

IBM z Systems

Operational Monitoring and Automation of z/VM and Linux on z Systems

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Agenda

- Introduction to recommended practices and examples
- Overview of product being used
 - IBM Operations Manager for z/VM
- Considerations for z/VM Single System Image
- Recommended practices in detail
 - Live demonstrations
- Summary
 - Reference information
 - Additional demos
 - Configuration options and sample code for all demos

IBM z/VM Management Solutions

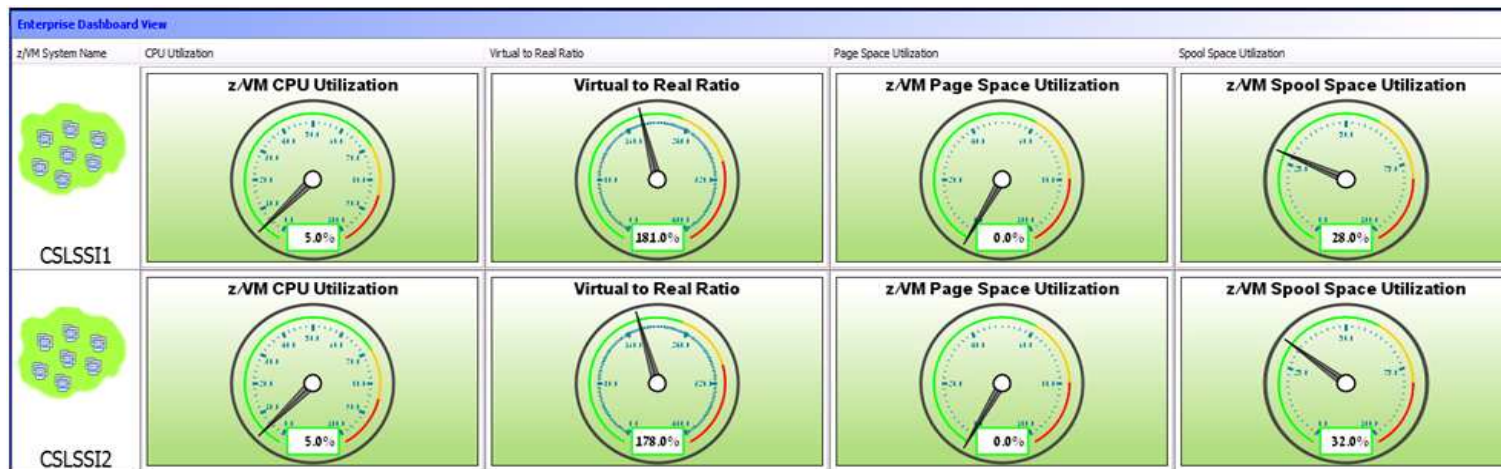
- Security
 - RACF and zSecure Manager for z/VM
- Performance monitoring
 - OMEGAMON XE on z/VM and Linux
 - Performance Toolkit for z/VM
- **Backup and recovery**
 - Backup and Restore Manager for z/VM
 - Tape Manager for z/VM
 - Spectrum Protect (aka Tivoli Storage Manager)
- Automation and operational monitoring **New V1.6**
 - Operations Manager for z/VM **GA May 20**
 - Including integration with existing monitoring and alert systems
- Interactive provisioning and system resource management
 - IBM Wave for z/VM

IBM Wave for z/VM and Operations Manager for z/VM

- IBM **Wave** for z/VM provides an **interactive** GUI interface for:
 - Provisioning of Linux guests
 - Basic performance information
 - Monitoring of virtual server **resources**
 - z/VM and Linux administrator tasks
- **Operations Manager** for z/VM provides **operational monitoring** & automation
 - **In the background**
 - Monitoring of console messages for z/VM service machines and Linux guests
 - Monitoring “state” information for z/VM service machines and Linux guests
 - Monitoring spool and page space on the z/VM system
 - Automated responses to these monitors when they are triggered
 - Email
 - SNMP alerts
 - Integration with IBM Tivoli Netcool/OMNibus enterprise alert system
 - Actions that address the problem immediately in addition to or instead of alert notification
 - **Interactive when needed**
 - View and interact with live service machine and Linux guest consoles
 - View and manage spool files
- **Complementary** solutions
 - Use Operations Manager to monitor Wave service machines
 - Use Operations Manager to automatically initiate tasks in Wave via the Wave CLI

IBM Wave for z/VM and OMEGAMON XE on z/VM and Linux

- IBM **Wave** for z/VM provides **point in time** monitoring of virtual server resources from a single graphical interface



- **OMEGAMON XE** on z/VM and Linux provides
 - **Deeper level** monitoring of z/VM
 - Deeper level monitoring of individual Linux guest environments
 - Ability to set service level **thresholds** and generate **events** when exceeded
 - **Historical** view of monitoring data
- Both OMEGAMON XE on z/VM and Linux and IBM Wave can **coexist** in customer environments
- Both gather the data from the **Performance Toolkit** for z/VM

Operational Monitoring and Automation



Recommended Practices – Operational Monitoring and Automation

Monitor consoles of Linux guests and CMS service machines


- Operations staff monitoring multiple consoles or a central console of alerts
- System programmers debugging a problem on a guest or service machine – view and issue commands on the console

Generate alerts and/or automatically recover from

- Abend, termination, or error messages
- Service machine disks approaching full
- Critical user IDs or guests being logged off or entering error state
- Spool and/or page space approaching full

Schedule automated system maintenance procedures

- Spool cleanup based on policies
- Minidisk cleanup (from logs), including archiving
- Orderly startup and shutdown
 - Relocation of critical guests to another SSI member
- Backups of z/VM system and or Linux guests



**Keep monitoring
close to the
operating system**



Product Overview
IBM Operations Manager for z/VM

Automation Demos Available

1. View consoles of Linux guests, Linux syslog data, and CMS user IDs or service machines
2. Send an e-mail based on a console message
3. **Send an alert to Netcool/OMNibus based on a console message, hold and unhold messages**
 - a. Using POSTZMSG interface to Netcool/OMNibus
 - b. **Using SNMP interface to Netcool/OMNibus**
4. **Send a message or email if spool approaches full**
 - a. Send a message if spool usage is too high on any member of an SSI Cluster – see how spool files appear in SSI
 - b. **Send an email if spool usage is too high on a single system**
5. **View and clean up spool files**
6. Automated spool cleanup
7. Archiving DIRMAINT's log files when disk gets full
8. Process a file of test messages as a console
9. Process Linux syslog data as a console
10. Create a central operations console on one z/VM system
11. Create a central operations console across multiple z/VM systems
 - a. When the systems are in an SSI cluster
 - b. When the systems are not in an SSI cluster
12. Monitor service machines for logoff – and autolog them
13. Send an email if page space approaches full
14. Monitor SSI connectivity between 2 cluster members
15. Suppress passwords on Linux consoles
16. Autolog a Linux guest and send message if doesn't start successfully
17. Monitor Linux file system and send email when approaching full
18. Send alerts to other tools via syslog
19. Non-SSI high availability environment: monitor LPAR CPU utilization – if too high, stop a guest and restart on another LPAR

