Automation Scenarios for a z/VM Cluster and Linux on System z Guests

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Agenda

- **Recommended practices**

- **Requirements for these scenarios**

- **Overview of product being used**

- **Automation scenarios**

  – Can be product agnostic

  – Live demos

  – Configuration options and sample code

- **Summary and reference information**

Recommended Practices – Operational Management

Generate alerts and/or automatically recover from

➢ Service machine disks approaching full

➢ Termination messages

➢ Abend messages

➢ Critical user IDs 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) – may include archiving

➢ Orderly shutdown and relocation of critical guests to another member in SSI cluster

Requirements
Implementing these Scenarios

Automation requirements for z/VM system

- **Take an action based on a message on a console**
  - Provide data from the message to the action

- **Send commands to Linux guests**

- **Trigger an action if spool usage reaches a specified percent full**
  - Provide data about spool usage to the action

- **Trigger an action if page space usage reaches a specified percent full**
  - Provide data about page space usage to the action

- **Chain any actions (triggered by messages, schedules, etc.)**

- **Suspend and resume message rules, schedules, spool/page monitors, etc.**

- **Issue commands real-time on a service machine console**

- **Add messages to a console view from local or remote sources**

- **Detect a user ID logging off**

- **Suppress lines when viewing a console**

Automating Operations
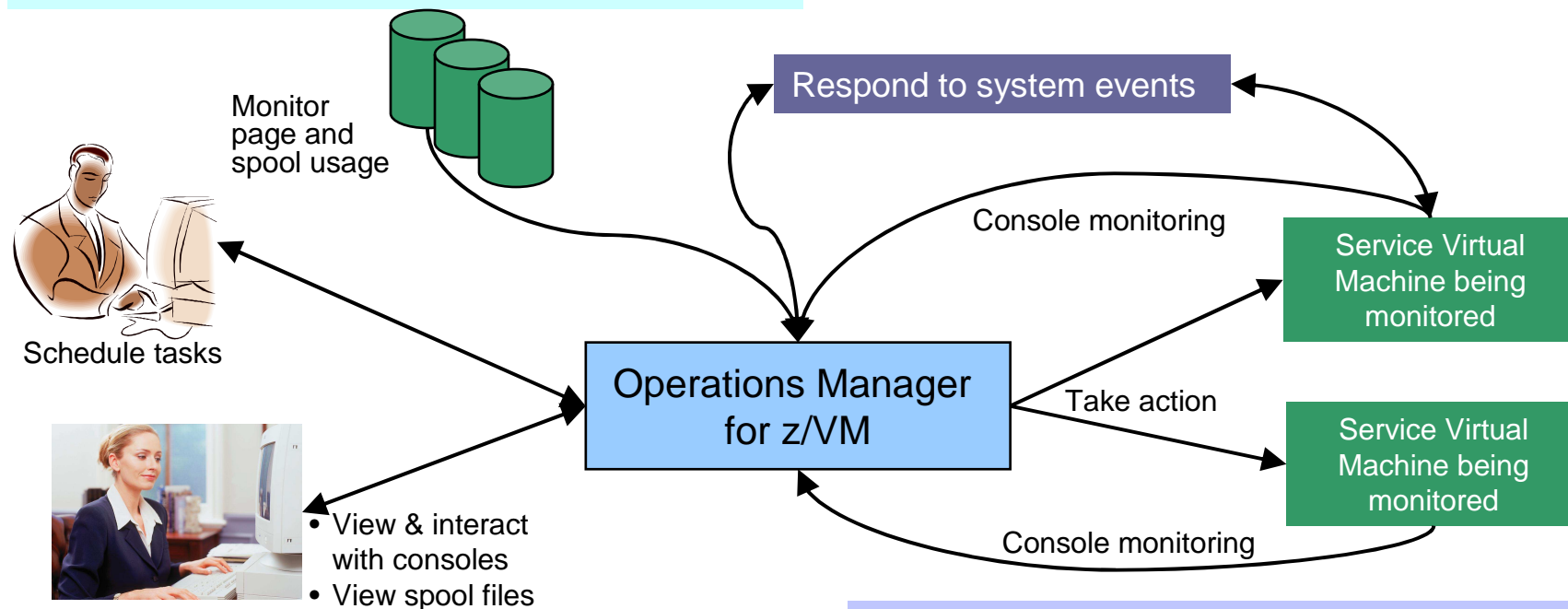## *Operations Manager for z/VM*

