z/VM Live Guest Relocation Planning and Use

John Franciscovich
francisj@us.ibm.com

Emily Kate Hugenbruch
ekhugen@us.ibm.com

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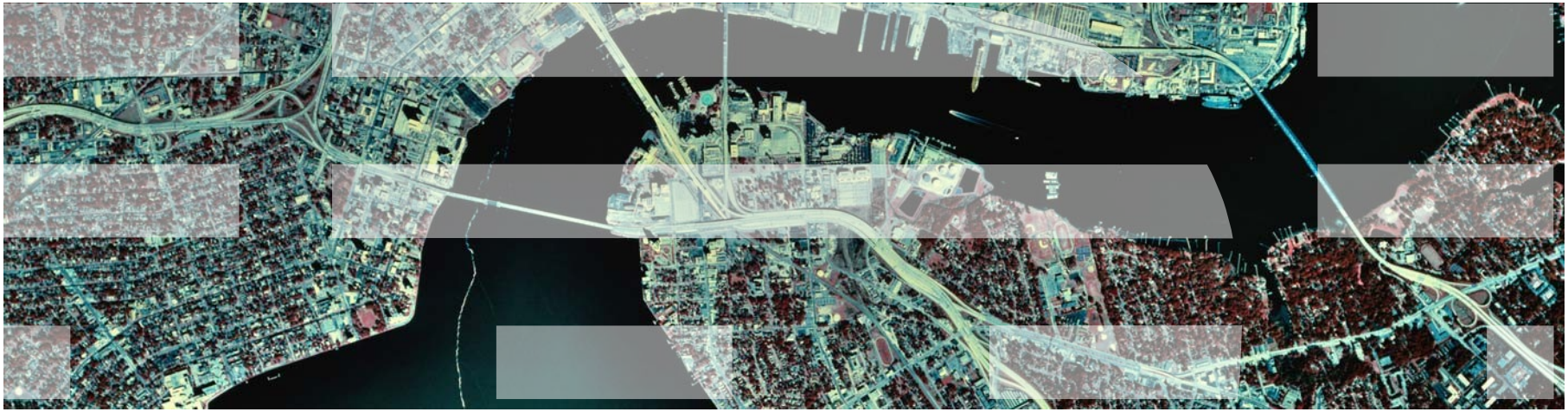
Agenda

- Planning and Configuring your SSI Cluster
- Planning for Live Guest Relocation (LGR)
- Relocation Domains
- Performing Live Guest Relocations
- Helpful Hints



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 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 (continued)

Linux server user ID	Memory	Virtual processors	DASD	Networking devices	Hardware feature or architecture	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):									

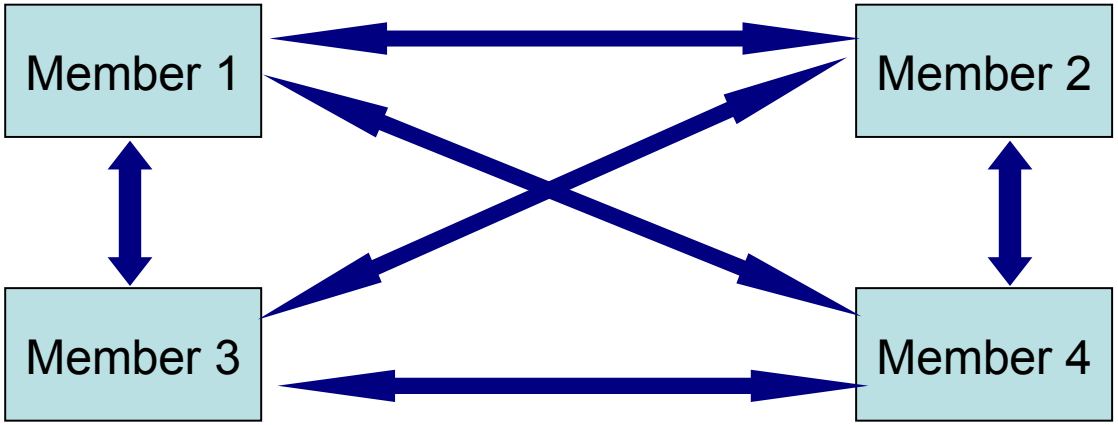
1. Total virtual memory should be no more than three times the total real memory.

SSI Cluster Planning

- CTC connections
- DASD
- Shared Source Directory
- Networks

CTC Connections

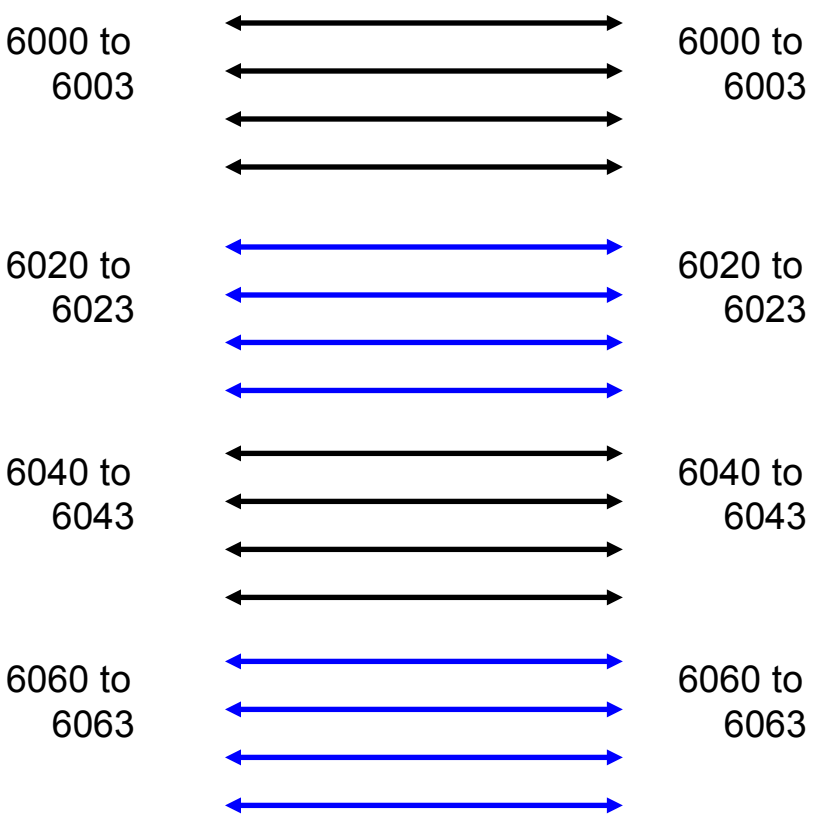
- Each member of an SSI cluster must have a direct ISFC connection to every other member (logical link)



- 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

CTC Connections – How Many Do I Need?

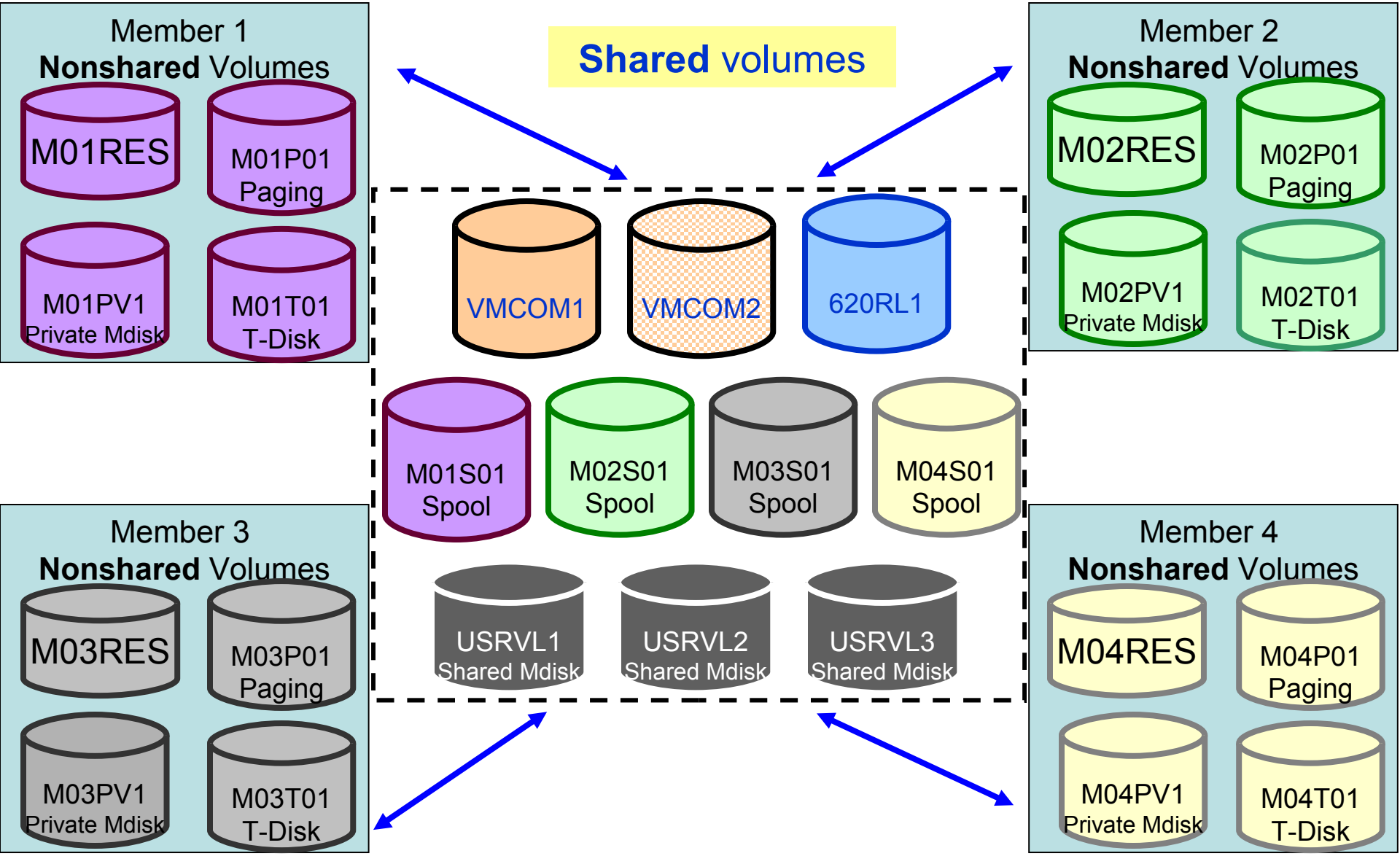
- 4 CTC devices per per FICON chpid
  - provides most efficient ISFC data transfer
- For large guests, relocation and quiesce times improve with more chpids
  - Up to 4 chpid paths, with 4 CTCs each
    - *Additional factors affect relocation and quiesce times*



