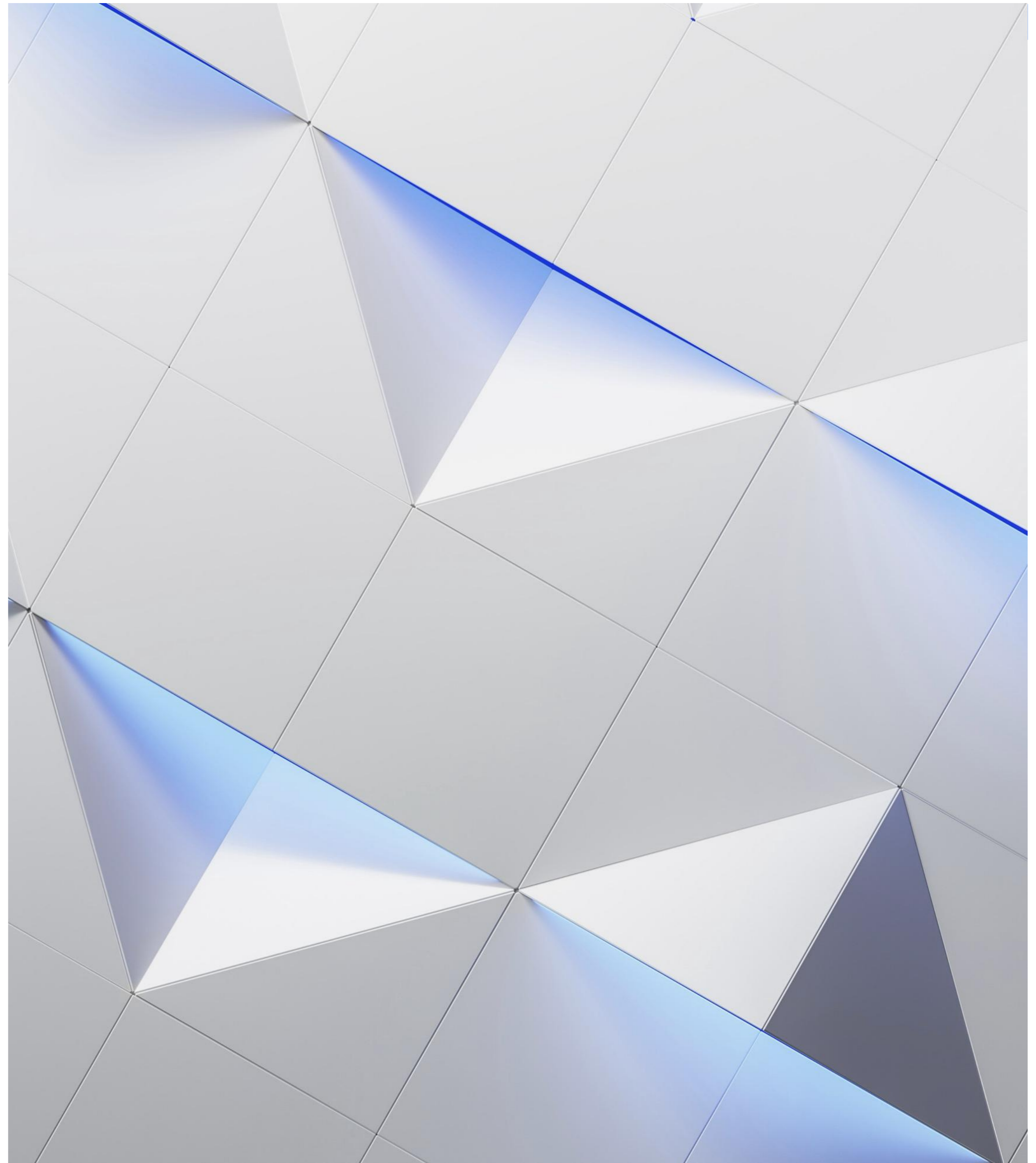


Operational Monitoring and Automation of z/VM and Linux on IBM Z

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Agenda

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Introduction to recommended practices and examples

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IBM Operations Manager for z/VM

- Overview
 - Customer experiences
-

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Considerations for z/VM Single System Image

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Summary

- Reference information

IBM 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
- Storage Protect (aka Spectrum Protect or Tivoli Storage Manager)