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

Monitor page and spool usage

Respond to system events

Schedule tasks

Console monitoring

Service Virtual Machine being monitored

Operations Manager for z/VM

Take action

Service Virtual Machine being monitored

• View & interact with consoles
• View spool files

Console monitoring

Automation

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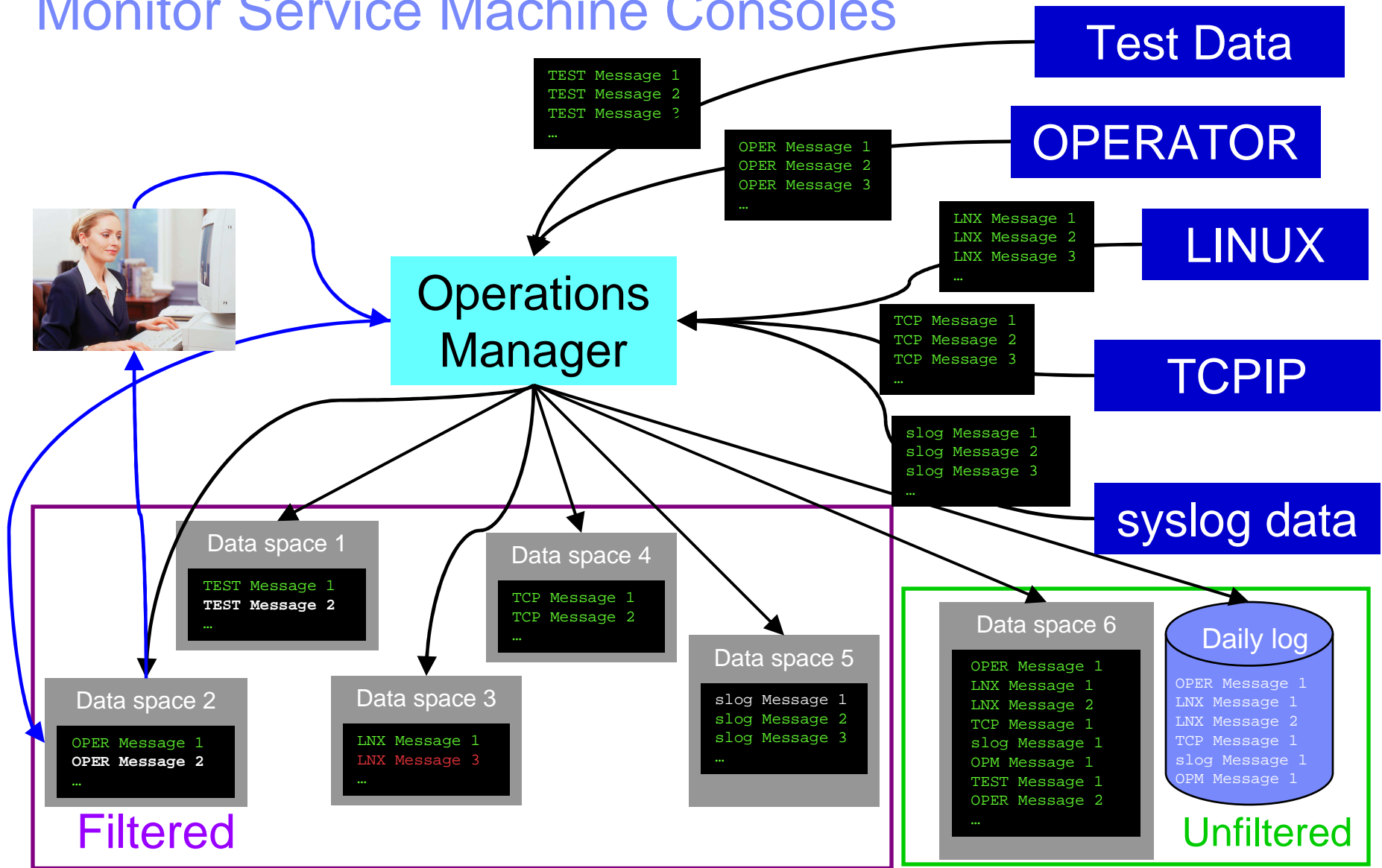➢ Schedule tasks to occur on a regular basis

