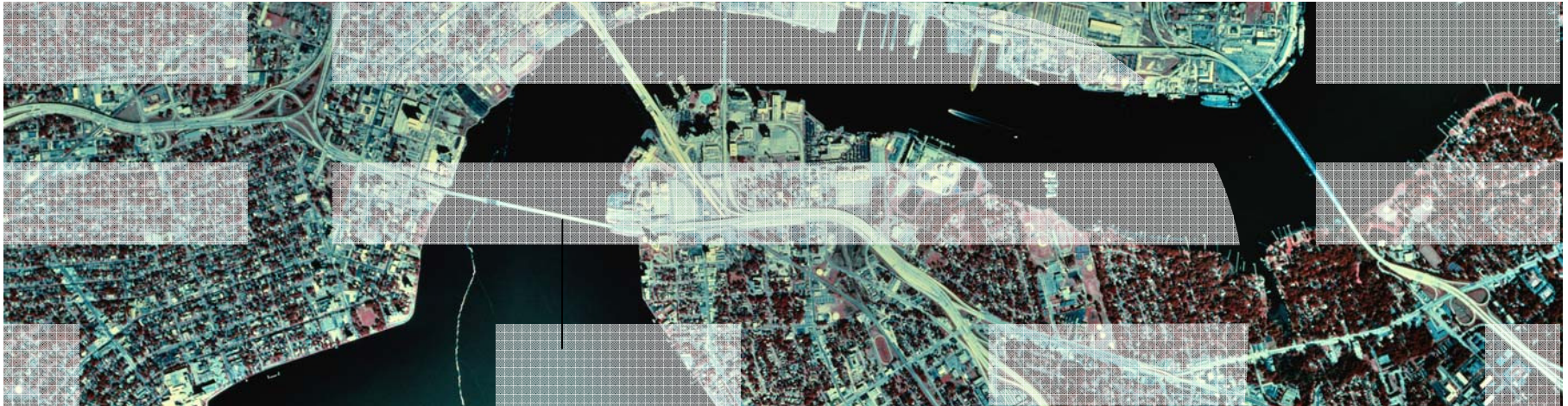IBM

Planning and Migrating to z/VM Single System Image (SSI)

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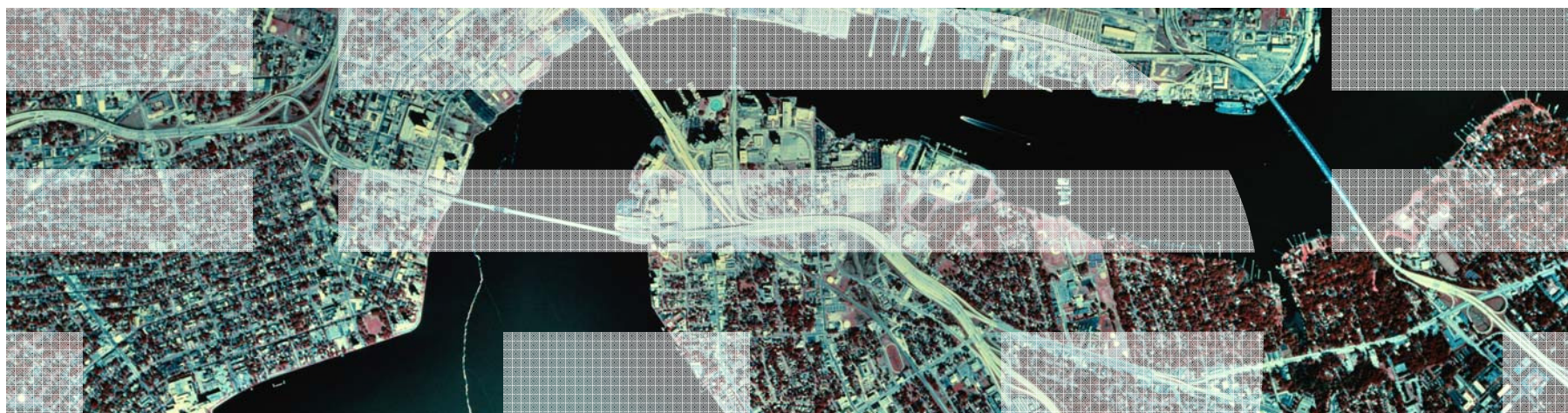
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Acknowledgement and Thanks to

John Franciscovich
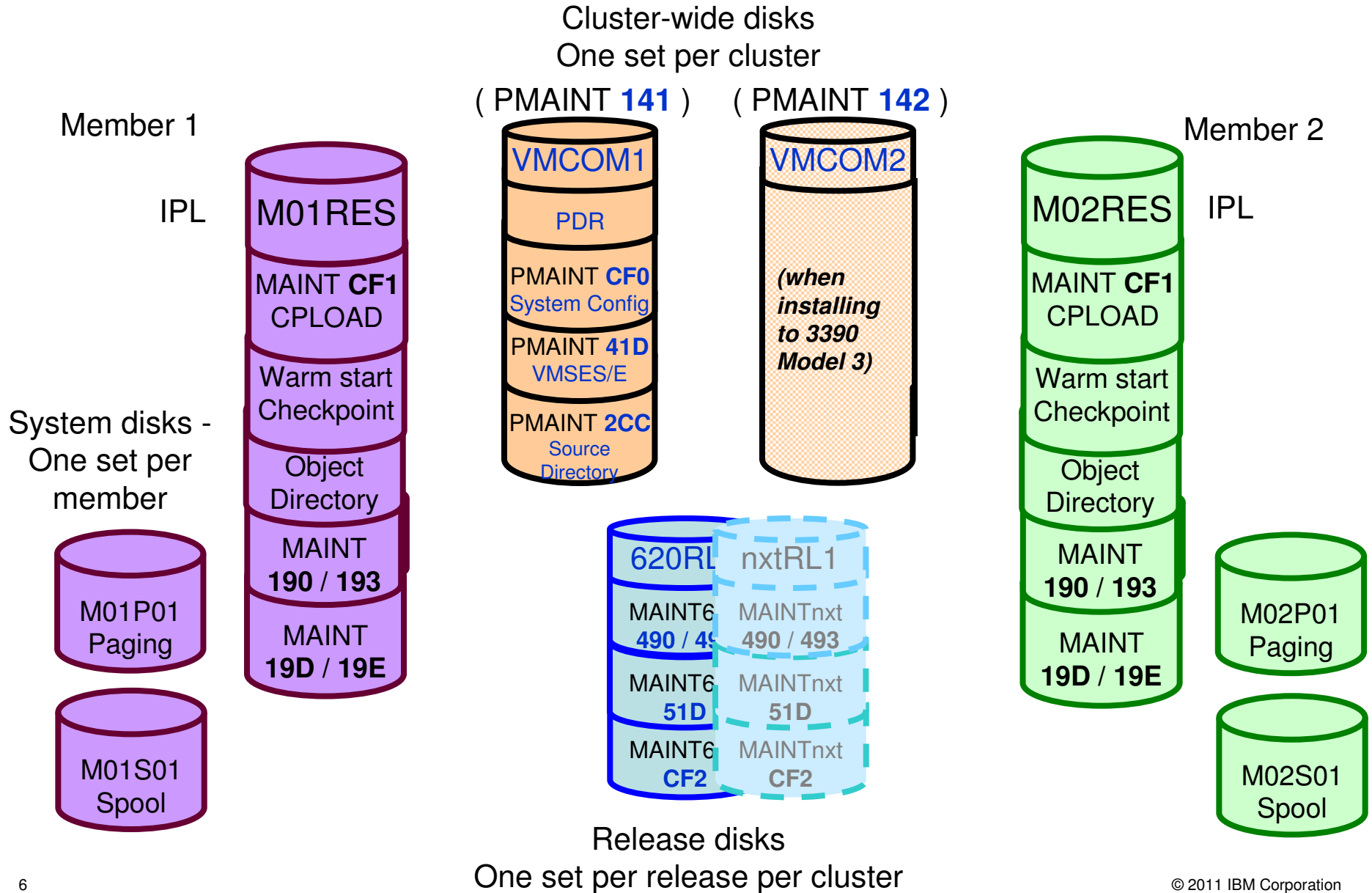Emily Kate Hugenbruch
Alan Altmark

Topics

- z/VM 6.2 Installation Planning

- Planning and Configuring your SSI Cluster

- Migrating to SSI

z/VM 6.2
Installation Planning

DASD Volumes and Minidisks – New Structure

Cluster-wide disks
One set per cluster

(PMAINT **141**)   (PMAINT **142**)

Member 1

IPL

M01RES

MAINT **CF1**
CPLOAD

Warm start
Checkpoint

Object
Directory

MAINT
190 / 193

MAINT
19D / 19E

**System disks -
One set per
member**

M01P01
Paging

M01S01
Spool

VMCOM1

PDR

PMAINT **CF0**
System Config

PMAINT **41D**
VMSES/E

PMAINT **2CC**
Source
Directory

VMCOM2

*(when
installing
to 3390
Model 3)*

620RL1   nxtRL1

MAINT6   MAINTnxt
490 / 49   **490 / 493**

MAINT6   MAINTnxt
51D   **51D**

MAINT6   MAINTnxt
CF2   **CF2**

Member 2

M02RES   IPL

MAINT **CF1**
CPLOAD

Warm start
Checkpoint

Object
Directory

MAINT
190 / 193

MAINT
19D / 19E

M02P01
Paging

M02S01
Spool

**Release disks
One set per release per cluster**

New MAINT Userids

MAINT	PMAINT	MAINT620
Multi Configuration Virtual Machine	Single Configuration Virtual Machine	Single Configuration Virtual Machine
Owns CF1, CF3 parm disks, 190, 193, 19D, 19E, 401, 402, 990 CMS disks	Owns CF0 parm disk, 2CC, 550, 551 disks	Owns the service disks (e.g., 490, 493, 49D) and the CF2 parm disk
Use for work on a particular member, such as attaching devices, or relocating guests	Use for updating the system config, or for SSI-wide work, e.g., defining relocation domains	Use for applying 6.2.0 service. The CF2 parm disk contains 6.2.0 CPLOAD modules.

