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

WAVV 2013

Bruce Hayden
IBM Advanced Technical Skills

bjhayden@us.ibm.com

Agenda

- **Recommended practices**
- **Requirements for these scenarios**
- **Overview of product being used**
  - IBM Operations Manager for z/VM
  - Considerations for z/VM V6.2 SSI
    - Apply to many automation solutions
- **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 page space approaching full

Schedule automated system maintenance procedures

- Spool cleanup based on policies
- Minidisk cleanup (from logs) – may include archiving
- Orderly startup and shutdown
  - Relocation of critical guests to another SSI member

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**

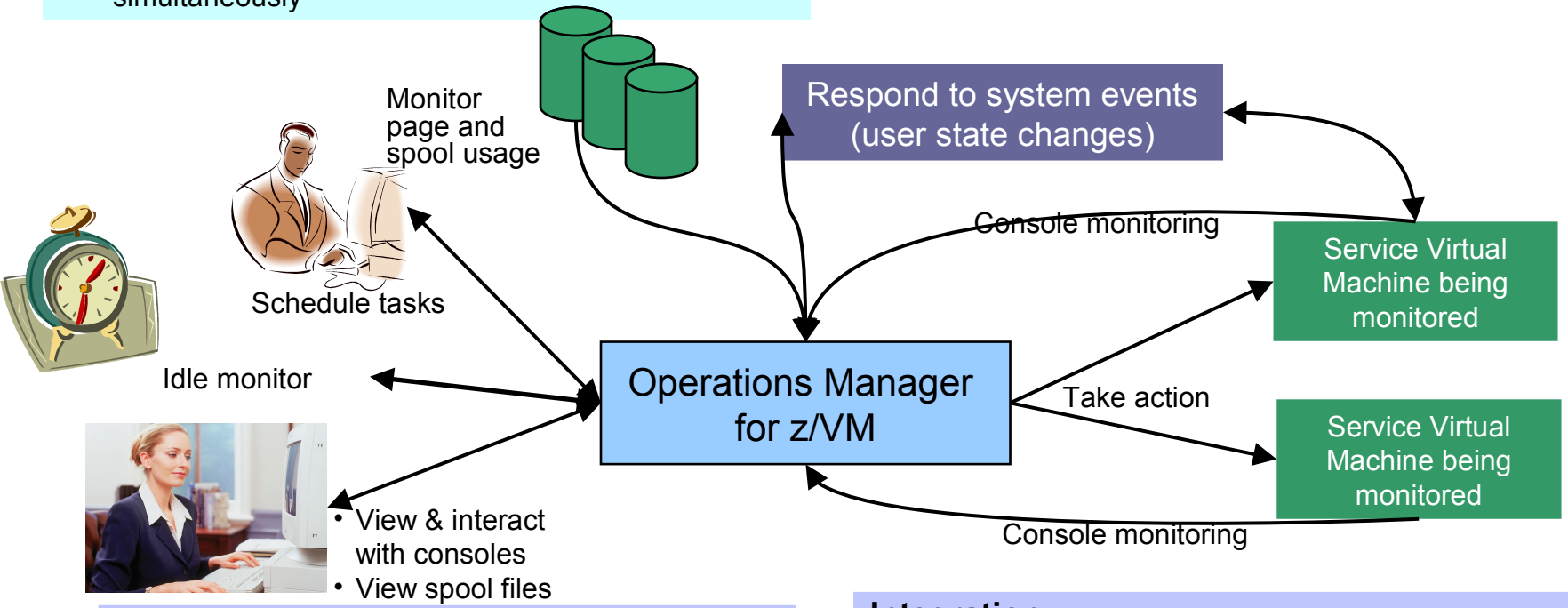
IBM Software

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



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**
- **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