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 spool usage**

- **Monitor system events**

- **Schedule events/actions**

- **Take actions automatically based on monitoring results**

- **View and interact with monitored consoles from authorized user IDs**

- **Find and view spool files**

- **Dynamic configuration**

- **Separation of access control**

Monitor Service Machine Consoles

Test Data

```
TEST Message 1
TEST Message 2
TEST Message ?
…
```

OPERATOR

```
OPER Message 1
OPER Message 2
OPER Message 3
…
```

LINUX

```
LNX Message 1
LNX Message 2
LNX Message 3
…
```

TCPIP

```
TCP Message 1
TCP Message 2
TCP Message 3
…
```

syslog data

```
slog Message 1
slog Message 2
slog Message 3
…
```

Operations Manager

Data space 1
```
TEST Message 1
TEST Message 2
…
```

Data space 4
```
TCP Message 1
TCP Message 2
…
```

Data space 5
```
slog Message 1
slog Message 2
slog Message 3
…
```

Data space 2
```
OPER Message 1
OPER Message 2
…
```

Data space 3
```
LNX Message 1
LNX Message 3
…
```

Data space 6
```
OPER Message 1
LNX Message 1
LNX Message 2
TCP Message 1
slog Message 1
OPM Message 1
TEST Message 1
OPER Message 2
…
```

Daily log
```
OPER Message 1
LNX Message 1
LNX Message 2
TCP Message 1
slog Message 1
OPM Message 1
```
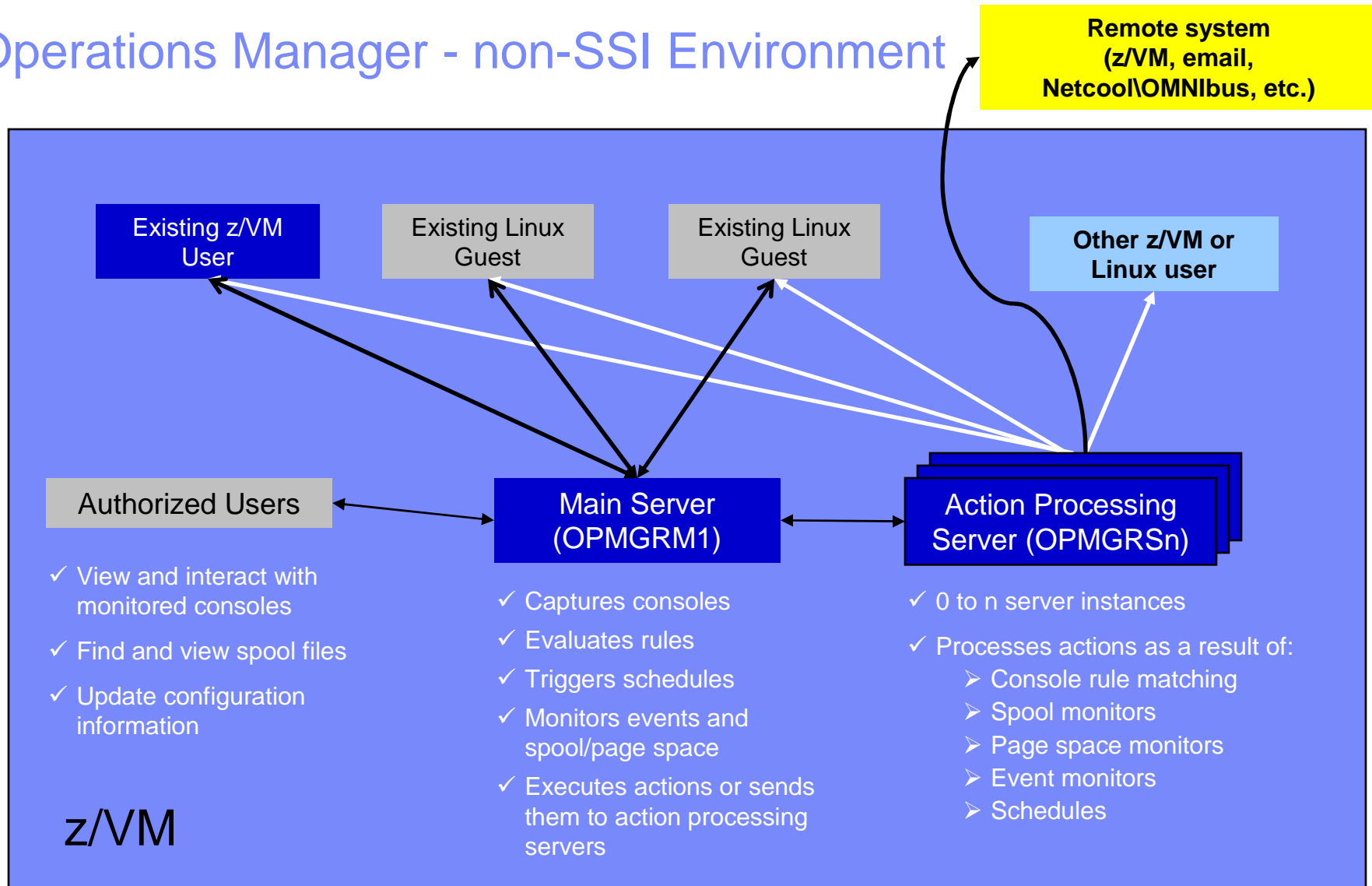
Filtered