Automation and operational monitoring

- Operations Manager for z/VM
- Including integration with existing monitoring and alert systems

Recommended Practices – Operational Monitoring and Automation

Console monitoring and viewing – current state and historical

- Operations staff monitoring a central console of alerts
- System programmers debugging a problem on a guest or service machine
- Console log data available for audits or future reference
- System and user events

Gather Data

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

React

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

Prevent

Product Overview

IBM Operations Manager for z/VM

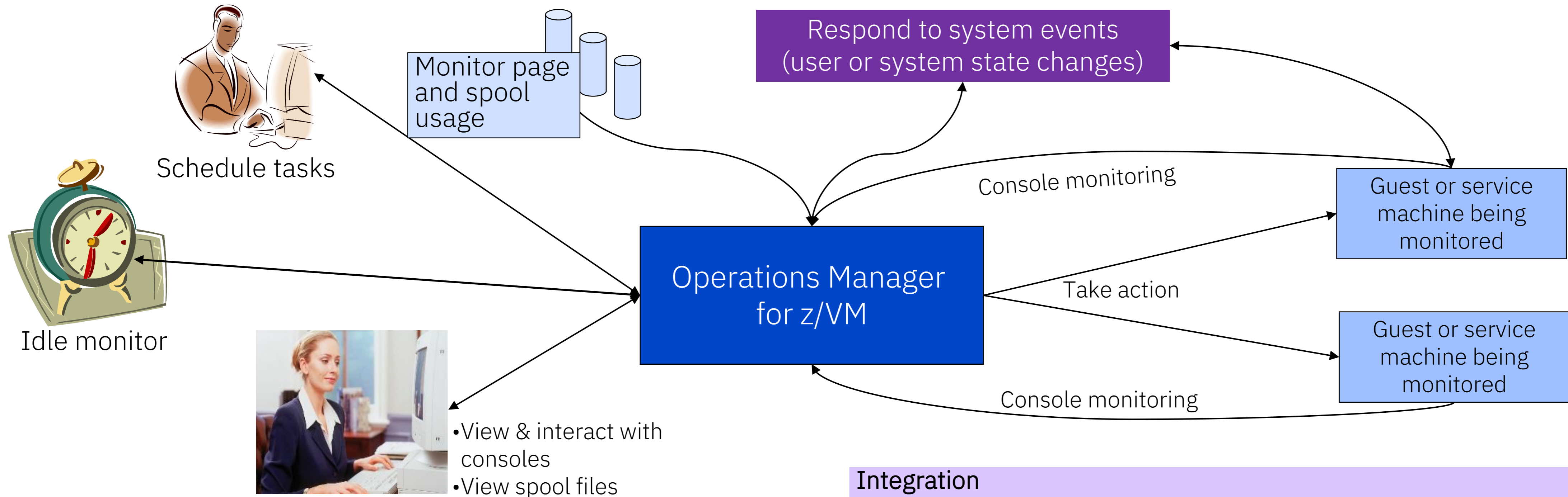
Operations Manager for z/VM

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
- OMEGAMON XE on z/VM and Linux, etc.
- Send alerts to email, central event management systems, analytics (Netcool/OMNIbus), etc.

Executing Actions

➤ Specify action to take in response to :

- Console rule definition
- Schedule
- Spool monitor
- Etc.

➤ 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 to a **TCP/IP** address/hostname and port
 - Send data to a syslog daemon/server
 - Send to any log analytics processor

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 a different action when the limit is reached
- Take multiple actions based on one message, event, schedule, etc.
 - Chain actions together
- **Execute the action on another LPAR** running Operations Manager
 - Communication is IP-based
 - **Does not require SSI**

Dynamic Configurations

- **Initial configuration** file loaded at startup
 - May imbed other configuration files
 - Filename can be a substitution carriable 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