slog Message 1
slog Message 2
slog Message 3
…

syslog data

OPER Message 1
OPER Message 2
OPER Message 3
…

OPERATOR

LNX Message 1
LNX Message 2
LNX Message 3
…

LINUX

Operations Manager

TCP Message 1
TCP Message 2
TCP Message 3
…

TCPIP

TEST Message 1
TEST Message 2
TEST Message 3
…

Test Data

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
…

Filtered

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

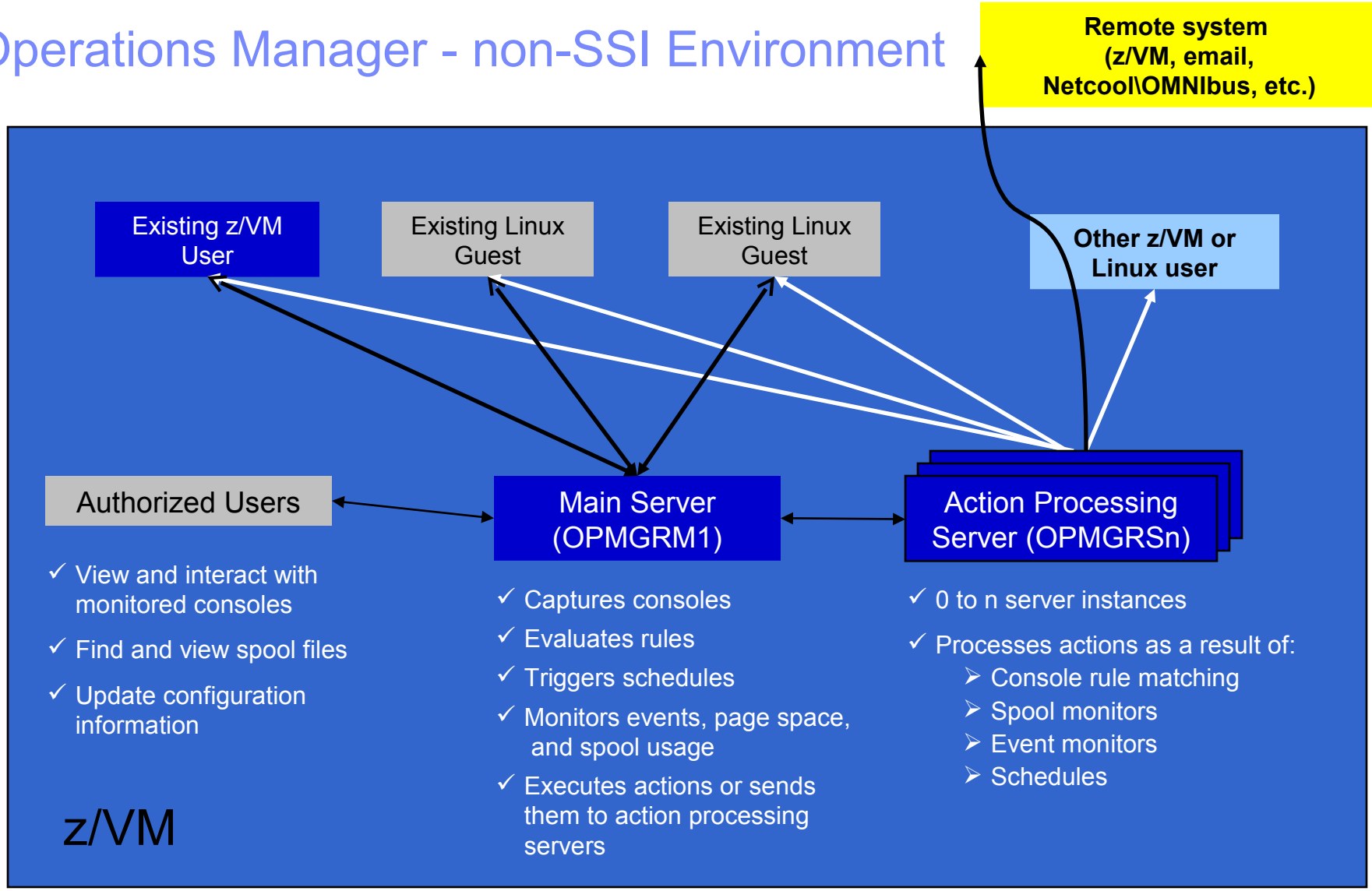
Monitor Service Machines

- **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 local 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

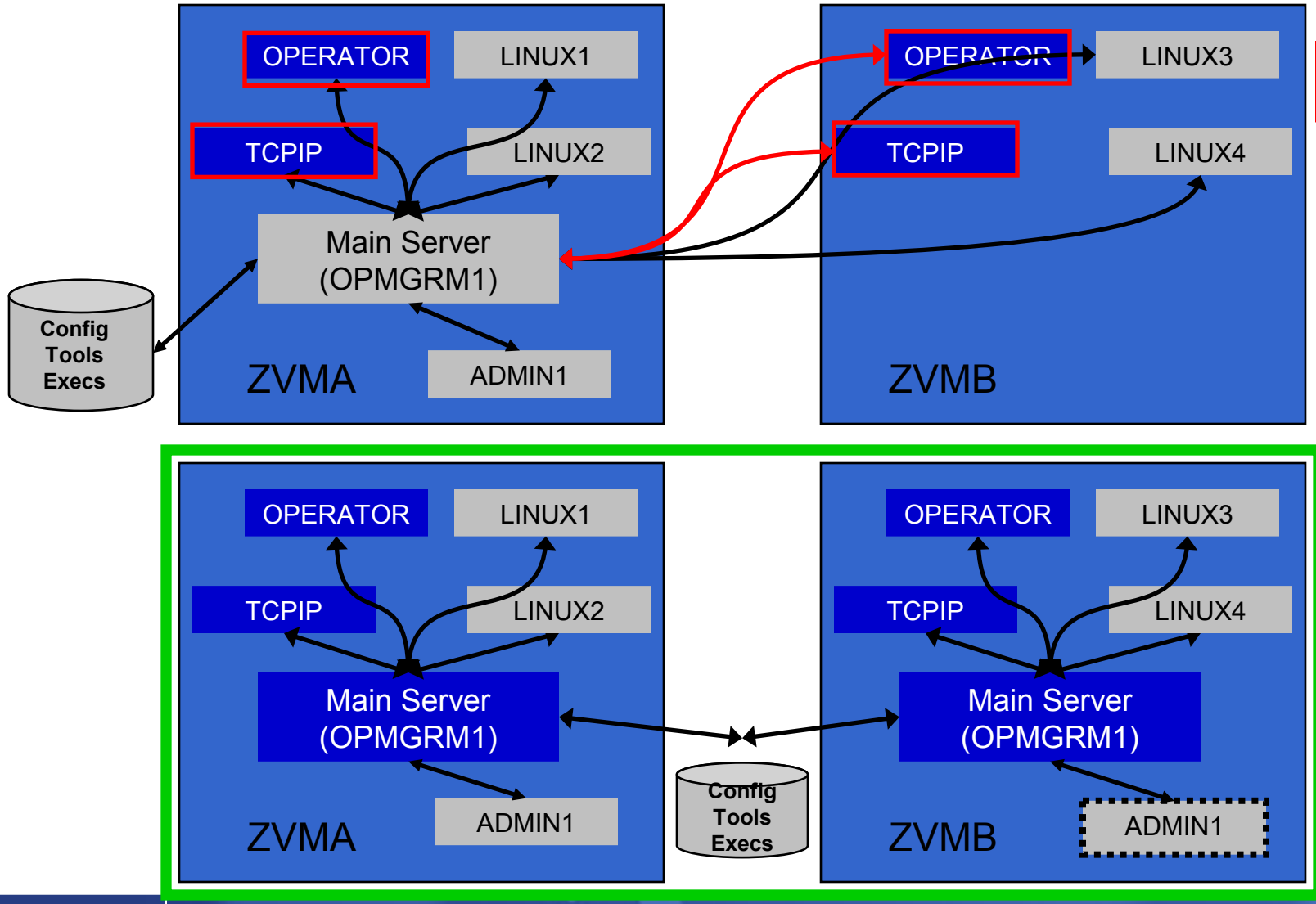
Operations Manager - non-SSI Environment