Unfiltered

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
    - Change color, highlight, hold, or suppress a console message
    - CP or CMS commands
    - REXX EXECs
- **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
- **Take multiple actions based on one message**
  - Chain actions together
- **Rules apply to consoles received by <u>local</u> Operations Manager server**

View and Interact with Consoles

- **Authorized users can view live consoles of monitored service machines and guests**
  - Multiple users can view the same console simultaneously
  - No need to logon to the service machine to see its console
  - Test data and Linux syslog data treated as a "console"
  - Views can be defined to look at a group of consoles in one view

- **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**

- **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**
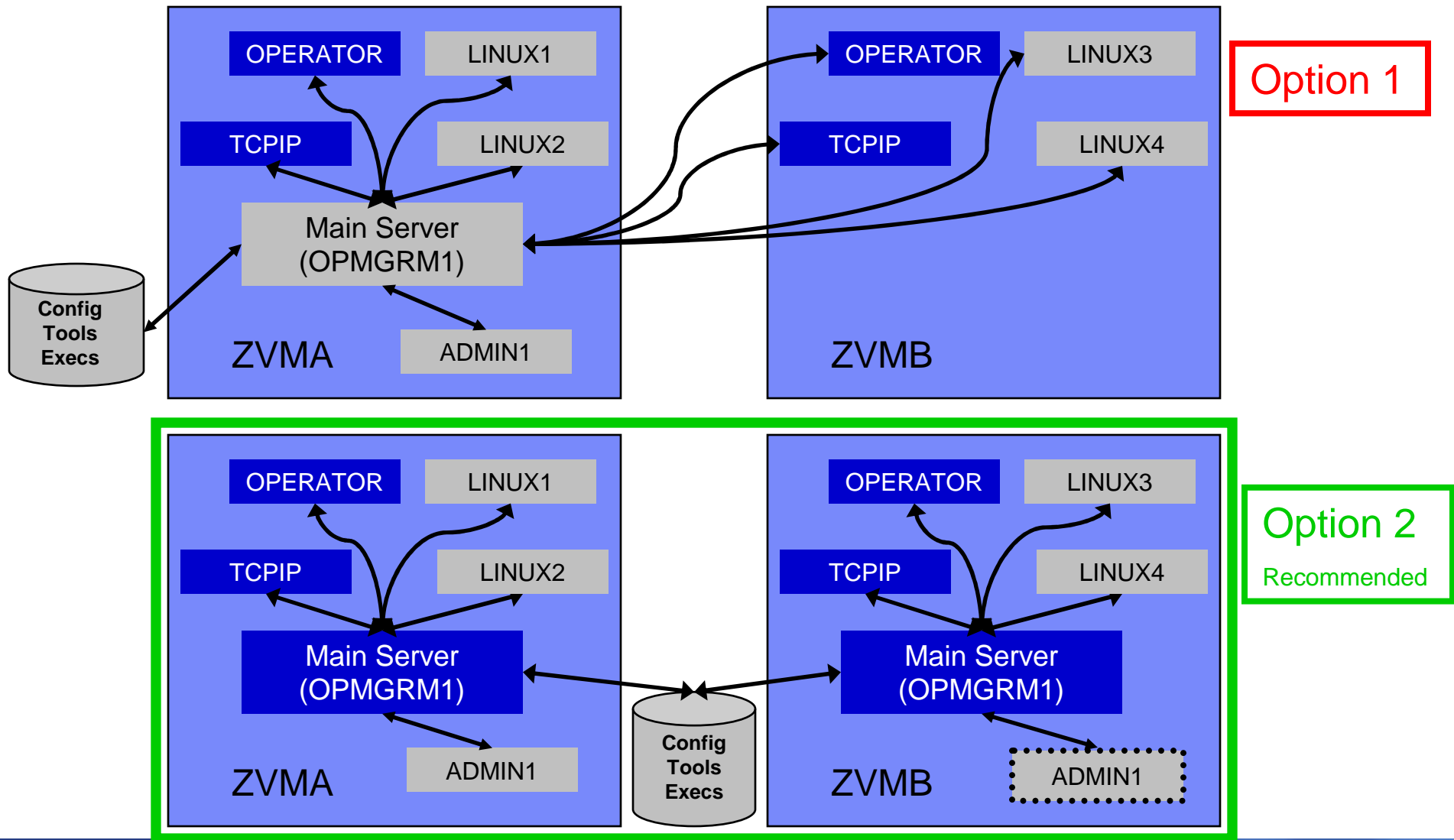 - Can also request a copy of the log file from today or a previous day