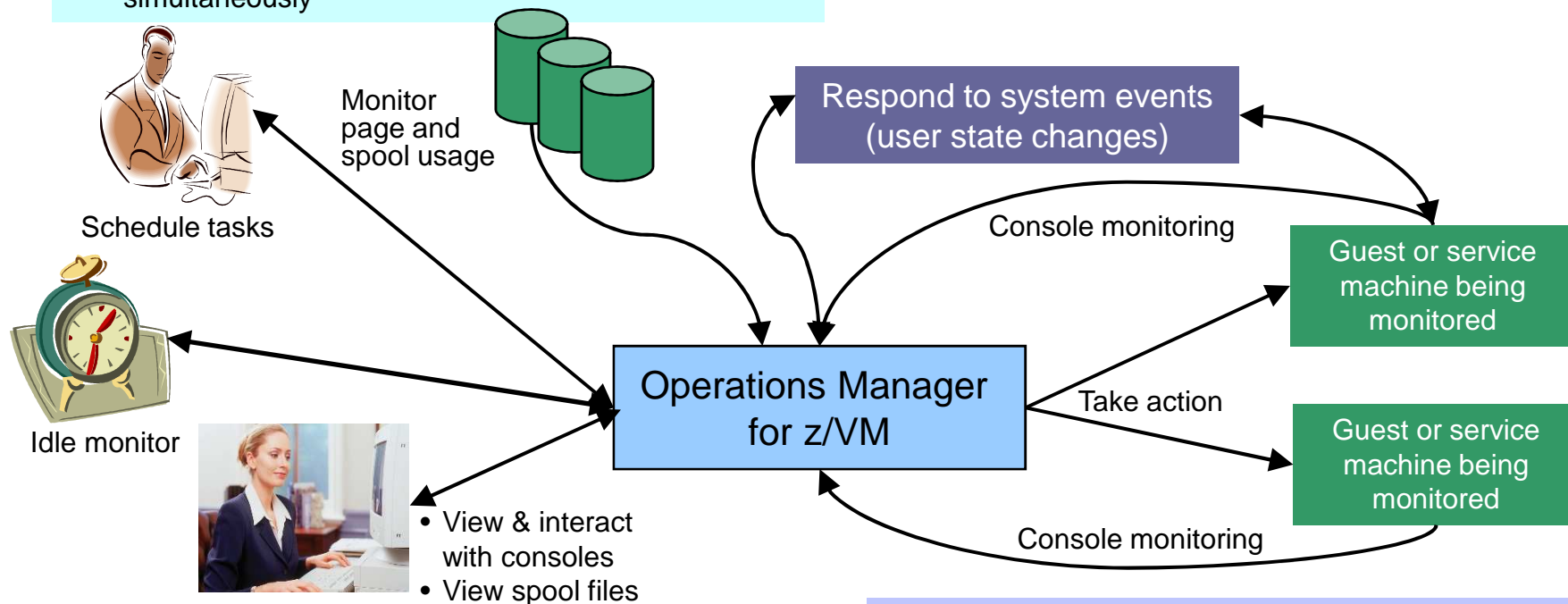
Operations Manager for z/VM

Increase productivity

- Authorized users to view and interact with monitored virtual machines without logging onto them
- Multiple users view/interact with a virtual machine simultaneously

Improve system availability

- Monitor virtual machines and processes
- Take automated actions based on console messages
- Reduce problems due to operator error



Automation

- Routine activities done more effectively with minimal operations staff
- Schedule tasks to occur on a regular basis

Integration

- Fulfill take action requests from performance monitoring products (e.g. OMEGAMON XE on z/VM and Linux)
- Send alerts to email, central event management systems (e.g. Netcool/OMNIBus), etc.

Features and Functions

- Monitor service machine consoles
- Monitor page space and spool usage
- Monitor system events
- Schedule events/actions
- Take actions automatically based on monitoring results
 - Includes taking actions on other z/VM systems with Operations Manager
- View and interact with monitored consoles from authorized user IDs
- Find and view spool files
- Dynamic configuration
- Separation of access control

Dynamic Configuration

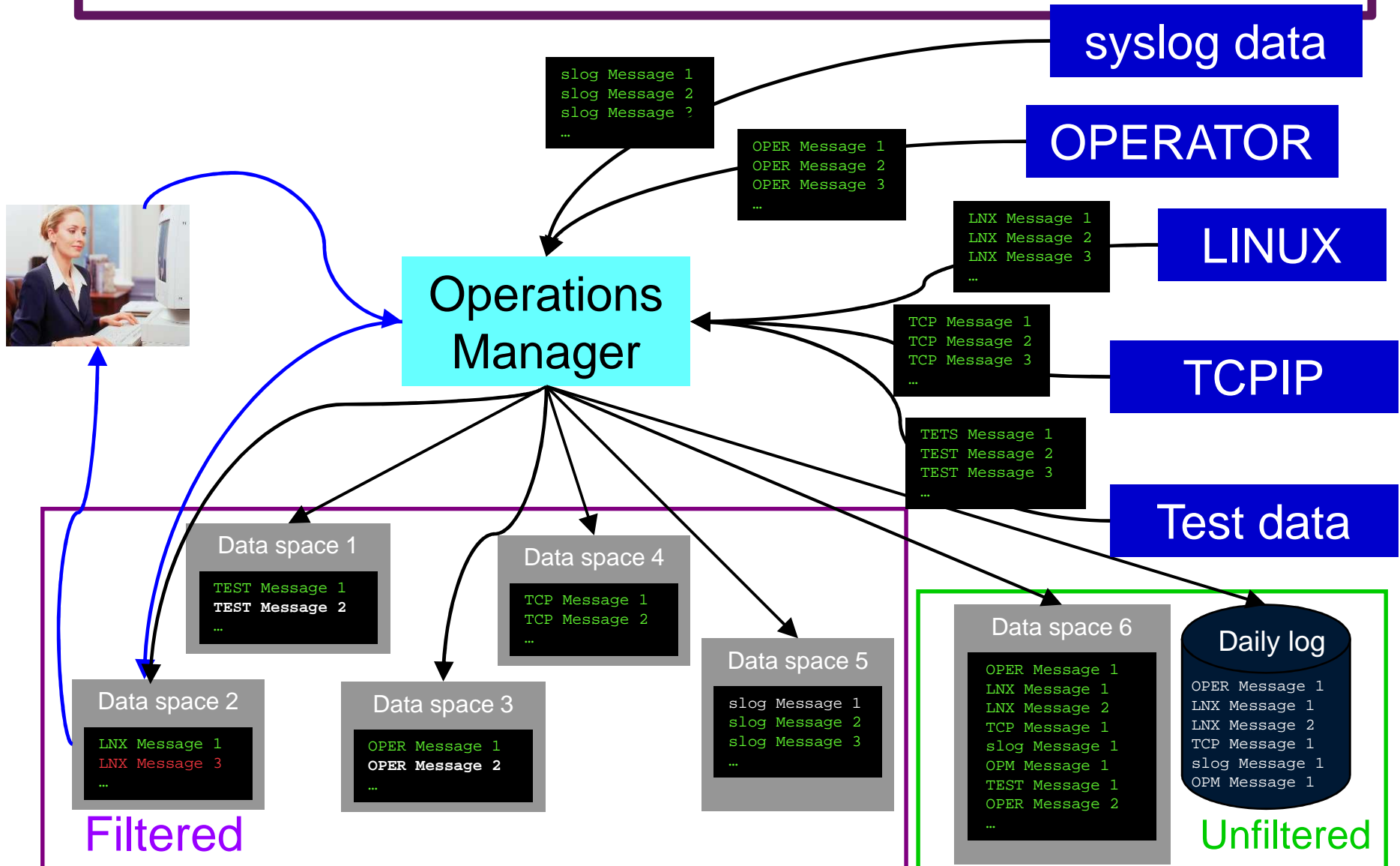
- **Initial configuration** file loaded at startup
 - May imbed other configuration files
 - Filename can be a substitution variable for the system name
- Most **configuration options** can be **updated** while **Operations Manager is running**
 - Add, delete, or change:
 - Rules, actions, monitors, schedules, holidays, groups, user authorization
 - **Suspend or resume** rules, monitors, schedules
- Multiple methods
 - CMS command interface
 - (Re)load a new or updated configuration file
 - Commands in action routines
- **Sample configuration** files provided
 - Includes some of the demos in this presentation
 - Operations Manager configuration statements
 - **Sample REXX** code