Minidisks for New MAINT Userids

<u>Parm Disks</u> *(Owner)*

- CF0   *(PMAINT)*
  - Common system configuration file

- CF1   *(MAINT)*
  - Production CPLOAD MODULE

- CF2   *(MAINT620)*
  - Used by SERVICE to hold test CPLOAD MODULE

- CF3   *(MAINT)*
  - Backup of CF1

<u>Full Pack Minidisks</u>

- MAINT
  - 122   M01S01
  - 123   M01RES
  - 124   M01W01

- MAINT620
  - 131   620RL1
  - 132   620RL2
  - 133   620RL3

- PMAINT
  - 141   VMCOM1
  - 142   VMCOM2

Minidisks for New MAINT Userids (by volume)

Cluster-Wide Volume (VMCOM1)

– PMAINT
  - CF0 - Common system configuration file
  - 2CC - Single source directory
  - 41D - VMSES/E production inventory disk
  - 551 - SSI cluster common disk - contains utilities that must be at the highest level for all members of the SSI cluster, including

    CPFMTXA, DIRECTXA, DIRMAP, DISKMAP

Release Volumes

– MAINT620
  - 490 - Test CMS system disk
  - 493 - Test system tools disk
  - 51D - VMSES/E software inventory disk
  - CF2 – Test parm disk

Which Type of Installation Should I Choose?

- SSI Installation
  - Single installation for multiple z/VM images
    - Can also install a single system configured as an SSI member
  - Installed and configured as an SSI cluster
    - Single source directory
    - Shared system configuration file
    - Creates Persistent Data Record (PDR) on Common volume

- Non-SSI installation
  - Single z/VM image
  - Can be converted to initial member of an SSI cluster later
  - Builds DASD layout, directory, and configuration file the same as SSI installation
  - Only valid option for SCSI only installations

- Both types of installation are different from previous releases of z/VM
  - Userids
  - Disks
  - Directory
  - System configuration file

- Review documented migration scenarios before deciding whether to do SSI or non-SSI install
  - CP Planning and Administration
  - SSI installation primarily for new or "from scratch" installs

INSTPLAN - Select Installation Type

*** z/VM INSTALLATION PLANNING ***

Mark the product(s) selected to be installed into the filepool with an "F"
and those selected to be installed to minidisks with an "M"

M	VM	M	OSA	M	PERFTK
M	VMHCD	M	RACF	M	DIRM
M	RSCS	M	ICKDSF	M	TCPIP

Select a System Default Language.
    X AMENG   _ UCENG   _ KANJI

Select a System DASD model. FBA size can be changed.
    X 3390 Mod 3   _ 3390 Mod 9   _ FBA DASD 6.0

Enter the name of common service filepool.
    Filepool Name: VMPOOL

Select a System Type: Non-SSI or SSI (SSI requires the SSI feature)
    _ Non-SSI Install: System Name _____
    X SSI Install: Number of Members 4   SSI Cluster Name SAMPLE

    F1 = HELP   F3/F12 = QUIT   F5 = Process   ENTER = Refresh

INSTPLAN - SSI Installation

Select first or second level and identify SSI member systems

```
*** z/VM INSTALLATION PLANNING PANEL 3 ***

SSI Cluster Name:    SAMPLE

After installation is complete, the SSI cluster will be IPLed:

X     First-Level
_     Second-Level


SSI Member Name(s):

SLOT #       MEMBER NAME      IPL LPAR/USERID
======       ===========      ================
   1          MEMBER1          LPAR1
   2          MEMBER2          LPAR2
   3          MEMBER3          LPAR3
   4          MEMBER4          LPAR4




     F1 = HELP   F3/F12 = QUIT   F5 = Process   ENTER = Refresh
```

INSTPLAN - SSI Installation (cont.)

Define CP-Owned and Release volumes for all members

```
*** z/VM INSTALLATION VOLUME DEFINITION ***

    TYPE      LABEL     ADDRESS                      FORMAT (Y/N)
    =======   ========  =========                    ============
    COMMON    VMCOM1    2000                              Y
    COMMON2   VMCOM2    2001
    RELVOL    620RL1    2002
    RELVOL2   620RL2    2003

    TYPE      LABEL     ADDRESS          TYPE      LABEL     ADDRESS
    =======   ========  =========        =======   ========  =========
MEMBER1                              MEMBER2
    RES       M01RES    3000             RES       M02RES    4000
    SPOOL     M01S01    3001             SPOOL     M02S01    4001
    PAGE      M01P01    3002             PAGE      M02P01    4002
    WORK      M01W01    3003             WORK      M02W01    4003
MEMBER3                              MEMBER4
    RES       M03RES    5000             RES       M04RES    6000
    SPOOL     M03S01    5001             SPOOL     M04S01    6001
    PAGE      M03P01    5002             PAGE      M04P01    6002
    WORK      M03W01    5003             WORK      M04W01    6003



    F1 = HELP       F3/F12 = QUIT     F5 = Process    ENTER = Refresh
```

INSTPLAN - SSI Installation (cont.)

Define Common Volume and CTC Device addresses

```
*** z/VM INSTALLATION FIRST-LEVEL CONFIGURATION ***

Real addresses for the common volume on each member LPAR:

VOLUME      DASD      MEMBER1      MEMBER2      MEMBER3      MEMBER4
 TYPE       LABEL     ADDRESS      ADDRESS      ADDRESS      ADDRESS
=======    ========   =========    =========    =========    =========
COMMON      VMCOM1      2000         2000         2000         2000

CTC device addresses:

From: MEMBER1                       From: MEMBER2
      To: MEMBER1     N/A                 To: MEMBER1   0100 0101
      To: MEMBER2   0100 0101            To: MEMBER2     N/A
      To: MEMBER3   0300 0301            To: MEMBER3   0310 0311
      To: MEMBER4   0400 0401            To: MEMBER4   0410 0411

From: MEMBER3                       From: MEMBER4
      To: MEMBER1   0300 0301            To: MEMBER1   0400 0401
      To: MEMBER2   0310 0311            To: MEMBER2   0410 0411
      To: MEMBER3     N/A                 To: MEMBER3   0320 0321
      To: MEMBER4   0320 0321            To: MEMBER4     N/A

   F1 = HELP        F3/F12 = QUIT      F5 = Process      ENTER = Refresh
```

INSTPLAN - Non-SSI Installation
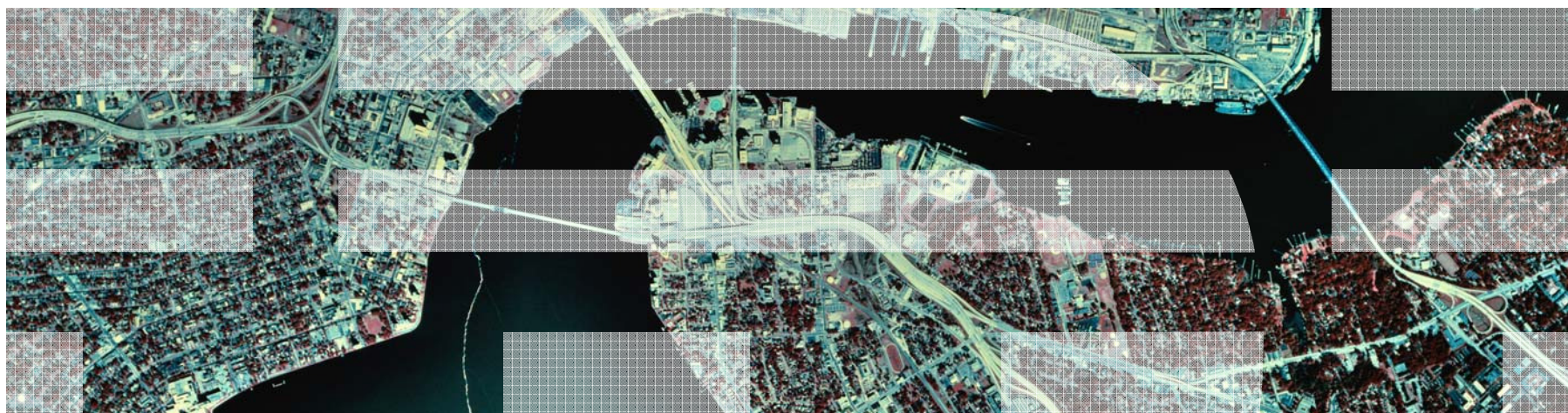
Identify CP-Owned and Release volumes

```
              *** z/VM INSTALLATION VOLUME DEFINITION ***

        TYPE      LABEL      ADDRESS                     FORMAT (Y/N)
        =======   ========   =========                   ============
        COMMON    VMCOM1     2000                             Y
        COMMON2   VMCOM2     2001
        RELVOL    620RL1     2002
        RELVOL2   620RL2     2003

        TYPE      LABEL      ADDRESS
        =======   ========   =========
EXAMPLE
        RES       M01RES     3000
        SPOOL     M01S01     3001
        PAGE      M01P01     3002
        WORK      M01W01     3003




     F1 = HELP      F3/F12 = QUIT      F5 = Process    ENTER = Refresh
```

Planning and Configuring
your SSI Cluster

SSI Cluster Requirements

- Servers must be IBM System z10 or later (z/VM Version 6)

- Shared and non-shared DASD
  - 3390 volume required for the PDR
  - All volumes should be cabled to all members
    - Makes non-shared disks accessible to other members to fix configuration problems

- LPARs
  - 1-16 FICON CTC devices/address between LPARs
    - Provide direct ISFC links from each member to all other members
  - FICON channels to shared DASD
  - OSA access to the same LAN segments
  - FCP access to same storage area networks (SANs) with same storage access rights

- Shared system configuration file for all members

- Shared source directory containing user definitions for all members

- Capacity planning for each member of the SSI cluster
  - Ensure sufficient resources are available to contain shifting workload
    - Guests that will relocate
    - Guests that logon to different members

SSI Cluster Topography

1. How many members in your cluster?

2. Production configuration
    ▪ How many CECs?
    ▪ How many LPARS/CEC?

        ▪ *Suggested configuration for 4-member cluster is 2 LPARs on each of 2 CECs*

3. Test configuration
    ▪ VM guests?
    ▪ LPARs?
    ▪ Mixed?

4. Virtual server (guest) distribution
    ▪ Each guest's "home" member?
    ▪ Where can each guest be relocated?

    ▪ *Distribute workload so each member has capacity to receive relocated guests*
        ▪ CPU
        ▪ Memory