Operations Manager - non-SSI Environment

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

Existing z/VM User

Existing Linux Guest

Existing Linux Guest

Other z/VM or Linux user

Authorized Users

Main Server (OPMGRM1)

Action Processing Server (OPMGRSn)

- ✓ View and interact with monitored consoles
- ✓ Find and view spool files
- ✓ Update configuration information

z/VM

- ✓ Captures consoles
- ✓ Evaluates rules
- ✓ Triggers schedules
- ✓ Monitors events and spool/page space
- ✓ Executes actions or sends them to action processing servers

- ✓ 0 to n server instances
- ✓ Processes actions as a result of:
  - ➢ Console rule matching
  - ➢ Spool monitors
  - ➢ Page space monitors
  - ➢ Event monitors
  - ➢ Schedules

SSI Considerations for Console Monitoring

Single Config User

Multiconfig User

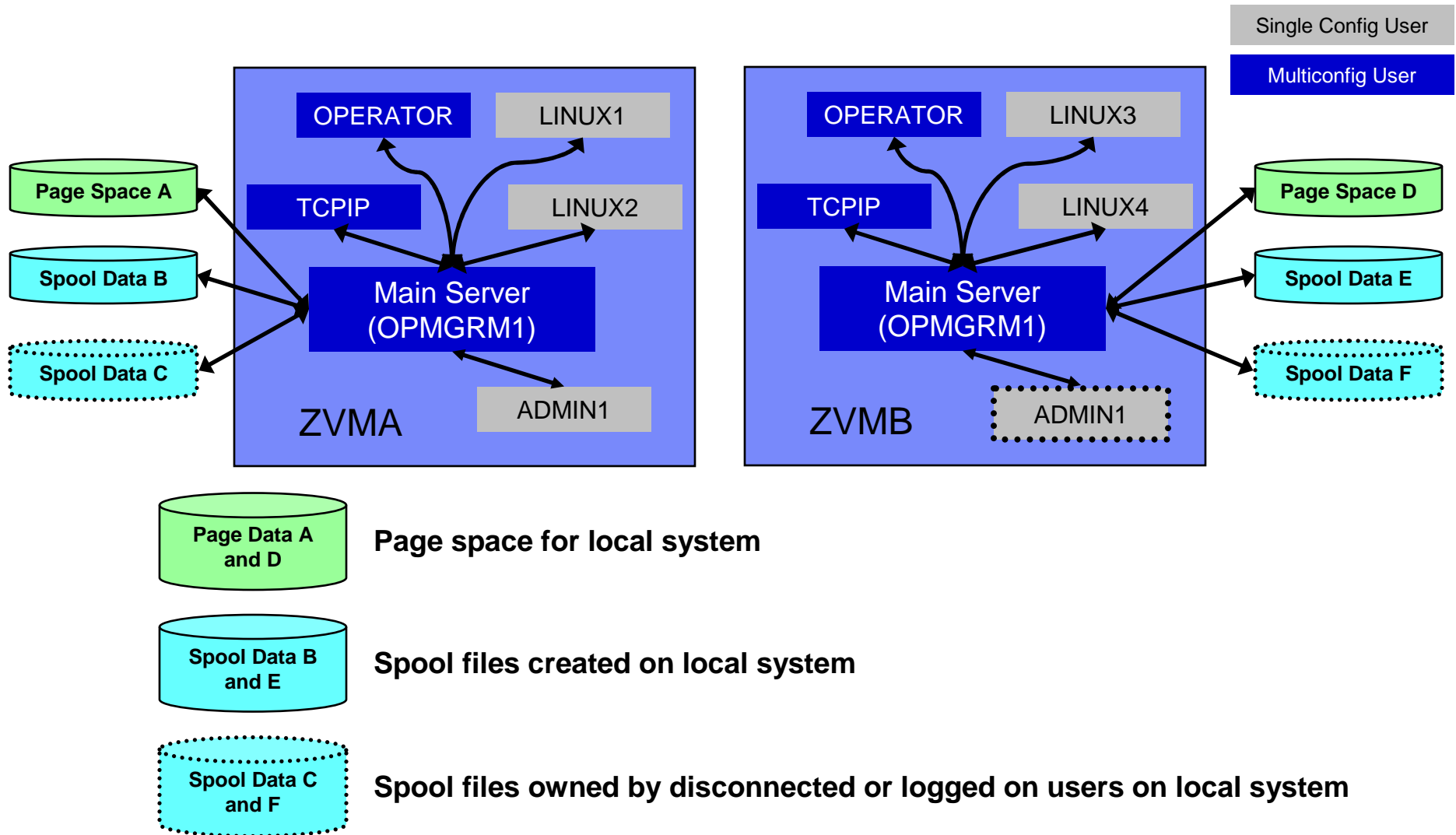Option 1

Option 2
Recommended

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 when user is logged on

- **SSI allows SECUSER and OBSERVER across members of cluster**
  - 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**
  - Have all consoles monitored by an Operations Manager server on the same member as the monitored guest
    - 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