View and Issue Commands on Consoles
Linux Guests and CMS Service Machines

Generate Alerts and/or Automatically Recover From
Abend Messages
Termination Messages
Error Messages

Monitor Guest and Service Machine Consoles



View and Interact with Consoles

- Authorized users can **view live consoles** of monitored service machines & guests
 - **Multiple users** can view the same console simultaneously
 - No need to logon to the user ID to see its console
 - No interruption of the user ID
 - No need to create and close console files of disjointed data
 - Test data and Linux syslog data treated as a “console”
 - Views can be defined to look at a group of consoles in one view
 - Can specify a date and time range for your view within currently available data
 - Can request a copy of the current console data for a user or set of users
 - Format of date in the view is based on requestor’s CP DATEFORMAT setting
- Full screen mode
 - **Scroll** up and down to view and search historical data
 - Auto scroll (on or off) as new output is displayed on the console
 - From command line, **issue commands** back to the monitored console
- Amount of data that is visible depends on specified or default data space size
 - Or date/time range specified
- Rules/actions may modify the view
 - **Suppress messages** from the console
 - **Hold or highlight messages** with color, blinking, etc.
- Authorized users can view the log file
 - Can also request a copy of the log file from today or a previous day

Monitor Service Machines

- Define rules to
 - Scan **console messages** for **text matching**
 - Includes column, wildcard, and exclusion support
 - Optionally restrict to specific user ID(s)
 - **Take actions** based on matches
- Multiple rules can apply to one message
 - Rules processed in order of definition in the configuration file
 - FINAL option available to indicate no additional rules should be evaluated

Executing Actions

- Define action(s) to be triggered
 - Specify action to take as part of the console rule definition
 - Action is taken when match is found
 - Types of actions
 - Change color, highlight, hold, or suppress a console message
 - **CP or CMS commands**
 - **REXX** EXECs, for example:
 - Send email
 - Send SNMP trap
 - Clean up a disk
 - **Write** data out on a **TCP/IP** port
 - E.g. send data to a syslog daemon/server

Executing Actions

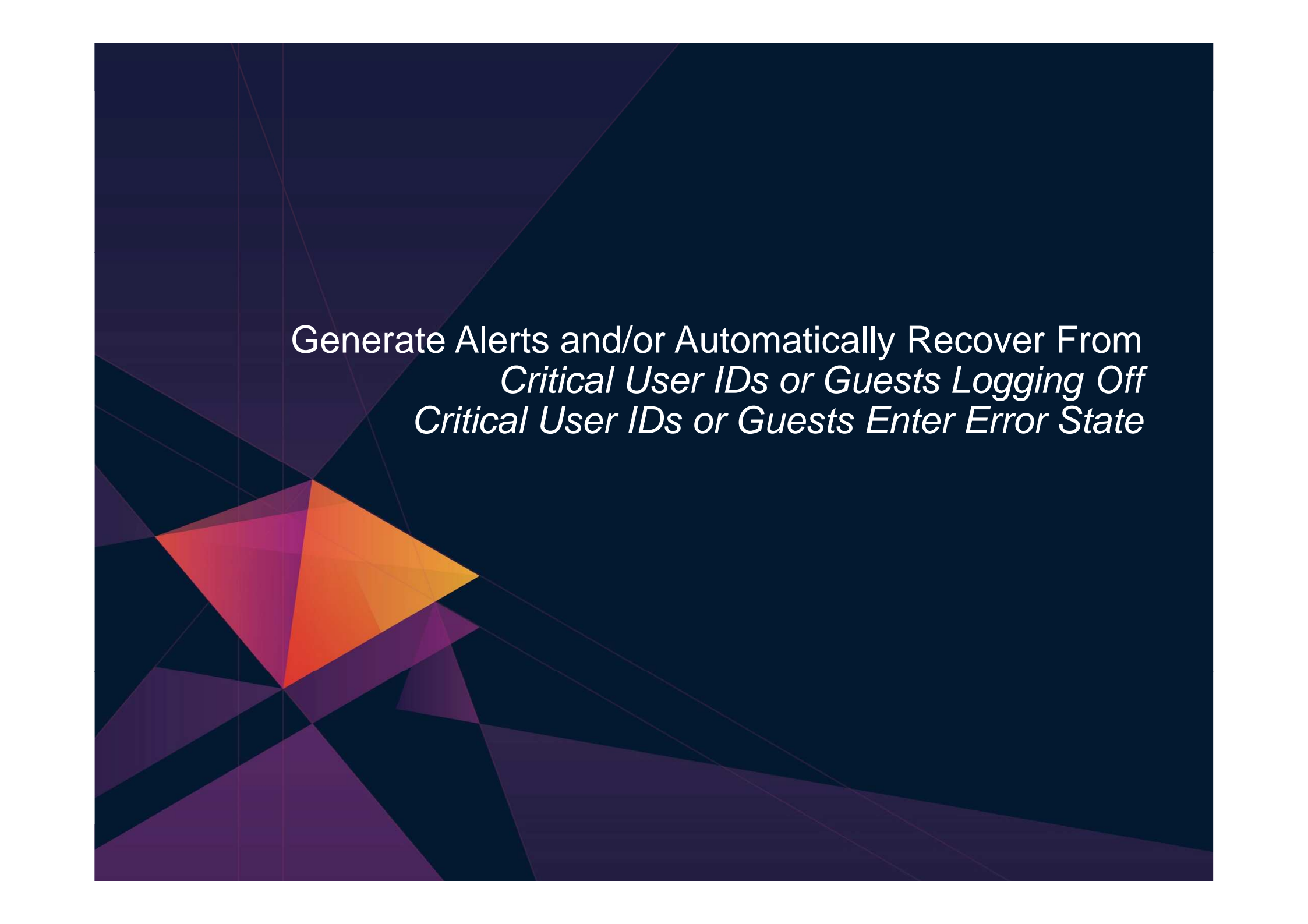
- Dynamically include data about the triggering event
 - Available to the action via substitution variables
- Limit the number of times an action is taken in a specified period of time
 - Avoid executing action repeatedly
- Take multiple actions based on one message
 - Chain actions together
- **Execute the action on another LPAR** running Operations Manager
 - Communication is IP-based
 - **Does not require SSI**