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

View and Issue Commands on Consoles

Linux Guests and CMS Service Machines

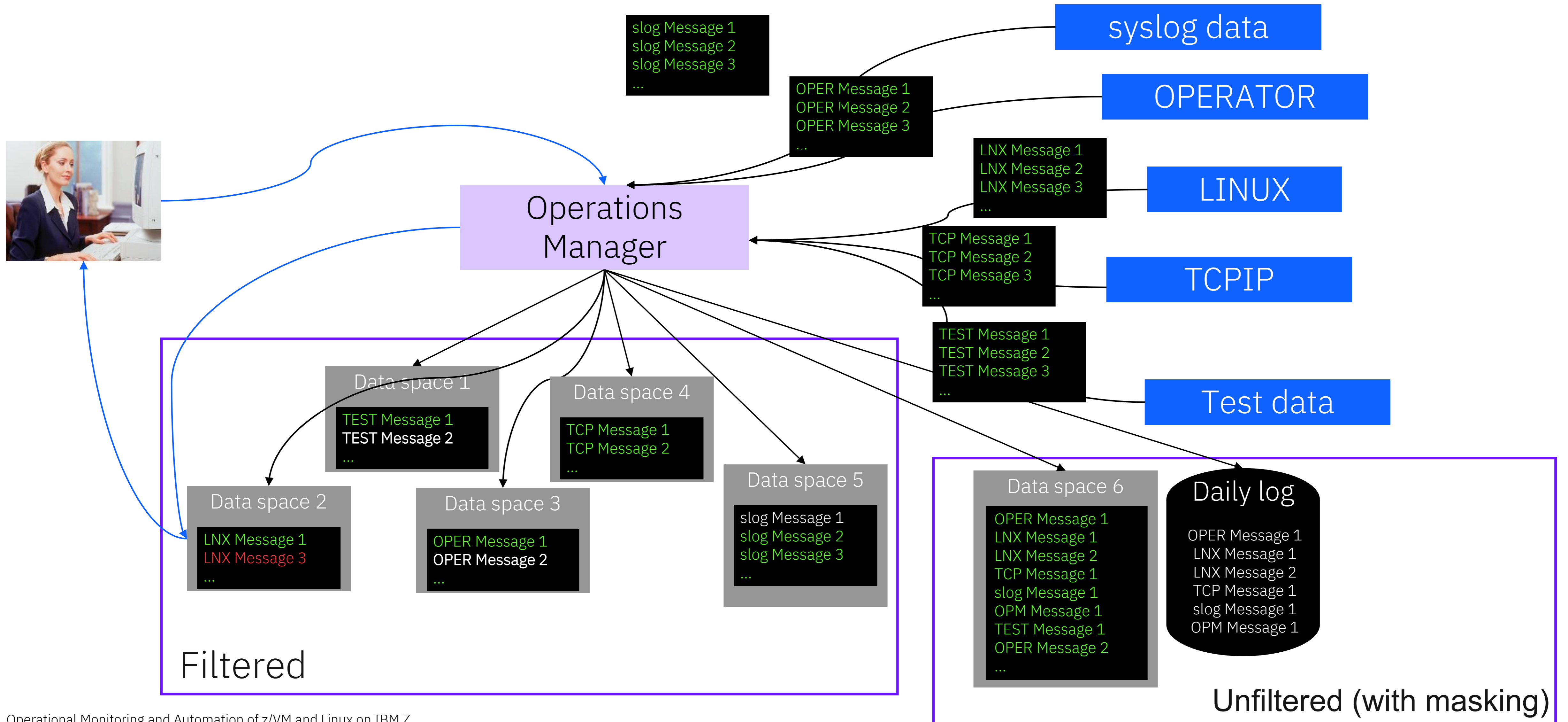
Generate Alerts and/or Automatically Recover From

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 (disk or reader file)
 - 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 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

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
 - Use [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
 - Includes information on spool volume name(s) where each spool file is located
 - Easily find all spool files on a specific spool volume