Monitor Page and Spool Space, 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**
  - Display a list of spool files based on one or more attributes
    - Owner
    - Size
    - Date created
  - From the list, the user can
    - Sort list on any column
    - View the contents of an individual spool file
    - Purge, transfer, or change a spool file

SSI Considerations for Spool and Page Space Monitoring

Single Config User

Multiconfig User

ZVMA

OPERATOR | LINUX1

TCPIP | LINUX2

Main Server (OPMGRM1)

ADMIN1

Page Space A

Spool Data B

Spool Data C

ZVMB

OPERATOR | LINUX3

TCPIP | LINUX4

Main Server (OPMGRM1)

ADMIN1

Page Space D

Spool Data E

Spool Data F

Page Data A and D — **Page space for local system**

Spool Data B and E — **Spool files created on local system**

Spool Data C and F — **Spool files owned by disconnected or logged on users on local system**

Spool and Page Space Monitoring - Considerations

- **Page space is local**
  - Separate space for each member and only visible to the local member

- **Spool data – visibility to authorized users**
  - Spool data for multiconfiguration users
    - Only 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 users
    - Files created while logged onto that member are always visible on that member
    - Files owned by the user but created while logged onto another member are only visible to the local member when the user is logged on (or running disconnected) on the local member

- **Another way of putting it**
  - Spool data created on a member is always visible on that member
    - Whether the owning user is currently logged on or not
    - This includes
      - Files created by single configuration users while logged onto that member
      - Files created by multiconfiguration users with subconfig info for that member
  - Spool data owned by single configuration users is seen by the local member when the user is logged on (or running disconnected on) the local member
    - Even if data was originally created while logged onto another member of the cluster

- **Recommendation**
  - Have an Operations Manager server on each member to monitor spool and page space

- **Future PTF to support indicator of spool files not on local spool volume**

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
  - 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, spool, and page space monitoring
- **No impact from SSI**

Respond to System Events

- **Create monitors for z/VM system events (*VMEVENT) related to user IDs**
    0 - Logon
    1 - Logoff
    2 - Failure condition (typically CP READ)
    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 - Time bomb exploded

- **Optionally restrict to specific user ID(s)**

- **Specify the action associated with the event**
    – Actions specified are the same as those for schedules, console, spool/page space monitors