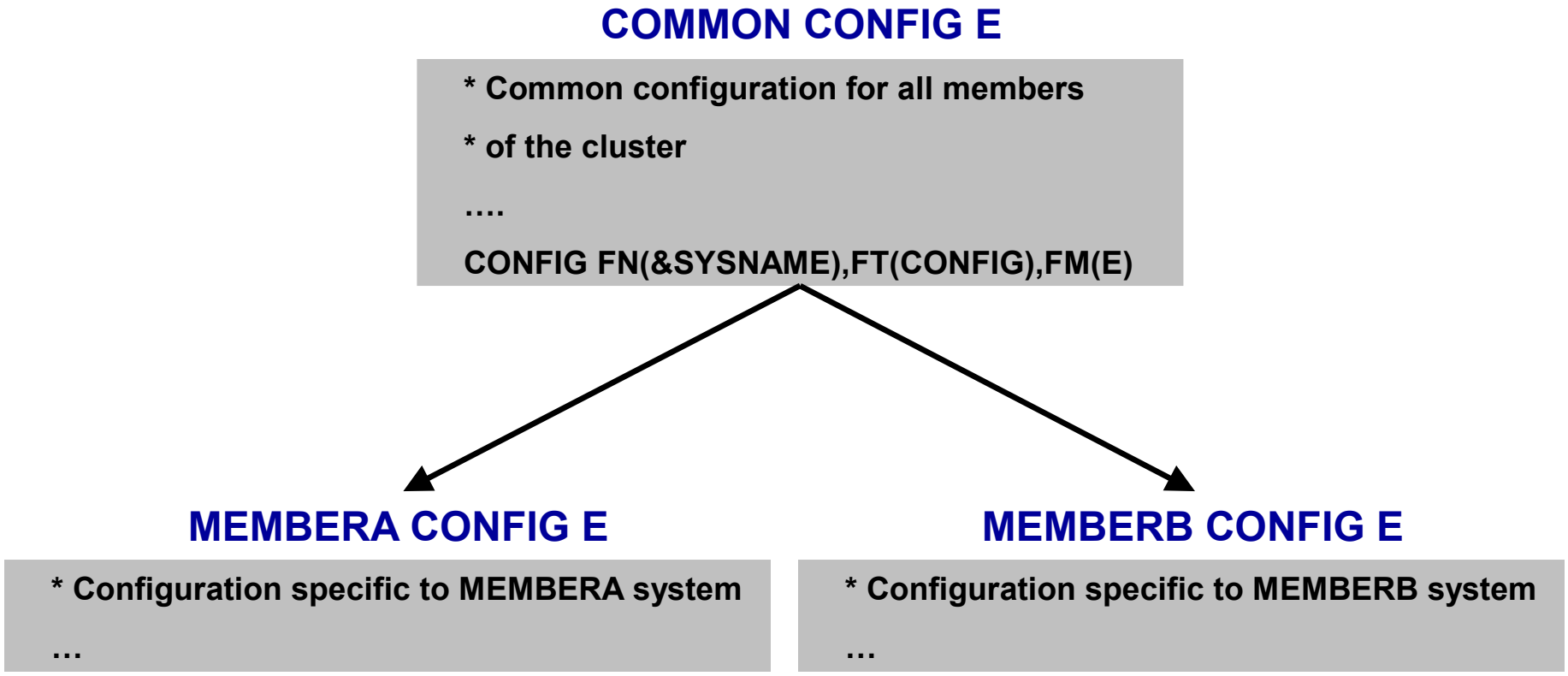
Single Config User

Multiconfig User

SSI Considerations for Console Monitoring

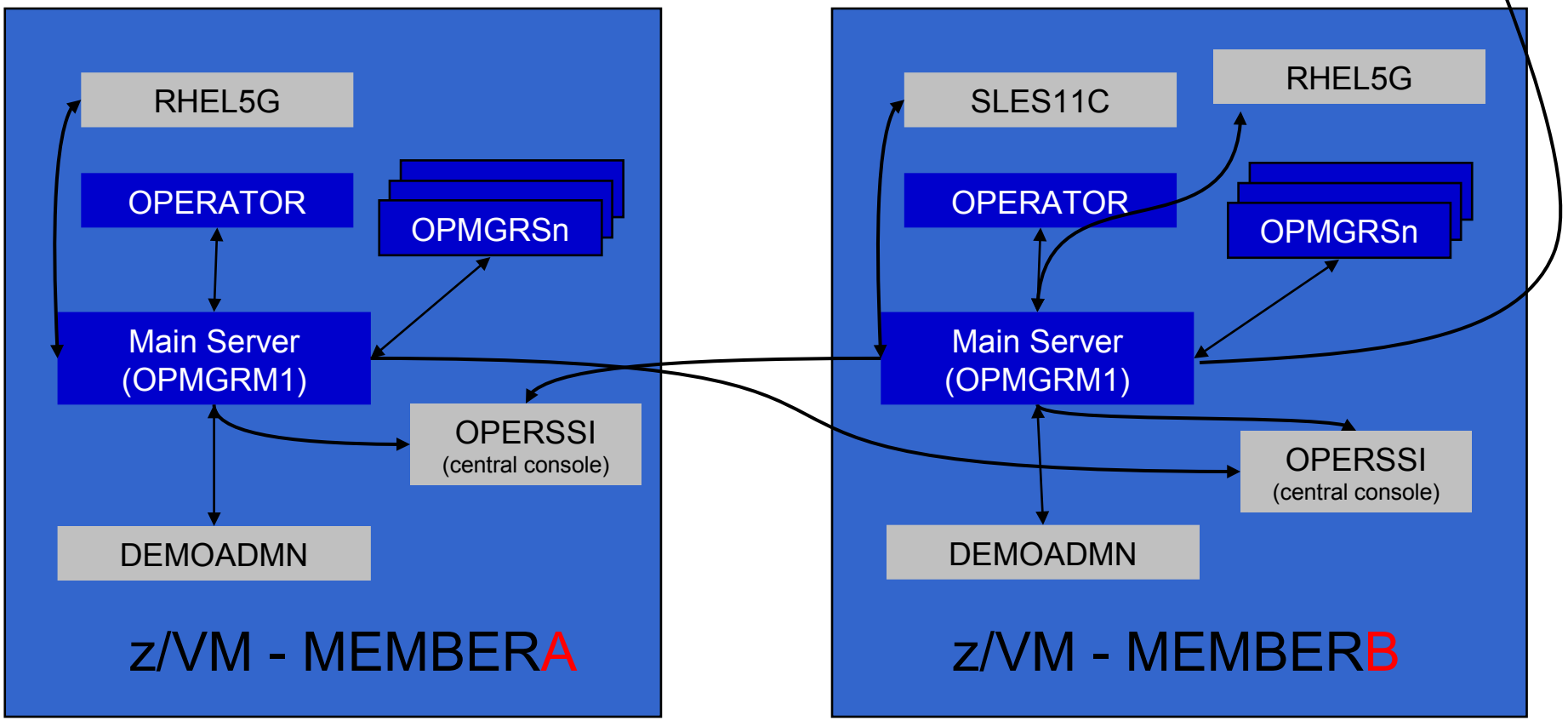


Managing Configuration Files



Operations Manager in SSI Cluster - Example

- Multiconfiguration users: OPMGRM1, OPMGRSn, OPERATOR, MAINT
- Single configuration users: RHEL5G, SLES11C, OPERSSI, DEMOADMN
  - May relocate OPERSSI and DEMOADMN manually or via VMRELOCATE



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
  - 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 can 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

