Using CA Tools in a z/VM Single System Image (SSI) Environment to Achieve High Availability

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Abstract

In this session representatives from CA Technologies will provide a high level overview of CA solutions in the z/VM and Linux on System z environments. They will then show how specific tools such as zVPS, VM:Operator, VM:Director, and VM:Spool can support and take advantage of the new Single System Image (SSI) environment to improve availability for z/VM based applications. Finally, they will discuss how UPSTREAM for Linux on System z can be used to backup and protect data in this environment.

Single System Image (SSI)

— z/VM V6.2 implements multisystem virtualization using a z/VM single system image (SSI) cluster composed of up to four z/VM systems. This multisystem virtualization technology for the mainframe extends the z/VM virtualization technology to a new level, allowing members of the cluster to share resources and synchronize with other nodes, together presenting the appearance of a single system.

— Members of a z/VM SSI cluster are part of the same Inter-System Facility for Communications (ISFC) collection and use ISFC channel connections to communicate. All members of a cluster also share DASD for virtual machines and selected z/VM data, as well as LAN segments and IP subnets. The concept of a global virtual switch provides identical network connectivity across all active members within a cluster.

Single System Image (SSI)

— Simplified z/VM systems management is realized when z/VM instances are members of an SSI cluster and can be serviced and administered as one system. Sharing of resources used by both CP and virtual machines is coordinated among all members. This allows Linux guests to access the same devices and networks regardless of which member they are logged on or relocated to. Shared resources include:
  - User directory
  - Minidisks
  - Spool files
  - Network device MAC addresses

— Each member of a z/VM SSI cluster is able to communicate with all other active members. When a z/VM system is configured as a member of a cluster, it automatically joins the other members during system startup. Coordination of members joining and leaving the cluster, maintaining a common view of member and resource states, and negotiating access to shared cluster resources are all done seamlessly.

Single System Image (SSI)

- Connect up to 4 z/VM systems together as one
- Share resources for systems as well as their virtual machines
- Guests can be run same or other systems
- Share DASD for common files
  - Disk protection
- Why is this useful?
  - One user directory
  - Manager members from across systems
  - Make Maintance easier
  - Commands form one member to move to another system

Live Guest Relocation (LGR)

— Live guest relocation (LGR) provides the capability for a running Linux virtual machine to be moved without disruption from one z/VM system to another within a z/VM SSI cluster.

— Live guest relocation provides continuity for virtual server workloads over planned z/VM and machine outages, such as service and hardware upgrades. LGR allows applications to remain available over such outages with less impact to the application and less setup required. Verification that needed resources and machine features are available on the destination system prior to the relocation is provided. This verification may also be performed on request to assess a guest's eligibility for relocation. In an SSI cluster comprising different machine models, the architecture level presented to each guest is tailored to the set of machine features common to the member systems to which the guest may be relocated.

Live Guest Relocation (LGR)

- Restrictions (something to think about)
  - Make sure what ever system you move the guest to has access to all the correct DASD (file, database)
  - Cards (OSA, Crypto, Etc)
  - Make sure you have enough capacity for the guest on the destination system.
  - Make sure you have enough power to handle the guest on the destination system.
  - Devices should be connected to the same LAN segment or SAN fabric
  - Try to use the same device number
  - Make sure the same VSWITCH is defined on the destination system and the OSAs have been set up.

Live Guest Relocation (LGR)

- Time (something to think about)
  - Remember that moving a guest from one system to another might be quick but it still takes time.
    - Relocation Time
    - Quiesce Time

CA VM:Operator

- Scenario one
  - Your systems programmer gets a ping from Velocity zVPS that VM1 is starting to consume too much CPU.
  - Your systems programmer needs to push workload to another system.
  - How?
  - What does the system look like.

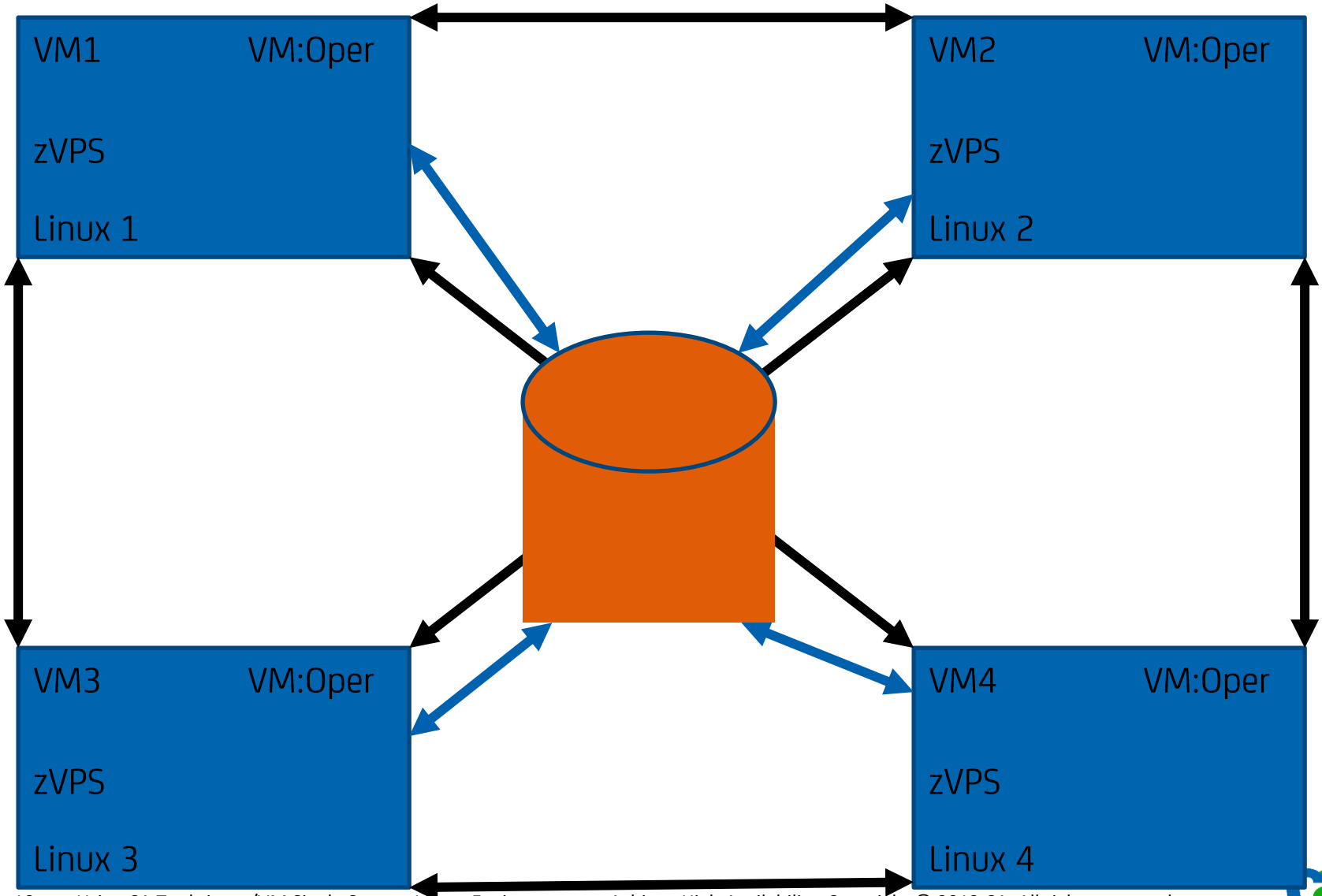
Products Needed

- The following products would required to help move a guest from one system to another
  - CA VM:Operator
  - Velocity zVPS –
    - Through partnership CA is now able to offer our customers the ZVPS Performance Suite

Best in class performance management for Linux on System z

Combine multi-platform system management expertise from **CA Technologies**

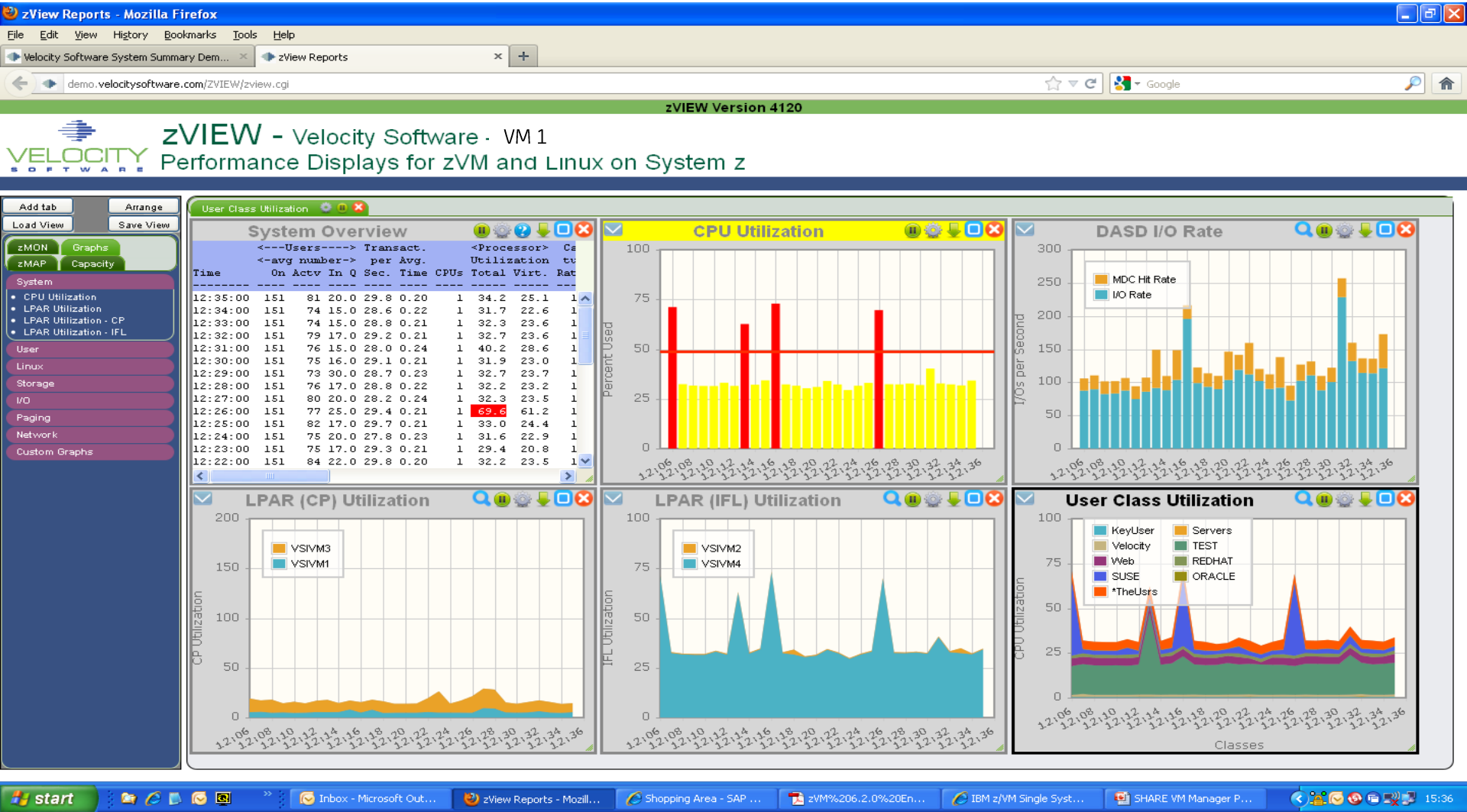
…with the performance measurement expertise from **Velocity Software**



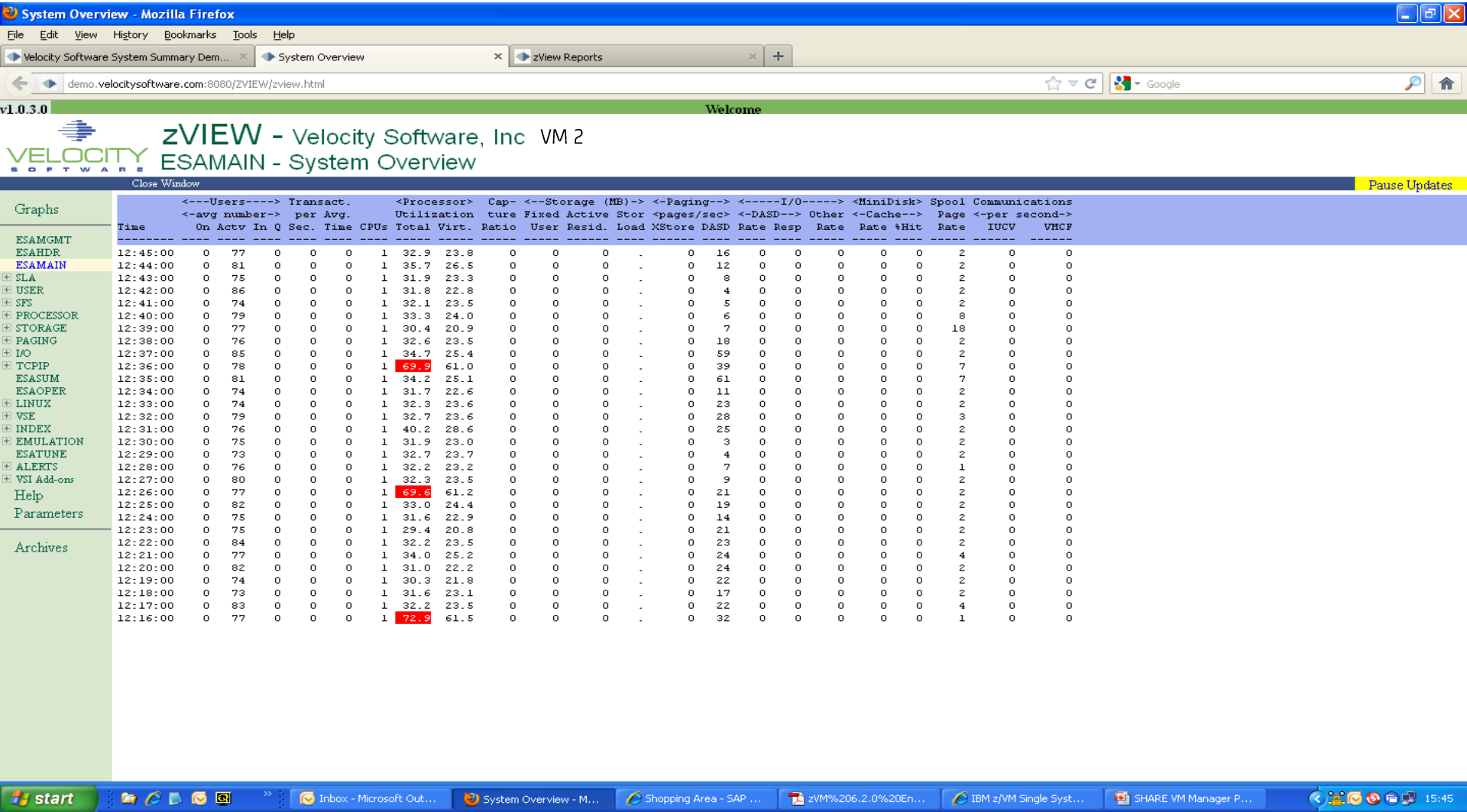
Manually moving the guest

- Once you notice that your VM1 is running too slow.
- You notice your having a problem with VM1.
  - Velocity's zVPS sends you the performance data from VM 1.
  - VM:Operator is posting messages.
  - Systems programmer can check the status of VM 2 to see if there is less of a load.
    - Again using Velocity's zVPS