DASD Planning

- Decide which DASD volumes will be used for
  - Cluster-wide volume(s)
  - Release volumes
  - System volumes
    - Shared
    - Non-shared
  - User data (minidisks)
    - Shared
    - Non-shared
- Decide which member owns each CP-Owned volume

DASD Planning – Non-Shared and Shared System Volumes



DASD Planning - CP Volume Ownership

- Link the full pack overlay for each CP-Owned volume
- Use **CPFMTXA** to add ownership information to each CP-Owned volume
  - Cluster name
  - System name of owning member

Volume	***Owner (CLUSTER.MEMBER)***
M01RES	**MYCLUSTER.MEMBER1**
VMCOM1	**MYCLUSTER.NOSYS**
M01S01	**MYCLUSTER.MEMBER1**
M01P01	**MYCLUSTER.MEMBER1**

- Ownership information may also be used on non-SSI systems
  - System name but no cluster name
  - Default on non-SSI installs

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

Definitions and resources unique to member 1

SUBCONFIG statement for member 2

Definitions and resources unique to member 2

Shared Source Directory – Global and Local disks

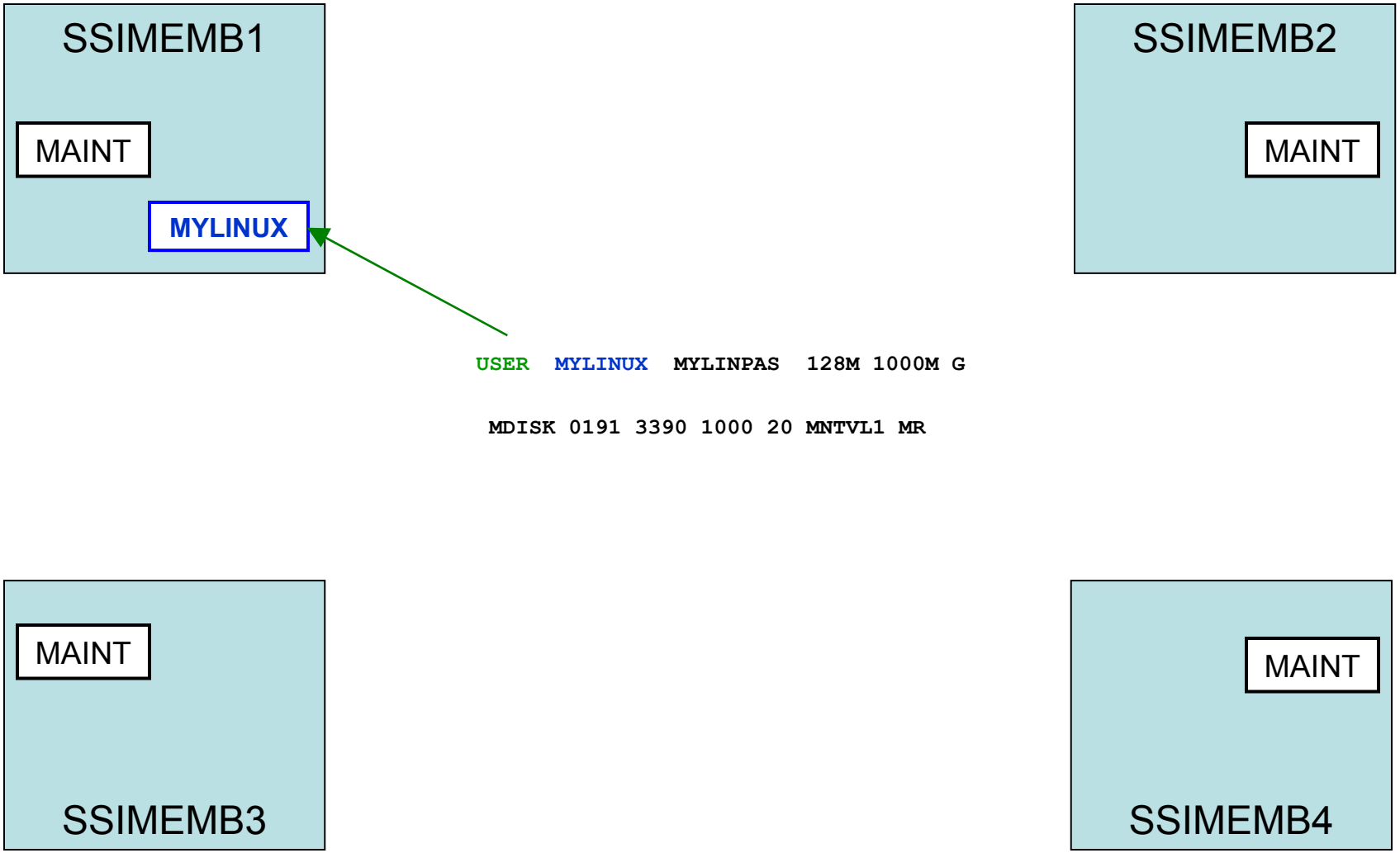
- For each guest you're turning into a multiconfiguration virtual machine, decide which disks should be global and which should be local
  - You may want to split existing disks into global and local.

Global	Local
•All instances have access	•Only one instance has access
•Usually R/O	•Usually R/W
•EXECs	•Log files
•Control 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

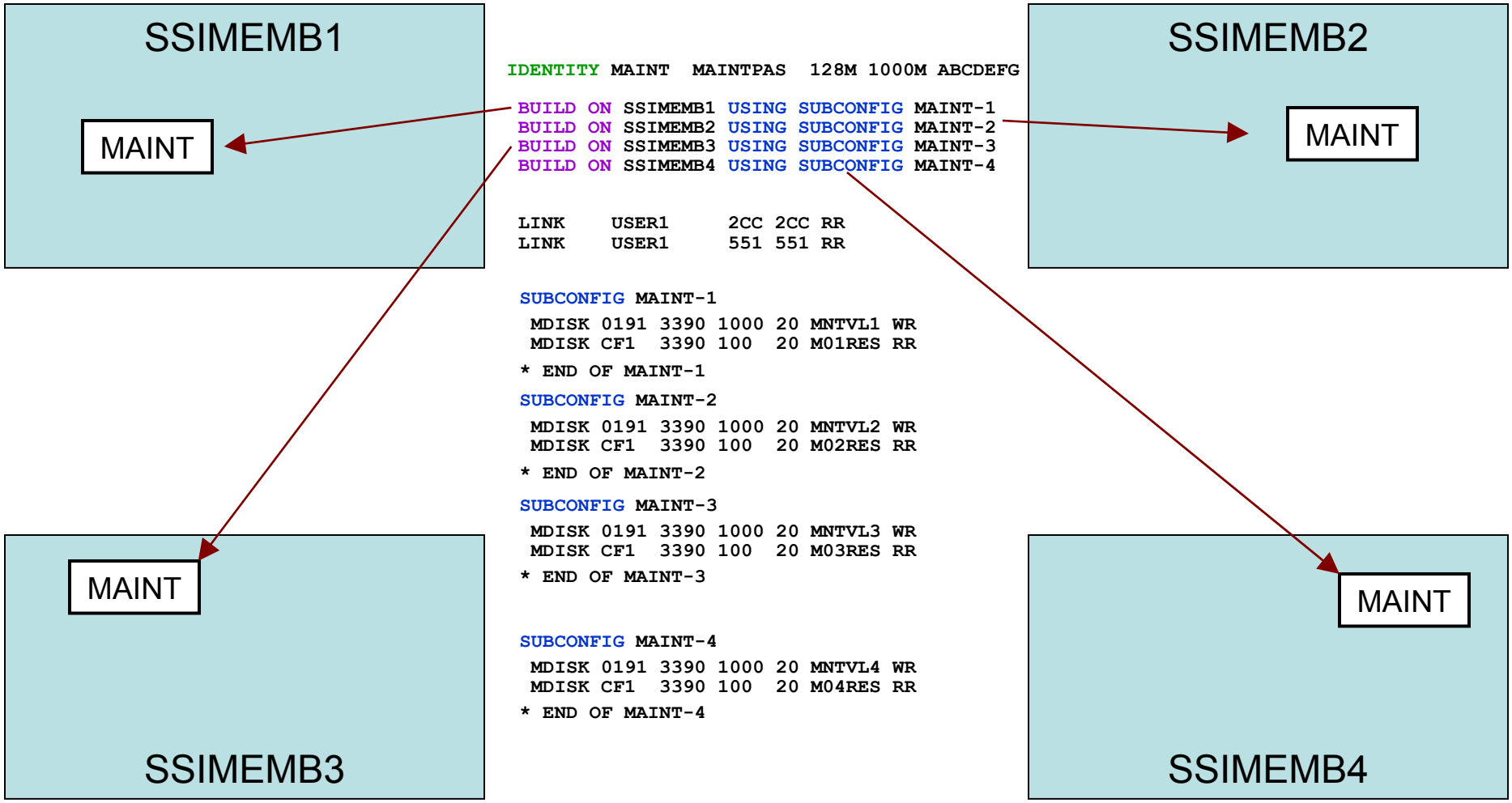
Shared Source Directory – Single Configuration Virtual Machines




```
USER  MYLINUX  MYLINPAS  128M 1000M G

MDISK 0191 3390 1000 20 MNTVL1 MR
```