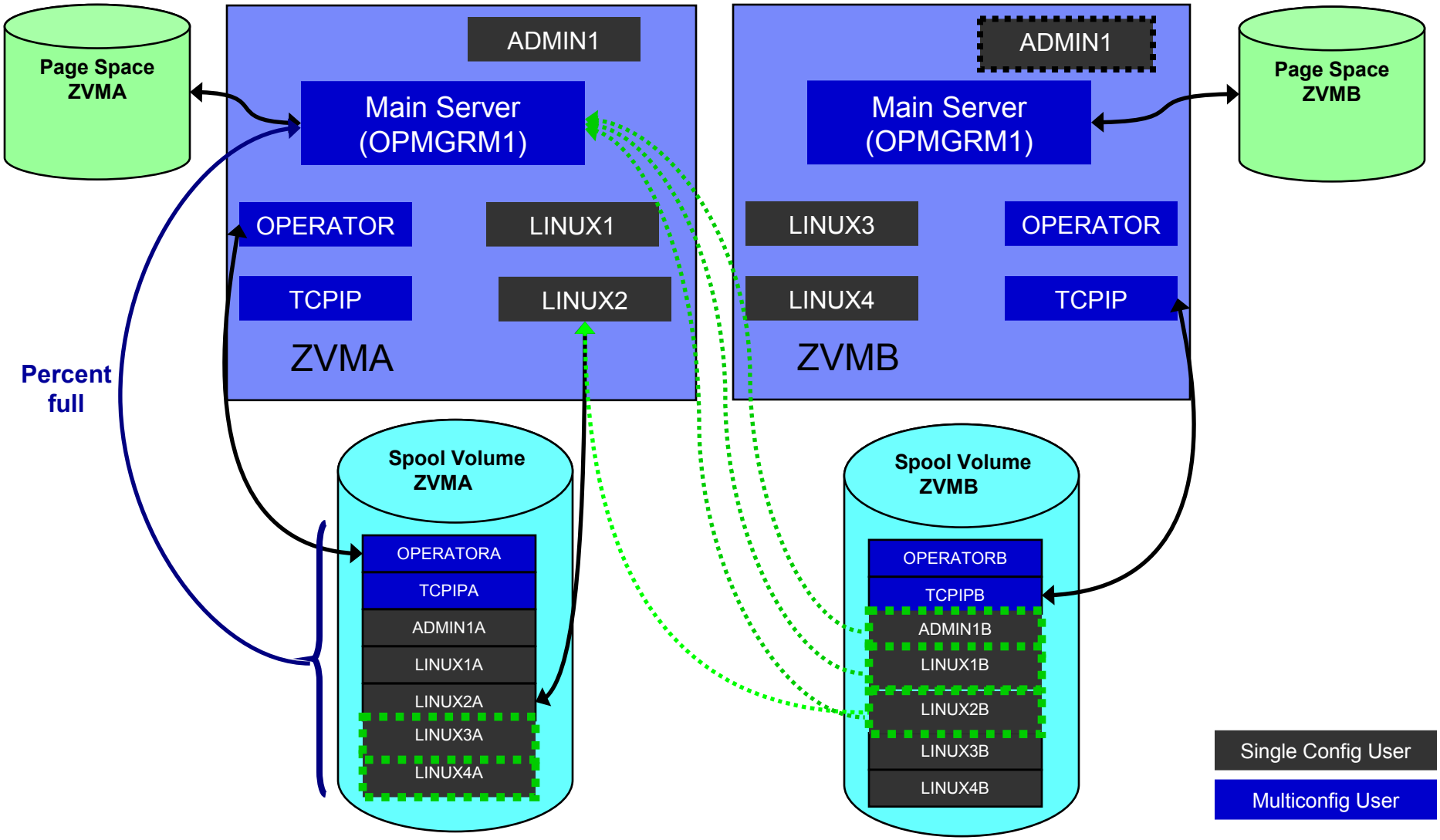
Monitor Service Machines - Considerations

- **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 when user is logged on
- **Single System Image 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 for z/VM V6.2 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)`

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**
  - Display a 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

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
- **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

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 and spool monitoring
- **No impact from SSI**

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 and spool monitoring
- **No impact from SSI**