SSI Planning Worksheet

Table 4. Linux virtual server requirements for memory, processors, and devices

Linux server user ID	Memory	Virtual processors	DASD	Networking devices	Cryptographic requirements	Member 1	Member 2	Member 3	Member 4
Maximum number of resident and relocated virtual servers:									
Maximum memory for normally resident and relocated virtual servers:									
Memory for z/VM:									
Total virtual memory requirement:									
Total real memory requirement (after considering overcommitment)[1]:									
Expanded storage estimate (Total real memory ×.25, but not more than 2 GB):									
Central storage estimate (Total real memory − expanded storage estimate):									
Number of real CPUs:									
DASD paging space (Total virtual memory × 2 or more):									

1. Total virtual memory should be no more than three times the total real memory.

Chapter 2. Planning for Linux virtual servers   45

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SSI Cluster Planning
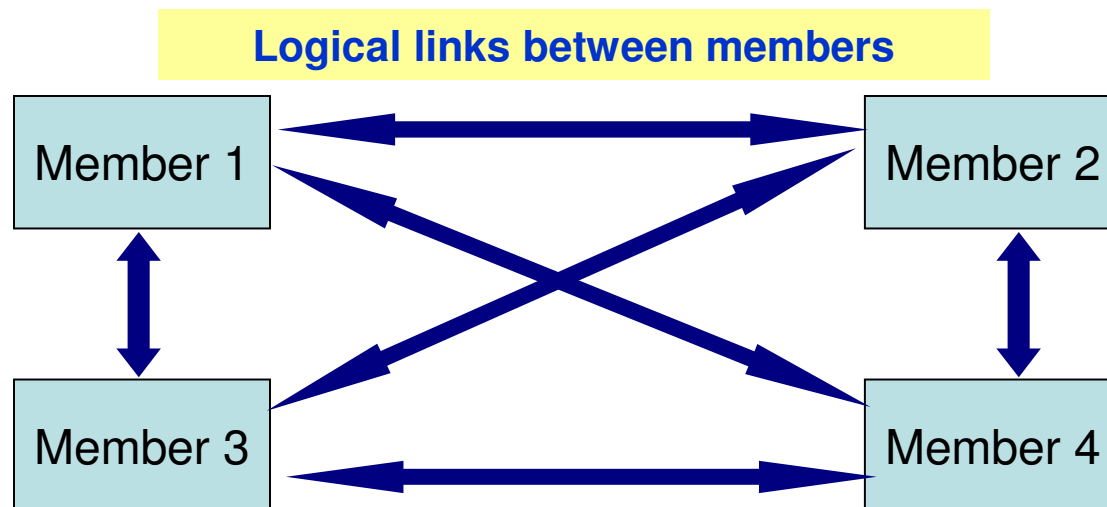
- CTC connections

- DASD

- Networks

- Cluster and member configuration

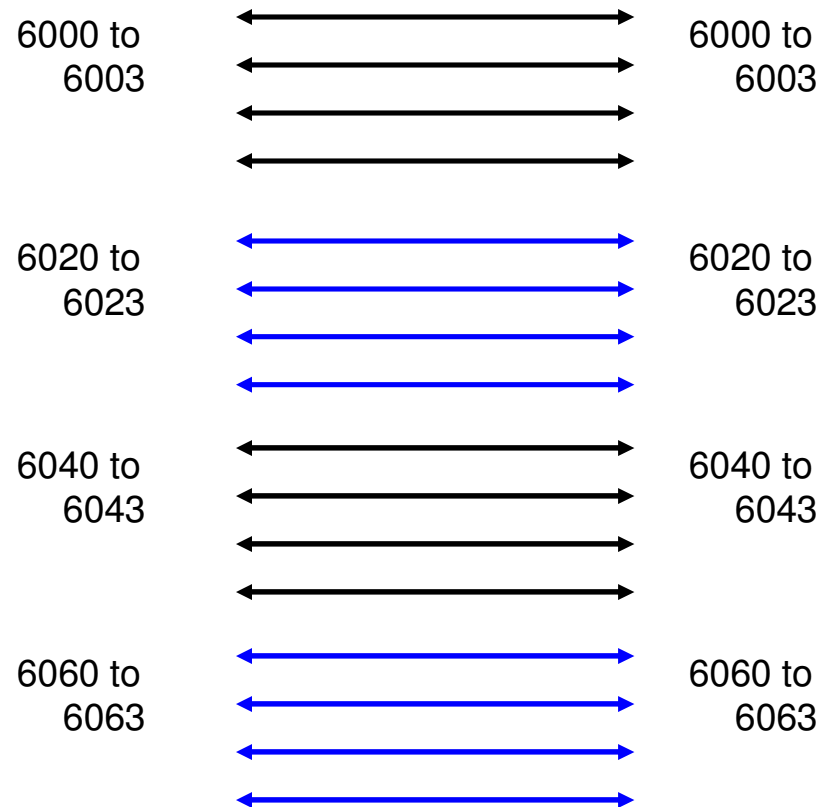- Shared Source Directory

CTC Connections

- Each member of an SSI cluster must have a direct ISFC connection to every other member (logical link)

- Logical links are composed of 1-16 CTC connections
  - FICON channel paths
  - May be switched or unswitched

- Use multiple CTCs distributed on multiple FICON channel paths between each pair of members
  - Avoids write collisions that affect link performance
  - Avoids severing logical link if one channel path is disconnected or damaged

- *Recommended practice:* Use same real device number for same CTC on each member

Logical links between members

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CTC Connections – How Many Do I Need?

- 4 CTC devices per per FICON chpid
  - provides most efficient ISFC data transfer

- For large guests, relocation and quiesce times improve with more chpids
  - Up to 4 chpid paths, with 4 CTCs each

    - *Additional factors affect relocation and quiesce times*

6000 to 6003		6000 to 6003
6020 to 6023		6020 to 6023
6040 to 6043		6040 to 6043
6060 to 6063		6060 to 6063

CTC Connections – Defining in the IOCP

```
*
CHPID PATH=(CSS(0,1),4A),PCHID=222,TYPE=FC,SHARED    SX*FC4 11/LG04/D3
CHPID PATH=(CSS(0,1),4E),PCHID=282,TYPE=FC,SHARED    SX*FC4 16/LG02/D3
*************************************************************
*** CHPID 4A SX FICON CTC                               ***
*************************************************************
*
 CNTLUNIT CUNUMBR=0C00,PATH=((CSS(0),4A)),UNIT=FCTC,           *
          UNITADD=((00,8)),CUADD=7
 IODEVICE ADDRESS=(0C00,8),CUNUMBR=(0C00),UNIT=FCTC,UNITADD=00,  *
          PART=((CSS(0),TEST7,TESTC))
*
*************************************************************
*** CHPID 4E SX FICON CTC                               ***
*************************************************************
*
 CNTLUNIT CUNUMBR=0D00,PATH=((CSS(0),4E)),UNIT=FCTC,           *
          UNITADD=((00,8)),CUADD=C
 IODEVICE ADDRESS=(0D00,8),CUNUMBR=(0D00),UNIT=FCTC,UNITADD=00,  *
          PART=((CSS(0),TEST7,TESTC))
```

IBM

IPL of 2nd member lacking proper CTC connectivity halts IPL

```
12:28:04 *************************************************************
12:28:04
 12:28:04 HCPZCO6718I Using parm disk 1 on volume PVMCM1 (device 3F25).
 12:28:04 HCPZCO6718I Parm disk resides on cylinders 1 through 120.
12:28:04 HCPMLM3016I Management by the Unified Resource Manager is not available
 for this system.
12:28:04 The directory on volume P02RES at address 3F3B has been brought online.
 12:28:04 HCPWRS2513I
 12:28:04 HCPWRS2513I Spool files available         96
 12:28:05 HCPWRS2512I Spooling initialization is complete.
12:28:05 DASD 3F3C dump unit CP IPL pages 46730
12:28:05 HCPAAU2700I System gateway POKLBS2 identified.
12:28:06 HCPPLM1644I The following is the current status of the SSI member
12:28:06 HCPPLM1644I systems according to the PDR:
12:28:06 SSI Name: POKLBS
12:28:06 SSI Persistent Data Record (PDR) device: PVMCM1 on 3F25
12:28:06 SLOT SYSTEMID STATE     CONNECT TYPE         HOPS
12:28:06    1 POKLBS1  Joined    Not connected        -
12:28:06    2 POKLBS2  Down      Local                -
12:28:06    3 -------- Available
12:28:06    4 -------- Available
12:28:06 HCPPLM1669I Waiting for ISFC connectivity in order to join the SSI clus
ter.




                                                      RUNNING   POKLBS2
                                                              42/1
```
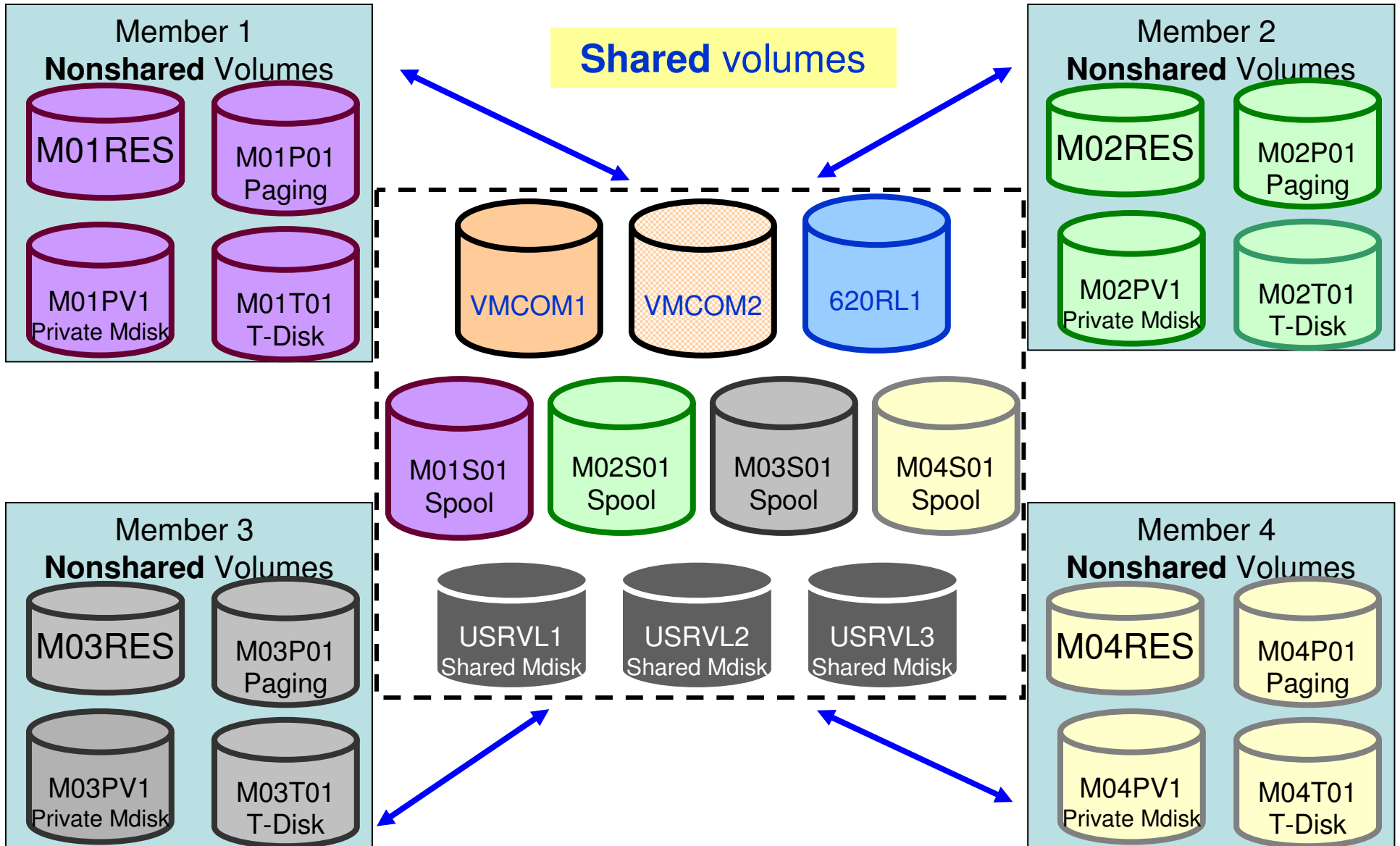
DASD Planning