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

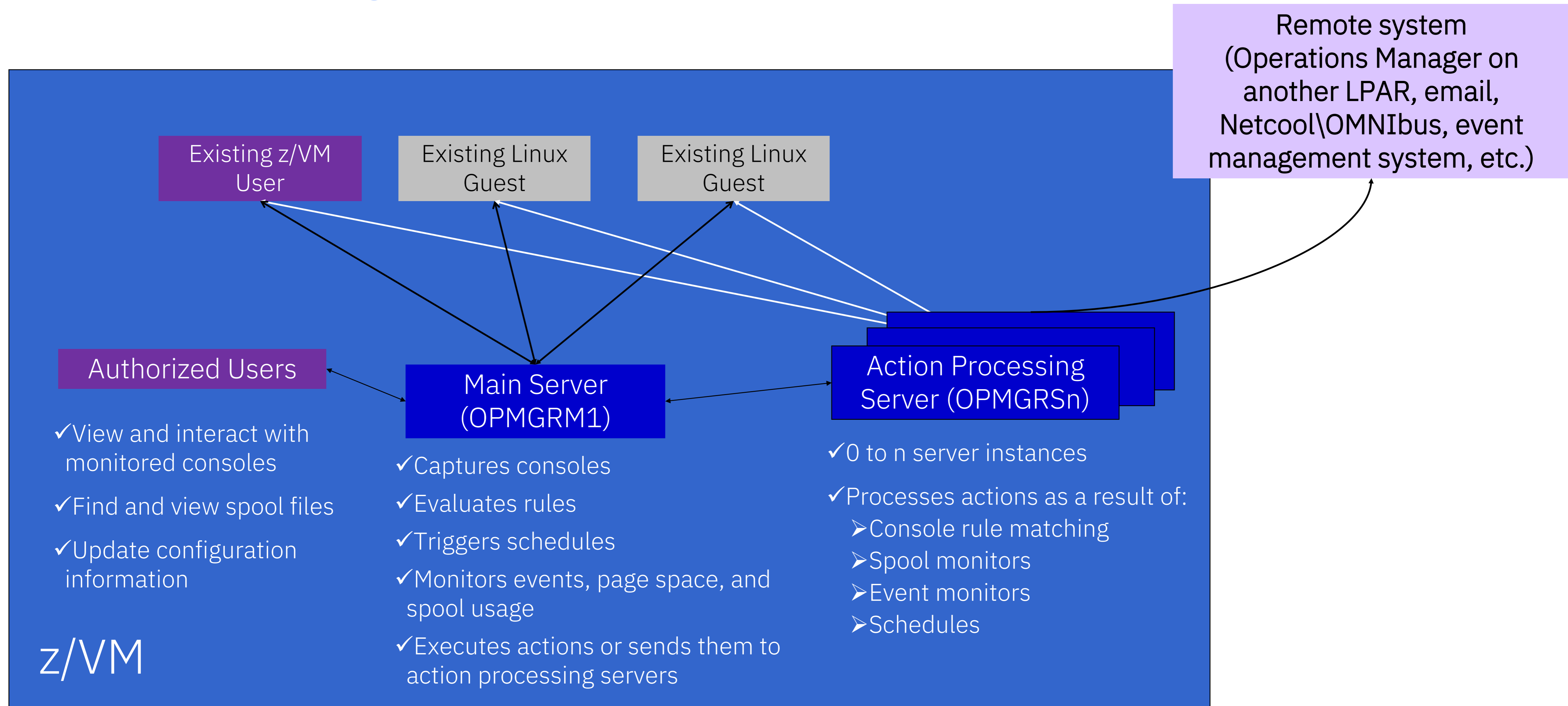
- Actions specified are the same as those for console rules and all other monitors

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

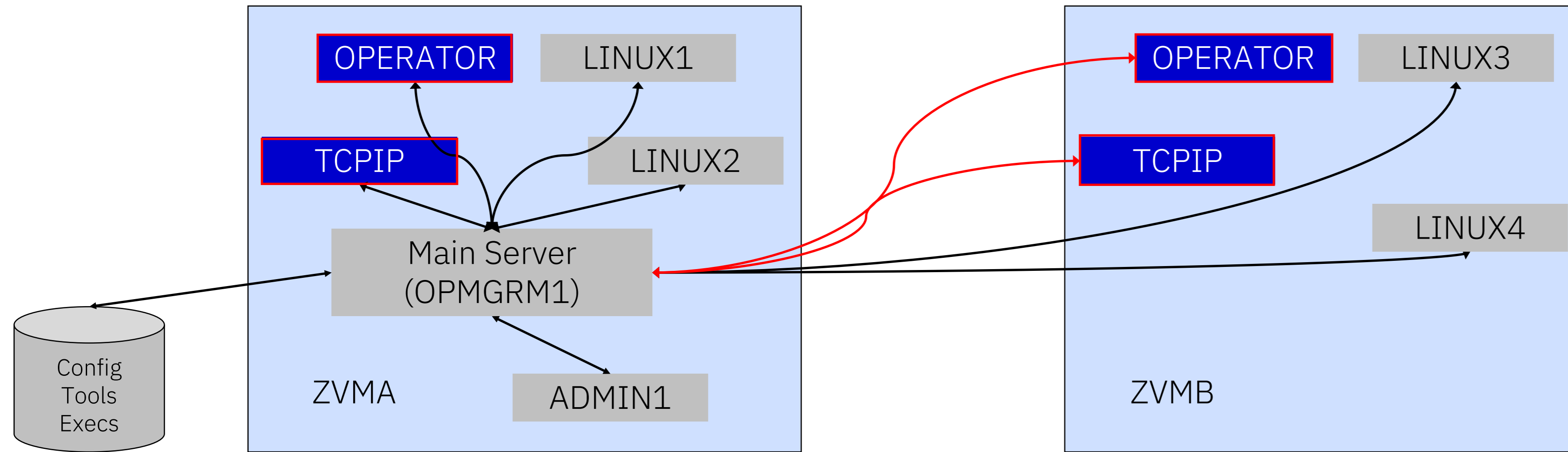
Operations Manager – non-SSI Environment