Respond to System Events

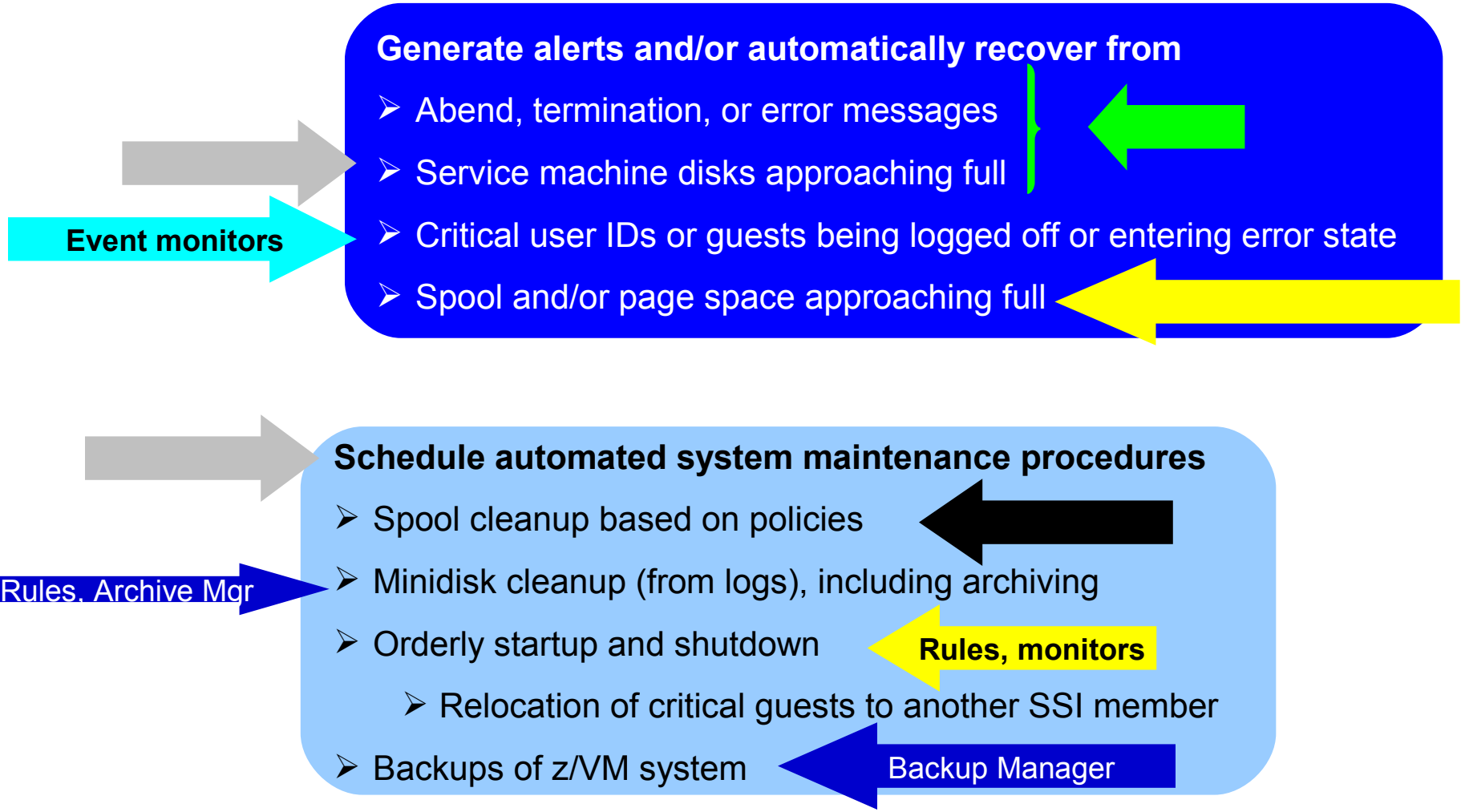
- **Create monitors for z/VM system events (*VMEVENT) related to user IDs**
  - Class 0

    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
- **Additional classes also supported**
- **Optionally restrict to specific user ID(s)**
- **Specify the action associated with the event**
  - Actions specified are the same as those for schedules and console and spool monitors

Dynamic Configuration

- **Initial configuration file loaded at startup**
  - May imbed other configuration files
- **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
  - Request reload from user IDs on other members of a cluster
    - Use SMSG OPMGR1 at <member> CONFIG …

Recommended Practices – Operational Management



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

Reference Information

- **Product Web site**
  - Start at http://www.ibm.com/software/stormgmt/zvm/
  - Product pages include
    - Publications
    - Pre-requisites
    - Announcements
    - Presentations
    - White papers
    - Support
- **e-mail**
  - Mike Sine, sine@us.ibm.com, Technical Marketing
  - Tracy Dean, tld1@us.ibm.com, Product Manager
- **White papers on Operations Manager website (Library page)**
  - 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

IBM Software

Automation Scenarios

Scenario 1:
Send an Email if an Error Message is Displayed

- **Watch all monitored consoles for an error message from CMS**
  - DMSxxx107S Disk mode(vdev) is full
  - DMSxxx1141W File space threshold exceeded
- **Send an email if we see the message**
- **Dynamically include in the email**
  - Host name of z/VM system where the error occurred
  - User ID that received the error message
  - Full text of the error message

Scenario 1: How Do You Do That?

Rules in Operations Manager:

```
* Watch for error message:
*  DMSERD107S Disk mode(vdev) is full
DEFRULE NAME(DSKSPACE),+
  MATCH(DMS%%%107S*),+
  LIMIT(2,600),+
  ACTION(EMAIL)
*
* DMSFNS1141W File space threshold exceeded
DEFRULE NAME(SFSTHRES),+
  MATCH(DMS%%%1141W*),+
  LIMIT(1,3600),+
  ACTION(EMAIL)
```

Scenario 1: How Do You Do That?

Action in Operations Manager:

```
*
* Replace "bjhayden at us.ibm.com" with the e-mail address of the user
* that should receive the e-mail
* Leave &u, &p, and &t as-is. These represent the user ID that had the
* "fatal" message, the parameter passed, and the
* text of the message.  These will be included in the text of the
* e-mail.
DEFACTN NAME(EMAIL),+
  COMMAND(EXEC SMTPNOTE bjhayden at us.ibm.com &u &p &t),+
  OUTPUT(LOG),+
  ENV(LVM)
```

Scenario 1: How Do You Do That?