Velocity – zVPS



Velocity – zVPS



Time	<---Users----> <-avg number-> On	Actv	In	Q	Transact. per Sec.	Avg. Time	CPUs	<Processor> Utilization Total	Virt.	Cap- ture Ratio	<--Storage (MB)-> Fixed User	Active Resid.	Stor Load	<-Paging--> <pages/sec> XStore	DASD	<-----I/O-----> <-DASD--> Rate	Resp	Other Rate	<MiniDisk> <-Cache--> Rate	%Hit	Spool Page Rate	Communications <-per second-> IUCV	VMCF
12:45:00	0	77	0	0	0	1	32.9	23.8	0	0	0	.	0	16	0	0	0	0	0	2	0	0
12:44:00	0	81	0	0	0	1	35.7	26.5	0	0	0	.	0	12	0	0	0	0	0	2	0	0
12:43:00	0	75	0	0	0	1	31.9	23.3	0	0	0	.	0	8	0	0	0	0	0	2	0	0
12:42:00	0	86	0	0	0	1	31.8	22.8	0	0	0	.	0	4	0	0	0	0	0	2	0	0
12:41:00	0	74	0	0	0	1	32.1	23.5	0	0	0	.	0	5	0	0	0	0	0	2	0	0
12:40:00	0	79	0	0	0	1	33.3	24.0	0	0	0	.	0	6	0	0	0	0	0	8	0	0
12:39:00	0	77	0	0	0	1	30.4	20.9	0	0	0	.	0	7	0	0	0	0	0	18	0	0
12:38:00	0	76	0	0	0	1	32.6	23.5	0	0	0	.	0	18	0	0	0	0	0	2	0	0
12:37:00	0	85	0	0	0	1	34.7	25.4	0	0	0	.	0	59	0	0	0	0	0	2	0	0
12:36:00	0	78	0	0	0	1	69.9	61.0	0	0	0	.	0	39	0	0	0	0	0	7	0	0
12:35:00	0	81	0	0	0	1	34.2	25.1	0	0	0	.	0	61	0	0	0	0	0	7	0	0
12:34:00	0	74	0	0	0	1	31.7	22.6	0	0	0	.	0	11	0	0	0	0	0	2	0	0
12:33:00	0	74	0	0	0	1	32.3	23.6	0	0	0	.	0	23	0	0	0	0	0	2	0	0
12:32:00	0	79	0	0	0	1	32.7	23.6	0	0	0	.	0	28	0	0	0	0	0	3	0	0
12:31:00	0	76	0	0	0	1	40.2	28.6	0	0	0	.	0	25	0	0	0	0	0	2	0	0
12:30:00	0	75	0	0	0	1	31.9	23.0	0	0	0	.	0	3	0	0	0	0	0	2	0	0
12:29:00	0	73	0	0	0	1	32.7	23.7	0	0	0	.	0	4	0	0	0	0	0	2	0	0
12:28:00	0	76	0	0	0	1	32.2	23.2	0	0	0	.	0	7	0	0	0	0	0	1	0	0
12:27:00	0	80	0	0	0	1	32.3	23.5	0	0	0	.	0	9	0	0	0	0	0	2	0	0
12:26:00	0	77	0	0	0	1	69.6	61.2	0	0	0	.	0	21	0	0	0	0	0	2	0	0
12:25:00	0	82	0	0	0	1	33.0	24.4	0	0	0	.	0	19	0	0	0	0	0	2	0	0
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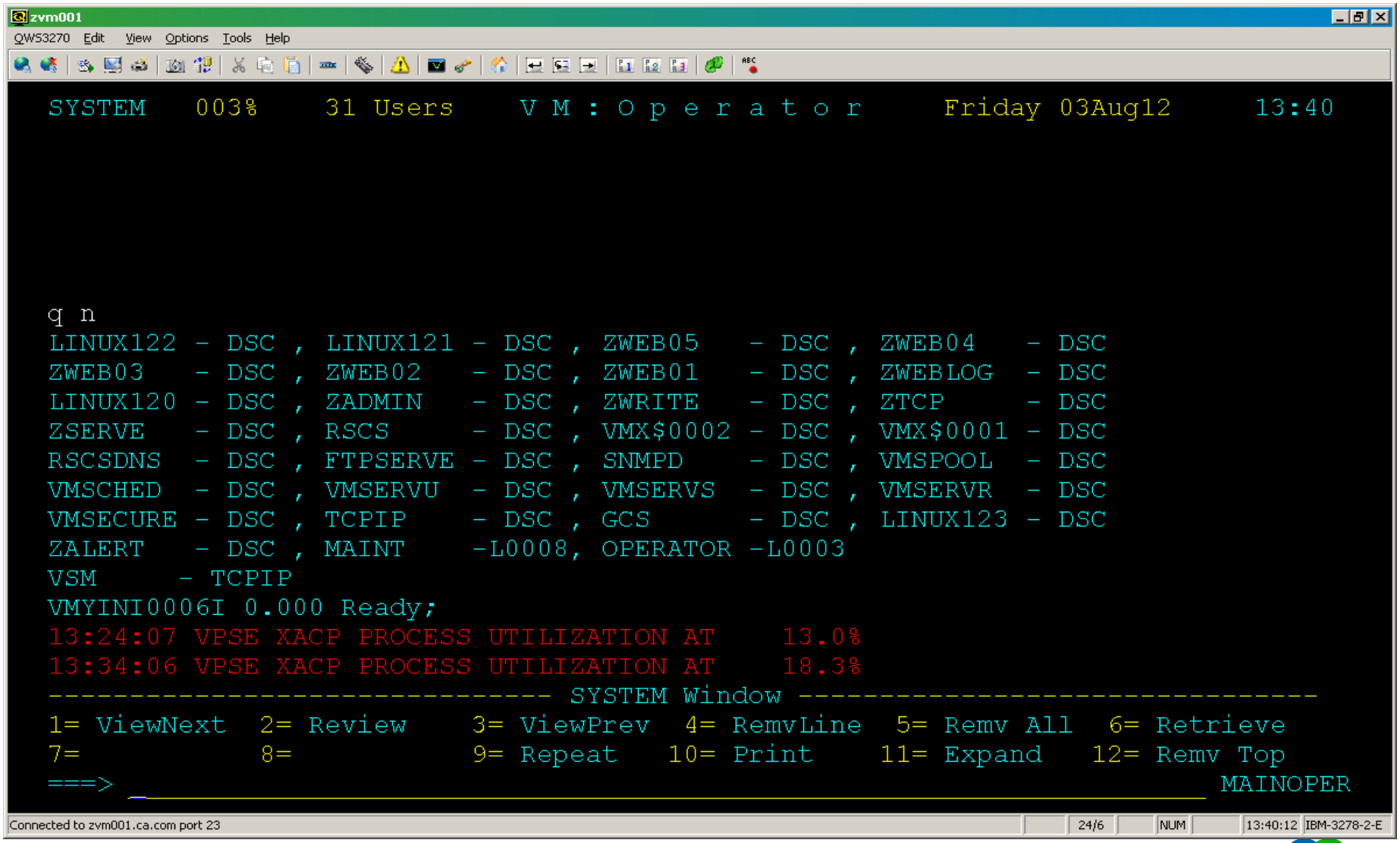
12:19:00	0	74	0	0	0	1	30.3	21.8	0	0	0	.	0	22	0	0	0	0	0	2	0	0
12:18:00	0	73	0	0	0	1	31.6	23.1	0	0	0	.	0	17	0	0	0	0	0	2	0	0
12:17:00	0	83	0	0	0	1	32.2	23.5	0	0	0	.	0	22	0	0	0	0	0	4	0	0
12:16:00	0	77	0	0	0	1	72.9	61.5	0	0	0	.	0	32	0	0	0	0	0	1	0	0