- Determine which DASD volumes will be used for

  - Cluster-wide volume

  - Release volumes

  - System volumes
    - Shared
    - Non-shared

  - User data (minidisks)
    - Shared
    - Non-shared

- Determine which member owns each CP-Owned volume

DASD Planning – Non-Shared and Shared System Volumes

DASD Planning – CP_OWNED List

Non-SSI / SSI

```
32 /**********************************************************************/
33 /*                      CP_Owned Volume Statements                    */
34 /**********************************************************************/
35 /*                                          SYSRES   VOLUME        */
36 /**********************************************************************/
37
38 MEMBER1.   CP_Owned   Slot   1   M01RES
39
40 /**********************************************************************/
41 /*                                          COMMON VOLUME        */
42 /**********************************************************************/
43
44    CP_Owned   Slot   5   VMCOM1
45
46 /**********************************************************************/
47 /*                                  DUMP & SPOOL VOLUMES        */
48 /**********************************************************************/
49
50    CP_Owned   Slot  10  M01S01
51
52 /**********************************************************************/
53 /*                                  PAGE & TDISK VOLUMES        */
54 /**********************************************************************/
55
56 MEMBER1.   CP_Owned   Slot 255  M01P01
```

DASD Planning – Prepare the CP-Owned volumes

- Link the full pack overlay for each disk

- Use **CPFMTXA** to mark the volumes with ownership information

- You CAN NOT skip this step

Volume	Full pack overlay	Owner
M01RES	MAINT 123	MYCLUSTR.MEMBER1
VMCOM1	PMAINT 141	MYCLUSTR.NOSYS
M01S01	MAINT 122	MYCLUSTR.MEMBER1
M01P01	$PAGE$ A01	MYCLUSTR.MEMBER1

DASD Planning – USER_VOLUME_LIST

Non-SSI

```
58 /******************************************************************/
59 /*                      User_Volume_List                          */
60 /******************************************************************/
61 /* These volumes contain the minidisks for your guests, as well as */
62 /* the product disks for z/VM. Volumes that are not intended to hold */
63 /* "local" minidisks, i.e., minidisks that would be unique to a    */
64 /* single system, should be kept on separate volumes.              */
65
66 /******************************************************************/
67 /* Shared User Volumes                                             */
68 /******************************************************************/
69               User_Volume_List  620RL1 620RL2 USRVL1
70
71 /******************************************************************/
72 /* User volumes for local minidisks                                */
73 /******************************************************************/
74
75 MEMBER1:   User_Volume_List M01W01 M01PV1
```

Networks in an SSI

- All members should have identical network connectivity
    - Connected to same physical LAN segments
    - Connected to same SAN fabric

- Assign equivalence identifiers (EQIDs) to all network devices
    - Devices assigned same EQID on each member must be
        - same type
        - have the same capabilities
        - have connectivity to the same destinations

- Updates to the main TCPIP stack configuration
    - *PROFILE TCPIP* now can have member-specific names like *MEMBER1 TCPIP* and M*EMBER2 TCPIP*
    - *TCPIP DATA* file can be shared among SSI members, so you can add system qualifiers to statements like **HOSTNAME**

Networks in an SSI – Virtual Switches

- Define virtual switches with same name on each member

- For relocating guests:

  - Source and destination virtual switch guest NIC and port configurations must be equivalent
    - Port type
    - Authorizations (access, VLAN, promiscuous mode)

  - Source and destination virtual switches must be equivalent
    - Name and type
    - VLAN settings
    - Operational UPLINK port with matching EQID
    - Device and port numbers need not match, but connectivity to the same LAN segment is required

Networks in an SSI – MAC Addresses

- MAC address assignments are coordinated across an SSI cluster

  - VMLAN statement
    - MACPREFIX must be set to different value for each member
    - Default is 02-xx-xx where xx-xx is "system number" of member (e.g., 02-00-01 for member 1)

  - USERPREFIX must be set for SSI members
    - Must be identical for all members
    - Must not be equal to any member's MACPREFIX value
    - Default is 02-00-00

  - MACIDRANGE is ignored in an SSI cluster
    - Because MAC assignment is coordinated among members

  - Example:

    ```
    VMSYS01: VMLAN MACPREFIX 021111 USERPREFIX 02AAAA

    VMSYS02: VMLAN MACPREFIX 022222 USERPREFIX 02AAAA

    VMSYS03: VMLAN MACPREFIX 023333 USERPREFIX 02AAAA

    VMSYS04: VMLAN MACPREFIX 024444 USERPREFIX 02AAAA
    ```

Cluster and Member Configuration – SYSTEM_IDENTIFIER Statement

No SSI

```
 1 /*******************************************************************/
 2 /*                SYSTEM CONFIG FILE                              */
 3 /*******************************************************************/
 4 /*                                                                */
 5 /*  Refer to CP Planning and Administration for SYSTEM CONFIG rules */
 6 /*                                                                */
 7 /*  Warning – Always run CPSYNTAX after updating the SYSTEM CONFIG  */
 8 /*                                                                */
 9 /*******************************************************************/
10
11 /*******************************************************************/
12 /*                System_Identifier Information                    */
13 /*******************************************************************/
14
15 System_Identifier LPAR LP01 MEMBER1
```

Cluster and Member Configuration – SSI Statement

```
17 /***************************************************************/
18 /*                    SSI Statement                           */
19 /***************************************************************/
20
21 SSI MYCLUSTR PDR_Volume VMCOM1 ,
22 Slot 1 MEMBER1
23
```

Cluster and Member Configuration – SYSTEM_RESIDENCE Statement

Non-SSI

```
24 /**************************************************************/
25 /*              Checkpoint and Warmstart Information          */
26 /**************************************************************/
27
28 System_Residence,
29     Checkpoint  Volid M01RES    From CYL 21  For 9 ,
30     Warmstart   Volid M01RES    From CYL 30  For 9
31
```

SSI

```
24 /**************************************************************/
25 /*              Checkpoint and Warmstart Information          */
26 /**************************************************************/
27
28 MEMBER1:  System_Residence,
29     Checkpoint  Volid M01RES    From CYL 21  For 9 ,
30     Warmstart   Volid M01RES    From CYL 30  For 9
31
```

Cluster and Member Configuration – Additional Steps

- Enable the SSI feature (Keep your paper work)

- If you're migrating from non-SSI to SSI, you'll want to enable the
  PROMPT_AFTER_SHUTDOWN_REIPL feature before you reIPL, so you can do a cold start

- Run CPSYNTAX

```
cpsyntax sysnew config (system member1
CONFIGURATION FILE PROCESSING COMPLETE -- NO ERRORS ENCOUNTERED.
Ready; T=0.25/0.26 11:43:57
```