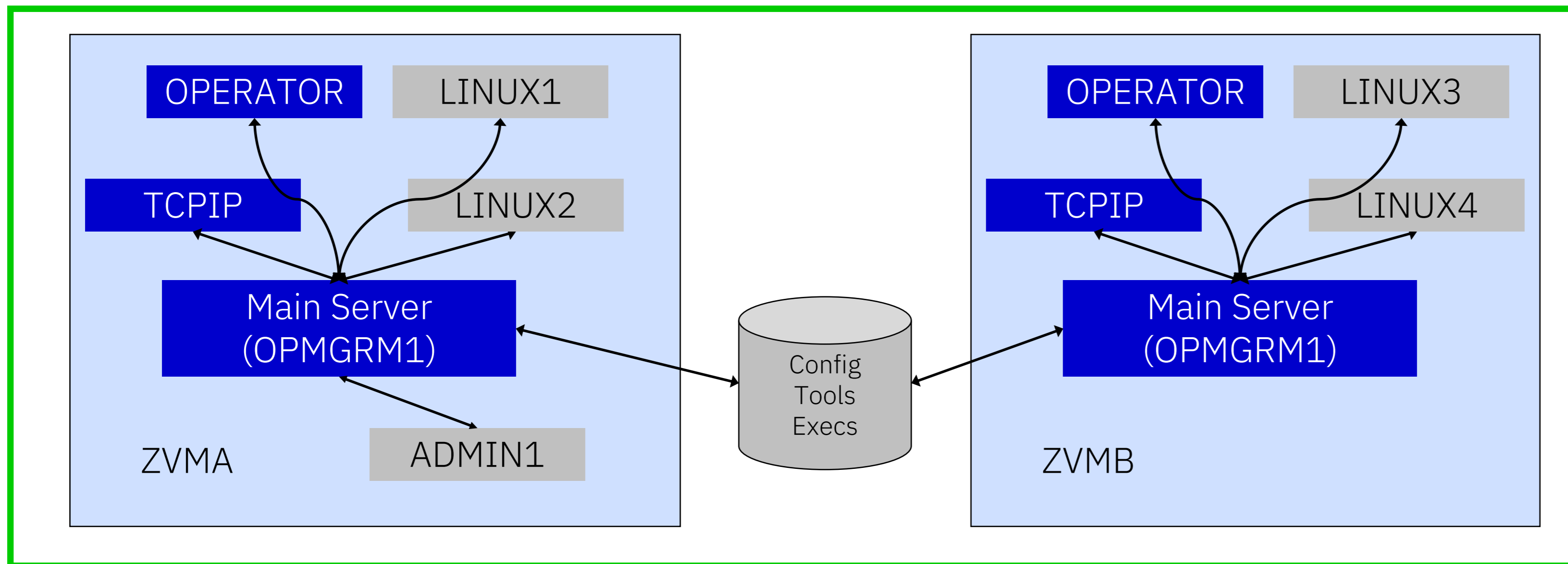
SSI Considerations

Console Monitoring

SSI Considerations for Console Monitoring



Option 1



Option 2
Recommended

Single Config User
Multiconfig User

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 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 198 minidisk owned by OPMGRM1 but in IDENTITY section (not SUBCONFIG section)
 - OPMGRM1 links the disk read only, files updated from system programmer user IDs
 - Main 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