Shared Source Directory – Multiconfiguration Virtual Machines




```
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
```

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

Parm Disks *(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

Full Pack Minidisks

- **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

Release Volumes (620RLn)

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

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*
    - *MEMBER2 TCPIP*
  - *TCPIP DATA* file can be shared among SSI members, so you can add system qualifiers to statements like **HOSTNAME**

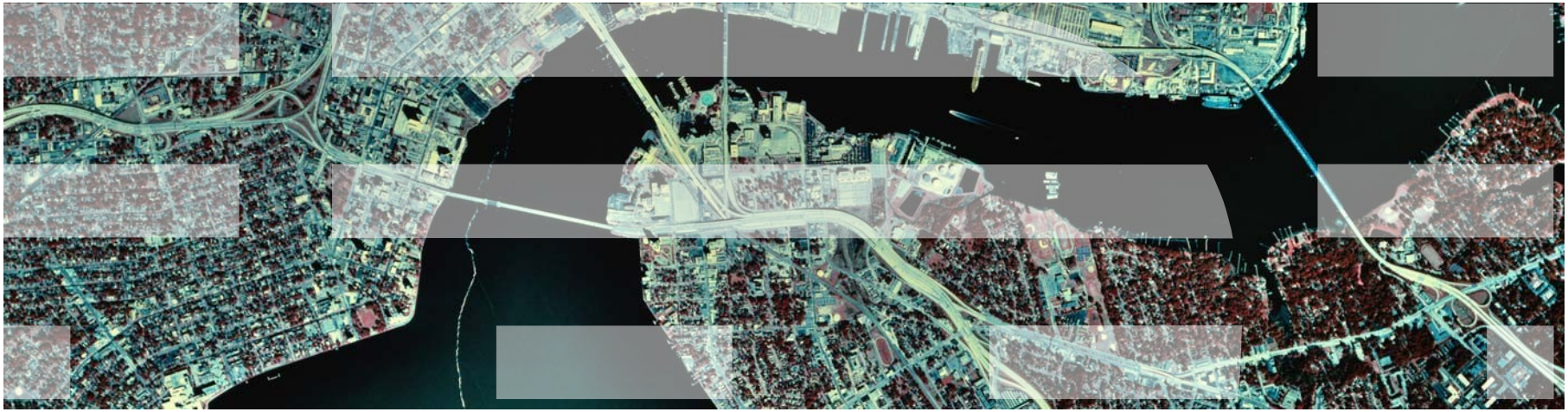
Networks in an SSI – Virtual Switches

- 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
```



Planning for Live Guest Relocation

General Guidelines for Relocating a Guest

Make sure all resources used by the virtual machine are available on the destination member

- Devices
- Facilities (will be handled automatically if you are relocating within a domain)
- Crypto cards
- Capacity for the virtual machine's memory and processor requirements
- Equivalency ids (**EQID**s) are defined for devices that need them
  - OSAs and FCPs
- Make sure that the devices really are equivalent
    - OSAs should be connected to the same LAN segment
    - FCPs should have access to the same SAN fabric
    - WWPNs and LUNs
  - If possible, use the same device numbers to refer to equivalent devices
- If connected to a VSWITCH, make sure the same VSWITCH is defined on the destination and the OSAs have been assigned EQIDs.
- If the virtual machine has an FCP, make sure the “queue_if_no_path” option is specified in Linux
- **OPTION CHPIDVIRTUALIZATION ONE** should be specified in guest's directory entry

Guest Configuration for Live Guest Relocation

- In order to be eligible to relocate, a guest must be:
  - Defined as a single configuration virtual machine
  - Running in an ESA or XA virtual machine in ESA/390 or z/Architecture mode
  - Logged on and disconnected
  - Running only type CP or type IFL virtual processors

- If a guest is using a DCSS or NSS:
  - Identical NSS or DCSS must be available on the destination member
  - It cannot have the following types of page ranges
    - SW (shared write)
    - SC (shared with CP)
    - SN (shared with no data)

Guest Configuration for Live Guest Relocation (cont.)

- A guest can relocate if it has any of the following:
  - Dedicated devices
    - Equivalent devices and access must be available on destination member
  - Private virtual disks in storage (created with DEFINE VFB-512 command)
  - No open spool files other than console files
  - VSWITCHes
    - Equivalent VSWITCH and network connectivity must be available on destination

- A relocating guest can be using any of the following facilities:
  - Cryptographic adapter
    - Crypto cards for shared domains on source and destination must be same AP type
  - Virtual machine time bomb (Diag x'288')
  - IUCV connections to *MSG and *MSGALL CP system services
  - Application monitor record (APPLDATA) collection
    - If guest buffer is not in a shared DCSS
  - Single Console Image Facility
  - Collaborative Memory Management Assist (CMMA)

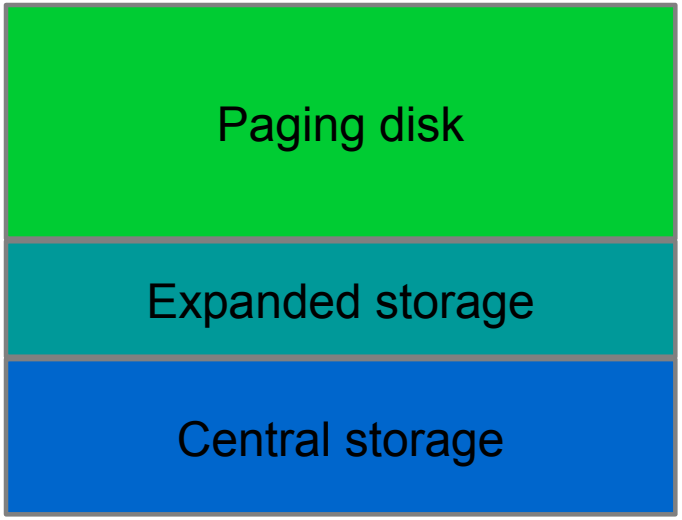
Memory Requirements for Live Guest Relocation

- A relocating guest's current memory size ***must*** fit in available space on the destination member

Guest's Current Memory Size

Virtual memory fully populated, including
- Private Vdisks
- Estimated size of supporting CP structures

Available space
- sum of available memory



Memory Requirements for Live Guest Relocation…

- Additional checks

1. Does the guest's current memory size exceed paging capacity on the destination?

Guest's Current Memory Size

Virtual memory fully populated, including
- Private Vdisks
- Estimated size of supporting CP structures

<

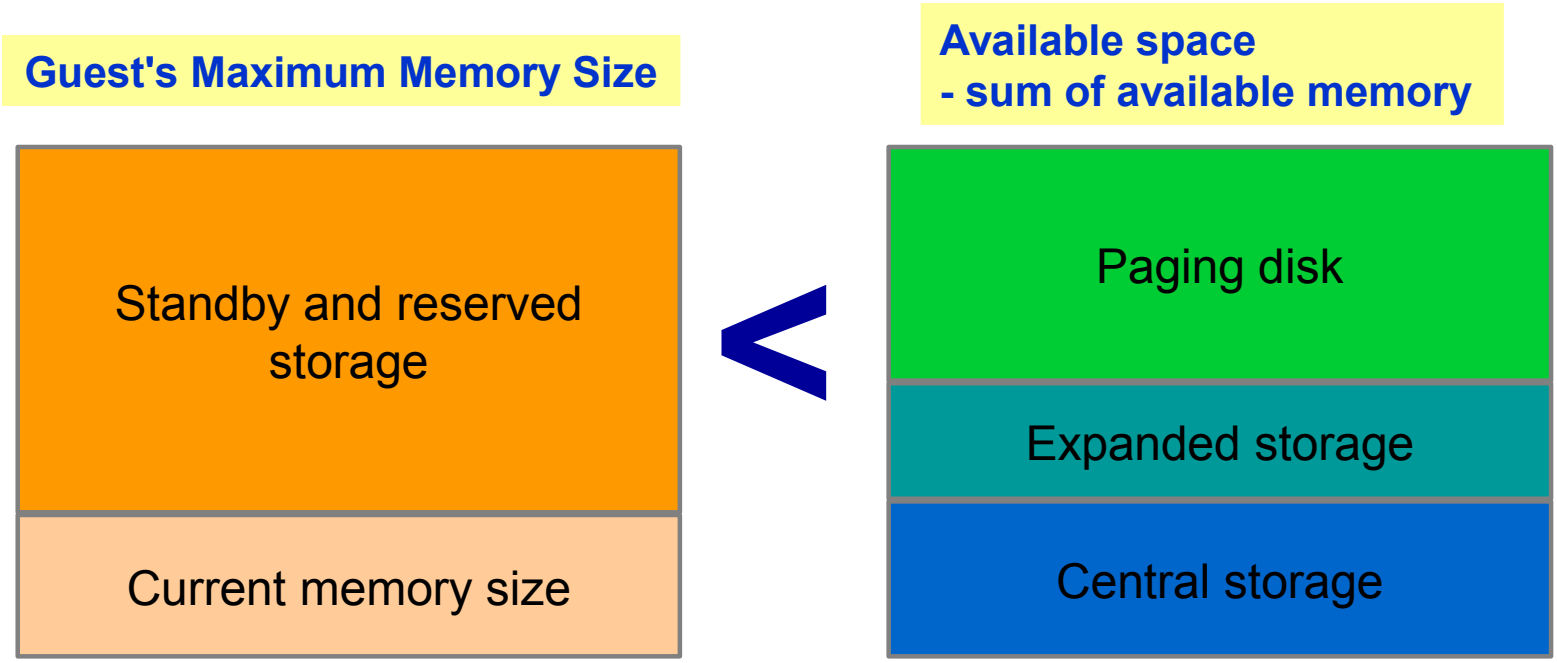
Paging disk capacity

May be overridden if you are certain that this is not applicable to your environment

Memory Requirements for Live Guest Relocation…

- Additional checks

2. Does the guest's maximum memory size exceed available space on the destination?



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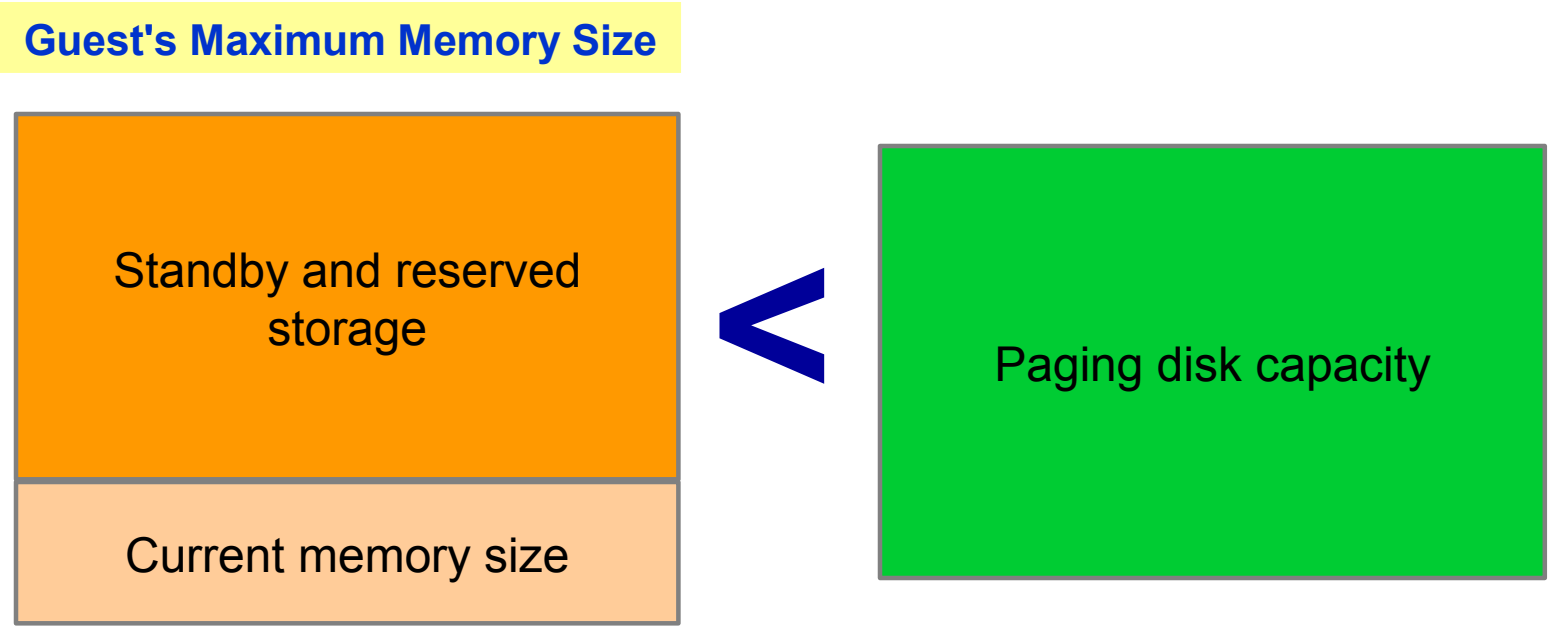
Memory Requirements for Live Guest Relocation…

- Additional checks

3. Does the guest's maximum memory size exceed paging capacity on the destination?



May be overridden if you are certain that this is not applicable to your environment

Memory Requirements for Live Guest Relocation…

- Include standby and reserved storage settings when calculating maximum memory size for a guest

- Relocations may increase paging demand
  - Available paging space should be at least 2x total virtual memory of all guests
    - Including guests to be relocated to this member
  - Avoid allocating more than 50% of available paging space
    - If size of guests to be relocated increase in-use amount to > 50%, system performance could be affected

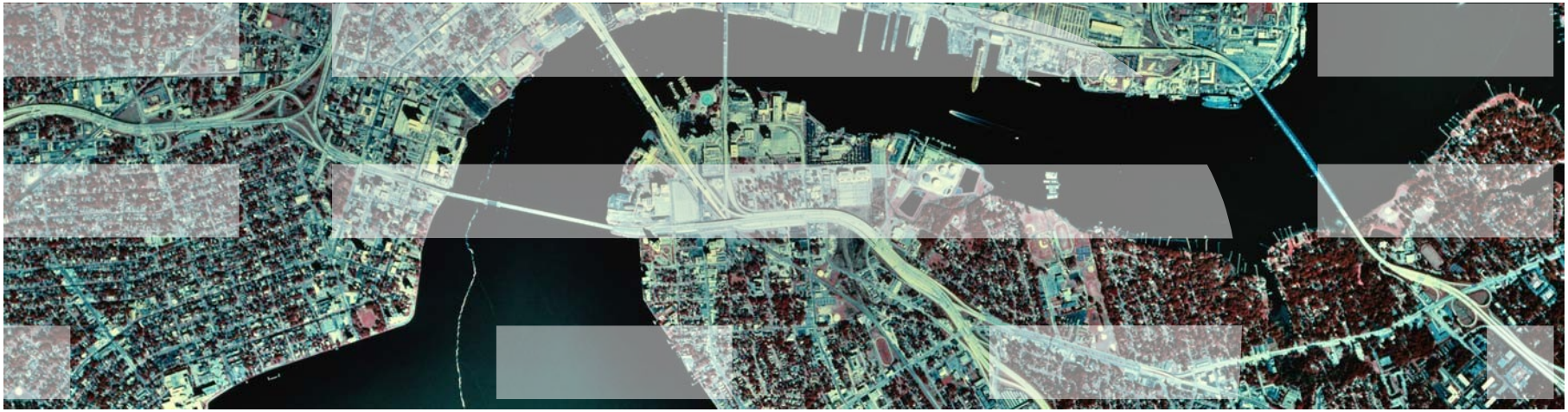
```
q alloc page