SMTPNOTE EXEC (excerpts)

```
/*  */
Parse arg mail_user 'AT' mail_node baduser errtype msgtext

if errtype = 'FATAL' then
  errtext = 'Fatal error on user ID' baduser 'on z/VM system'
else
  if errtype = 'ABEND' then
    errtext = 'Abend on user ID' baduser 'on z/VM system'
  else errtext = msgtext
/* Construct the e-mail */
line.1 = 'OPTIONS: NOACK    LOG    SHORT   NONOTEBOOK ALL CLASS A'
line.2 = 'Date: ' Date() ',' Time()
line.3 = 'From: Operations Manager for z/VM'
line.4 = 'To:  ' mail_user 'at' mail_node
line.5 = 'Subject: ' errtext
line.6 = 'The following message was received on' baduser 'running on'
line.7 = msgtext
line.8 = ' '
line.9 = 'DO NOT REPLY - This e-mail was generated by an automated service machine
line.0 = 9

'PIPE stem line. | > TEMP NOTE A'
'EXEC SENDFILE TEMP NOTE A (NOTE SMTP'
```

Scenario 2: Process Linux Syslog Data as a Console

- **Route syslog data from a Linux guest to Operations Manager for z/VM**
  - Supports syslogd, syslog-ng, rsyslog
  - syslog-ng and rsyslog include hostname or IP address in message
- **Treat it as the console of a "fake" user ID**
- **Trigger rules and actions based on syslog data**
- **View the "console" containing syslog data**
- **Option to create one console per syslog or combine multiple syslogs into one console**

Scenario 2: Detailed Steps

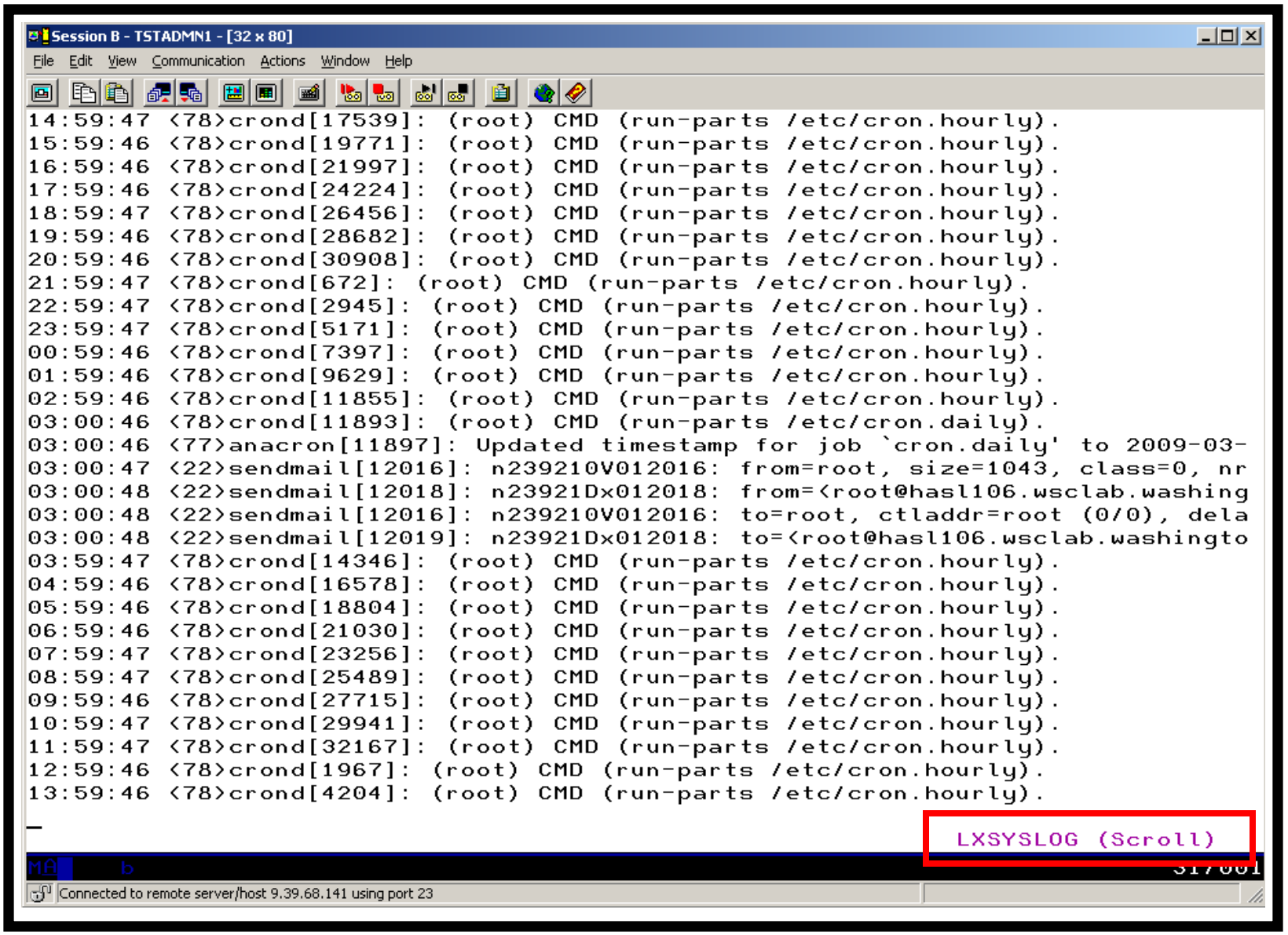
- **From an authorized z/VM user ID, view any syslog data already received**