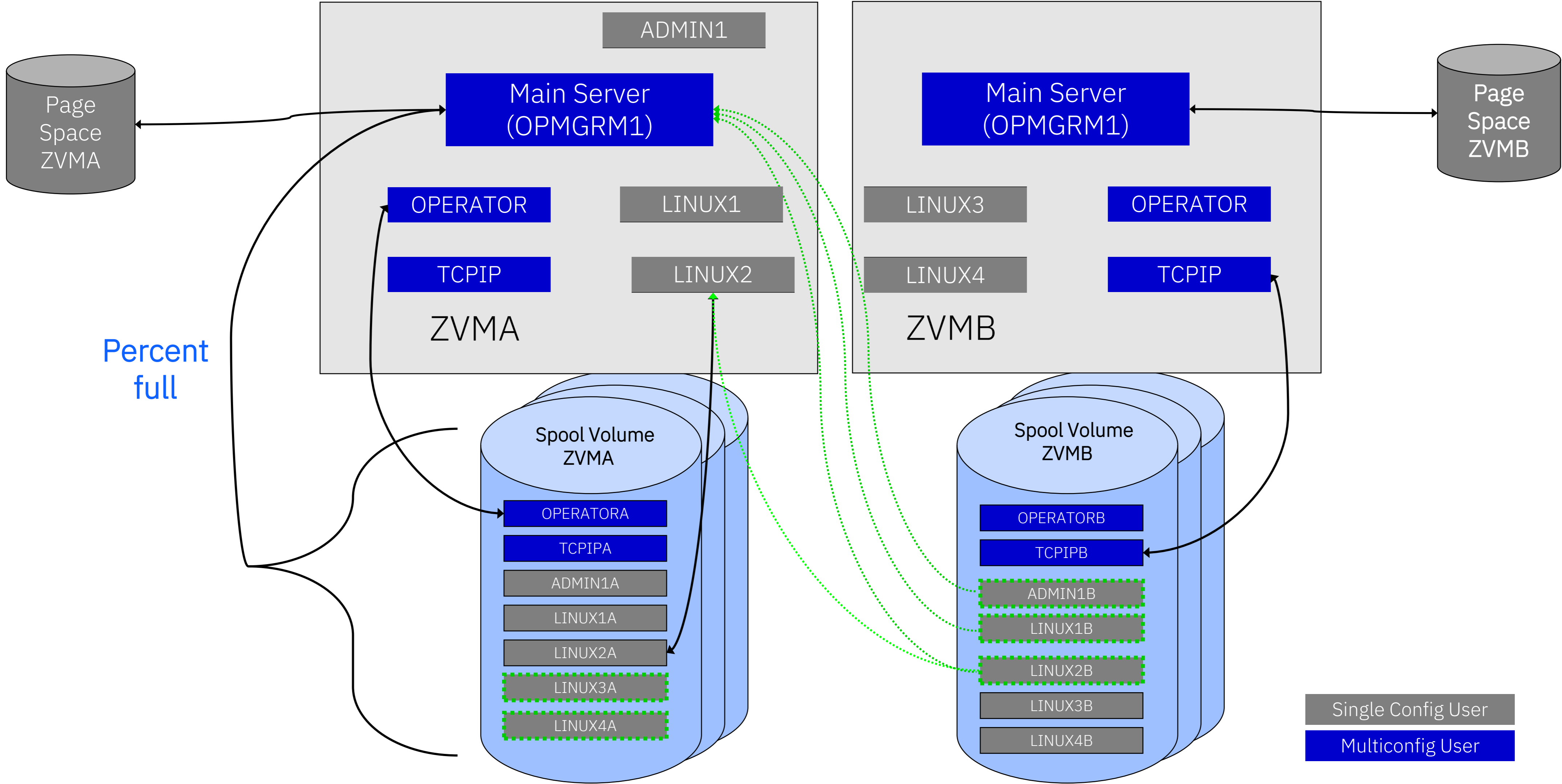
SSI Considerations

Page Space Monitoring

Spool Space Monitoring

Viewing and Managing Spool Files

SSI Considerations for Page and Spool 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	All spool files created on this member	PRT/PUN files created on other members	RDR files created on other members
User logged off	Visible	Visible	Not visible
User logged onto <u>this</u> member	Visible	Visible	Visible (but not on local spool volumes)
User logged onto <u>another</u> member	Visible	Visible	Not visible