                 EXTENT     EXTENT  TOTAL  PAGES   HIGH    %
VOLID  RDEV       START        END  PAGES IN USE   PAGE USED
------ ---- ---------- ---------- ------ ------ ------ ----
L24B66 4B66          0       3338 601020 252428 252428   42%
```

Conditions That Prevent a Relocation

- Conditions in the following categories could prevent a relocation from completing:
  - Guest State Conditions
  - Device Conditions
  - Device State Conditions
  - Virtual Facility Conditions
  - Configuration Conditions
  - Resource Limit Conditions
  - Other…

- Entire list of conditions documented in CP Planning and Administration
  - "Preparing for Live Guest Relocation in a z/VM SSI Cluster"

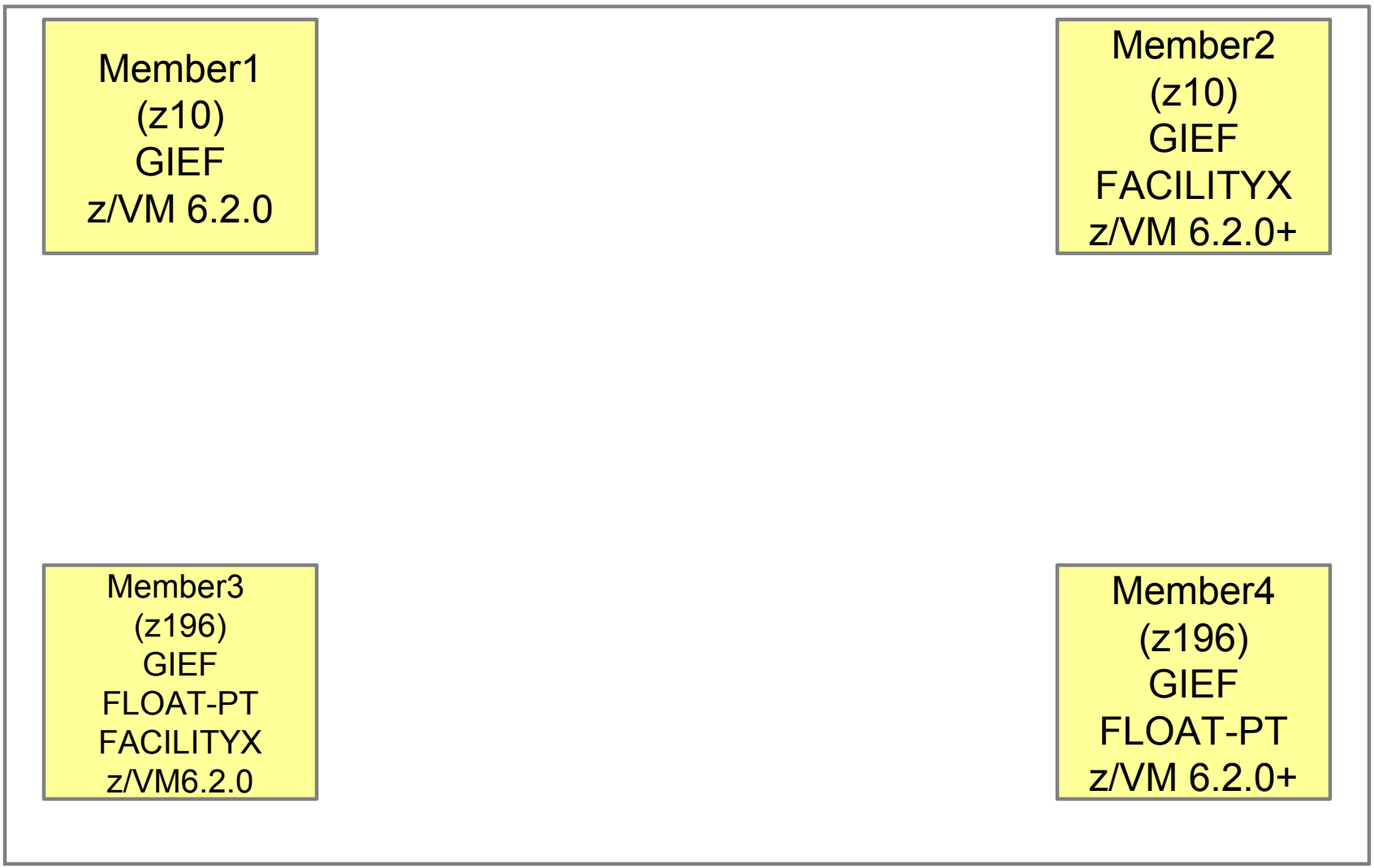


Relocation Domains

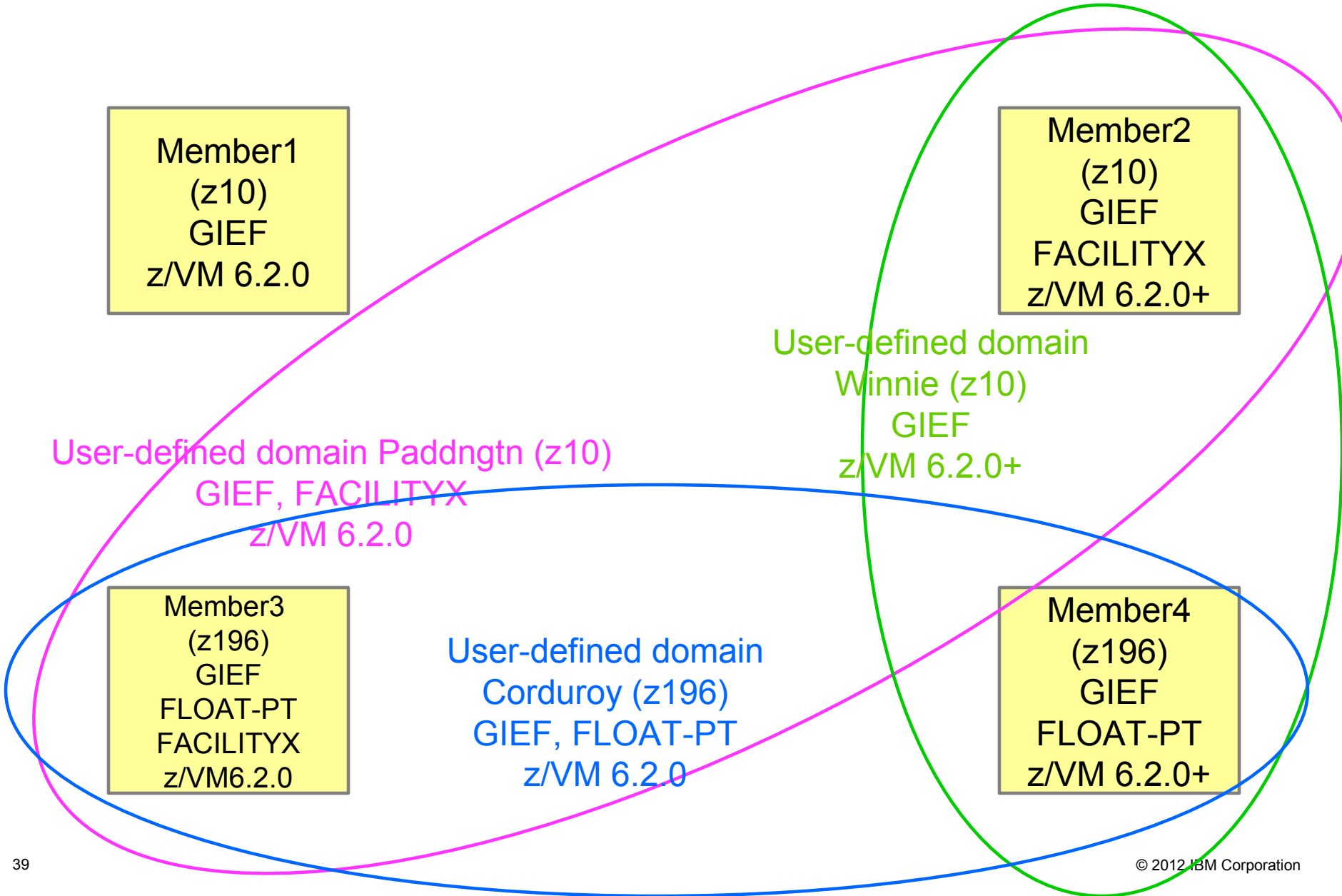
What is a Relocation Domain?

- A relocation domain defines a set of members of an SSI cluster among which virtual machines can relocate freely
- Relocation domains can be defined for business or technical reasons
- Regardless of differences in the facilities of the individual members, a domain has a common architectural level
  - This is the maximal common subset of all the members' facilities
- Several default domains are automatically defined by CP
  - Single member domains for each member in the SSI
  - An SSI domain that will have the features and facilities common to all members
- Defining your own domains is useful in a 3+ member cluster
  - In a 1 or 2 member cluster, all possible domains are defined by default

Relocation Domains



Relocation Domains



Defining Relocation Domains

- In system configuration file:

```
88
89 RELOCATION_DOMAIN PADDNGTN MEMBER2 MEMBER3
90 RELOCATION_DOMAIN WINNIE MEMBER2 MEMBER4
91 RELOCATION_DOMAIN CORDUROY MEMBER3 MEMBER4
92
```

- Dynamically via a **DEFINE** command:

```
define relodomain paddngtn members member2 member3

define relodomain winnie members member2 member4

define relodomain corduroy members member3 member4
```

Assigning Relocation Domains

- Virtual machines may be assigned to a domain in their directory entry
  - Default for single configuration virtual machines is the SSI domain
  - Default for multiconfiguration virtual machines is their single member domain, which cannot be changed
- Virtual machines are assigned a virtual architecture level when they log on, according to what domain they are in
- They cannot use facilities or features not included in the domain even if the member they are on has access to those features
  - We call this “fencing”
- Examples of commands/instructions with “fenced” responses:
  - **Q CPUID** -the model number will always reflect the virtual architecture level, the processor number is set at logon and not affected by relocation or relocation domain changes
  - **Diagnose x'00'** – will reflect the virtual CPLEVEL
  - **STFLE**

Assigning Relocation Domains - Directory

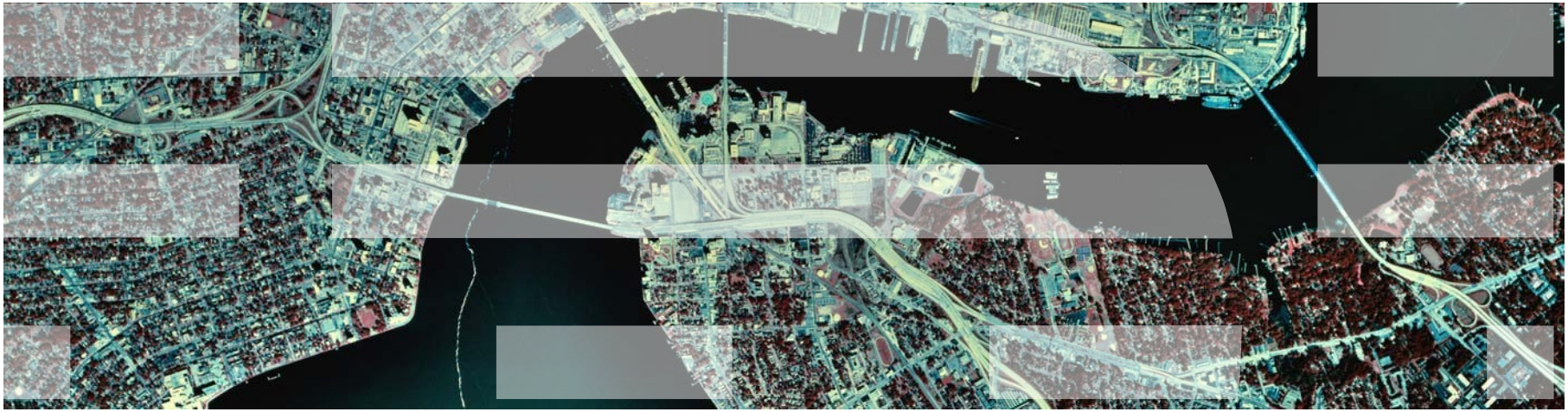
```
dirm for lgrrh56 vmrelocate on domain winnie
DVHXMT1191I Your VMRELOCATE request has been sent for processing to
DVHXMT1191I DIRMAINT at MEMBER1 via DIRMSAT2.
Ready; T=0.01/0.02 11:32:46
DVHREQ2288I Your VMRELOCATE request for LGRRH56
DVHREQ2288I at * has been accepted.
DVHBIU3450I The source for directory e
DVHBIU3450I LGRRH56 has been updated.
DVHBIU3424I The next ONLINE will take
DVHBIU3424I immediately.
DVHRLA3891I Your DSATCTL request has b
DVHRLA3891I for processing.
DVHRLA3891I Your DSATCTL request has b
DVHRLA3891I for processing.
DVHRLA3891I Your DSATCTL request has been relayed
DVHRLA3891I for processing.
DVHRLA3891I Your DMVCTL request has been relayed
DVHRLA3891I for processing.
DVHRLA3891I Your DMVCTL request has been relayed
DVHRLA3891I for processing.
DVHRLA3891I Your DMVCTL request has been relayed
DVHRLA3891I for processing.
DVHBIU3428I Changes made to directory entry LGRRH56
DVHBIU3428I have been placed online.
DVHREQ2289I Your VMRELOCATE request for LGRRH56
DVHREQ2289I at * has completed; with RC = 0.
```