DirMaint in an SSI Cluster
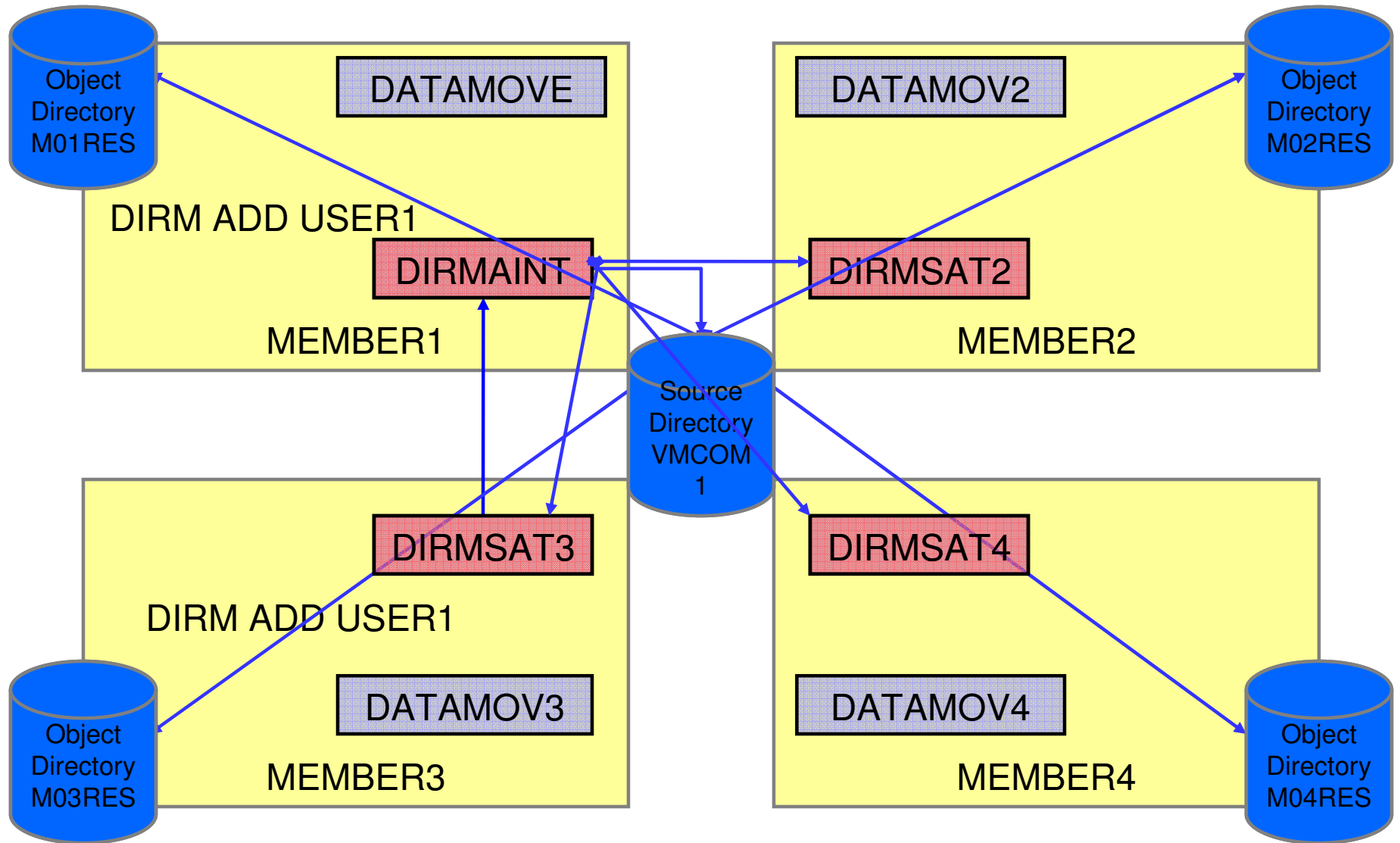
DIRMAINT Infrastructure

- DIRMAINT runs on only one SSI member

- DIRMSATx will run on other members

- A common source directory is managed by the one DIRMAINT

- Updates made to DIRMAINT are pushed out to other members

- AUTOLOG1 PROFILE EXEC contains code to determine where to start DIRMSAT, you do NOT need to add them.

Shared Source Directory – Virtual Machine Definition Types

Single Configuration Virtual Machine (traditional)

USER statement

Same definitions and resources on all members
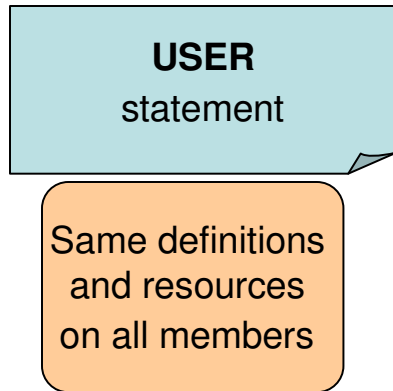
- May log on to any member
  - Only one member at a time

- General Workload
  - Guest Operating Systems
  - Service virtual machines requiring only one logon in the cluster

Multiconfiguration Virtual Machine (new)

IDENTITY statement

Definitions and resources common to all members

- May log on to multiple members at the same time (known by IDENTITY name)

- System support virtual machines
- Service virtual machines

+

SUBCONFIG statement for member 1

SUBCONFIG statement for member 2

Definitions and resources unique to member 1

Definitions and resources unique to member 2
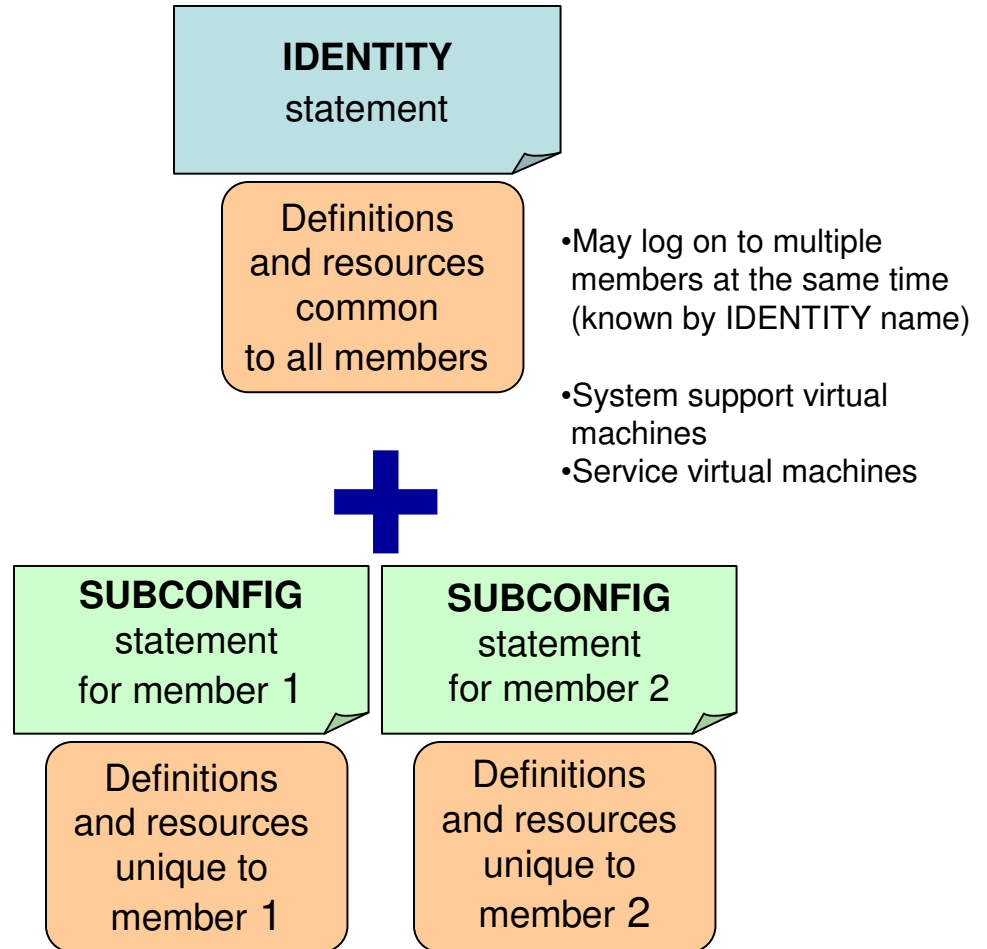
Shared Source Directory – Global and Local disks

- For each guest you're turning into a multiconfiguration virtual machine, decide which disks should be global and which should be local
  - You may want to split existing disks into global and local.

Global
•All instances have access •Usually R/O •EXECs •Control files

Local
•Only one instance has access •Usually R/W •Log files •Work files

Shared Source Directory - New Layout

- IBM-supplied directory will be significantly different than in 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 defined as multiconfiguration virtual machines

- Determine if any of your guests 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

Shared Source Directory - Multiconfiguration Virtual Machine Definition

```
IDENTITY MAINT    MAINTPAS      128M 1000M ABCDEFG

BUILD ON SSIMEMB1 USING SUBCONFIG MAINT-1
BUILD ON SSIMEMB2 USING SUBCONFIG MAINT-2
BUILD ON SSIMEMB3 USING SUBCONFIG MAINT-3
BUILD ON SSIMEMB4 USING SUBCONFIG MAINT-4

CONSOLE 009 3215 T
SPOOL 00C 2540 READER *
SPOOL 00D 2540 PUNCH  A          These statements apply to all instances of MAINT on all members
SPOOL 00E 1403 A
LINK    USER1    2CC 2CC RR
LINK    USER1    551 551 RR

SUBCONFIG MAINT-1
 MDISK 0191 3390 1000 20 MNTVL1 WR     These statements only apply to MAINT on member SSIMEMB1
 MDISK CF1  3390 100  20 M01RES RR
* END OF MAINT-1

SUBCONFIG MAINT-2
 MDISK 0191 3390 1000 20 MNTVL2 WR     These statements only apply to MAINT on member SSIMEMB2
 MDISK CF1  3390 100  20 M02RES RR
* END OF MAINT-2

SUBCONFIG MAINT-3
 MDISK 0191 3390 1000 20 MNTVL3 WR     These statements only apply to MAINT on member SSIMEMB3
 MDISK CF1  3390 100  20 M03RES RR
* END OF MAINT-3

SUBCONFIG MAINT-4
 MDISK 0191 3390 1000 20 MNTVL4 WR     These statements only apply to MAINT on member SSIMEMB4
 MDISK CF1  3390 100  20 M04RES RR
* END OF MAINT-4
```

Shared Source Directory – Multiconfiguration Virtual Machines

SSIMEMB1

MAINT

SSIMEMB2

MAINT

```
IDENTITY MAINT  MAINTPAS  128M 1000M ABCDEFG

BUILD ON SSIMEMB1 USING SUBCONFIG MAINT-1
BUILD ON SSIMEMB2 USING SUBCONFIG MAINT-2
BUILD ON SSIMEMB3 USING SUBCONFIG MAINT-3
BUILD ON SSIMEMB4 USING SUBCONFIG MAINT-4


LINK    USER1    2CC 2CC RR
LINK    USER1    551 551 RR


SUBCONFIG MAINT-1
 MDISK 0191 3390 1000 20 MNTVL1 WR
 MDISK CF1  3390 100  20 M01RES RR
* END OF MAINT-1

SUBCONFIG MAINT-2
 MDISK 0191 3390 1000 20 MNTVL2 WR
 MDISK CF1  3390 100  20 M02RES RR
* END OF MAINT-2


SUBCONFIG MAINT-3
 MDISK 0191 3390 1000 20 MNTVL3 WR
 MDISK CF1  3390 100  20 M03RES RR
* END OF MAINT-3


SUBCONFIG MAINT-4
 MDISK 0191 3390 1000 20 MNTVL4 WR
 MDISK CF1  3390 100  20 M04RES RR
* END OF MAINT-4
```