Spool and Page Space Monitoring - Considerations

➤ Recommendation

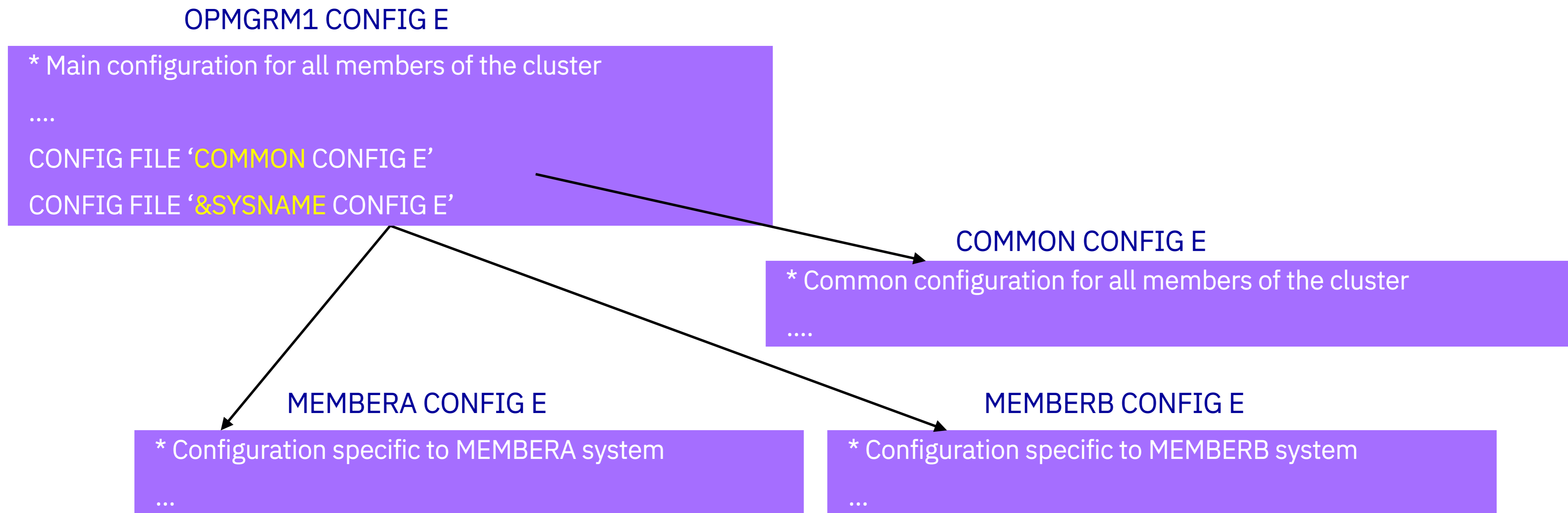
- Have an Operations Manager server on each member to monitor spool and page space
- Be aware of spool files visible in Operations Manager but not resident on this member's spool volumes
 - Indicated with "+" in VIEWSPPL

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



Summary and References

Recommended Practices – Operational Monitoring and Automation

Console monitoring and viewing

Operations staff monitoring a central console of alerts

System programmers debugging a problem on a guest or service machine

Console log data available for audits or future reference

VIEWCON
VIEWLOG
Log file

Rules
Event monitors
Spool/page monitors

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
SFPURGER
Rules
Backup Manager

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

Summary

- Use Operations Manager to
 - Automate daily operations
 - Integrate your z/VM and Linux on IBM Z 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

Reference Information

➤ Web sites

- Product page: <https://www.ibm.com/products/operations-manager-for-zvm>
 - Publications, presentation, white papers
 - Pre-requisites
 - Support

➤ 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

➤ IBMVM Mailing list

- <http://listserv.uark.edu/archives/ibmvm.html>

धन्यवाद

Hindi

多謝

Traditional

감사합니다

Korean

Спасибо

Russian

Ndzi khense ngopfu

Tsonga

Gracias

Spanish

Thank You

English

Obrigado

Brazilian Portuguese

شكراً

Arabic

Grazie

Italian

Danke

German

多谢

Simplified Chinese

Merci

French

Ke a leboha

Tswana

நன்றி

Tamil

ありがとうございました

Japanese

ขอบคุน

Thai