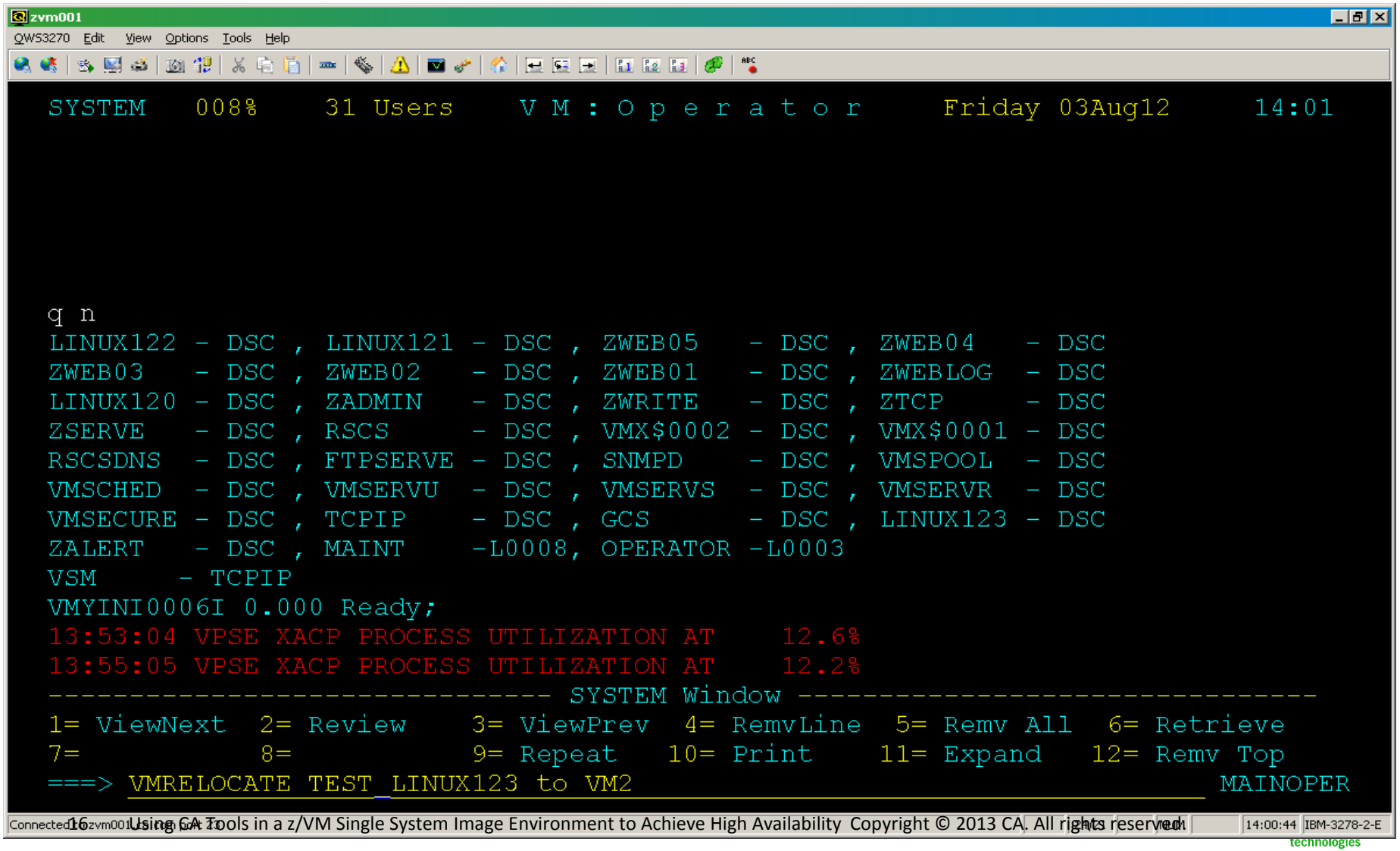
ZVPS ALERT to VM:Operator



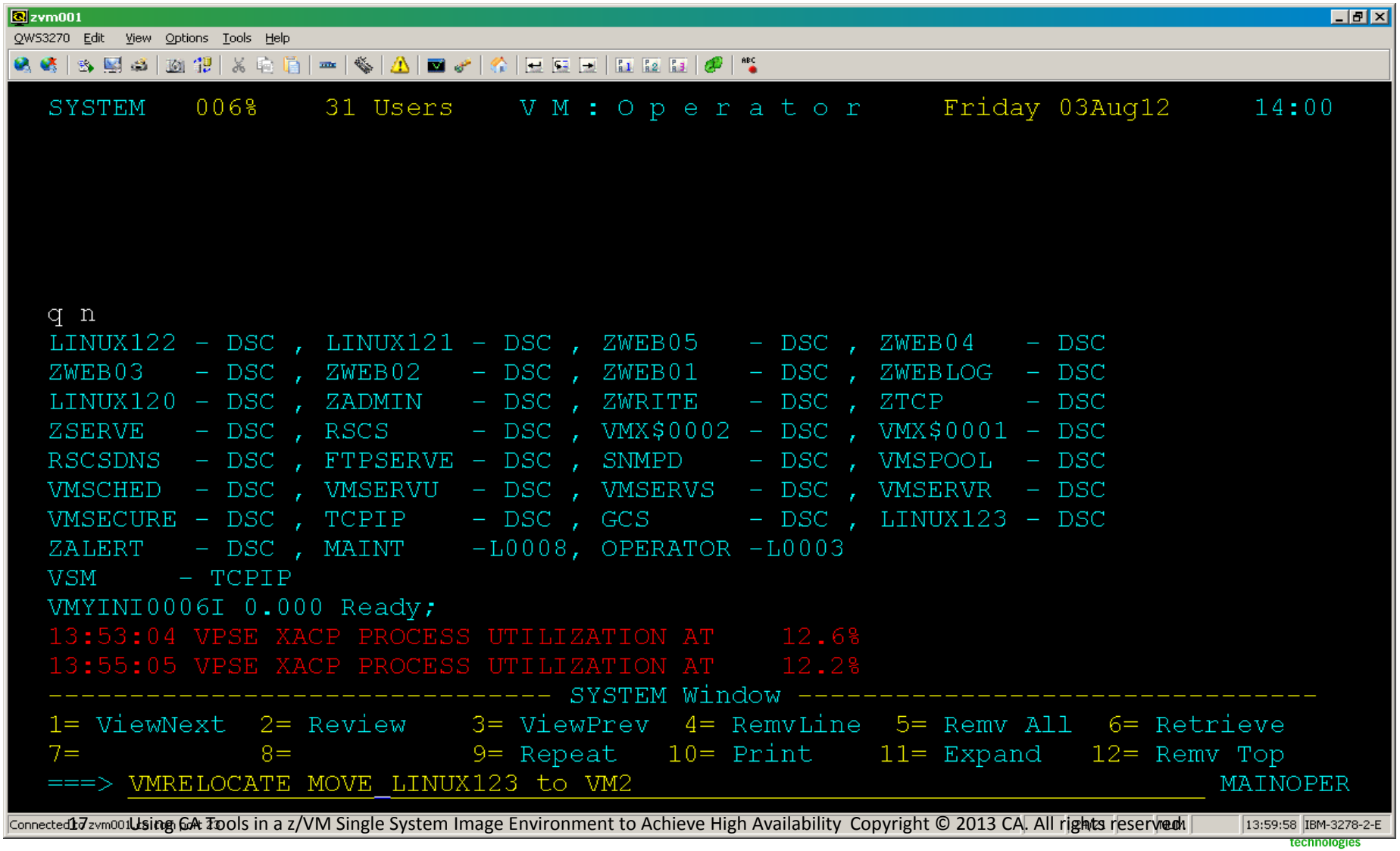
Manually moving the guest

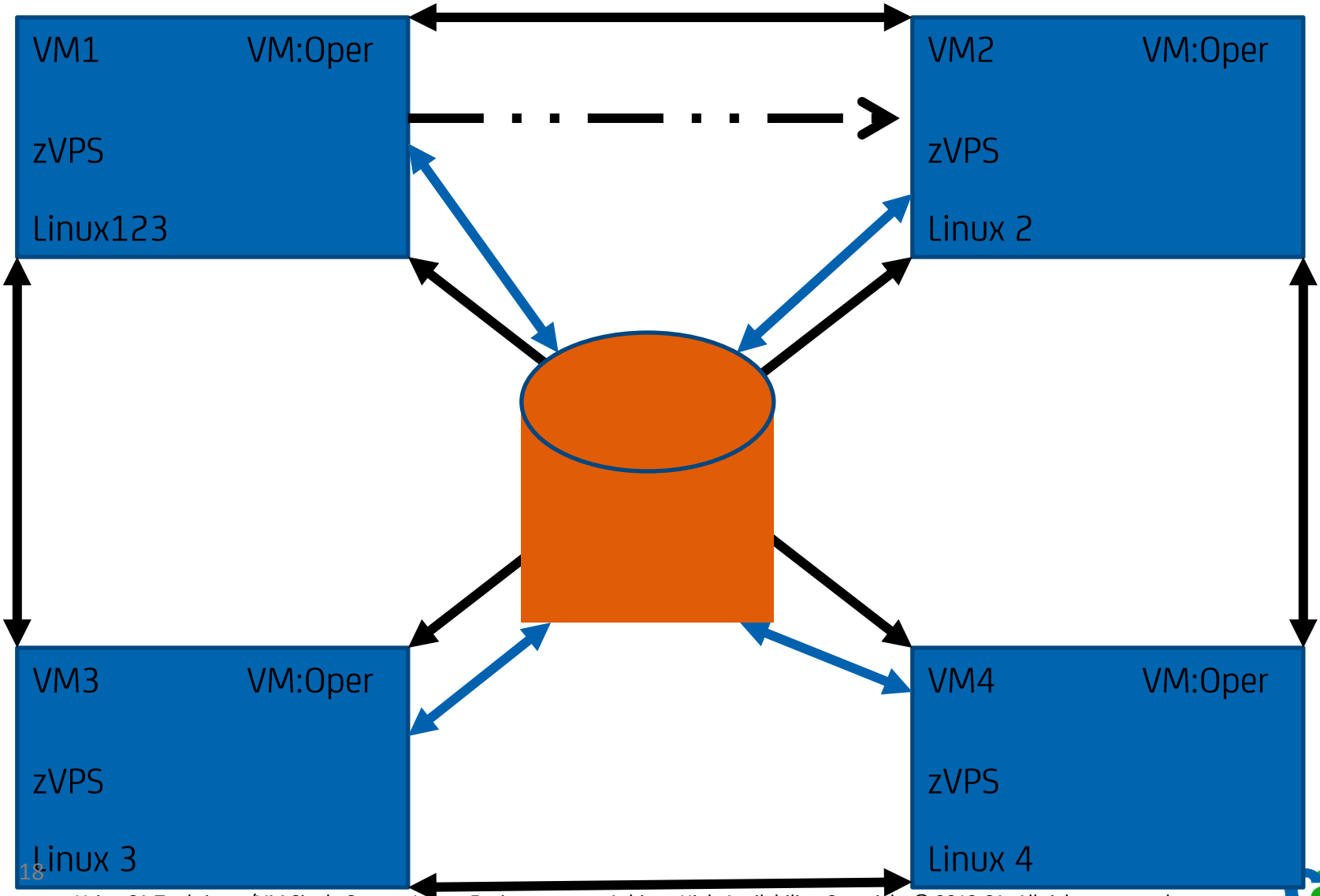
- At this point the systems programmer see's they have cycles on VM 2.
  - They sign on to VM 1 and issue:
    - VMYIAMOP – To access the operator console.
    - VMRELOCATE TEST LINUX123 TO VM2
    - VMRELOCATE MOVE LINUX123 TO VM2

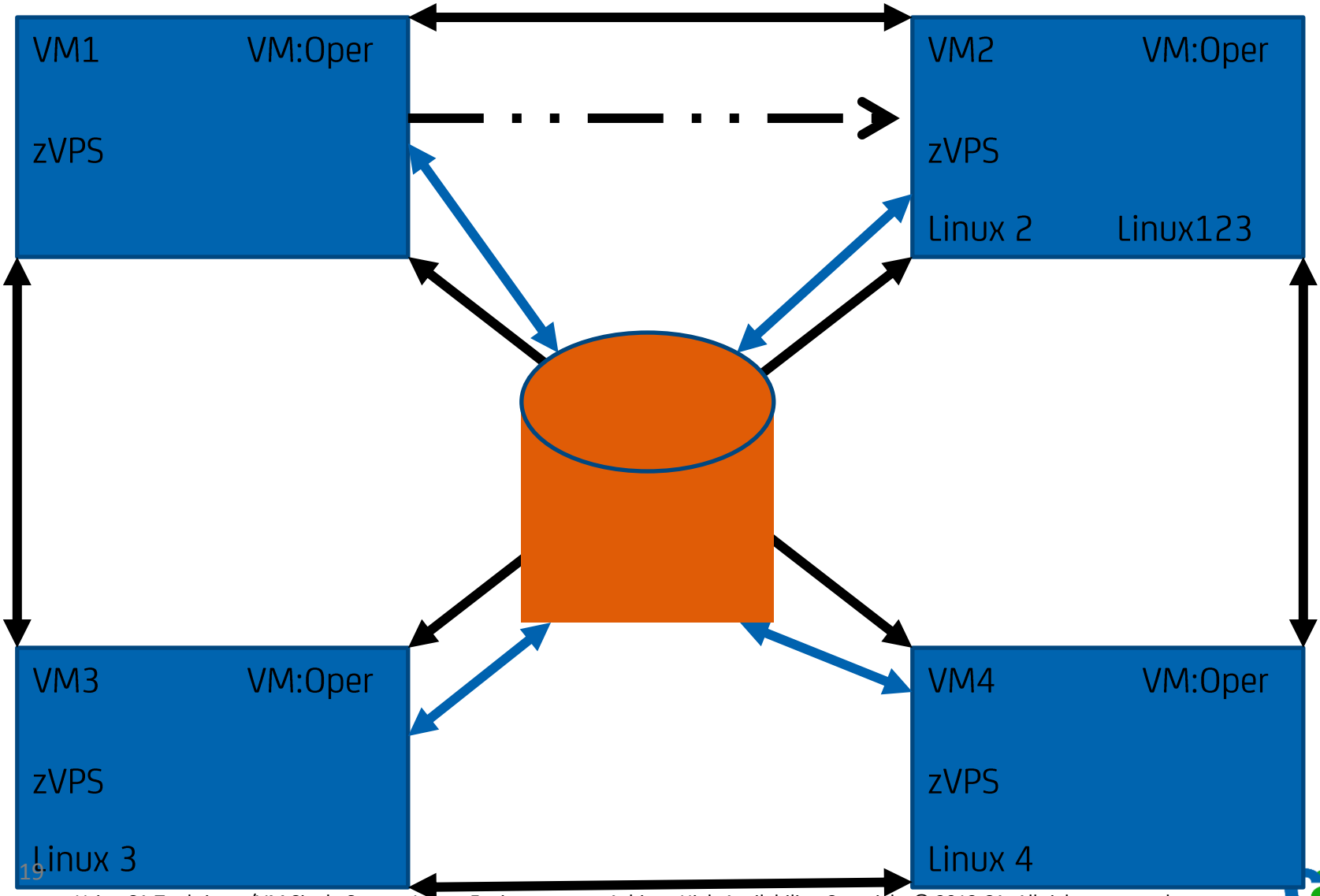
VMRELOCATE TEST



VMRELOCATE MOVE







REXX Script - MOVEIT

```
/*  REXX   */
/*  This is an exec to TEST a LINUX Guest Move from VM1        */
/*  to VM2.  If the TEST is successful, the exec will then     */
/*  issue the command to actually move the guest from VM1 to VM2  */
VMRELOCATE TEST LINUX123 to VM2
If rc = 0
  then do
    say 'NOW MOVING LINUX123 to VM2'
    'PIPE CP SPOOL CONSOLE * RDR'
    VMRELOCATE MOVE LINUX123 to VM2
    If rc = 0
      then do
        say 'MOVEIT: LINUX123 was successfully moved to VM2'
        'PIPE CP SPOOL CONSOLE * RDR'
        'cp smsg ztcp stop LINUX123'
        REMOTE VM2 cp smsg ztcp READ LINUX123
        REMOTE VM2 cp smsg ztcp start LINUX123
  end
```


REXX Script – MOVEIT – cont'd

```
else do
   say 'MOVE of the linux guest has failed'
   'CMS PIPE CP SPOOL CONSOLE * RDR'
   'cp smsg ztcp start LINUX123'
  end
 end
else do
   say 'TEST of the linux guest move has failed'
   'CMS PIPE CP SPOOL CONSOLE * RDR'
 end
```


Velocity zVPS™ Alert Definition

```
extract
Parms CPU TOTAL

var  cpu_serial I 6   I serial
var  util      I 5 1 I sytprp.cpuutil
var  syspgrt   I 6 0 I sytsyp.plspiopw + sytsyp.plspiopr
var  inqueue   I 4 0 I sytusr.inqueue
var  spool_use I 4 0 I (sytasg.calslti2*100)/sytasg.calslta2

alert util xacp
limit 3 1
level ##  yellow action cp msg op VPSW XACP PROCESS UTILIZATION AT
&UTIL%
level ##  red action cp msg op VPSE XACP PROCESS UTILIZATION AT &UTIL%
text Processor utilization at &util%
```