SSIMEMB3

MAINT

SSIMEMB4

MAINT

Shared Source Directory – Single Configuration Virtual Machines

SSIMEMB1

MAINT

MYLINUX

SSIMEMB2

MAINT

MYLINUX

```
USER  MYLINUX  MYLINPAS  128M 1000M G
  MDISK 0191 3390 1000 20 MNTVL1 MR
```

MAINT

MYLINUX

SSIMEMB3

MAINT

MYLINUX

SSIMEMB4
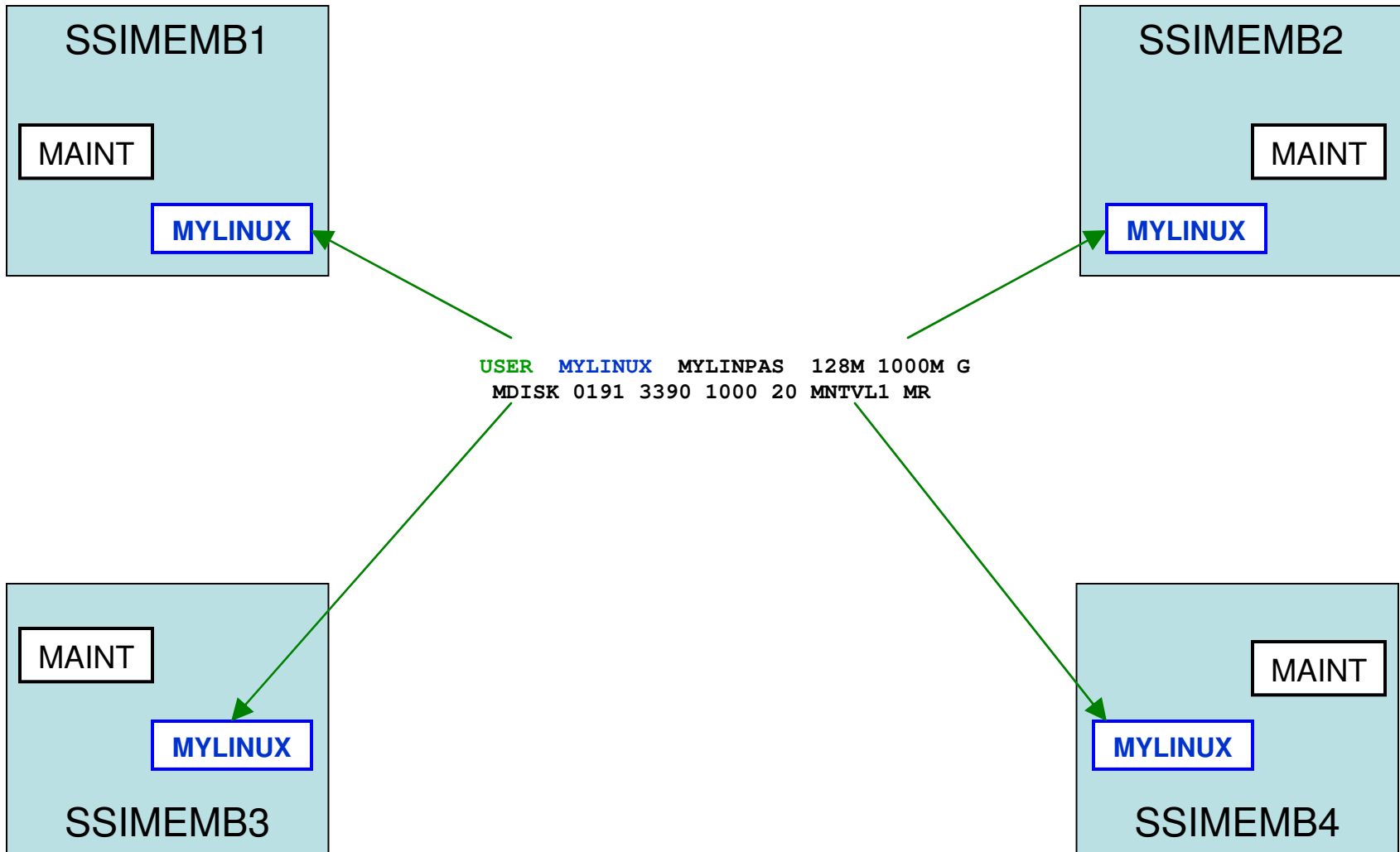
Shared Source Directory – DISKMAP

	VOLUME	USERID	CUU	DEVTYPE	START	END	SIZE	SUBCONFIG	MEMBER
17	VOLUME	USERID	CUU	DEVTYPE	START	END	SIZE	SUBCONFIG	MEMBER
18	M01RES	$ALLOC$	A04	3390	00000	00000	00001		*
19		$DIRECT$	A01	3390	00001	00020	00020		*
20		$SYSCKP$	A01	3390	00021	00029	00009		*
21		$SYSWRM$	A01	3390	00030	00038	00009		*
22		MAINT	CF1	3390	00039	00158	00120	MAINT-1	*
23		MAINT	CFD	3390	00159	00159	00001	MAINT-1	*
24		MAINT	CF3	3390	00160	00279	00120	MAINT-1	*
25		MAINT	190	3390	00280	00493	00214	MAINT-1	*
26		MAINT	191	3390	00494	00668	00175	MAINT-1	*
27		MAINT	193	3390	00669	01168	00500	MAINT-1	*
28		MAINT	19D	3390	01169	01460	00292	MAINT-1	*
29		MAINT	19E	3390	01461	01960	00500	MAINT-1	*
30		MAINT	401	3390	01961	02252	00292	MAINT-1	*
31		MAINT	402	3390	02253	02544	00292	MAINT-1	*
32		MAINT	990	3390	02545	02604	00060	MAINT-1	*
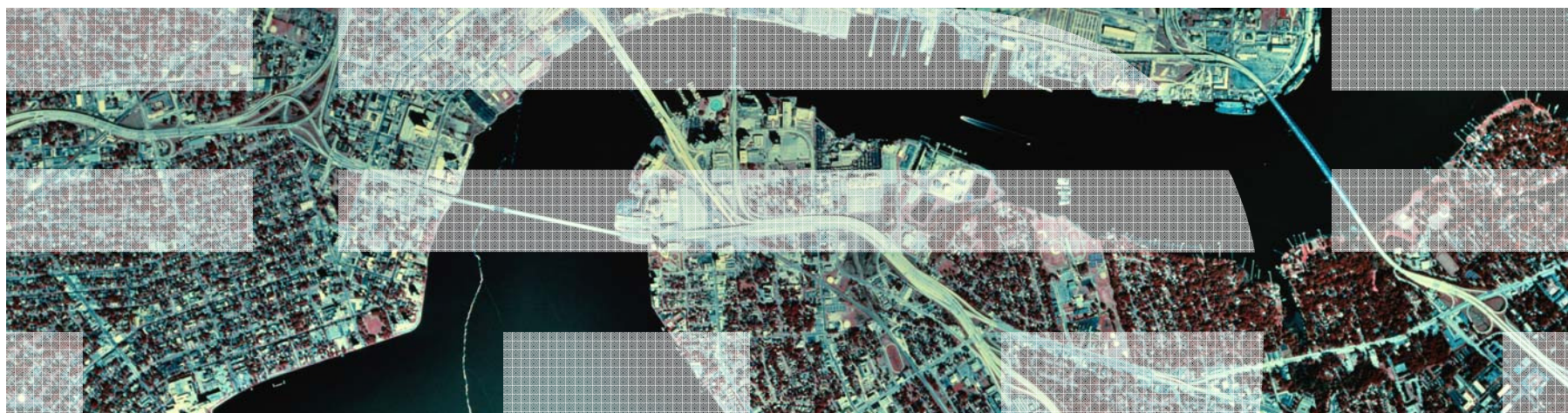
Migrating to SSI

Use Case Scenarios

- Migration procedures for existing z/VM environments

  - Documented in CP Planning and Administration

    - Converting a z/VM System to a Single-Member z/VM SSI Cluster

    - Adding a Member to a z/VM SSI Cluster by Cloning an Existing Member

    - Combining Two Non-SSI z/VM Systems to Create a z/VM SSI Cluster

    - Moving a Second-Level z/VM SSI Cluster to First-Level

    - Converting a CSE Complex to a z/VM SSI Cluster

    - Decommissioning a Member of a z/VM SSI Cluster

- Review documented procedures before deciding whether to do SSI or non-SSI install

Migrating from a Non-SSI 6.2.0 system to a Single Member SSI

1. Prepare the New DASD Volumes

2. Update the System Configuration File

3. Update the User Directory

4. Manage the User Spool Files

5. Prepare the CP-Owned Volumes

6. Create the PDR

7. Modify the Startup Parameters for the VMPSFS File Pool

8. Shut Down and Cold Start

9. Load the Spool Files

10. Change the User Directory to SSI-Enabled

"SSI-enable" the Shared Source Directory

Non-SSI SSI

```
 1 ************************************************************
 2 *   z/VM 6.2.0   SYSTEM DIRECTORY                         *
 3 ************************************************************
 4 *                                                         *
 5 *   THE ADDRESSES 123 THROUGH 133 ARE VIRTUAL ADDRESSES.  *
 6 *                                                         *
 7 *   NOTES:                                                *
 8 *   REMEMBER THESE ARE ONLY VIRTUAL ADDRESSES NOT REAL    *
 9 *   ADDRESSES, SO THERE IS NO NEED TO CHANGE THEM TO MATCH *
10 *   YOUR HARDWARE ADDRESSES.                              *
11 *                                                         *
12 *                                                         *
13 ************************************************************
14 *                                                         *
15 *   FOR A DESCRIPTION OF DIRECTORY STATEMENTS SEE:        *
16 *      VM ENTERPRISE SYSTEM ARCHITECTURE                  *
17 *      PLANNING AND ADMINISTRATION MANUAL.                *
18 *                                                         *
19 ************************************************************
20 *
21 *
22 *

23 DIRECTORY SSI 123 3390 DRM01RES M02RES M03RES M04RES
```

"SSI-enable" the Shared Source Directory

- Update the **BUILD** statements with the actual member name
  - Multiconfiguration virtual machines will have asterisks instead of member names

