration Guide**
- **z/VM Directory Maintenance Facility Commands Reference**
- **z/VM Directory Maintenance Facility Messages**
- **z/VM Web page: http://www.vm.ibm.com/**

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**Thanks:**


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شكراً
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धन्यवाद
Hindi

תודה רבה
Hebrew

Obrigado
Brazilian Portuguese

谢谢
Chinese

Dankon
Esperanto

Thank You

ありがとうございます
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Trugarez
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děkuji
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ขอบคุณ
Thai

go raibh maith agat
Gaelic

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