VM:Operator Routing Tables

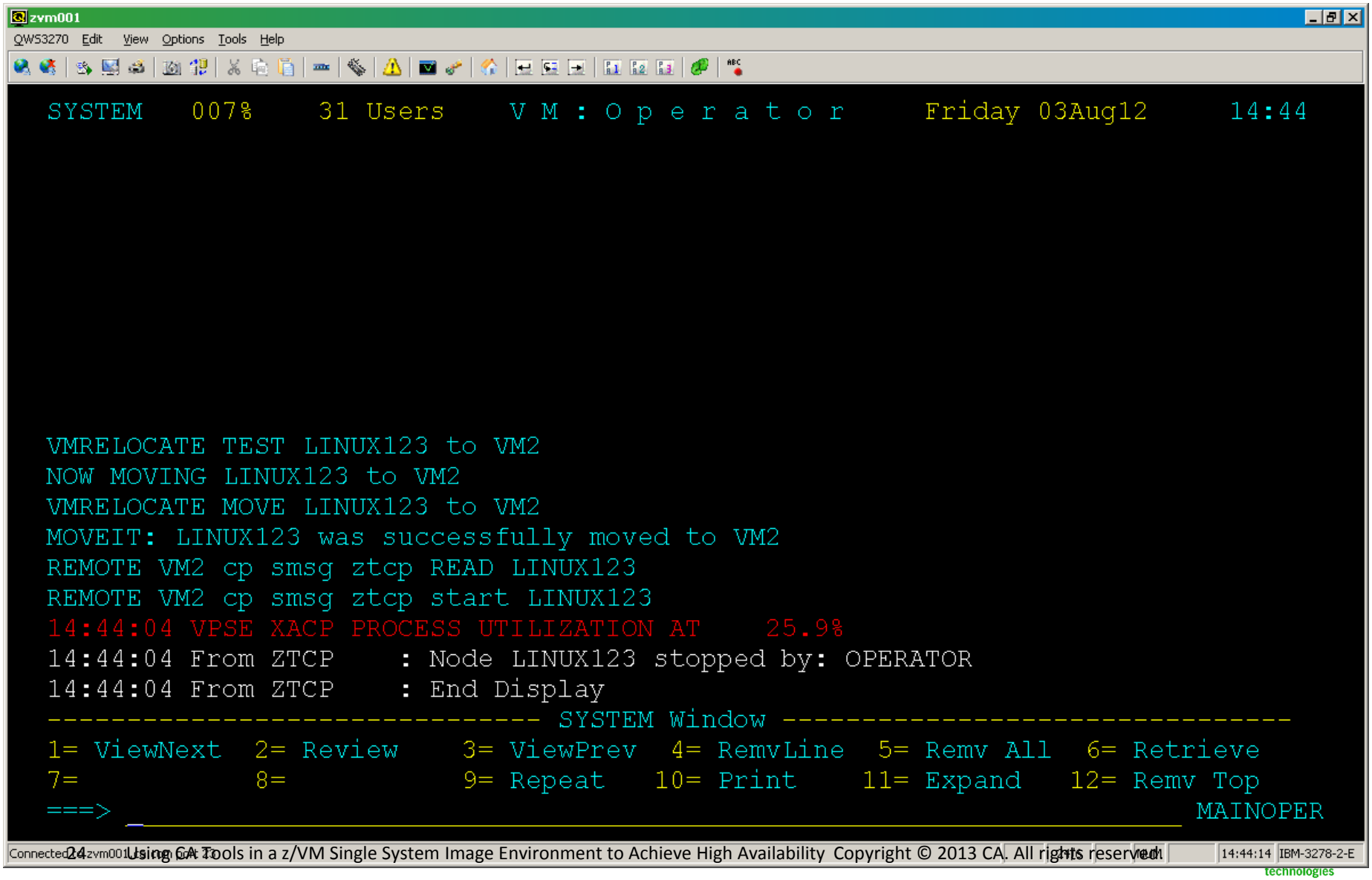
SYSTEM LOGTABLE – entry for XACP alert to initiate relocation automation Script, MOVEIT

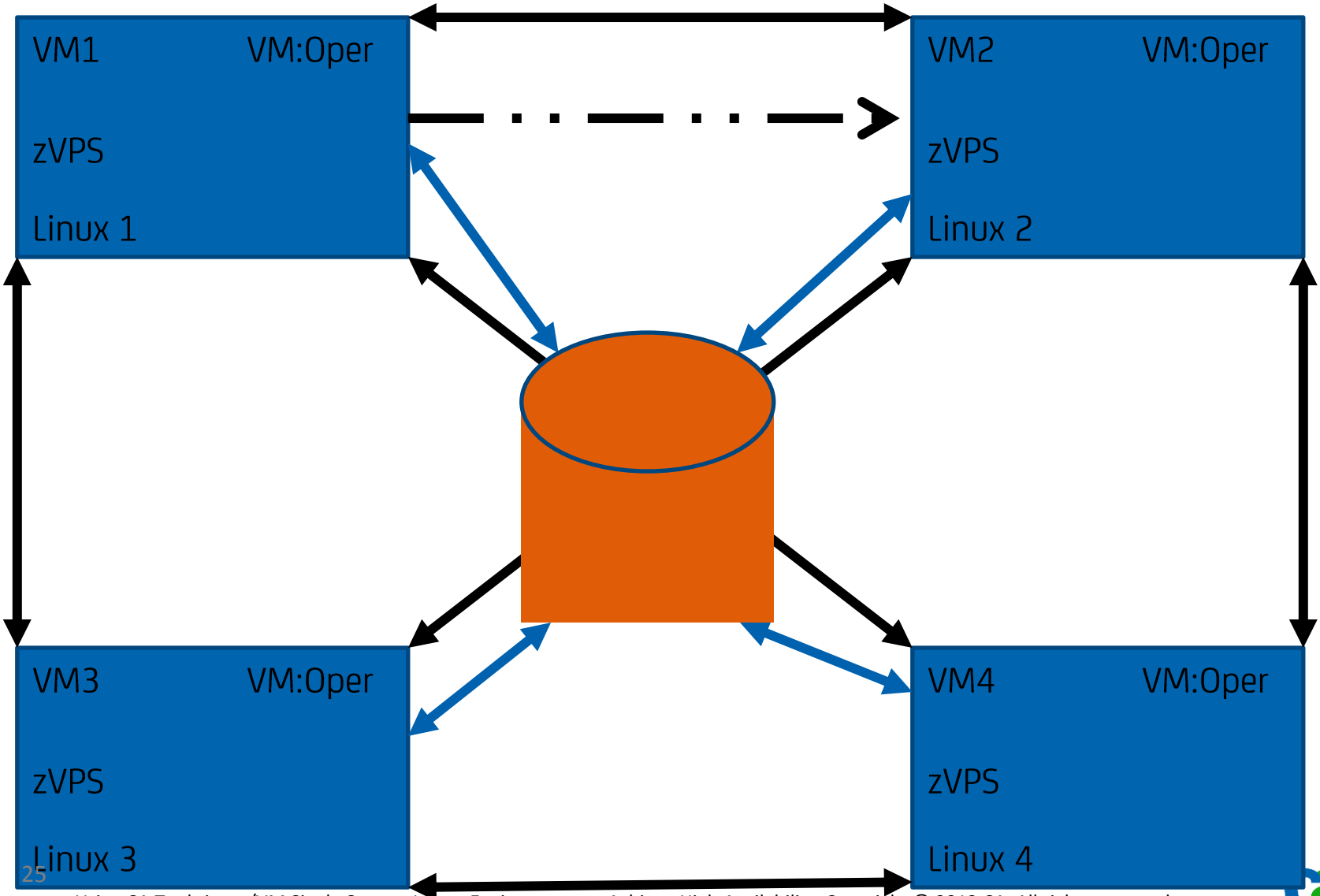
```
*  Process ZVPS Alerts
SPAWN MOVEIT MSG ZALERT *1 1 VPSE XACP
```

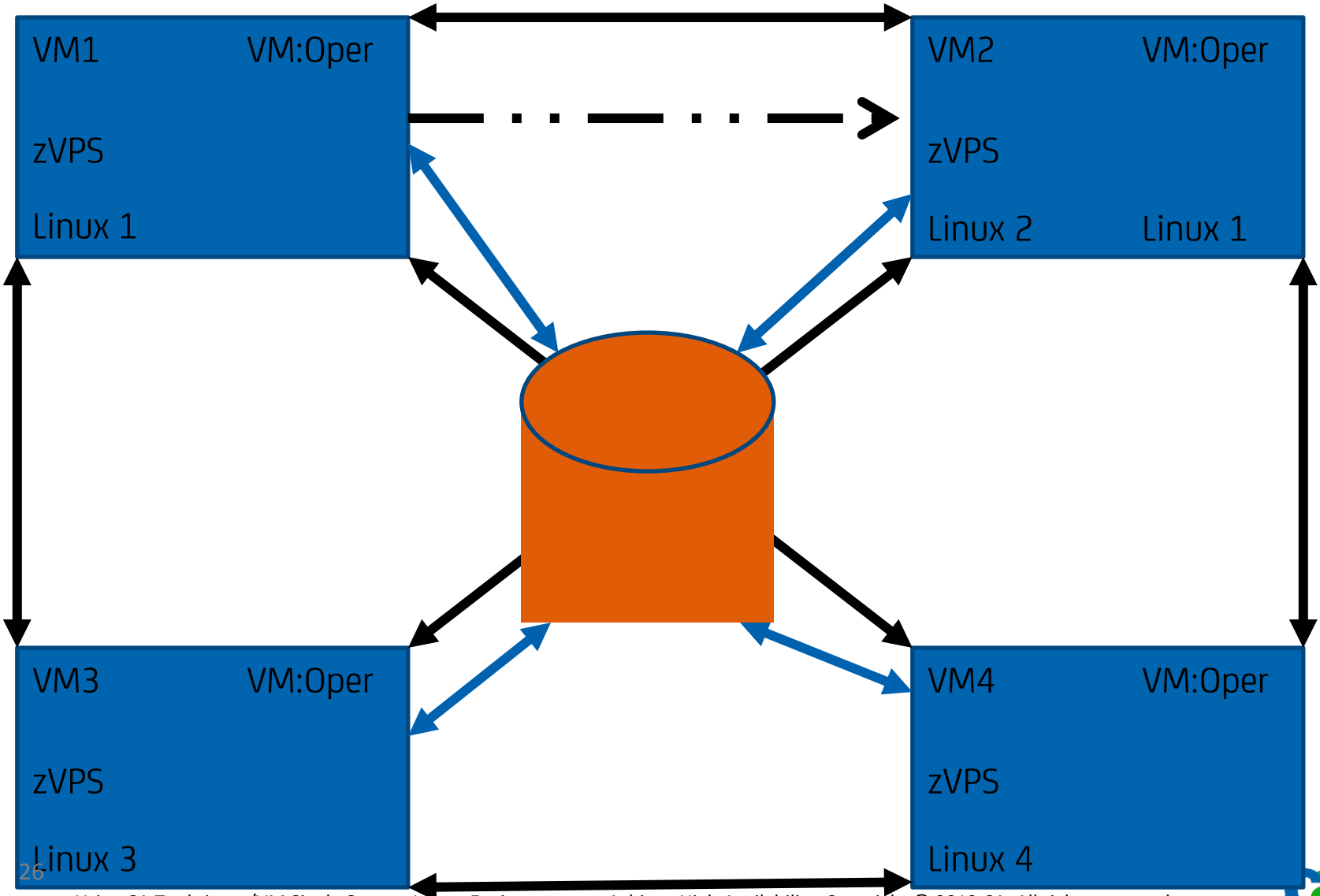
SYSTEM SYSTABLE – entry to control display of ZVPS alert

```
***   ZVPS ERROR ALERT Display Control
SERVER ROLL NOTIME RED MSG ZALERT *1 1 VPSE
```