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Additional Operational Monitoring

Additional Monitoring and Automation Capabilities

- Event monitoring
 - User ID run status
 - SSI and network status
- Monitor page and spool space
 - Current state and growth rate
- Scheduling
- Idle monitor
 - Events/monitors not occurring as expected



Generate Alerts and/or Automatically Recover From
Critical User IDs or Guests Logging Off
Critical User IDs or Guests Enter Error State

Respond to System Events (Guest State Changes)

- Create monitors for z/VM system events (*VMEVENT)
 - Class 0, related to **user IDs**
 - 0 - Logon
 - 1 - **Logoff**
 - 2 - Failure condition (including **CP READ and Disabled Wait**)
 - 3 - Logoff timeout started
 - 4 - Forced sleep started
 - 5 - Runnable state entered (VM READ)
 - 6 - Free storage limit exceeded
 - 9 - Outbound relocation started
 - 10 - Inbound relocation started
 - 11 - **Outbound relocation complete**
 - 12 - Inbound relocation complete
 - 13 - **Outbound relocation terminated**
 - 14 - Inbound relocation terminated
 - 15 – Timebomb exploded
 - Optionally restrict to specific user ID(s)

Respond to System Events (System State Changes)

- Class 2 and 3, **related to SSI**
 - 7 – SSI Mode (Stable, Influx, Safe)
 - 8 – SSI Member State (Down, Joining, Joined, Leaving, Isolated, Suspended, Unknown)
- Class 4, related to **networking**
 - 16 – Device activated
 - 17 – Additional device activated
 - 18 – Device deactivated, connection to hardware still operational
 - 19 – Device deactivated, connection to hardware not operational
- Specify the **action** associated with the event
 - Actions specified are the same as those for schedules, console rules, and other monitors



Generate Alerts and/or Automatically Recover From
Spool Space Approaching Full
Page Space Approaching Full

Monitor Page and Spool Usage, View Spool Files

- Create page and spool space monitors to trigger actions when
 - Percent of spool usage falls within a **specified range**
 - Percent of spool usage increases at a specified rate
 - Percent of page space usage falls within a specified range
 - Percent of page space **usage increases** at a specified rate
- Actions triggered can be the same actions used by console monitoring
- For spool files, authorized users can
 - **Full screen interface to list of spool files** based on one or more attributes
 - Owner
 - Size
 - Date created
 - From the list, the user can
 - **Sort** the list on any of the available columns
 - **View the contents** of an individual spool file
 - **Purge**, transfer, or change a spool file

Schedule Automated System Maintenance Procedures

Monitor for Rules, Monitors and Schedules Not Triggered

Spool Cleanup Based on Policies

Backups

Disk Cleanup

Orderly Startup and Shutdown

Schedule Events and Actions

- Define schedules
 - Hourly, daily, weekly, monthly, or yearly, nth weekday of the month
 - Once on specified month, day, year, and time
 - Based on ISO week definitions (week number; even, odd, first, last week)
 - At regular intervals
 - Every x hours and y minutes
 - Within a specified window of time
 - Specify start time
 - Specify conflicting schedules
 - Specify maximum time to defer this schedule
 - Within limits
 - Restrict to specific days of the week: Monday through Sunday plus holidays
 - Restrict to certain hours of the day

- Specify the action associated with the schedule
 - Actions specified are the same as those for console rules and all other monitors