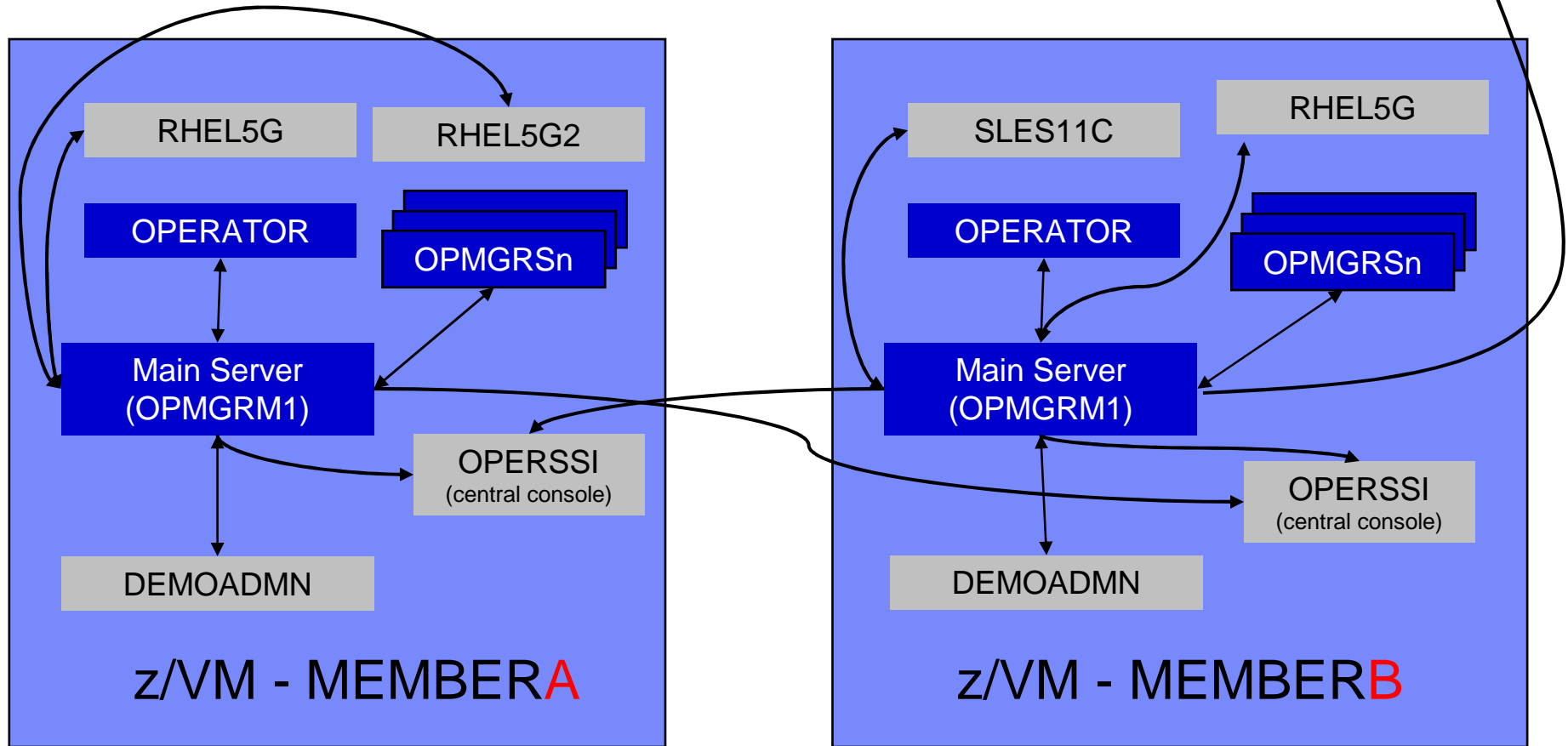- **Future PTF to support CLASS value**

Dynamic Configuration

- **Initial configuration file loaded at startup**
  - May imbed other configuration files
  - Share configuration files on a "common" disk – SFS or minidisk owned by single configuration user

- **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
  - Load a new or updated configuration file
  - Commands in action routines
  - Request reload from user IDs on other members of a cluster
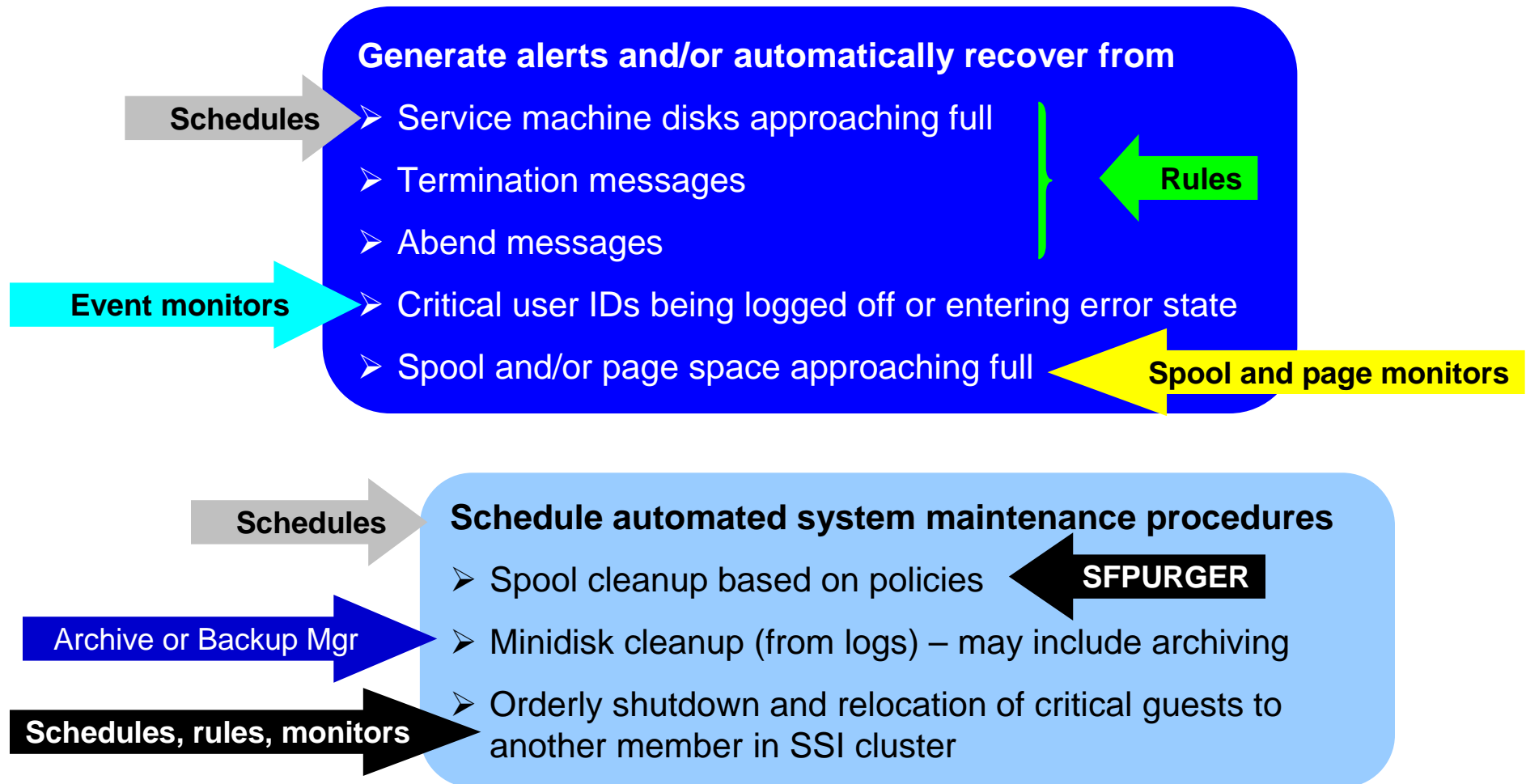   - SMSG OPMGRM1 at <member> CONFIG …