- Run **DIRECTXA** to put the new directory into production

Non-SSI

```
165 IDENTITY MAINT MAINT 128M 1000M ABCDEFG
166  BUILD ON * USING SUBCONFIG MAINT-1
```

SSI

```
165 IDENTITY MAINT MAINT 128M 1000M ABCDEFG
166  BUILD ON MEMBER1 USING SUBCONFIG MAINT-1
```

Create the Persistent Data Record (PDR)

▪ **LINK** the fullpack overlay of *VMCOM1,* **PMAINT** *141*

```
formssi create 141 myclustr
HCPPDF6613R Device 0141 label is VMCOM1 – continue (Yes/No)?
yes
HCPPDF6614I Persistent Data Record created on device 0141
Ready; T=0.01/0.01 14:35:48

formssi display 141
HCPPDF6618I Persistent Data Record on device 0141 (label VMCOM1) is for MYCLUSTR
HCPPDF6619I PDR                    state: Unlocked
HCPPDF6619I               time stamp: 09/23/11 14:35:48
HCPPDF6619I    cross-system timeouts: Enabled
Ready; T=0.01/0.01 14:35:54
```

Changes to the VMPSYS file pool

- In the *VMSERVP DMSPARMS* file the **LOCAL** startup parameter has changed to **SSI**:

Non-SSI

```
00001 ADMIN MAINT MAINT620
AUTOLOG1
00002 NOBACKUP
00003 SAVESEGID CMSFILES
00004 LOCAL
00005 FILEPOOLID SERVPOOL
00006 USERS 100
```

SSI

```
00001 ADMIN MAINT MAINT620
AUTOLOG1
00002 NOBACKUP
00003 SAVESEGID CMSFILES
00004 SSI
00005 FILEPOOLID SERVPOOL
00006 USERS 100
```

IPL the Single (First) Member of your SSI Cluster

```
20:12:47 HCPAAU2700I System gateway MEMBER1 identified.
20:12:47 HCPNET3010I Virtual machine network device configuration changes are permitted
20:12:47 HCPPLM1697I The state of SSI system MEMBER1 has changed from DOWN to JOINED
20:12:47 HCPPLM1698I The mode of the SSI cluster is STABLE
```

```
q ssi
16:57:39 SSI Name: MYCLUSTR
16:57:39 SSI Mode: Stable
16:57:39 Cross-System Timeouts: Enabled
16:57:39 SSI Persistent Data Record (PDR) device: VMCOM1 on E00A
16:57:39 SLOT SYSTEMID STATE      PDR HEARTBEAT       RECEIVED HEARTBEAT
16:57:39    1 MEMBER1  Joined     2011-10-13 16:57:17 2011-10-13 16:57:17
16:57:39    2 -------- Available
16:57:39    3 -------- Available
16:57:39    4 -------- Available
Ready; T=0.01/0.01 16:57:39
```

Moving 2nd Level SSI to First Level

```
/*****************************************************************/

/*              System_Identifier Information                */

/*****************************************************************/


        System_Identifier LPAR POKLBS1 POKLBS1              ← 2nd level guest

        System_Identifier LPAR LP28    POKLBS1              ← 1st level LPAR

        System_Identifier LPAR POKLBS2 POKLBS2

        System_Identifier LPAR LP29    POKLBS2
```

Moving 2nd Level SSI to First Level

```
/********************************************************************/
/*        Activate ISLINK statements                        */
/********************************************************************/


   POKLBS1:    ACTIVATE ISLINK A2B1 A2B2  NODE POKLBS2        ← 2nd level
   POKLBS1:    ACTIVATE ISLINK F520 F521  NODE POKLBS2        ← 1st level
   POKLBS2:    ACTIVATE ISLINK B2A1 B2A2  NODE POKLBS1
   POKLBS2:    ACTIVATE ISLINK F514 F515  NODE POKLBS1
```

Adding a Second Member to Create a Two-member Cluster

1. Format the new member's volumes

2. Create the new member's services' configurations

3. Copy the member-specific volumes

4. Update the user directory

5. Update the shared system configuration

6. Enable the existing member to access the new member

7. IPL the new member

8. Update the Product Inventory Table

9. Build the saved segments

10. **XAUTOLOG AUTOLOG1** and check MEMBER2

Enable Existing Members to Accept the New Member

```
set ssi slot 2 member2
Ready; T=0.01/0.01 16:57:51
q ssi
16:57:53 SSI Name: MYCLUSTR
16:57:53 SSI Mode: Stable
16:57:53 Cross-System Timeouts: Enabled
16:57:53 SSI Persistent Data Record (PDR) device: VMCOM1 on E00A
16:57:53 SLOT SYSTEMID STATE       PDR HEARTBEAT         RECEIVED HEARTBEAT
16:57:53    1 MEMBER1  Joined      2011-10-13 16:57:47 2011-10-13 16:57:47
16:57:53    2 MEMBER2  Down (not IPLed)
16:57:53    3 -------- Available
16:57:53    4 -------- Available
Ready; T=0.01/0.01 16:57:53
```

```
activate islink 50 60 70
16:58:26 Link device 0050 activated.
16:58:26 Link device 0060 activated.
16:58:26 Link device 0070 activated.
Ready; T=0.01/0.01 16:58:26
```

Paging Volume – Ownership Must Be Set for CP Owned Volumes

```
ICK00001I FUNCTION COMPLETED, HIGHEST CONDITION CODE WAS 0
        16:40:41    01/03/12

ENTER INPUT COMMAND:
 END

ICK00002I ICKDSF PROCESSING COMPLETE. MAXIMUM CONDITION CODE WAS 0
Ready; T=0.08/0.62 16:40:42
detach 3f00 from *
DASD 3F00 DETACHED BY MAINT HYPERPAV BASE
Ready; T=0.01/0.01 16:41:13
define cpowned slot 254 p01p02
Ready; T=0.01/0.01 16:41:55
attach 3f00 to system
HCPRDA6629I Ownership of DASD 3F00, volume P01P02 was read as UNDEFINED.UNDEFINE
D. No extents can be brought online; the device is not attached.
Ready; T=0.01/0.01 16:42:04
```

Setting Volume Ownership with CPFMTXA

cpfmtxa

ENTER FORMAT, ALLOCATE, LABEL, OWNER OR QUIT:

owner

ENTER THE VDEV TO BE PROCESSED OR QUIT:

3f00

ENTER THE VOLUME LABEL FOR DISK 3F00:

p01p2

ENTER THE OWNING SSI NAME (OR NOSSI) FOR DISK 3F00:

poklbs

ENTER THE OWNING SYSTEM NAME (OR NOSYS) FOR DISK 3F00:

poklbs1

Page Volumes at High End of Slot List & 255 Slots per Member

```
/*******************************************************************/
/* Page and Tdisk volumes for Member 1                           */
/*******************************************************************/

   POKLBS1:   BEGIN

           CP_Owned   Slot 253  P01P03
           CP_Owned   Slot 254  P01P02
           CP_Owned   Slot 255  P01P01
   POKLBS1:   END


/*******************************************************************/
/* Page and Tdisk volumes for Member 2                           */
/*******************************************************************/

   POKLBS2:   BEGIN

           CP_Owned   Slot 255  P02P01
   POKLBS2:   END
```

SSI Look and Feel - Query Names on Member 1

```
q n
19:18:12 RGYLX002 – SSI , TPMLX002 – SSI , DIRMSAT2 – SSI
19:18:12 SRILXTGT – DSC , ORALX001 – DSC , RGYVM62A – DSC , DATAMOVE – DSC
19:18:12 ORALX002 – DSC , HECALZAR – DSC , HECLX0E1 – DSC , MAINT    – DSC
19:18:12 VSMEVSRV – DSC , VSMPROXY – DSC , VSMREQIU – DSC , VSMREQI6 – DSC
19:18:12 VSMREQIN – DSC , DTCSMAPI – DSC , PERSMAPI – DSC , VSMWORK3 – DSC
19:18:12 VSMWORK2 – DSC , VSMWORK1 – DSC , VSMGUARD – DSC , RGYLXTPM – DSC
19:18:12 TCPIP    – DSC , SRILXTPM – DSC , GIWLX001 – DSC , DIRMAINT – DSC
19:18:12 PERFSVM  – DSC , RGYLXVPN – DSC , DTCVSW2  – DSC , DTCVSW1  – DSC
19:18:12 VMSERVP  – DSC , VMSERVR  – DSC , VMSERVU  – DSC , VMSERVS  – DSC
19:18:12 RACFVM   – DSC , OPERSYMP – DSC , DISKACNT – DSC , EREP     – DSC
19:18:12 HECLX0E2 – DSC , RYOUNG1  –L0004
19:18:12 VSM      – TCPIP
Ready; T=0.01/0.01 19:18:12
```

                                                    RUNNING   POKLBS1

Query Names Locally

```
q n at *
19:18:51 SRILXTGT - DSC , ORALX001 - DSC , RGYVM62A - DSC , DATAMOVE - DSC
19:18:51 ORALX002 - DSC , HECALZAR - DSC , HECLX0E1 - DSC , MAINT    - DSC
19:18:51 VSMEVSRV - DSC , VSMPROXY - DSC , VSMREQIU - DSC , VSMREQI6 - DSC
19:18:51 VSMREQIN - DSC , DTCSMAPI - DSC , PERSMAPI - DSC , VSMWORK3 - DSC
19:18:51 VSMWORK2 - DSC , VSMWORK1 - DSC , VSMGUARD - DSC , RGYLXTPM - DSC
19:18:51 TCPIP    - DSC , SRILXTPM - DSC , GIWLX001 - DSC , DIRMAINT - DSC
19:18:51 PERFSVM  - DSC , RGYLXVPN - DSC , DTCVSW2  - DSC , DTCVSW1  - DSC
19:18:51 VMSERVP  - DSC , VMSERVR  - DSC , VMSERVU  - DSC , VMSERVS  - DSC
19:18:51 RACFVM   - DSC , OPERSYMP - DSC , DISKACNT - DSC , EREP     - DSC
19:18:51 HECLX0E2 - DSC , RYOUNG1  -L0004
19:18:51 VSM      - TCPIP
Ready; T=0.01/0.01 19:18:51

                                                    RUNNING   POKLBS1
```