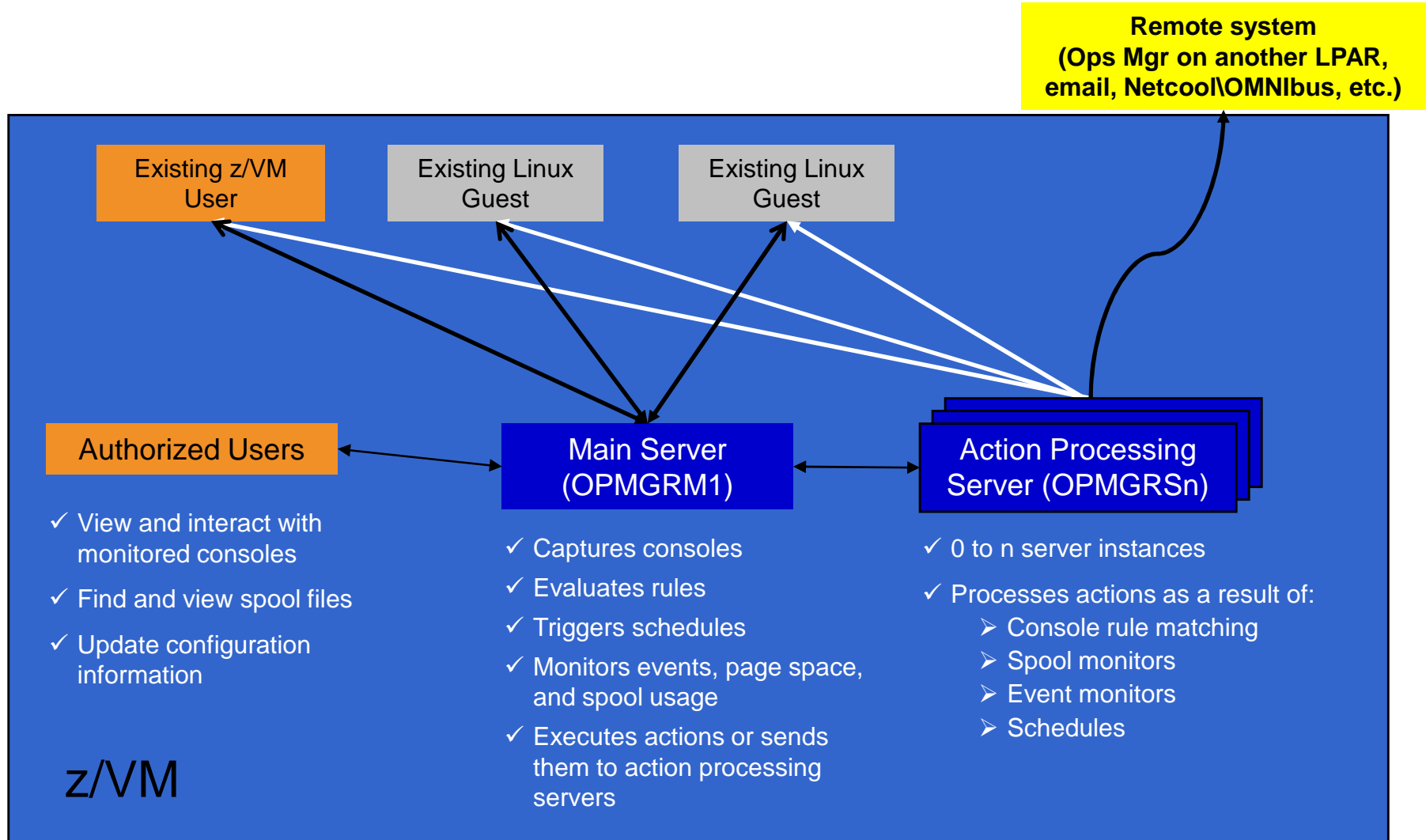
Idle Monitors

- Define idle monitors
 - Watch for idle rules, schedules, and monitors
 - Rule, schedule, or monitor **not triggered** *n* number of times within specified period of time
- Specify the action associated with the idle monitor
 - Actions specified are the same as those for schedules, console rules, other monitors