```
USER LGRRH56 E 2G 3G ABCDEFG
   INCLUDE LGRDFLT
   IPL 150
   VMRELOCATE ON DOMAIN WINNIE
   LINK PMAINT 0193 0F93 RR
   MDISK 0150 3390 1 END FL4BC8 MR ALL WRITE MULTI
   MDISK 0151 3390 1 END FL4BC9 MR ALL WRITE MULTI
   MDISK 0152 3390 1 END FL4BCA MR ALL WRITE MULTI
```

Assigning Relocation Domains - Dynamic

- A running virtual machine may be dynamically reassigned to a domain with the same or greater facilities, so long as the member he is currently on has access to those facilities
- For example, a guest may be in the SSI domain, but relocate to a member with access to more facilities, so you may want to reassign him to a domain with higher facilities

```
set vmrelocate * domain ssi
Running on member GDLRCTS2
Relocation enabled in Domain SSI
Ready;
q cpuid
CPUID = FF3B6D8520978000
Ready;
define relodomain winnie gdlrcts1 gdlrcts2
Ready;
set vmrelocate * domain winnie
Running on member GDLRCTS2
Relocation enabled in Domain WINNIE
Ready;
q cpuid
CPUID = FF3B6D8528178000
Ready;
```



Live Guest Relocation

Starting and Managing a Live Guest Relocation

- New **VMRELOCATE** command
  - Several operands to start and monitor relocations, including:
    - **TEST** – determine if guest is eligible for specified relocation
    - **MOVE** – relocates guest
    - **STATUS** – display information about relocations that are in progress
    - **CANCEL** – stop a relocation
    - **MAXQUIESCE** – maximum quiesce time (relocation is cancelled if exceeded)
    - **MAXTOTAL** – maximum total time (relocation is cancelled if exceeded)

What to Know Before Starting Relocations

- Guests are relocated in several stages
- A relocation can be canceled at any time until after the guest's final state is moved
  - **VMRELOCATE CANCEL** command from the source or destination
  - **CPHX** will cancel a **VMRELOCATE SYNC** command
- If there are any eligibility failures at any point until after the guest's final state is moved, the relocation cancels
- The guest continues to run on originating member if a relocation fails or is cancelled

What to Know Before Starting Relocations…

- Use the **VMRELOCATE TEST** command before you try a **VMRELOCATE MOVE**

- Choose one class A user to always issue your **VMRELOCATE** commands
  - Only issue one **VMRELOCATE** command at a time
    - Default **SYNCHRONOUS** option to enforce one-at-a-time relocations

- Use the **AT** command to issue **VMRELOCATE**s on another member in your SSI cluster

- Know how long your Linux machine can be quiesced, look at applications and when they will timeout (30 seconds? 5 seconds?)
  - Use the **MAXQUIESCE** option to tell CP how long quiesce time can be
  - If this is exceeded, the relocation will be canceled and the virtual machine resumed on the source member

Live Guest Relocation – Example

```
q ssi
SSI Name: SSITEST
SSI Mode: Stable
Cross-System Timeouts: Enabled
SSI Persistent Data Record (PDR) device: FL4B84 on 4B84
SLOT SYSTEMID STATE     PDR HEARTBEAT        RECEIVED HEARTBEAT
   1 GDLLCPX1 Joined    2011-10-13 15:10:18 2011-10-13 15:10:18
   2 GDLLCPX2 Joined    2011-10-13 15:10:12 2011-10-13 15:10:12
   3 GDLLCPX3 Joined    2011-10-13 15:10:26 2011-10-13 15:10:26
   4 GDLMCPX4 Joined    2011-10-13 15:10:35 2011-10-13 15:10:35
Ready; T=0.01/0.01 15:10:41
```

Live Guest Relocation – Example

```
formssi display 141
HCPPDF6618I Persistent Data Record on device 0141 (label FL4B84) is for
HCPPDF6619I PDR                  state: Unlocked
HCPPDF6619I                 time stamp: 10/13/11 15:10:42
HCPPDF6619I      cross-system timeouts: Enabled
HCPPDF6619I PDR slot  1          system: GDLLCPX1
HCPPDF6619I                      state: Joined
HCPPDF6619I                 time stamp: 10/13/11 15:10:18
HCPPDF6619I                last change: GDLLCPX1
HCPPDF6619I PDR slot  2          system: GDLLCPX2
HCPPDF6619I                      state: Joined
HCPPDF6619I                 time stamp: 10/13/11 15:10:42
HCPPDF6619I                last change: GDLLCPX2
HCPPDF6619I PDR slot  3          system: GDLLCPX3
HCPPDF6619I                      state: Joined
HCPPDF6619I                 time stamp: 10/13/11 15:10:26
HCPPDF6619I                last change: GDLLCPX3
HCPPDF6619I PDR slot  4          system: GDLMCPX4
HCPPDF6619I                      state: Joined
HCPPDF6619I                 time stamp: 10/13/11 15:10:35
HCPPDF6619I                last change: GDLMCPX4
Ready; T=0.01/0.01 15:10:48
```

Live Guest Relocation – Example

```
xautolog lgrlin21
Command accepted
Ready; T=0.01/0.01 15:11:44
AUTO LOGON  ***       LGRLIN21 USERS = 21
HCPCLS6056I XAUTOLOG information for LGRLIN21: The IPL command is verifi
set secuser lgrlin21 *
HCPCFX6768I SECUSER of LGRLIN21 initiated.
Ready; T=0.01/0.01 15:11:50
LGRLIN21: Booting default (ipl)...
LGRLIN21: Linux version 2.6.16.60-0.21-default (geeko@buildhost) (gcc ve
 UTC 2008
```

...

```
Welcome to SUSE Linux Enterprise Server 10 SP2 (s390x) - Kernel 2.6.16.6
"
"
linux-nxpt login:
```

Live Guest Relocation – Example

```
q lgrlin21 at all
GDLLCPX2 : LGRLIN21 - DSC
Ready; T=0.01/0.01 15:44:52
```

```
vmrelocate test lgrlin21 to gdllcpx1
User LGRLIN21 is eligible for relocation to GDLLCPX1
Ready; T=0.01/0.01 15:45:21
```

```
VMRELOCATE MOVE LGRLIN21 TO GDLLCPX1 MAXQ 5 SEC
Relocation of LGRLIN21 from GDLLCPX2 to GDLLCPX1 started
User LGRLIN21 has been relocated from GDLLCPX2 to GDLLCPX1
LGRLIN21: User LGRLIN21 has been relocated from GDLLCPX2 to GDLLCPX1
```

Live Guest Relocation – Example

```
LGRLIN21: qeth: check on device 0.0.0700, dstat=x0, cstat=x2 <4>qeth: ir
qeth: irb: 00 00 00 00  00 00 00 00  00 00 00 00  00 00 00 00
qeth: irb: 00 00 00 00  00 00 00 00  00 00 00 00  00 00 00 00
qeth: irb: 00 00 00 00  00 00 00 00  00 00 00 00  00 00 00 00
qdio : received check condition on activate queues on device 0.0.0702 (c
qeth: Recovery of device 0.0.0700 started ...
qeth: Device 0.0.0700/0.0.0701/0.0.0702 is a OSD Express card (level: 03
with link type OSD_100 (portname: whatever)
qeth: Hardware IP fragmentation not supported on eth0
qeth: VLAN enabled
qeth: Multicast enabled
qeth: IPV6 enabled
qeth: Broadcast enabled
qeth: Using SW checksumming on eth0.
qeth: Outbound TSO enabled
USER DSC   LOGOFF AS  LGRLIN21 USERS = 20    FORCED BY SYSTEM
Ready; T=0.01/0.01 15:45:52
LGRLIN21: qeth: Device 0.0.0700 successfully recovered!
Oct 13 15:45:51 linux-nxpt kernel: qeth: check on device 0.0.0700, dstat
00 00  00 80 e0 80"
Oct 13 15:45:51 linux-nxpt kernel: qeth: irb: 00 00 00 00  00 00 00 00
Oct 13 15:45:51 linux-nxpt kernel: qeth: irb: 00 00 00 00  00 00 00 00
Oct 13 15:45:51 linux-nxpt kernel: qeth: irb: 00 00 00 00  00 00 00 00
LGRLIN21: Oct 13 15:45:51 linux-nxpt kernel: qdio : received check condi
Oct 13 15:45:51 linux-nxpt kernel: qeth: Recovery of device 0.0.0700 sta
Oct 13 15:45:56 linux-nxpt kernel: qeth: Device 0.0.0700/0.0.0701/0.0.07
Oct 13 15:45:56 linux-nxpt kernel: with link type OSD_100 (portname: wha
Oct 13 15:45:56 linux-nxpt kernel: qeth: Using SW checksumming on eth0."
```

Live Guest Relocation – Example