Query Names at Remote Member

```
q n at poklbs2

19:19:23 MAINT    - DSC , RGYLX002 - DSC , TPMLX002 - DSC , FTPSERVE - DSC

19:19:23 TCPIP    - DSC , DIRMSAT2 - DSC , DTCVSW2  - DSC , DTCVSW1  - DSC

19:19:23 VMSERVR  - DSC , VMSERVU  - DSC , VMSERVS  - DSC , RACFVM   - DSC

19:19:23 OPERSYMP - DSC , DISKACNT - DSC , EREP     - DSC , OPERATOR - DSC

19:19:23 VSM      - TCPIP

Ready; T=0.01/0.01 19:19:23


                                                      RUNNING   POKLBS1
```

IBM

Query Names on 2nd Member

```
q n

RYOUNG1  - SSI , SRILXTGT - SSI , ORALX001 - SSI , RGYVM62A - SSI

DATAMOVE - SSI , ORALX002 - SSI , HECALZAR - SSI , HECLX0E2 - SSI

HECLX0E1 - SSI , RGYLXTPM - SSI , SRILXTPM - SSI , GIWLX001 - SSI

DIRMAINT - SSI , RGYLXVPN - SSI , VMSERVP  - SSI

RGYLX002 - DSC , TPMLX002 - DSC , FTPSERVE - DSC , TCPIP    - DSC

DIRMSAT2 - DSC , DTCVSW2  - DSC , DTCVSW1  - DSC , VMSERVR  - DSC

VMSERVU  - DSC , VMSERVS  - DSC , RACFVM   - DSC , OPERSYMP - DSC

DISKACNT - DSC , EREP     - DSC , OPERATOR - DSC , MAINT    -L0003

VSM      - TCPIP

Ready; T=0.01/0.01 19:22:04


                                              RUNNING   POKLBS2
```

IBM

Spool Display from First Member

```
q alloc spool

                EXTENT      EXTENT   TOTAL  PAGES    HIGH     %
VOLID   RDEV     START         END   PAGES  IN USE   PAGE  USED

------  ----  ----------  ----------  ------  ------  ------  ----

P01S01  3F28           1       10016  1761K  179382  369020   9%

P02S01  3F3C           -           -       0       0       0   0  SHARED

                                        ------  ------          ----

SUMMARY                                  1761K  179382           9%

USABLE                                   1761K  179382           9%

Ready; T=0.01/0.01 19:21:05
```

RUNNING   POKLBS1

Spool Display from 2nd Member

```
q alloc spool

                 EXTENT      EXTENT   TOTAL  PAGES    HIGH    %

VOLID  RDEV       START         END   PAGES IN USE   PAGE USED

------ ---- ---------- ---------- ------ ------ ------ ----

P01S01 3F28          -           -        0      0      0   0  SHARED

P02S01 3F3C          1       10016    1761K  94550  95486   5%

                                    ------ ------        ----

SUMMARY                             1761K  94550         5%

USABLE                              1761K  94550         5%

Ready; T=0.01/0.01 19:22:48


                                              RUNNING    POKLBS2
```

Performance Toolkit SSI Features

```
FCX271        CPU 2097  SER 82DBF        SSI data menu            Perf. Monitor


   SSI performance reports
S Command       Description
_ SSICONF       SSI configuration
=
_ SSISCHLG      SSI State Change Synchronization Activity log
_ SSISMILG      SSI State/Mode Information log

   ISFC performance reports
S Command       Description
_ ISFECONF      ISFC End Point configuration
_ ISFEACT       ISFC End Point activity
_ ISFLCONF      ISFC Logical Link configuration
_ ISFLACT       ISFC Logical Link activity state
_ ISFLALOG      ISFC Logical Link activity log






Select performance screen with cursor and hit ENTER
Command ===> _____
F1=Help  F4=Top  F5=Bot  F7=Bkwd  F8=Fwd  F12=Return
MA    A                                                        06/002
```

SSI Configuration Information

```
FCX276       CPU 2097   SER 82DBF              SSI Config.        Perf. Monitor

Initial Status on 2012/01/03 at 16:34:36
SSI Name                     POKLBS
Number of slots configured  4
Number of slots in use      2

Members Information
Slot SystemID
   1 POKLBS1
   2 POKLBS2
   3 ........
   4 ........

Changed Config Status
Date  Time      Changed
..... ........  No status changes received




Command ===>  _
F1=Help  F4=Top   F5=Bot   F7=Bkwd   F8=Fwd   F12=Return
MA    A                                                            23/015
```

SSI State change History

SSI Link Configuration/Status Log

```
FCX275        CPU 2097  SER 82DBF        LogLinks Config.        Perf. Monitor

Initial Status on 2012/01/03 at 16:34:36

Partner  Devs Rdevs
POKLBS2    2  F520 F521

Changed Config Status
Date  Time      Changed
..... ........   No status changes received

















Command ===> _
F1=Help  F4=Top  F5=Bot  F7=Bkwd  F8=Fwd  F12=Return
MA    A                                                              23/015
```

71

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Link Information - Sent Received

```
Host: |                    Port: |         Lu Name: |              Disconnect
FCX274        CPU 2097   SER 82DBF   Interval 19:30:36 - 19:31:36    Perf. Monitor
_____      .      .      .      .      .      .      .      .      .      .
                  <------- Sent --------> <----- Received ------>
Partner  Devs  LSByte LSBRt LSMsg LSMR LRByte LRBRt LRMsg LRMR
POKLBS2  2.0     1422 23.70     9  .15    1616 26.93     9  .15















Command ===> _
F1=Help  F4=Top   F5=Bot   F7=Bkwd   F8=Fwd   F12=Return
MA     A                                                            23/015
```

Link Activity History

Summary

- SSI is a new way to deploy z/VM images and resources
  - Benefit from clustering and virtual server mobility

- Planning and thought required
  - Capacity and equipment
  - Resource sharing
  - Virtual networks
  - Installation
    - SSI cluster configuration
    - Migrating from your current z/VM environment
  - User directory
    - Virtual machine (guest) definition and distribution
  - Live Guest Relocation

- New documentation to assist with
  - SSI Planning
  - Migrating to an SSI cluster

z/VM 6.2.0 information and documentation:
http://www.vm.ibm.com/zvm620/

Thanks!

Richard G. Young

IBM Senior Certified

STG Lab Services

Virtualization & Linux Team Lead

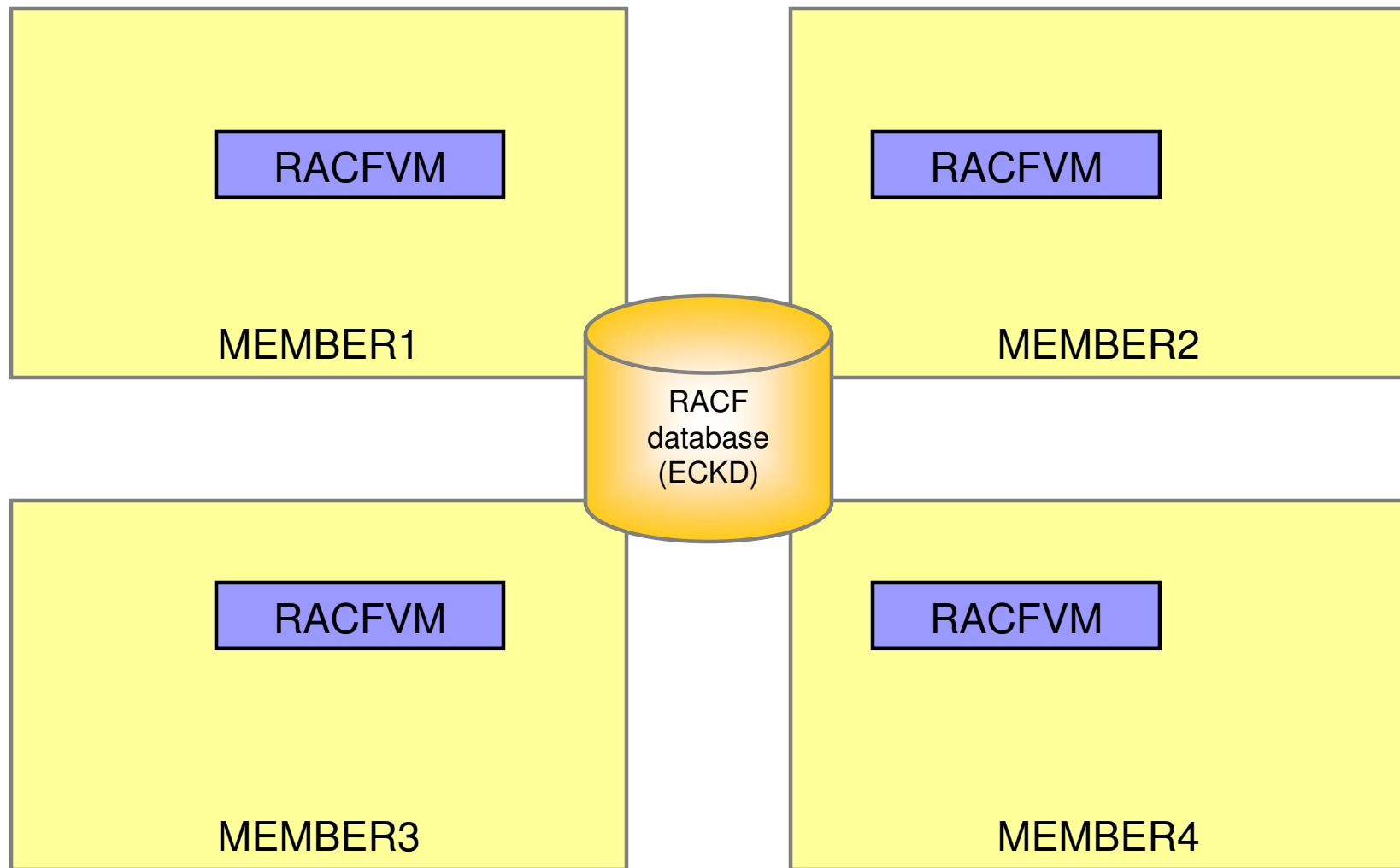**IBM**

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RACF in an SSI Cluster

IBM

PerfKit in an SSI Cluster

System console
and
Web interface

PERFSVM

MONDCSS

MEMBER1

PERFSVM

MONDCSS

MEMBER2

PERFSVM

MONDCSS

MEMBER3

PERFSVM

MONDCSS

MEMBER4