SSI vs non-SSI Considerations

Operations Manager - non-SSI Environment





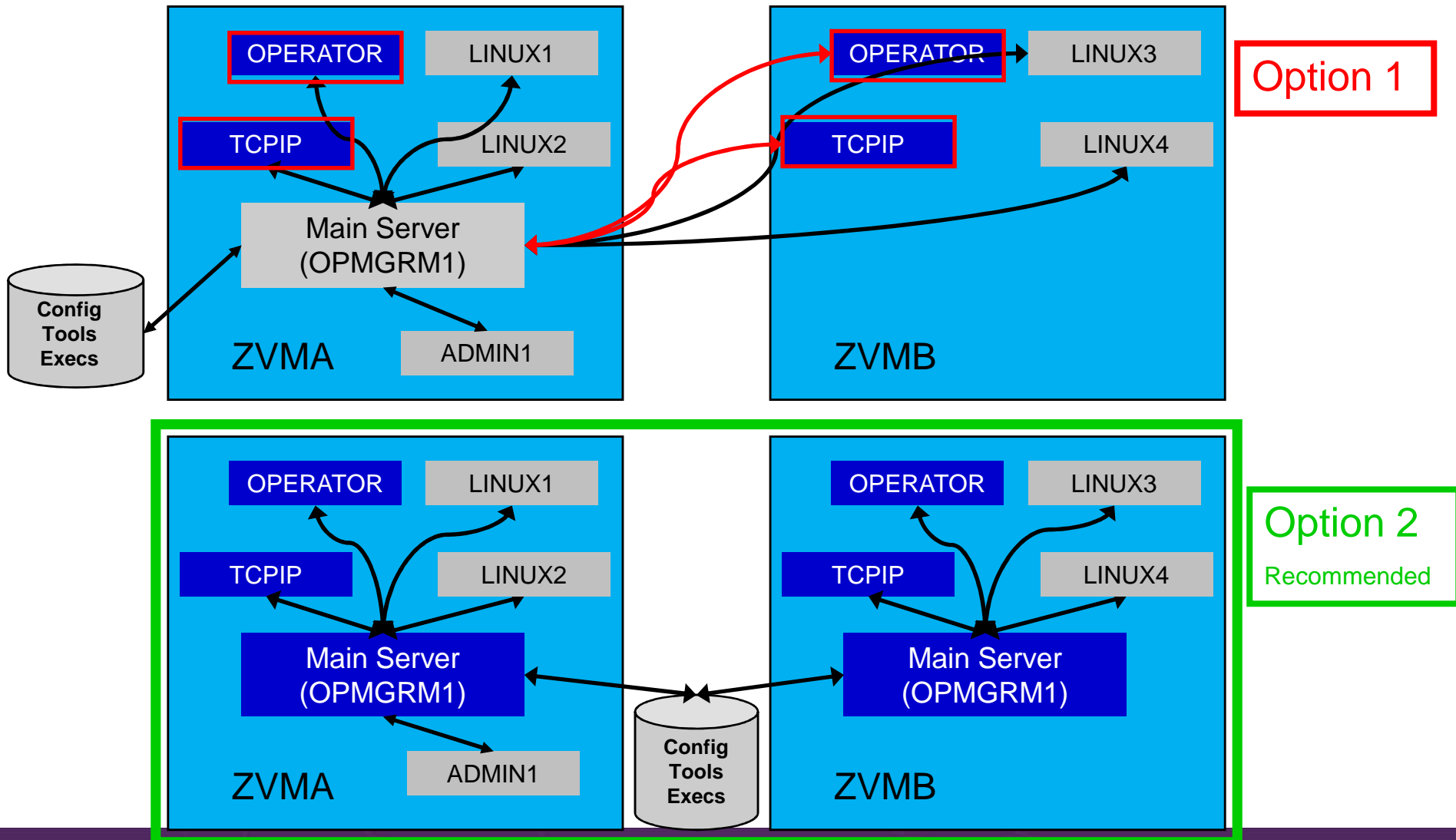
SSI Considerations

Console Monitoring

SSI Considerations for Console Monitoring

Single Config User

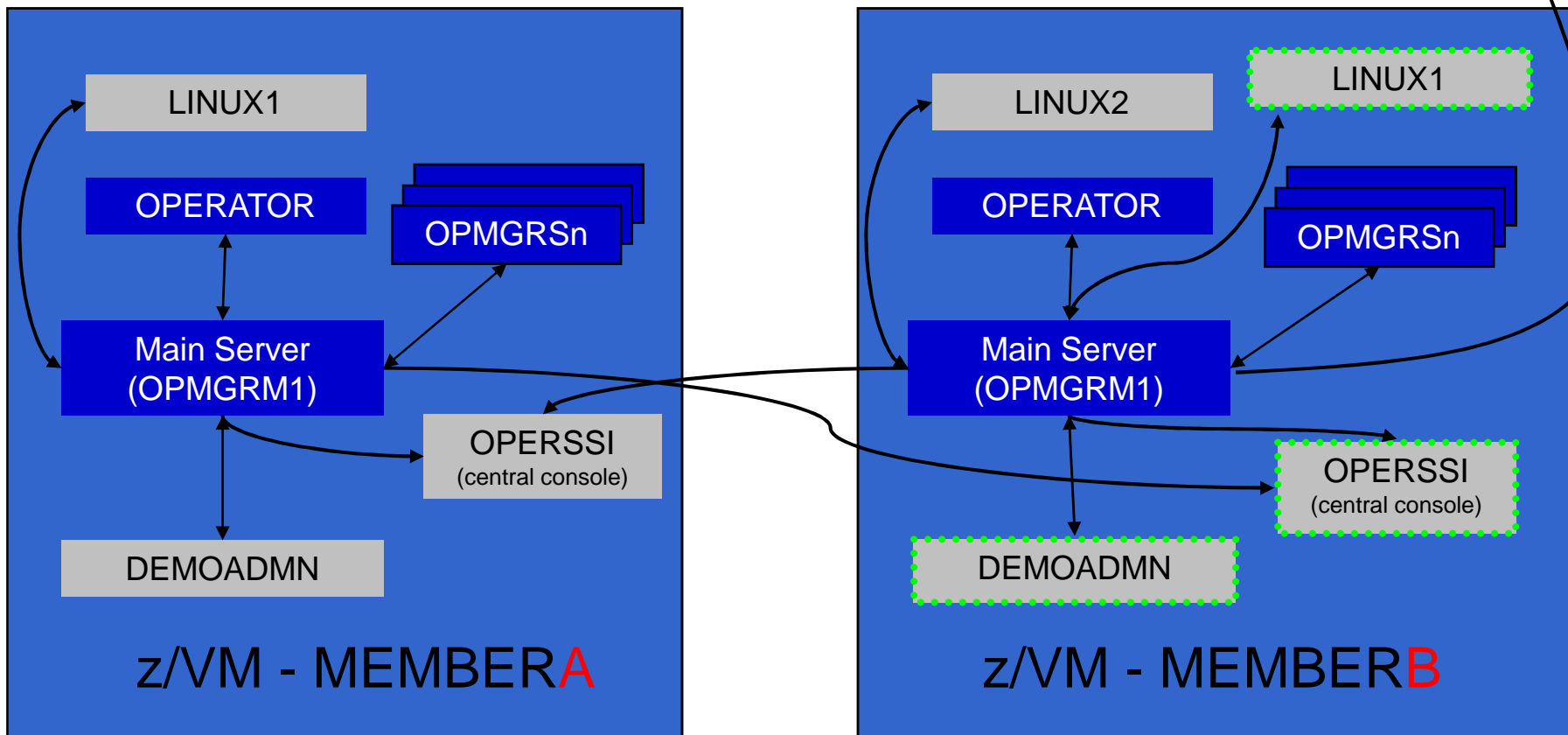
Multiconfig User



Operations Manager in SSI Cluster - Example

Remote system
(z/VM, email,
Netcool\OMNibus, etc.)

- Multiconfiguration users: OPMGRM1, OPMGRSn, OPERATOR, MAINT
- Single configuration users: RHEL5G, SLES11C, OPERSSI, DEMOADMN
 - May relocate OPERSSI and DEMOADMN manually (supported) or via VMRELOCATE (unsupported, but you can make it work)



Relocating OPERSSI and DEMOADMN (CMS Users) ...

- VMRELOCATE for CMS user IDs not officially supported
- Can be done for some CMS users
 - Create single configuration user ID for z/VM system disks
 - Copy MAINT 190, 19D, 19E to minidisks owned by this new user ID
 - Use DDR for 190 since it needs to be IPLable
 - Relocateable CMS user must IPL from identical NSS (CMS) or minidisk (190)
 - Use SPXTAPE to copy CMS NSS
 - VMRELOCATE uses checksum of NSS to determine if identical
 - CMS NSS includes date/time it was loaded
 - Or, have relocateable CMS users IPL 190 instead of IPL CMS

OPERSSI DIRECT

```

USER OPERSSI ...
...
OPTION CHPIDVIRTUALIZATION ONE
...
IPL 190
...
LINK CMAINT 0190 0190 RR
LINK CMAINT 019D 019D RR
LINK CMAINT 019E 019E RR
...

```

PROFILE EXEC

```

/* PROFILE EXEC for OPERSSI */
...
'SET RELPAGE OFF'
...

```

... Relocating OPERSSI and DEMOADMN (CMS Users)

➤ Beware

- It's worth repeating ... **VMRELOCATE for CMS user IDs not officially supported**
- All members of the cluster must be kept at same z/VM (or at least CMS) code level
- If IPL 190, will use more memory as each user ID will have private copy of CMS
- SET RELPAGE OFF may have a negative impact on overall system performance
- Only works for “basic” CMS users
 - All relocation rules still apply
 - E.g. user IDs connecting to VMCF or IUCV can't relocate

Monitor Service Machines - Considerations

- Consoles received by Operations Manager via SECUSER or OBSERVER
 - Prefer SECUSER
 - OBSERVER won't detect CP and VM READ messages
 - Output of actions on OBSERVED console may not be viewable in console
 - OBSERVER allows Operations Manager to receive console output even if user is logged on
- SSI allows SECUSER and OBSERVER across members of cluster in some situations
 - Content does not contain member name information
 - Rules, actions, and users wouldn't be able to distinguish between IDENTITY users on multiple members
 - Creates single point of failure on one member
- Recommendation for z/VM V6.2 or V6.3 Single System Image environments
 - Have all consoles monitored by an Operations Manager server on the same member as the monitored guest (i.e. all Operations Manager servers are IDENTITY users)
 - Requires action processing servers (OPMGRSn) to be on same member as main server
 - Share configuration data on minidisk owned by single configuration user
 - For example: VMTOOLS 198
 - Master configuration file unique to each member
 - Imbed common file(s) used by all members
 - Request a copy of the current console of a remote user
 - `SMSG OPMGRM1 at membername VIEWCON USER(userid),MODE(RDR)`