```
q lgrlin21 at all
GDLLCPX1 : LGRLIN21 - DSC
Ready; T=0.01/0.01 15:46:35
```

```
AT GDLLCPX1 CMD VMRELOCATE MOVE LGRLIN21 TO GDLLCPX2 MAXQ 5 SEC
Relocation of LGRLIN21 from GDLLCPX1 to GDLLCPX2 started
LGRLIN21: User LGRLIN21 has been relocated from GDLLCPX1 to GDLLCPX2
User LGRLIN21 has been relocated from GDLLCPX1 to GDLLCPX2
LGRLIN21: qeth: check on device 0.0.0700, dstat=x0, cstat=x2 <4>qeth: ir
qeth: irb: 00 00 00 00  00 00 00 00  00 00 00 00  00 00 00 00
qeth: irb: 00 00 00 00  00 00 00 00  00 00 00 00  00 00 00 00
qeth: irb: 00 00 00 00  00 00 00 00  00 00 00 00  00 00 00 00
qdio : received check condition on activate queues on device 0.0.0702 (c
qeth: Recovery of device 0.0.0700 started ...
qeth: Device 0.0.0700/0.0.0701/0.0.0702 is a OSD Express card (level: 03
with link type OSD_100 (portname: whatever)
qeth: Hardware IP fragmentation not supported on eth0
qeth: VLAN enabled
qeth: Multicast enabled
qeth: IPV6 enabled
qeth: Broadcast enabled
qeth: Using SW checksumming on eth0.
qeth: Outbound TSO enabled
Ready; T=0.01/0.01 15:47:10
LGRLIN21: qeth: Device 0.0.0700 successfully recovered!
```

Live Guest Relocation – Example

```
q LGRLIN21 AT ALL
GDLLCPX2 : LGRLIN21 - DSC
Ready; T=0.01/0.01 15:47:41
```

Helpful Hints

Help! My relocation hasn't completed yet!

Try
VMRELOCATE STATUS DETAILS

Helpful Hints…

```
vmrelocate test lgrcp021 gdlrcts1
User LGRCP021 is eligible for relocation to GDLRCTS1
Ready; T=0.01/0.01 15:28:09
vmrelocate move lgrcp021 gdlrcts1 asynchronous maxquiesce 10
Relocation of LGRCP021 from GDLRCTS2 to GDLRCTS1 started
Ready; T=0.01/0.01 15:28:15
vmrelocate status
User     From     To       By       Status          Elapsed
LGRCP021 GDLRCTS2 GDLRCTS1 CELESKEY Moving Memory   00:00:05
Ready; T=0.01/0.01 15:28:21
vmrelocate status lgrcp021 details
User     From     To       By       Status          Elapsed
LGRCP021 GDLRCTS2 GDLRCTS1 CELESKEY Moving Memory   00:00:10