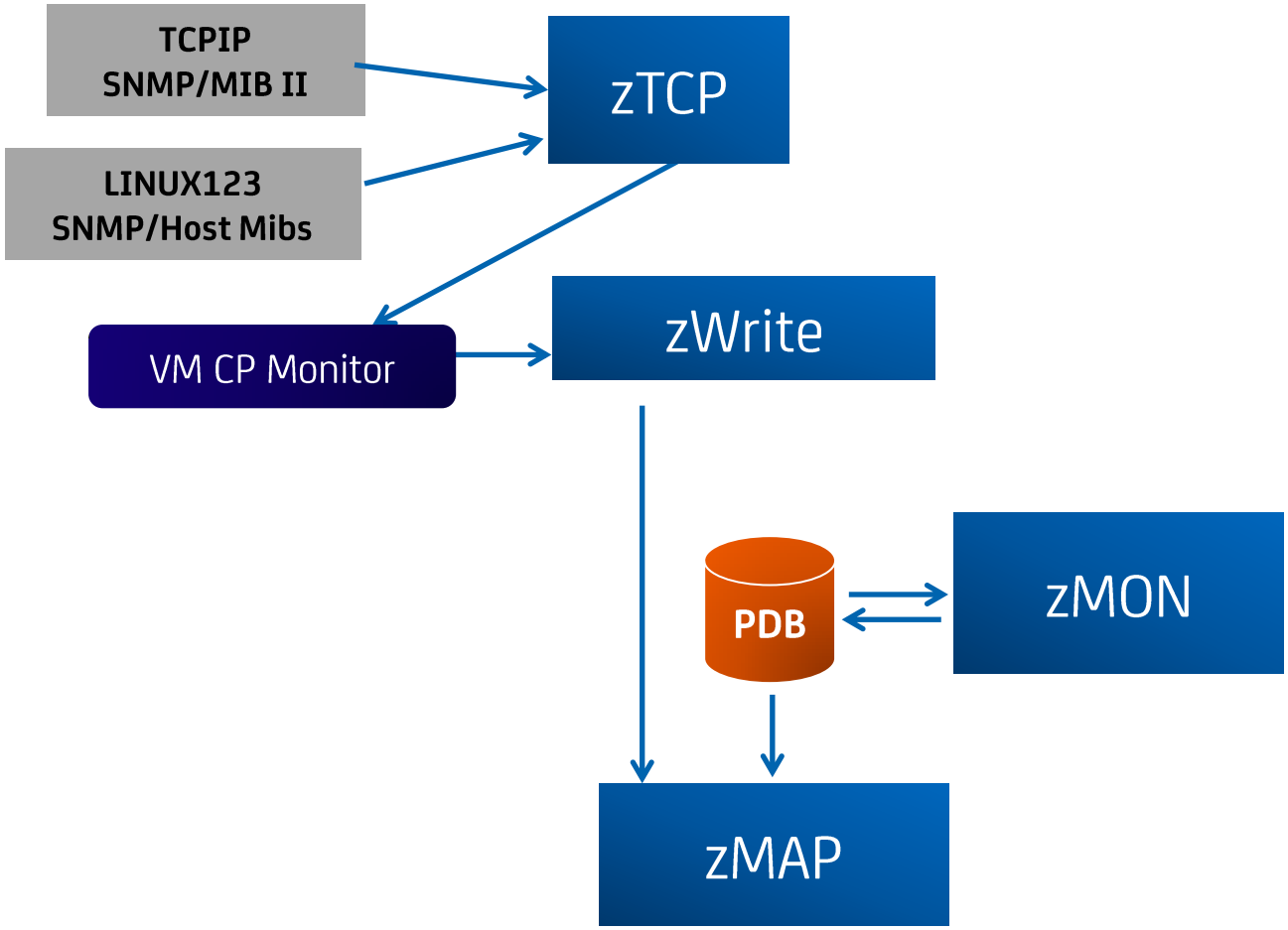

VM:Operator: ZVPS Alert







ZVPS on VM1



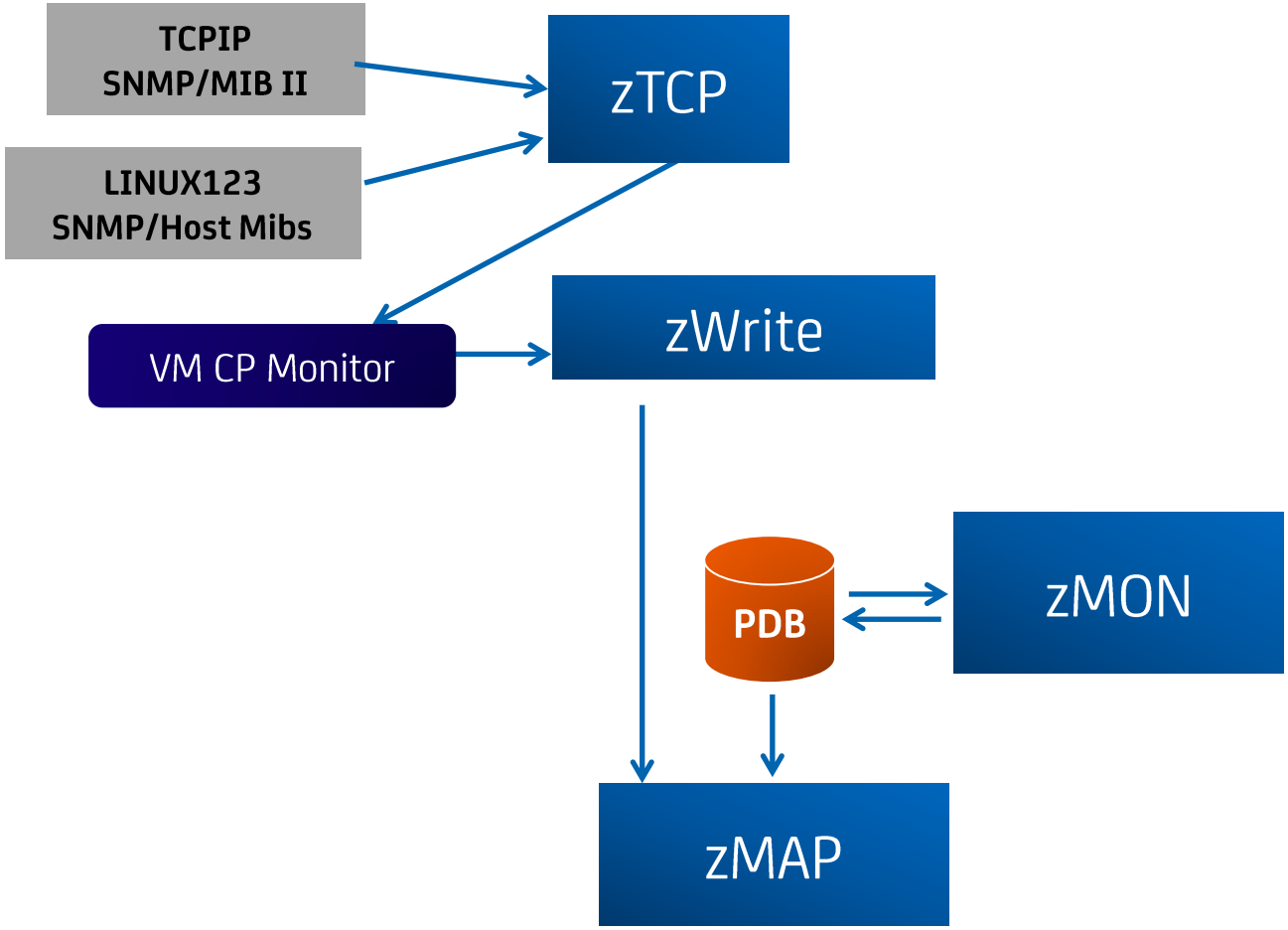
Swap ZVPS Monitoring VM1 to VM2

- Stop ZVPS SNMPD Data Collection on VM1 prior to Server Move
  - SMSG ZTCP STOP <linux guest>

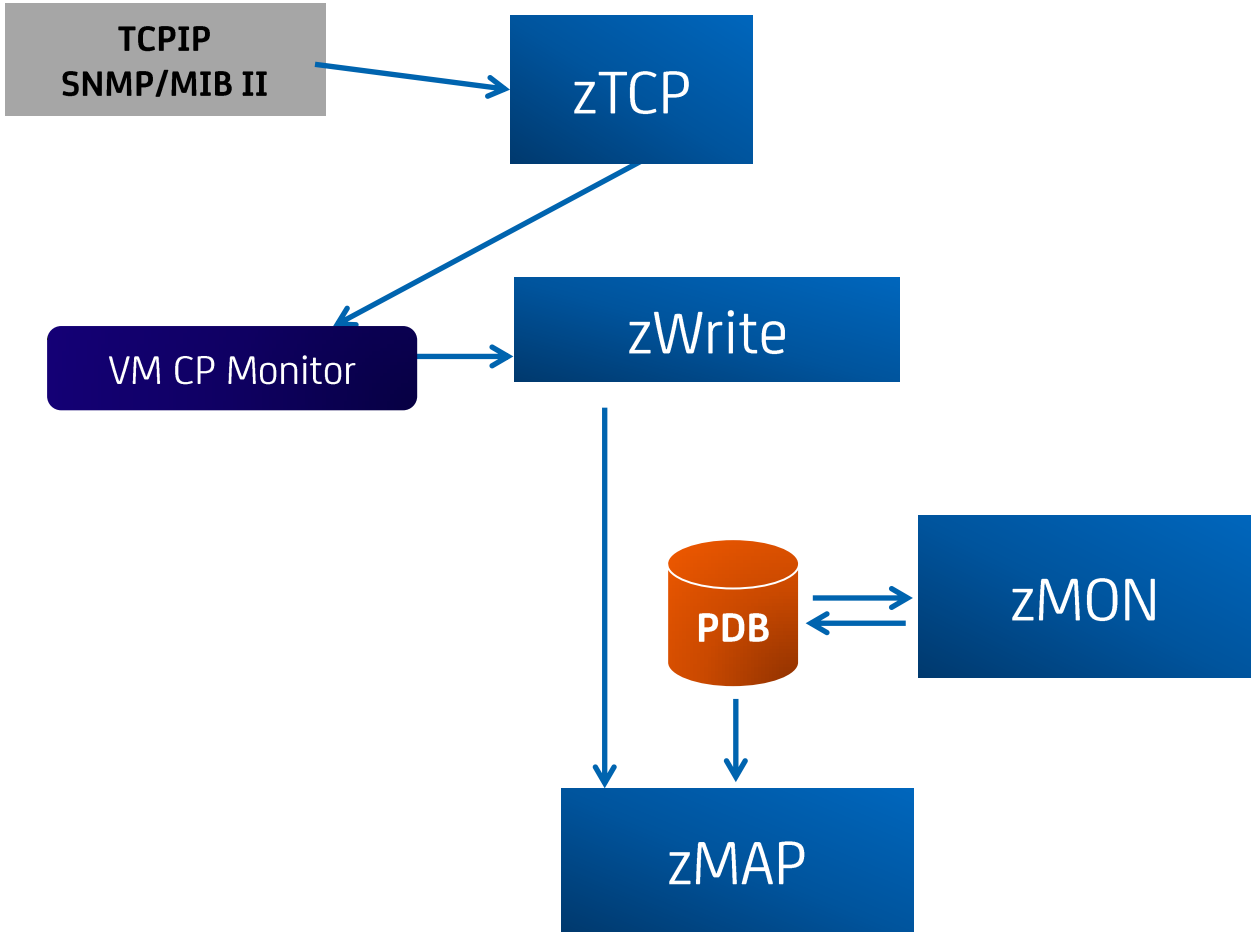
    OR

  - SMSG ZTCP Delete <linux guest>
- Should be included in relocation automation script
  - Include logic to restart SNMPD collection on VM1 if relocation fails
- Failure to stop means VM1 performance data will only have SNMPD data from server…NO VM related data

ZVPS on VM1



ZVPS on VM2



Swap ZVPS Monitoring VM1 to VM2

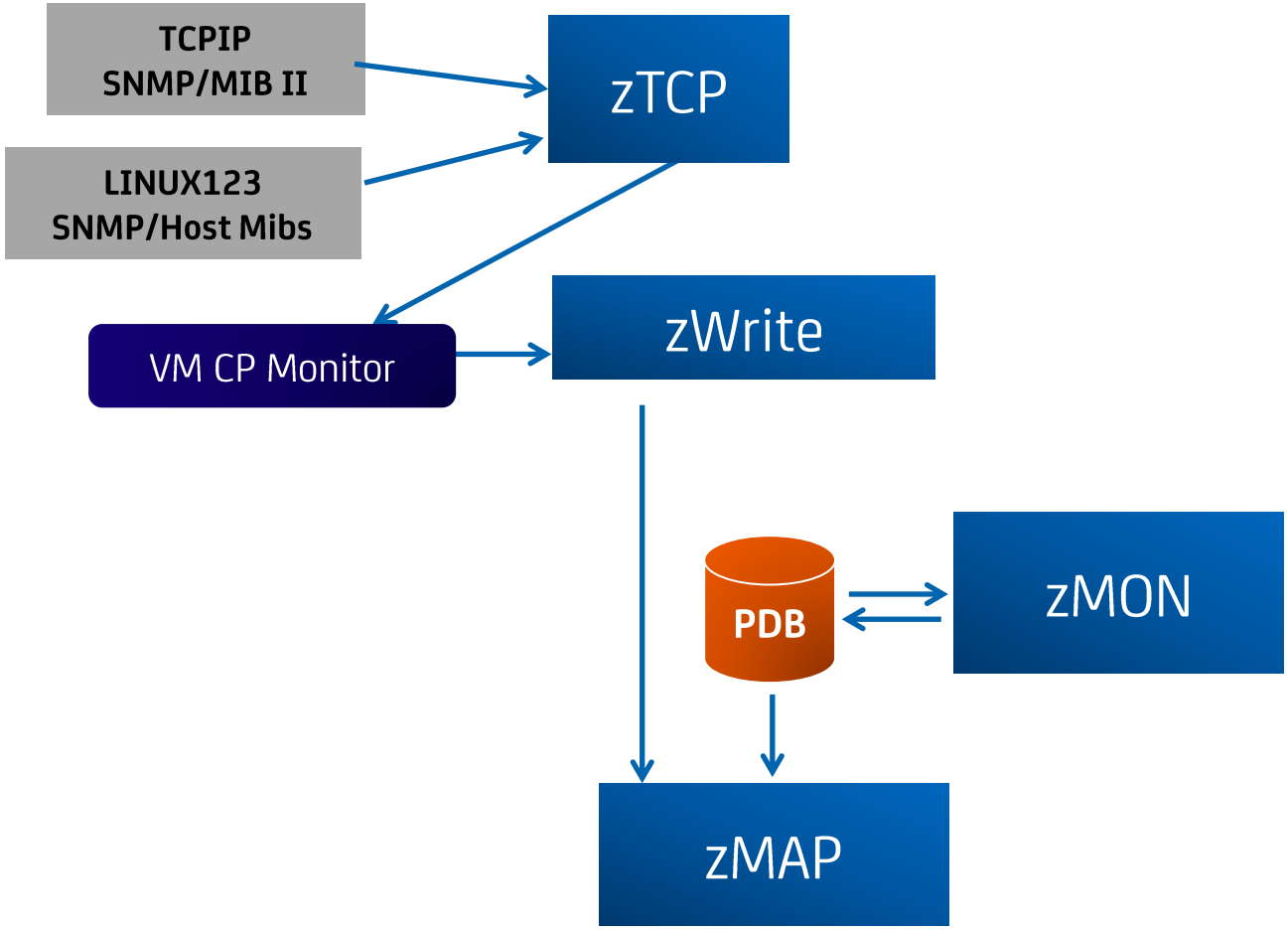
— Start ZVPS SNMPD Data Collection on VM2 after Server Move completes
  - SMSG ZTCP ADDNODE nodename IP_Address community
  - SMSG ZTCP ADDVMID node virtmachine

    OR
  - SMSG ZTCP READ <nodefile>
    - NODEFILE must exist on VM2 ZVPS SFS or Config disk

- Utilize **Remote VM:Operator Support (RVS) capabilities between VM1 and VM2**
  - Node Start command can be included in relocation automation script or set up through VM2 VM:OPER automation

— Failure to define and start node on VM2 means performance data will only have guest level data BUT no Linux level data from SNMPD

ZVPS on VM2



Other CA VM Products and SSI

SSI - Single System Image

CA VM:Secure / CA VM:Director maintains a consistent view of system administration definitions across members of a complex

- CP Object Directory virtual machine definitions
  - You get the same virtual machine wherever you log on
- Security Manager Rules definitions
  - You have the same authorizations and access to resources
- Directory Management or ESM Administration Interfaces
  - You enter VMSECURE commands the same way wherever you log on

CA VM:Spool and SSI

- New release of CA VM:Spool - 1.8
  - Install as IDENTITY user for each system that requires its function
  - Spool files from other systems can be accessed as long as the owning user is logged on to the requesting system
  - For backup and accounting CA VM:Spool only works with spool files originating on the system where the service machine runs

CA VM:Spool V/SEG Plus and SSI

- New release of CA VM:Spool V/SEG Plus Feature – 1.7
  - Install as Identity user for each system that requires its function
  - Spool files from other systems can be accessed as long as the owning user is logged on to the requesting system
  - If Linux guest uses DCSSs and is to be relocated to another member of the SSI complex the same DCSS must exist on the other member
    - Use SPDISK utility to back up DCSS and restore it on another system

CA VM:Backup and SSI

- Informational solution for release 3.5 - RI37867
  - Describes how to set up and use VM:Backup in an SSI environment
    - Set up separate VM:Backup service virtual machines
      - USER entries vs. IDENTITY
        - Minidisks need to be on shared volumes
      - Set up one for backing up all minidisks on shared volumes
        - Can run on any member since captures shared volume minidisks
      - Set up additional server on each system to back up the minidisks that exist on volumes that are available to only one system
        - Must always run on the system the volumes being backed up exist on
      - All done with inclusion/exclusion features