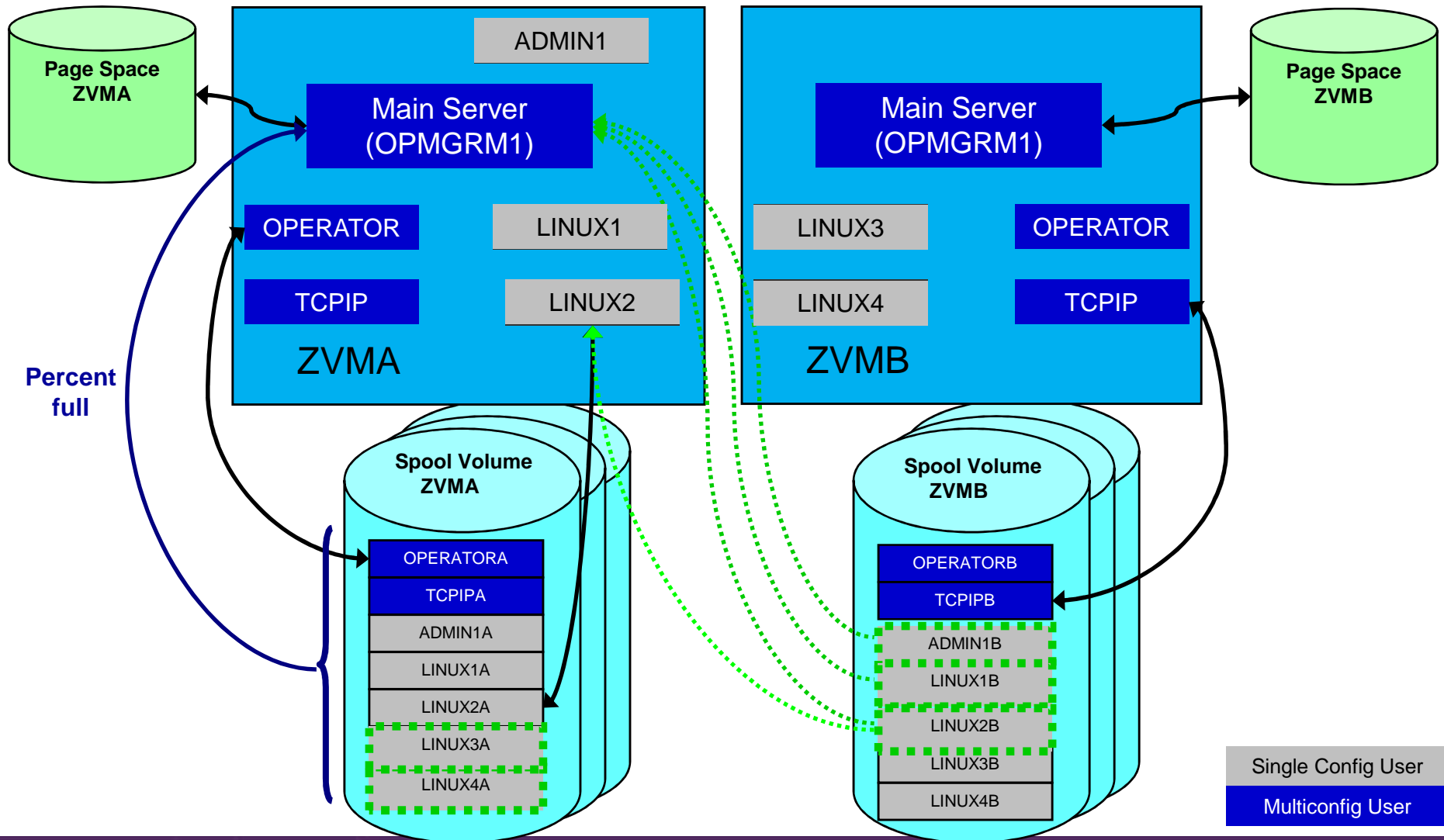
SSI Considerations

Page Space Monitoring

Spool Space Monitoring

Viewing and Managing Spool Files

SSI Considerations for Spool and Page Space Monitoring



Spool and Page Space Monitoring - Considerations

- Page space is local
 - Separate space for each member and only visible to the local member
 - **No impact from SSI**
- Spool data
 - Spool files are placed on spool volumes owned by the member where the spool file was created
 - Users see their own spool data no matter where they are logged on and where the data was created

Spool and Page Space Monitoring - Considerations

Users and applications (like Operations Manager) who can see all spool files need to be aware:

- Spool data for **multiconfiguration** users
 - Only spool files owned by the local instance of that user are visible on the local member
 - No visibility to spool files owned by other instances of that user on other members
- Spool data for single configuration users:

Single configuration user Status	Spool files created on <u>this</u> member	Spool files created on <u>other</u> members
User logged off	Visible	Not visible
User logged onto <u>this</u> member	Visible	Visible (but not on local spool volumes)
User logged onto <u>another</u> member	Visible	Not visible

Spool and Page Space Monitoring - Considerations

➤ Recommendation

- Have an Operations Manager server on each member to monitor spool and page space
- Be aware of spool files visible in Operations Manager but not resident on this member's spool volumes
 - Indicated with "+" in VIEWSPPL



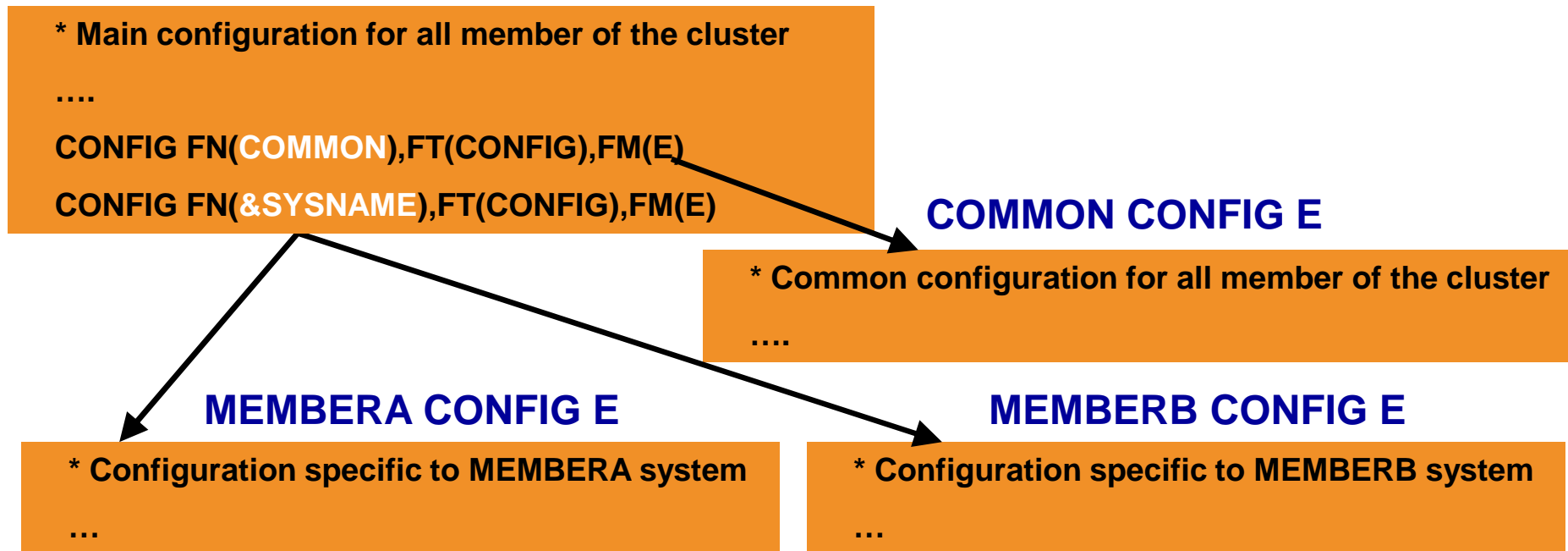
SSI Considerations

Managing Configuration Files

Managing Configuration Files

- Put all configuration files on a shared disk
 - Default is 198 disk for OPMGRM1 – in IDENTITY section
 - Alternatively SFS
- Create a main configuration file with authorizations and system settings – shared by all members
 - All Operations Manager servers on all members load this file
- Create a common configuration file used by all members
- Imbed a unique configuration file based on the system name of this member