Operations Manager in SSI Cluster - Example

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

➢ Multiconfiguration users: OPMGRM1, OPMGRSn, OPERATOR, MAINT

➢ Single configuration users: RHEL5G, RHEL5G2, SLES11C, OPERSSI, DEMOADMN

　　➢ Must "relocate" OPERSSI and DEMOADMN "manually"

RHEL5G	RHEL5G2
OPERATOR	OPMGRSn
Main Server (OPMGRM1)	OPERSSI (central console)
DEMOADMN	

z/VM - MEMBERA

SLES11C	RHEL5G
OPERATOR	OPMGRSn
Main Server (OPMGRM1)	OPERSSI (central console)
DEMOADMN	

z/VM - MEMBERB

Recommended Practices – Operational Management

Generate alerts and/or automatically recover from

Schedules ➤

- ➤ Service machine disks approaching full

- ➤ Termination messages   **Rules**

- ➤ Abend messages

Event monitors ➤

- ➤ Critical user IDs being logged off or entering error state

- ➤ Spool and/or page space approaching full   **Spool and page monitors**

Schedules ➤ **Schedule automated system maintenance procedures**

- ➤ Spool cleanup based on policies   **SFPURGER**

Archive or Backup Mgr ➤

- ➤ Minidisk cleanup (from logs) – may include archiving

Schedules, rules, monitors ➤

- ➤ Orderly shutdown and relocation of critical guests to another member in SSI cluster

Summary

- **Use Operations Manager to**

  - Automate daily operations

  - Integrate your z/VM and Linux on System 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

Demonstration Scenarios

Automation Demos Available

1. **Send an e-mail based on a console message**
2. **Send an alert to Netcool/OMNIbus based on a console message**
   a. Using POSTZMSG interface to Netcool/OMNIbus
   b. Using SNMP interface to Netcool/OMNIbus
3. **Send a message or email if spool approaches full**
   a. When the systems are in an SSI cluster – view spool files in a cluster environment
   b. When the systems are not in an SSI cluster
4. **View and clean up spool files**
5. **Automated spool cleanup**
6. **Archiving DIRMAINT's log files when disk gets full**
7. **Process a file of test messages as a console**
8. **Process Linux syslog data as a console**
9. **Create a central operations console on one z/VM system**
10. **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
11. **Integration with OMEGAMON XE on z/VM and Linux - take action based on CPU usage of a Linux guest**
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**

धन्यवाद
Hindi

多謝
Traditional Chinese

감사합니다
Korean

Спасибо
Russian

Gracias
Spanish

Thank You
English

شكراً
Arabic

Obrigado
Brazilian Portuguese

Danke
German

Grazie
Italian

多谢
Simplified Chinese

Merci
French

நன்றி
Tamil

ありがとうございました
Japanese

ขอบคุณ
Thai