CA VM:Backup HiDRO and SSI

- Informational solution for release 2.8 – RI38224
  - Describes how to set up and use CA VM:Backup HiDRO in an SSI environment
  - Same set up as CA VM:Backup
    - Multiple server sets (HIDRO, SYBMON and SYBCOM) vs. 1 server
    - Also normal USER entries with minidisk on shared dasd
    - One set to back up minidisks on shared volumes
    - Other sets to back up minidisks on volumes available to only one system
    - Also done with HiDRO flavor of inclusion/exclusion features

CA VM:Operator and SSI

- Informational solution for release 3.1 – RI37868
  - Describes how to set up and use CA VM:Operator in an SSI environment
    - IBM supplies OPERATOR virtual machine definition as an IDENTITY entry
    - Install VM:Operator into that environment
    - Steps given to get product installed and operational in this environment

CA VM:Tape and SSI

- Informational solution for release 2.0 – RI37869
  - Describes how to set up and use CA VM:Tape in an SSI environment
  - Allocate the server virtual machine as normal USER with all minidisks on shared dasd
  - Then convert directory entry to an IDENTITY adding BUILD and SUBCONFIG information for each member of the complex
    - Steps given to do this
  - Information also given for sharing TMCs and tape drives among systems
  - Set up information also supplied to enable Linux guests that use the VM:Tape Linux agent to run without interruption if relocated

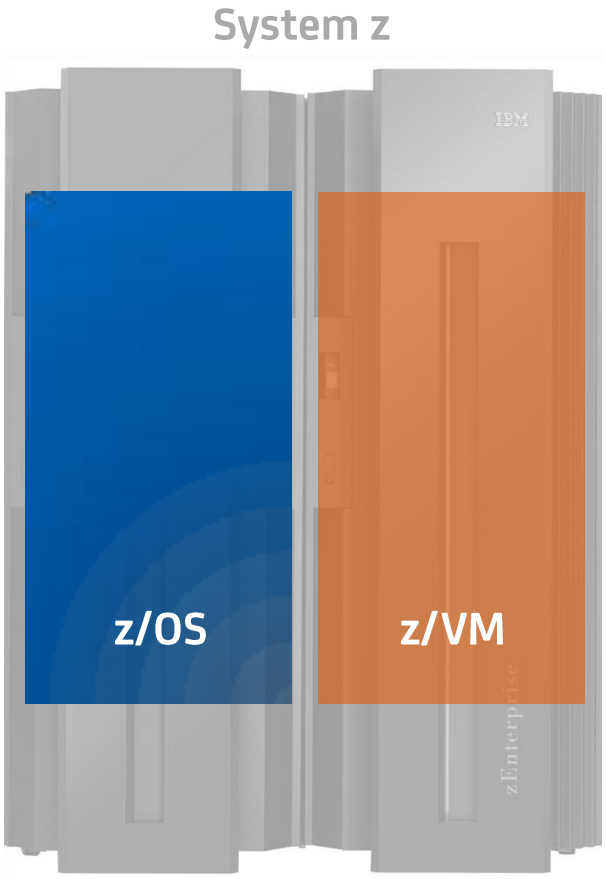
UPSTREAM for Linux on System z
best-in-class data protection

Business Continuity

- **Fast, scalable** and highly **reliable** backup and recovery for Linux on System z
- **Only** solution that will **backup up to z/OS**
  - Leverage existing z/OS skills and infrastructure for operational efficiency
  - Rely on proven z/OS disaster recovery strengths

Peace of Mind

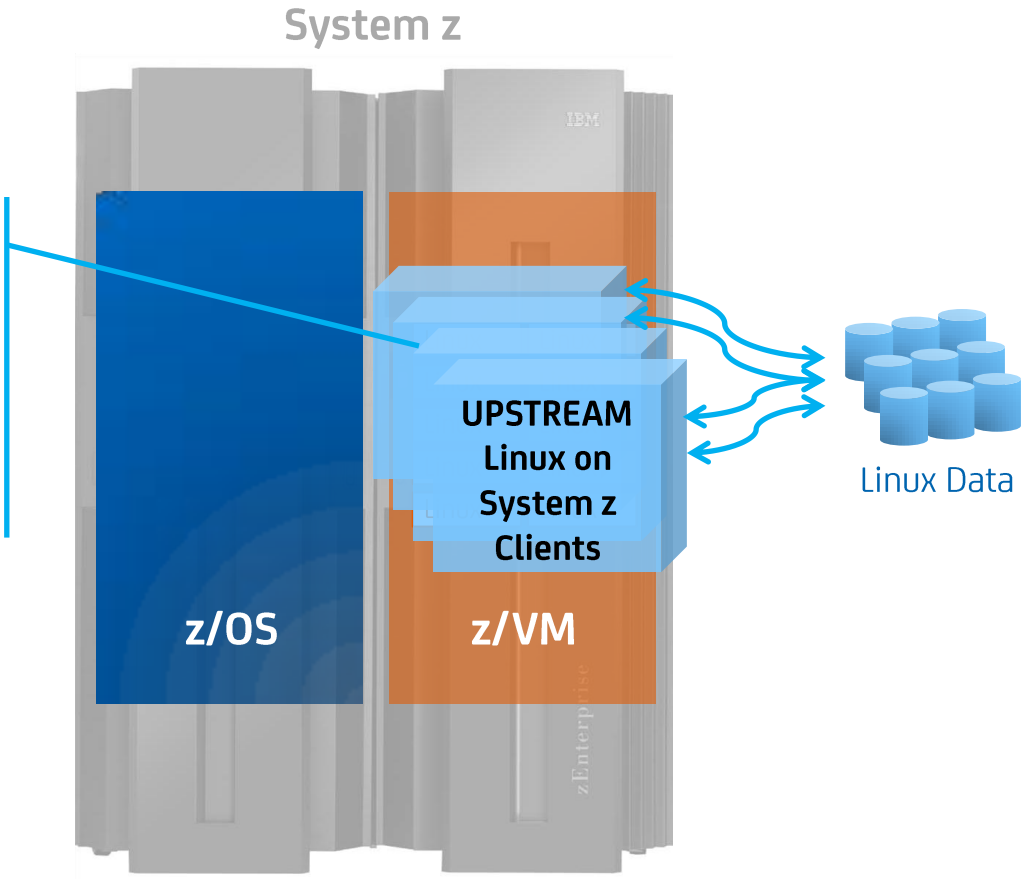
UPSTREAM for Linux on System z
architecture



UPSTREAM for Linux on System z
architecture

UPSTREAM Linux on System z Clients

UPSTREAM agents run on Linux servers to protect Linux data



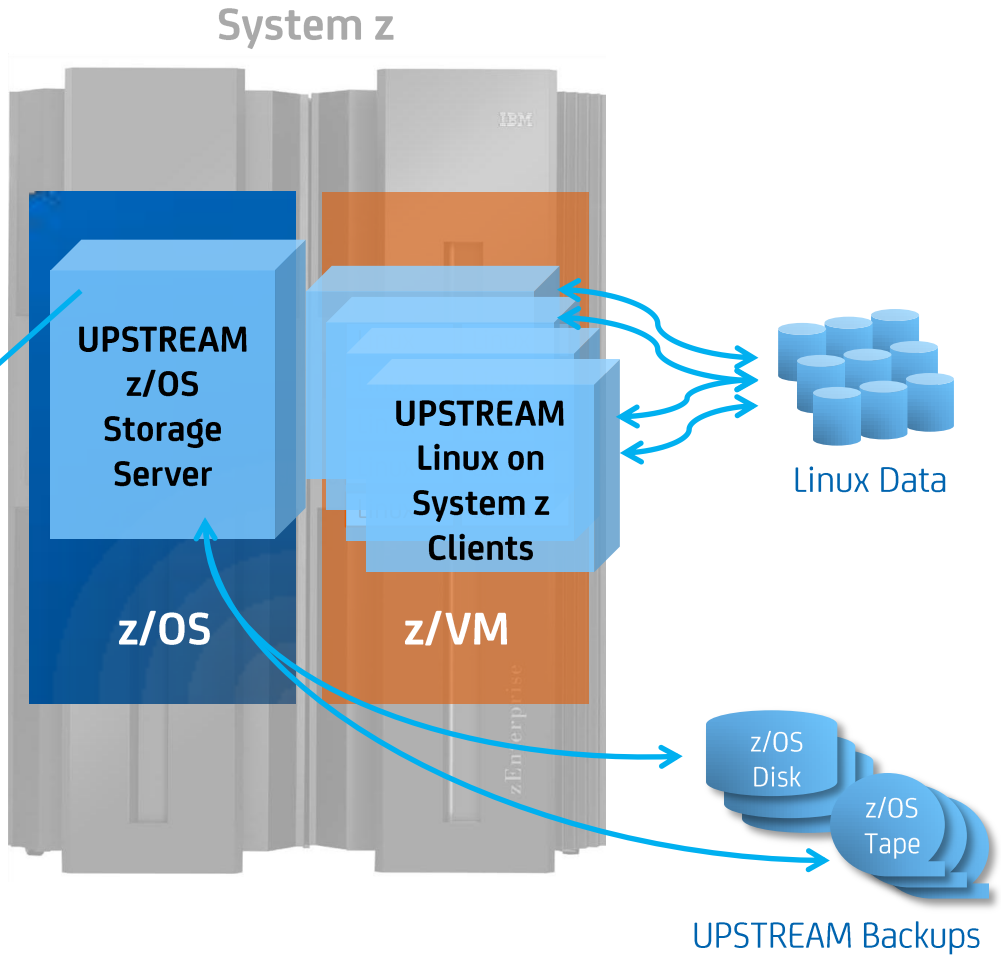
UPSTREAM for Linux on System z
architecture

UPSTREAM z/OS Storage Server

UPSTREAM is only data protection solution that provides backup to z/OS storage server