OPMGRM1 CONFIG E





Summary

References

Demos – Including Screenshots, Configuration Info, REXX

Recommended Practices – Operational Management

View and issue commands on consoles of Linux guests and CMS service machines

- Operations staff monitoring multiple consoles or a central console of alerts
- System programmers debugging a problem on a guest or service machine

VIEWCON

Generate alerts and/or automatically recover from

- Abend, termination, or error messages
- Service machine disks approaching full
- Critical user IDs or guests being logged off or entering error state
- Spool and/or page space approaching full

Schedules

Event monitors

Rules

Spool/Page monitors

Schedules

Schedule automated system maintenance procedures

- Spool cleanup based on policies
- Minidisk cleanup (from logs), including archiving
- Orderly startup and shutdown
 - Relocation of critical guests to another SSI member
- Backups of z/VM system

Rules, Archive Mgr

SFPURGER

Rules, monitors

Backup Manager

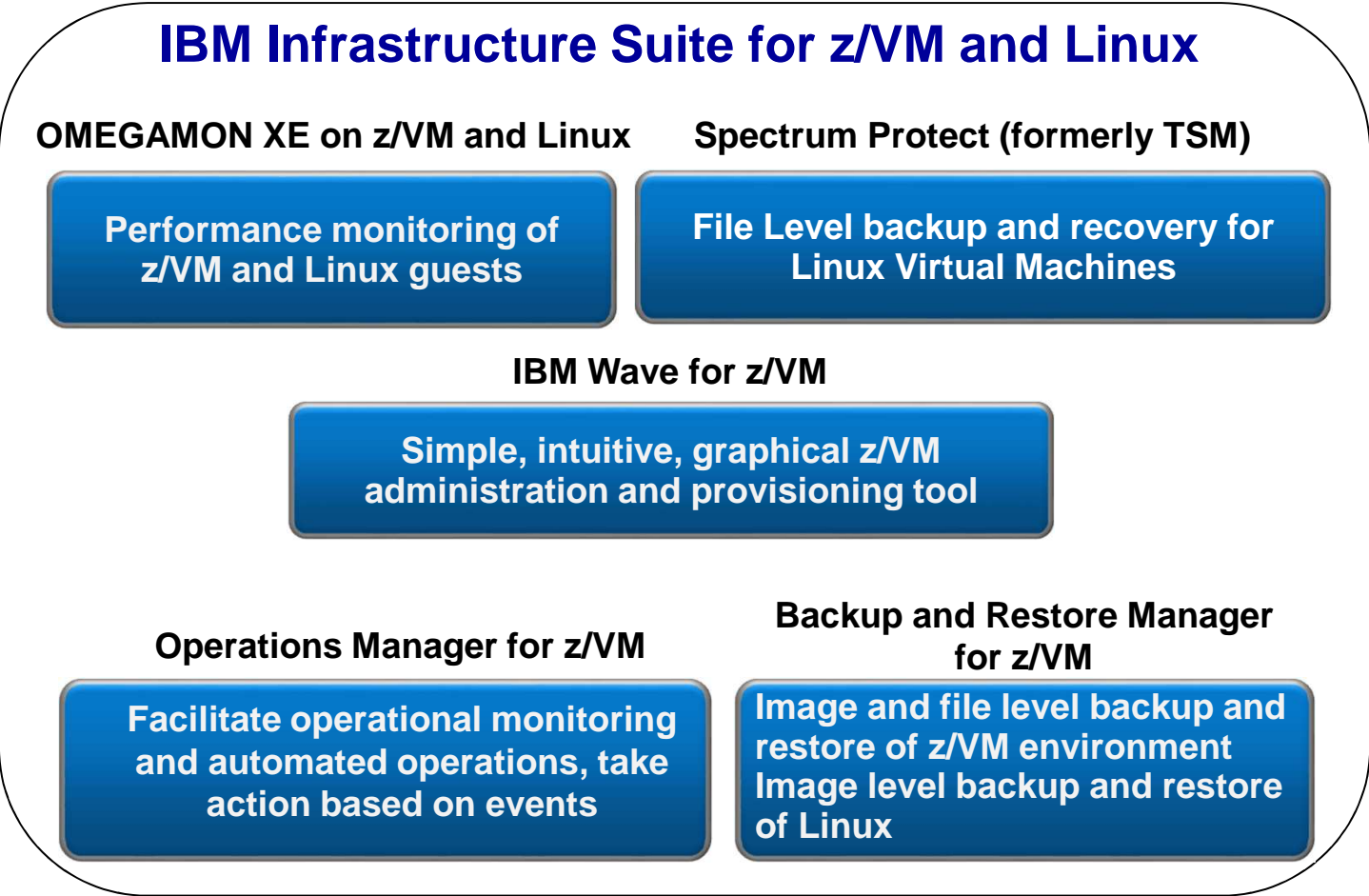
Summary

- Use Operations Manager to
 - **Automate** daily operations
 - **Integrate** your z/VM and Linux on z Systems environment with existing enterprise monitoring and **alerting**
 - Prevent problems rather than react to them
 - Automate reactions to problems when they can't be prevented
 - **Improve problem determination** procedures
 - Increase programmer and operator productivity
 - Continue to monitor locally with improved management of clusters
- Sometimes several alternatives for monitoring for the same event
 - Console message (rules)
 - Scheduled healthchecks (schedules)
 - User ID status changes (event monitor)
- Actions allow integration with other platforms and products

Complete Solution for administration and management of the z/VM and Linux on z Systems or LinuxONE environment



Single PID
5698-IS2 OTC
5698-IS1 Annual S&S



Add Tape Manager for z/VM (5697-J08) for customers backing up from z/VM to tape

Reference Information

- Web sites
 - Product page: <http://www.ibm.com/software/products/en/operations-manager-for-zvm>
 - Publications, presentation, white papers
 - Pre-requisites
 - Support
- Infrastructure Suite **wiki**: – **Videos of demos**
 - <http://ibm.biz/Bd4up3>
- e-mail
 - Tracy Dean, tld1@us.ibm.com, Product Manager
- White papers on Operations Manager website (Resources tab)
 - Routing Linux syslog data
 - Sending alerts from Operations Manager to Netcool/OMNIbus
 - Using Shared File System to store Operations Manager configuration files and automation EXECs
 - Automatically logging on a user at Linux system boot time for easier console management and action execution
 - Enabling the FACILITY Class for Use by RACF for z/VM

धन्यवाद

Hindi

多謝

Traditional Chinese

감사합니다

Korean

Спасибо

Russian

Gracias

Spanish

شكراً

Arabic

Thank
You

English

Obrigado

Brazilian Portuguese

Grazie

Italian

多谢

Simplified Chinese

Danke
German

Merci

French

நன்றி

Tamil

ありがとうございました

Japanese

ขอบคุณ

Thai

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Demonstration Scenarios

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