Options: ASYNCH IMMED NO
Max Total Time NO LIMIT
Max Quiesce Time 10 sec

Total pages sent 702176 in 1 passes; 524320 pages sent in pass 2
Ready; T=0.01/0.01 15:28:25
User LGRCP021 has been relocated from GDLRCTS2 to GDLRCTS1
```

Helpful Hints…

Help! My relocation always exceeds my quiesce time!

Are you issuing relocations one at a time?

Check system constraints, are you trying to relocate to a member that really can't handle another user?

How many CTCs do you have between your members? How fast are they? How many devices do you have on each CHPID?

Helpful Hints…

I don't trust that you're really leaving the guest running,
I want to see what my guest is doing as he relocates!

Use SCIF from another single configuration virtual machine -
SET OBSERVER LINUX01 *

Have the virtual machine spool his console
SPOOL CONS * START

Connect to Linux via SSH or VNC

Helpful Hints…

What are all these messages I see on my Linux console after relocation?

You may see recovery messages for OSA or FCP devices after relocation, this is normal

More Information

z/VM 6.2 resources

http://www.vm.ibm.com/zvm620/

z/VM Single System Image Overview

http://www.vm.ibm.com/ssi/

Redbook – An Introduction to z/VM SSI and LGR

http://publib-b.boulder.ibm.com/redpieces/abstracts/sg248006.html?Open

Thanks!

Contact Information:

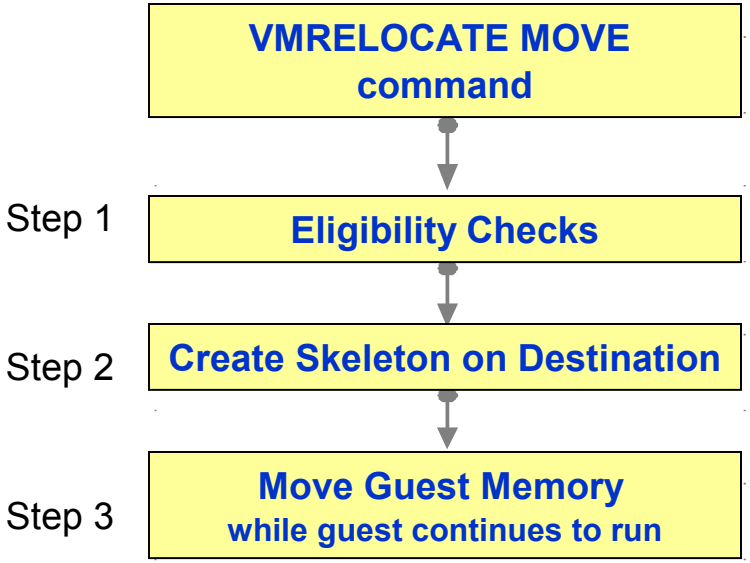
Emily Hugenbruch
IBM
z/VM Development
Endicott, NY

ekhugen@us.ibm.com

Celebrating 40 years!
http://www.vm.ibm.com/vm40bday.html

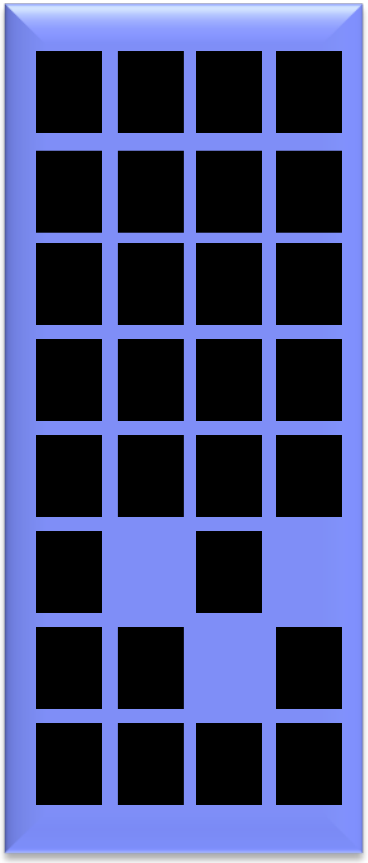
Additional information

Stages of a Live Guest Relocation



LGR, High-Level View of Memory Move

Source



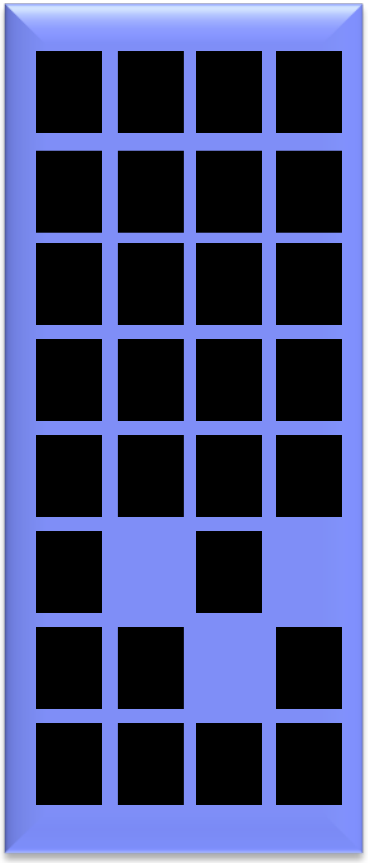
Guest Address Space

PUSH with resend

Pass 1

Walk through guest memory moving all non-zero pages

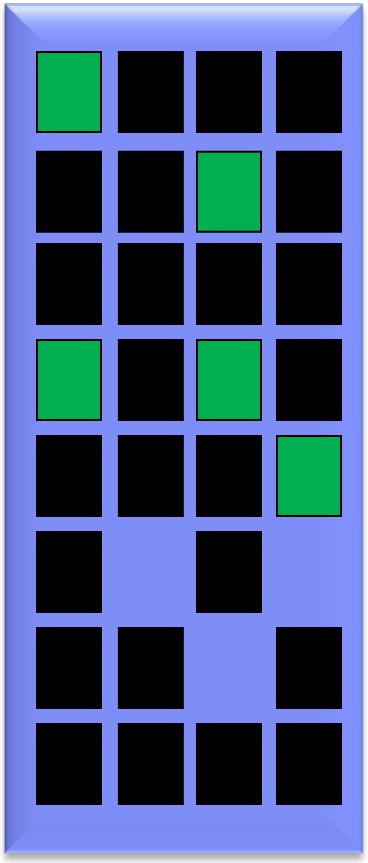
Destination



Guest Address Space

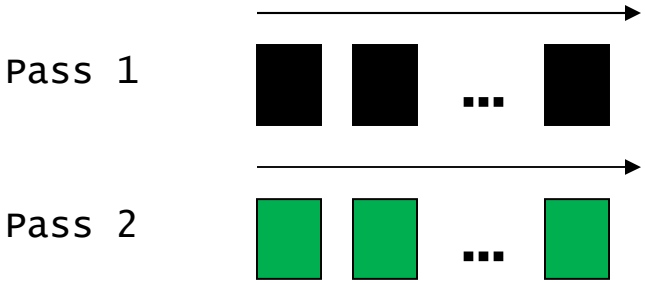
LGR, High-Level View of Memory Move

Source



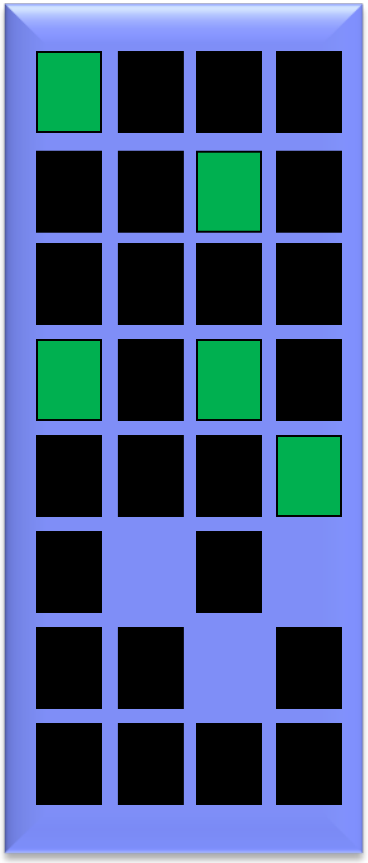
Guest Address Space

PUSH with resend



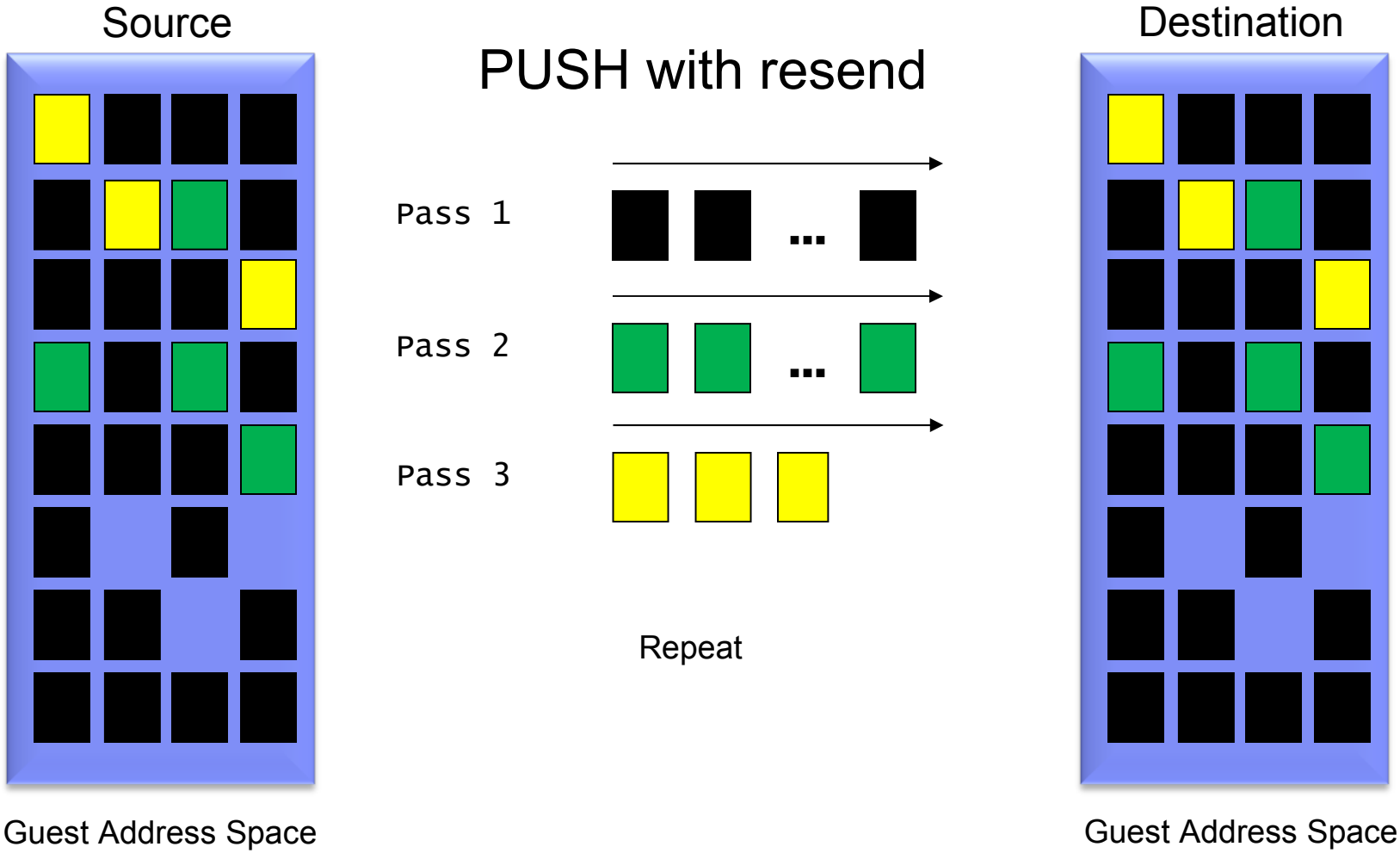
Walk through memory and resend any changed pages.

Destination

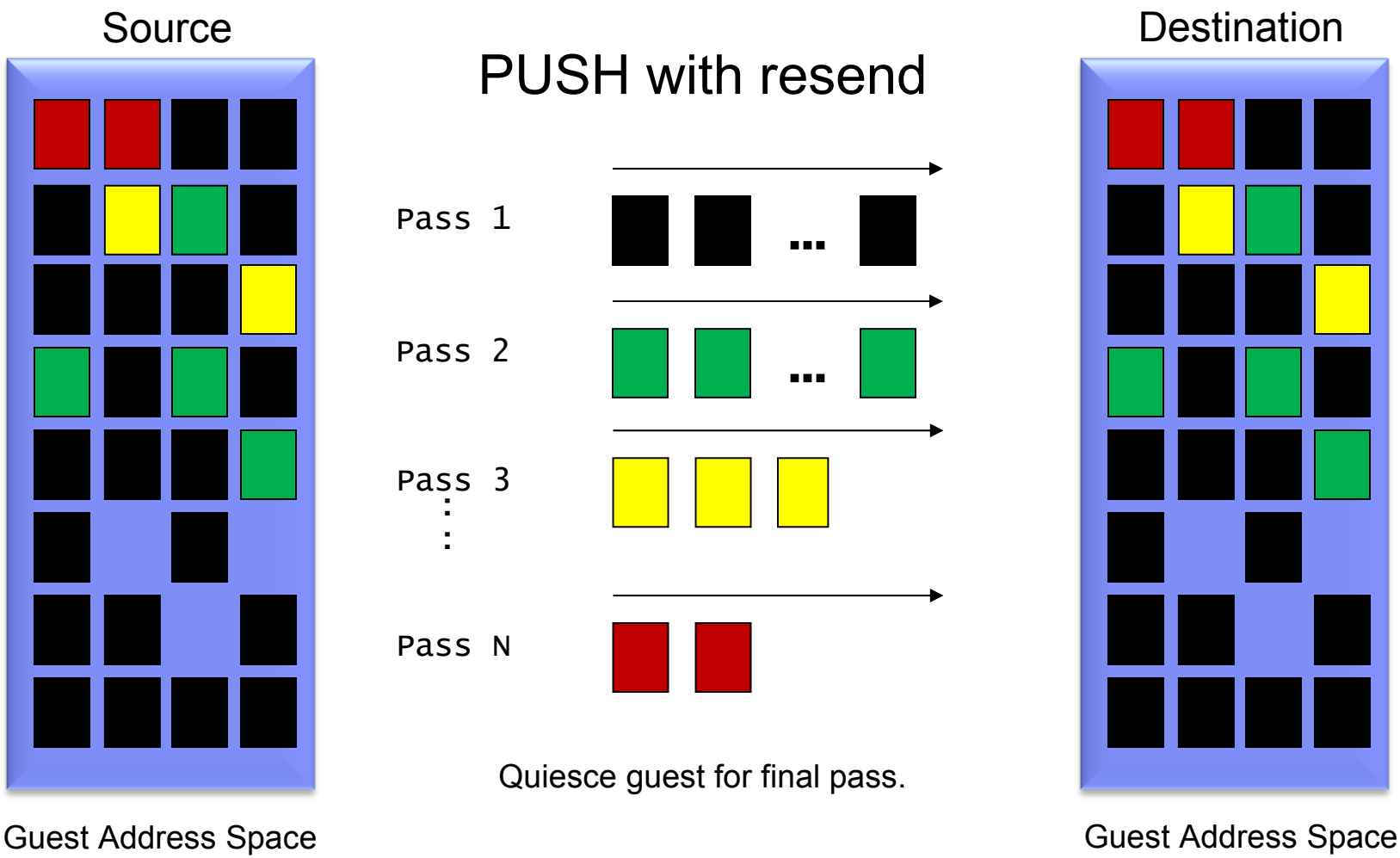


Guest Address Space

LGR, High-Level View of Memory Move



LGR, High-Level View of Memory Move



Stages of a Live Guest Relocation