Enabling backup to z/OS tape or disk

For increased reliability and compliance

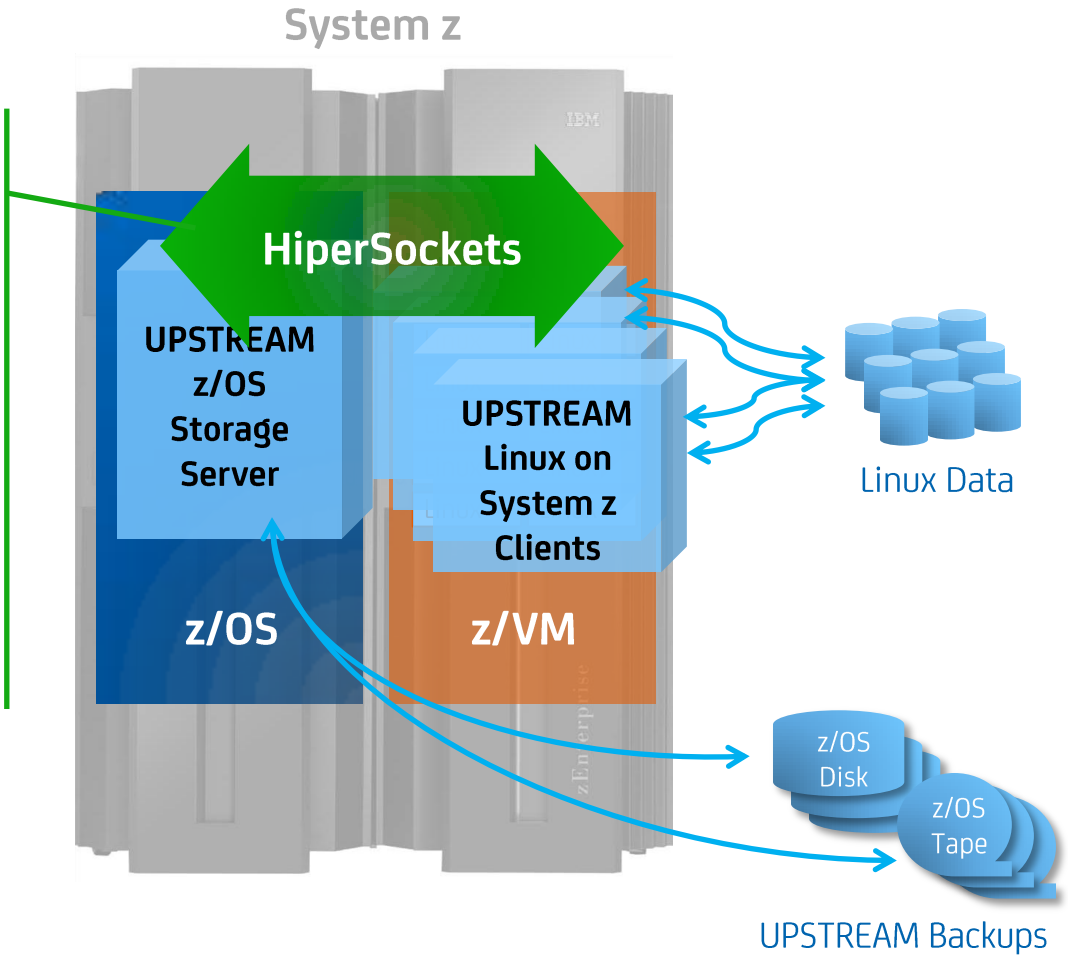


UPSTREAM for Linux on System z
innovative high performance data protection

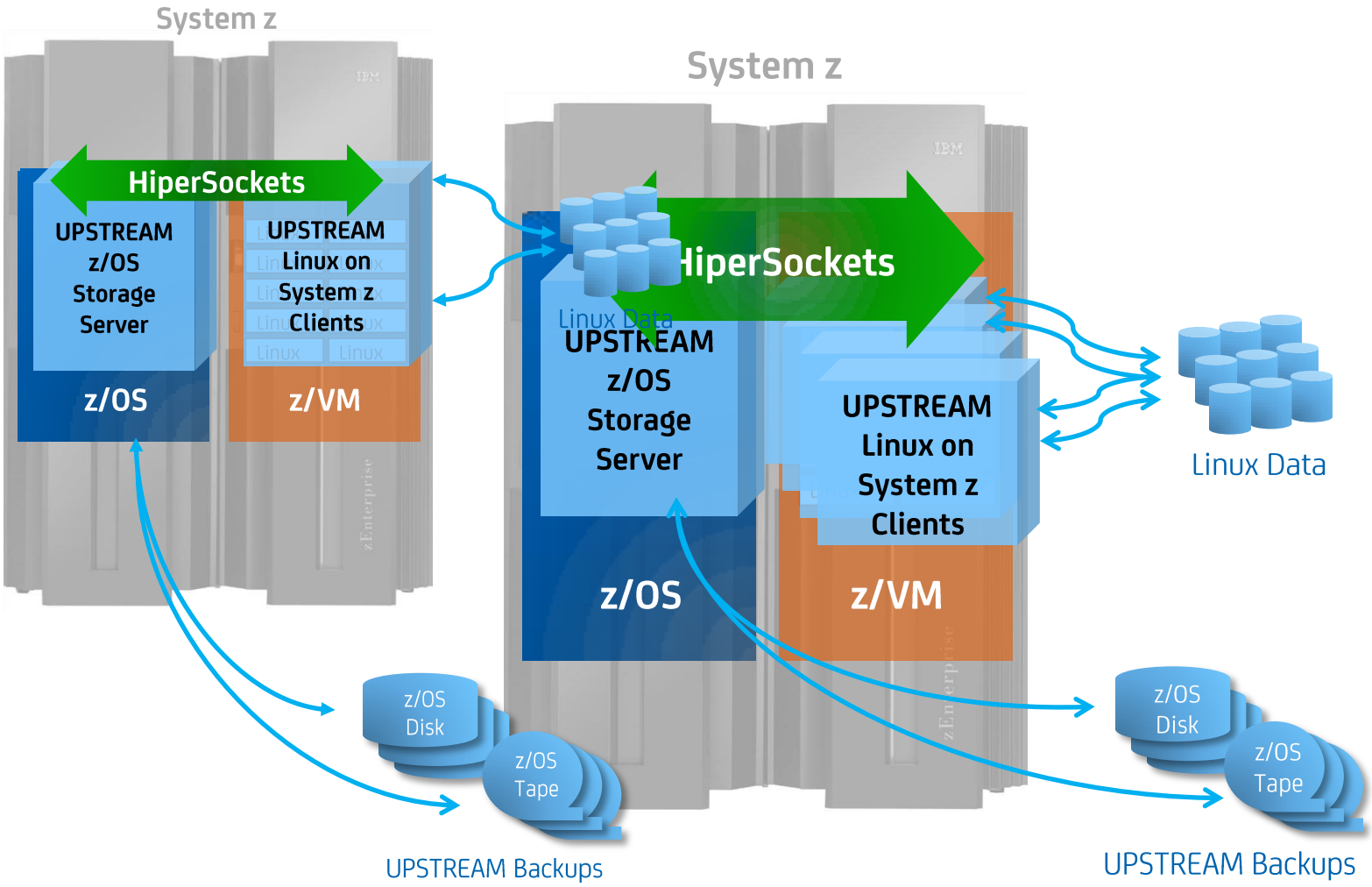
UPSTREAM exploits HiperSocket Technology

Takes backup and recovery off corporate network

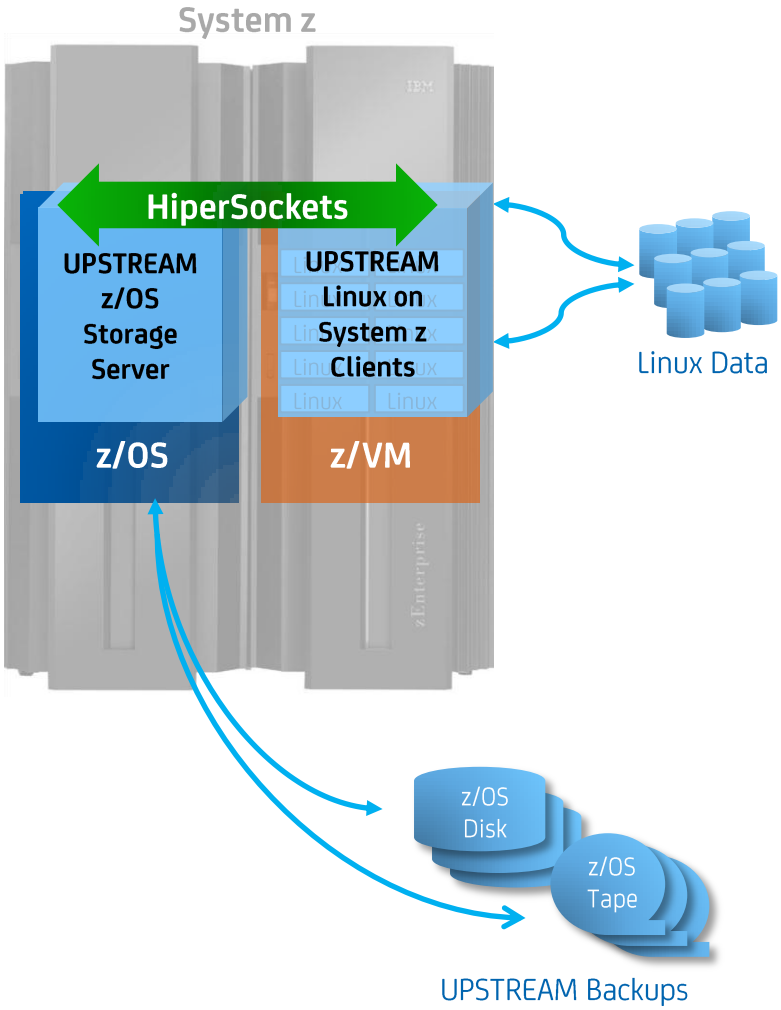
Protect very large amounts of data without negatively impacting corporate communications or customer access



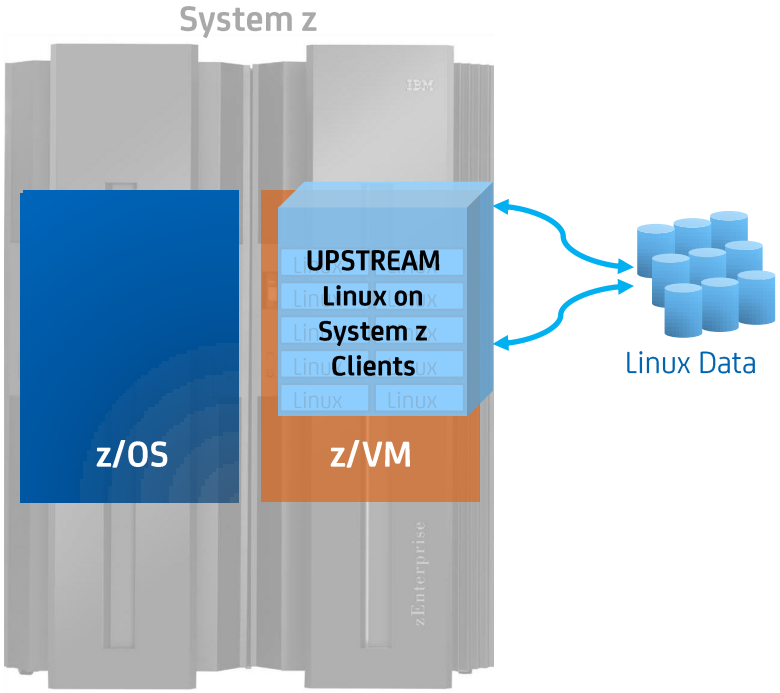
UPSTREAM for Linux on System z
scalable architecture



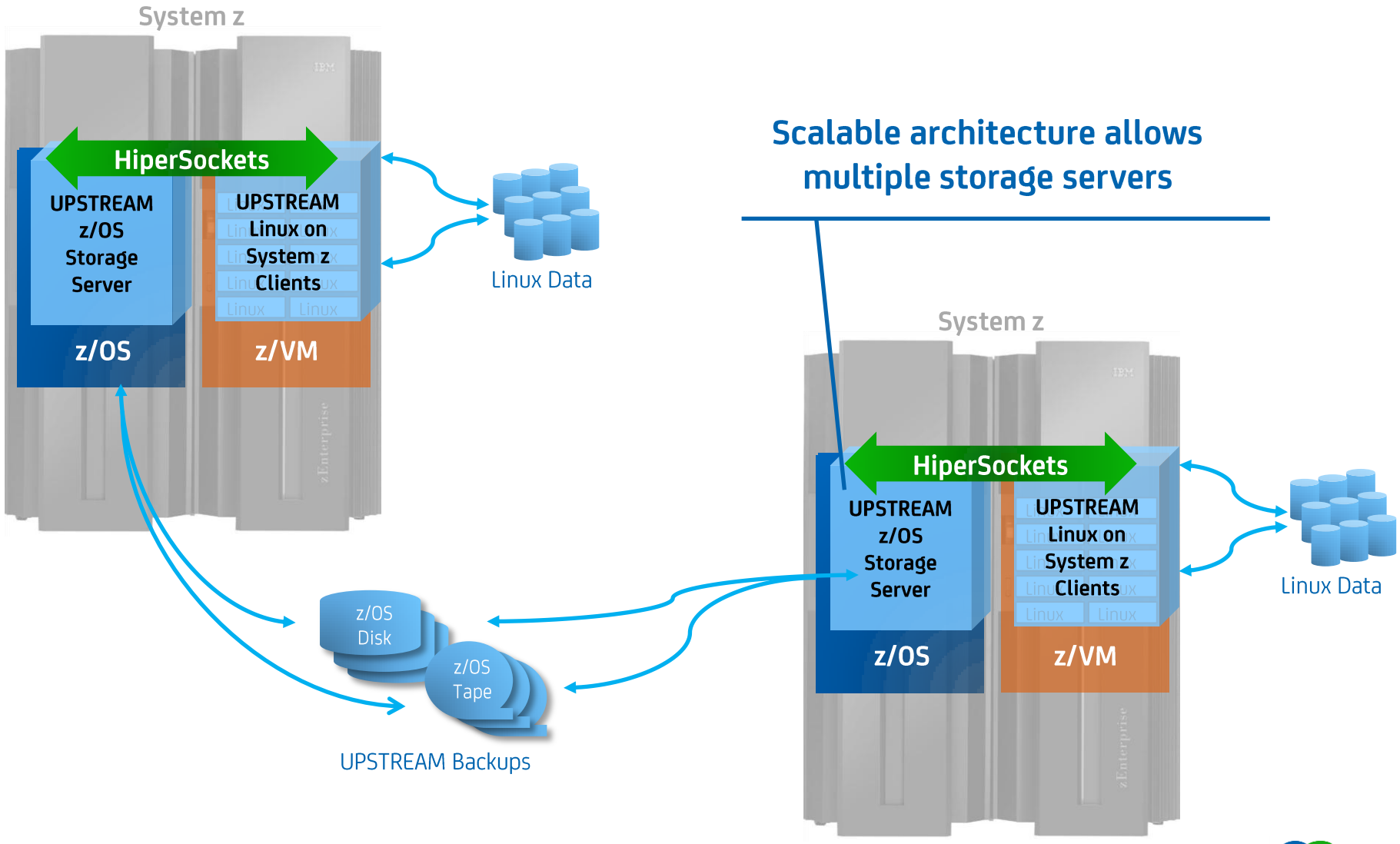
UPSTREAM for Linux on System z
scalable architecture



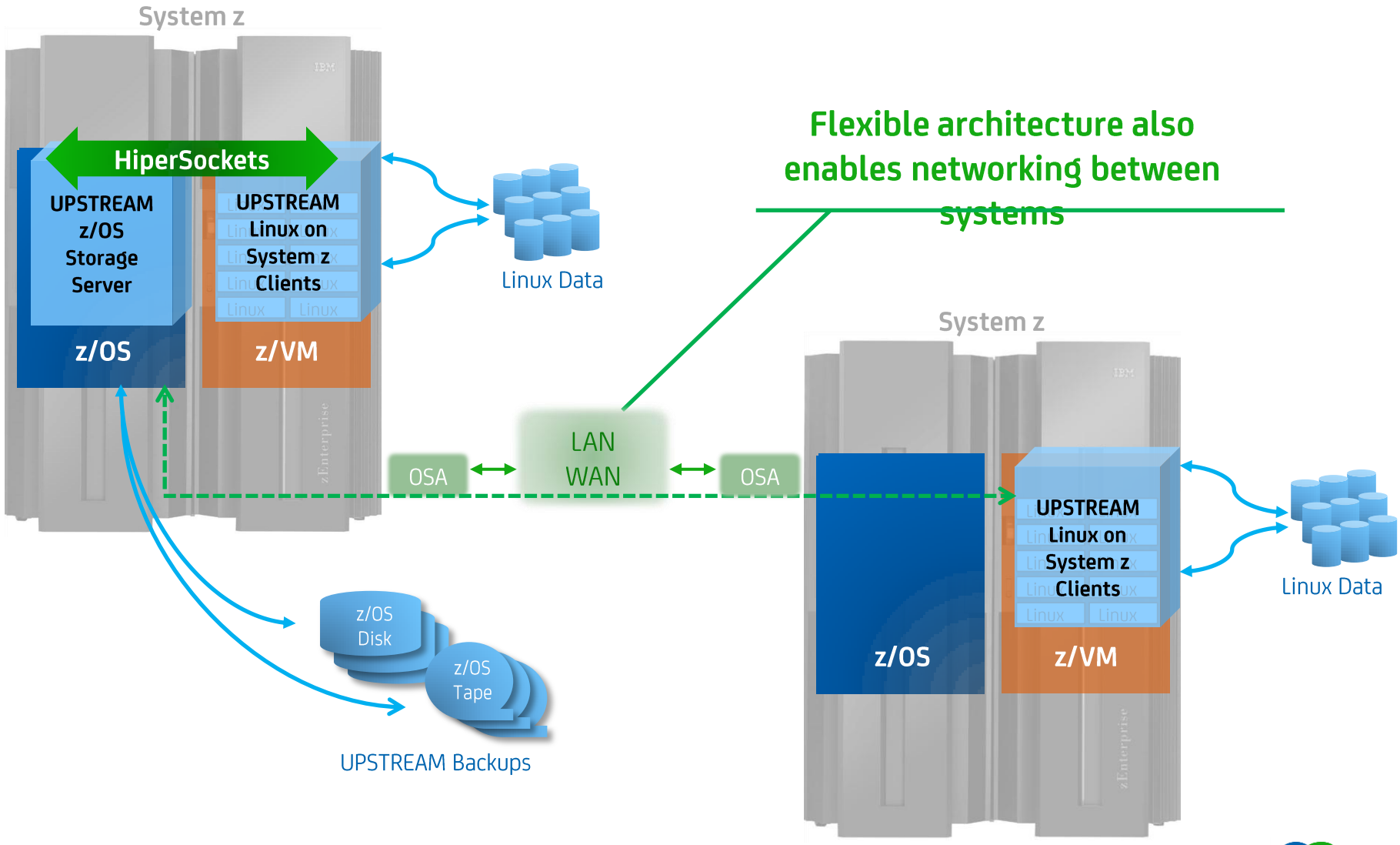
UPSTREAM architecture provides scalability to protect your data as your business grows



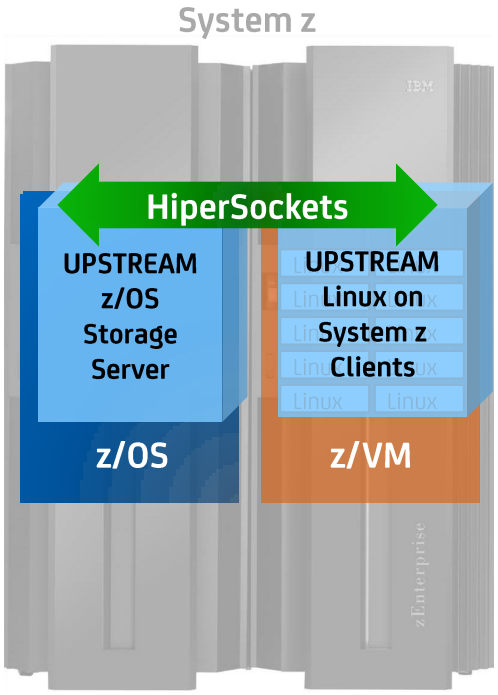
UPSTREAM for Linux on System z
scalable architecture



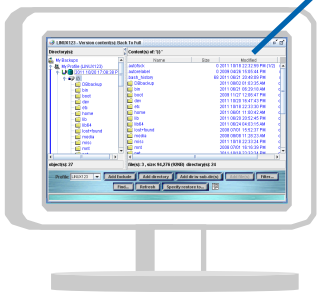
UPSTREAM for Linux on System z
scalable architecture

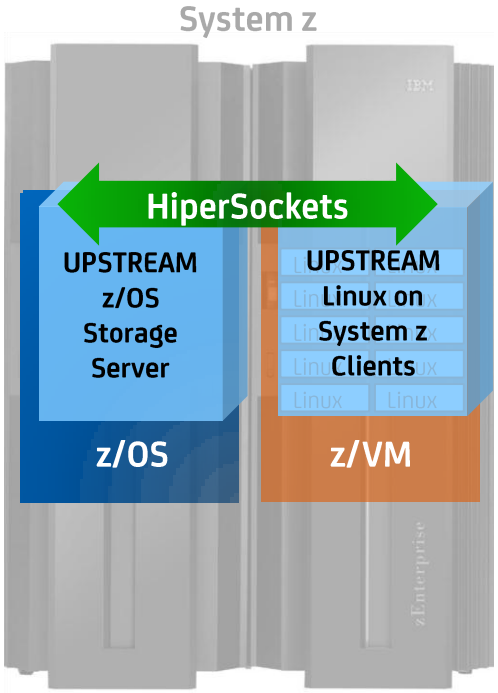


UPSTREAM for Linux on System z
centralized control and view of backups

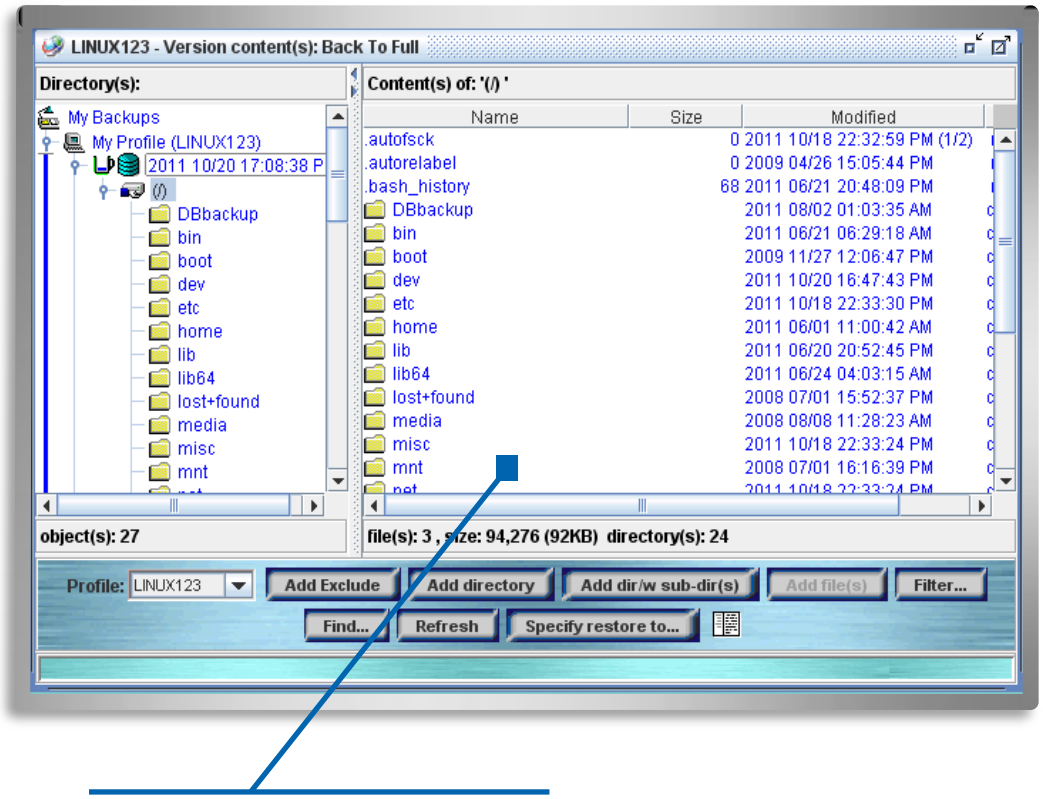


Flexible management interface provides centralized view and control of Linux on System z backups





UPSTREAM “Director”
save time by simplifying and automating data protection



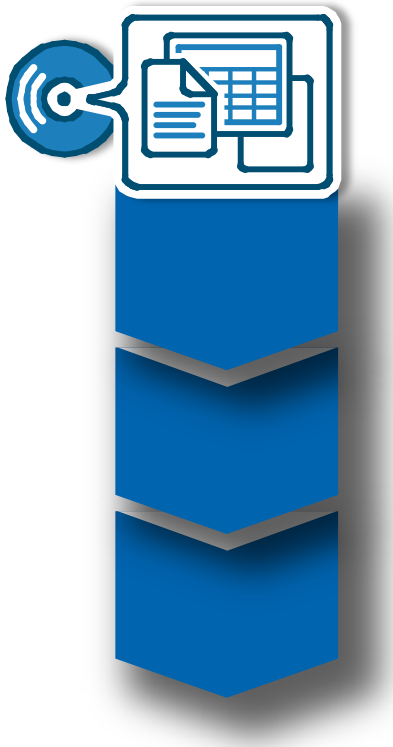
User-friendly graphical management interface for centralized single view and control of Linux on System z backups

- Communicate, control and monitor Linux on System z backups
  - Initiate backups and restores
  - Check status of running operations
  - Retrieve log files
  - Perform profile configuration
  - Run pre- and post-processing jobs
- Run from web browser for easy cross platform operations
- Keep storage administrators efficient, aware and advised

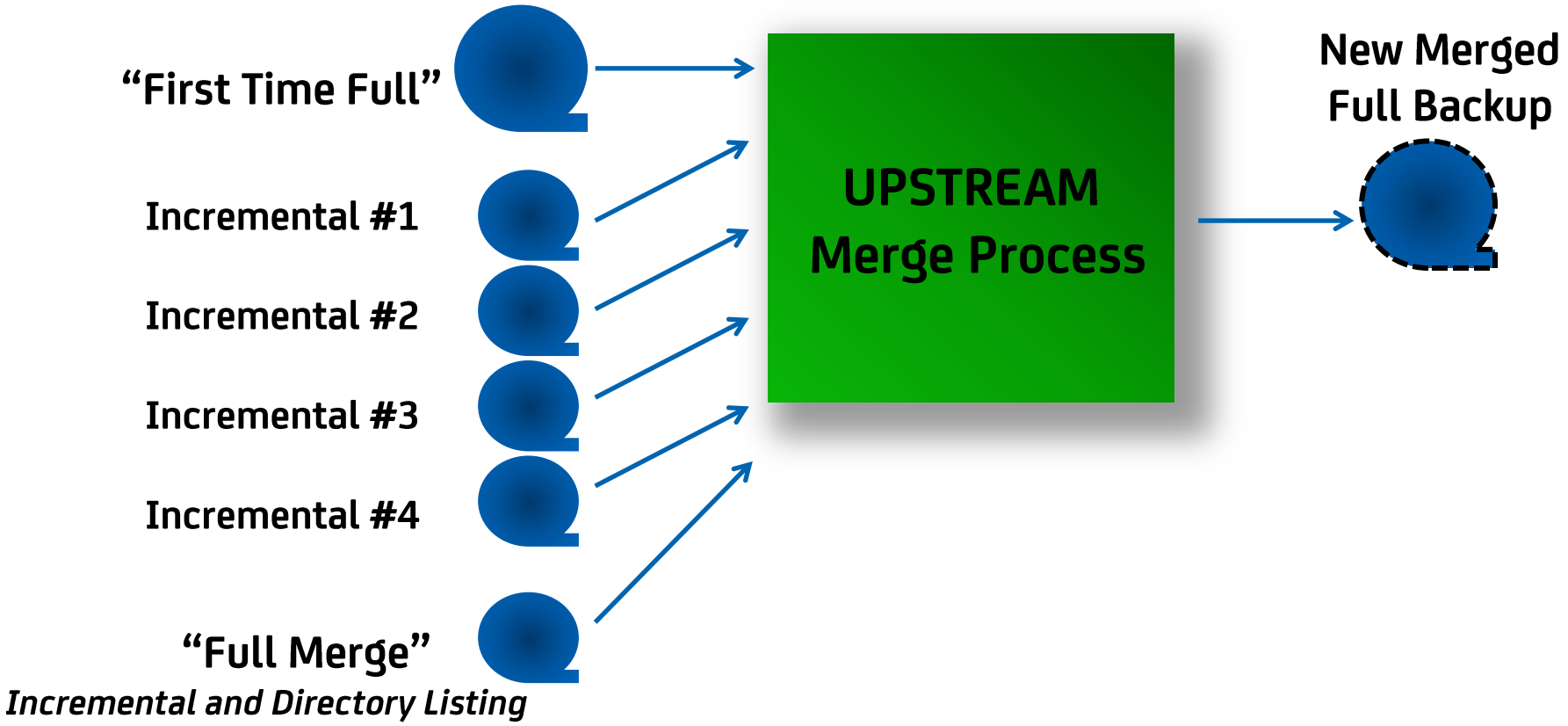
data reduction technology
reduce overhead and speed up backup/recovery

Advanced Data Reduction Technology Features

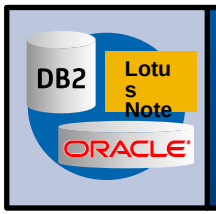
- Data Compression
  - 5 levels available
- Synthetic Full Merge Backup
  - Logical file granularity
  - Incremental backup processing
  - Eliminates need to do more than one “traditional” full backup
- Block level segmented backup support
- Exclude/Include
- Migration or disk grooming of inactive data
- Integration with leading mainframe de-duplication hardware appliance makers



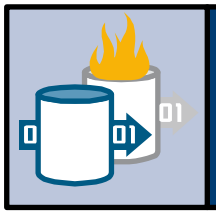
synthetic full merge technology
minimizes data transmission and reduces backup time



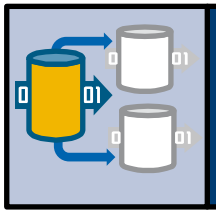
high performance database agents
efficient, reliable protection for large amounts of data



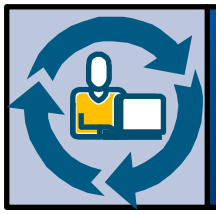
On-line agents for DB2/UDB, ORACLE, LOTUS Notes



Manage large amounts of data within scheduled backup window with “hot backup” technology



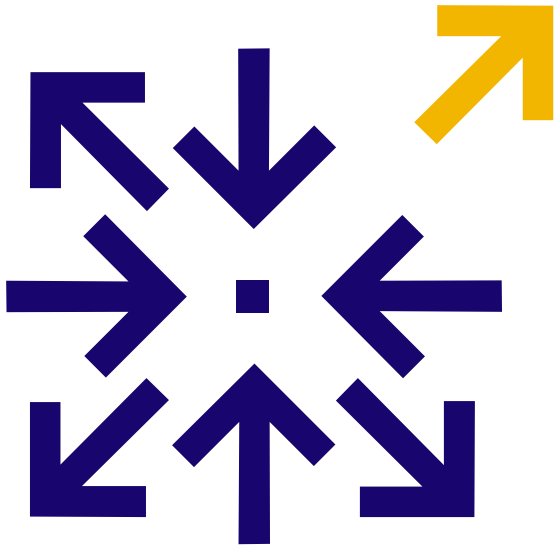
Perform backups without bringing down database



Allows continuous customer access

UPSTREAM
"Rescuer" facility

Quick and easy disaster recovery of Linux on System z applications, systems, configurations and data



- Backup the whole system without taking it offline
- Clone a complete machine easily
- Reduces training and administration while saving resources
- Makes recovery more consistently successful

Questions ???

Interested in Seeing More?

Join us at the CA Technologies Booth in the Share Technology Exchange for a closer look!

Also, visit the CA Linux Management for Mainframe web portal at:

http://www.ca.com/us/mainframe-linux.aspx

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