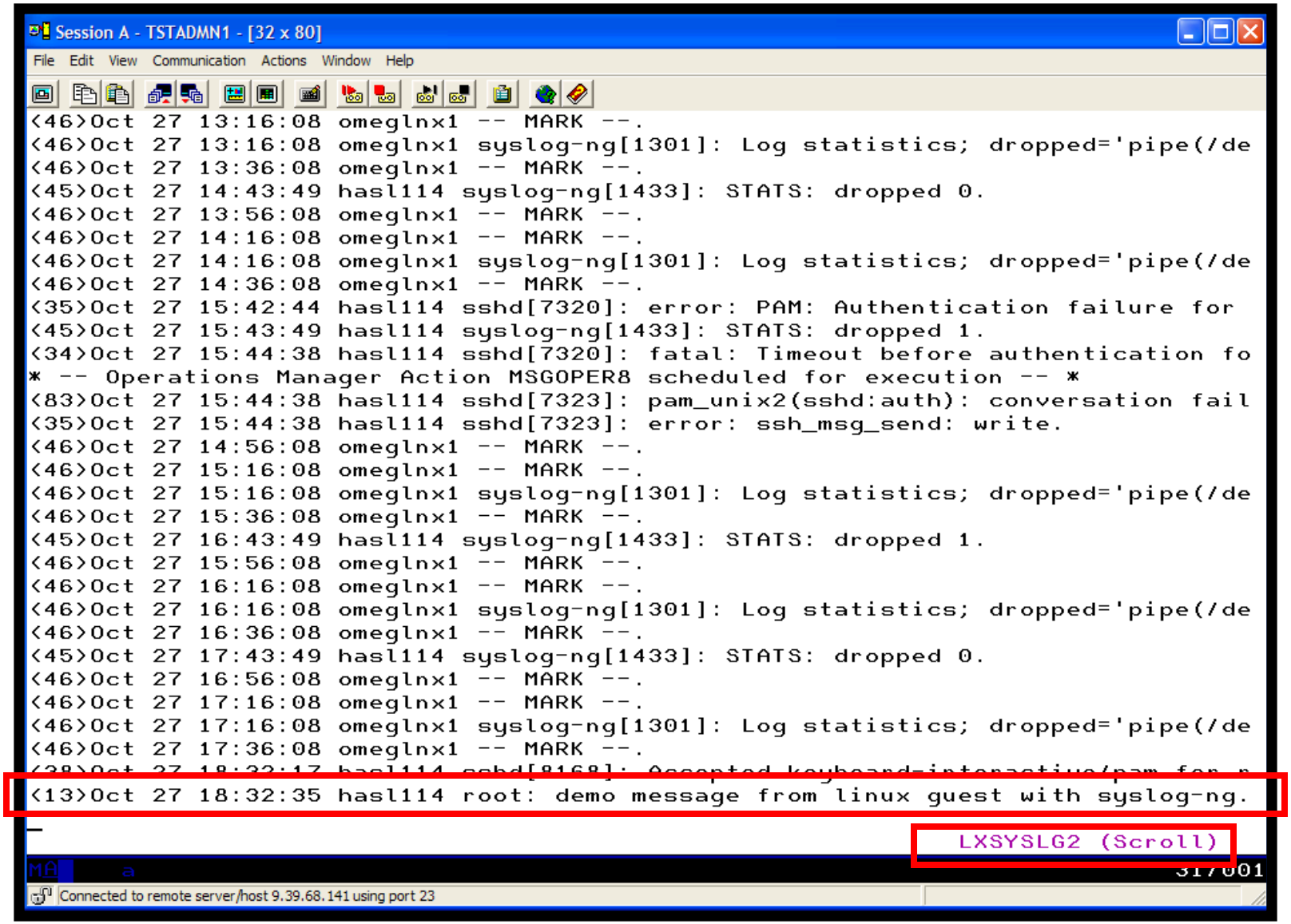
```
gomcmd opmgrm1 viewcon user(lxsyslog)
```

- **Use PUTTY to connect to a Linux guest**
- **Login as root and issue the command**

```
logger here is a critical test message from WAVV
```

- **Return to the VIEWCON session**
  - See the message in the syslog “console”





Scenario 2: How Do You Do That?

Console rule and action in Operations Manager:

```
*
DEFRULE NAME(LXLOG),+
  MATCH(*critical*),+
  ACTION(LXLOG1),+
  USER(LXSYSLOG)
*
DEFACTN NAME(LXLOG1),+
  INPUT(AHI),+
  NEXTACTN(LXLOG2)
*
DEFACTN NAME(LXLOG2),+
  COMMAND(CP MSGNOH OPERSSI Got a critical message '&T' from &U.),+
  OUTPUT(LOG),+
  ENV(LVM)
```

Scenario 2: How Do You Do That?

- **Set up TCP/IP listener for syslog data**

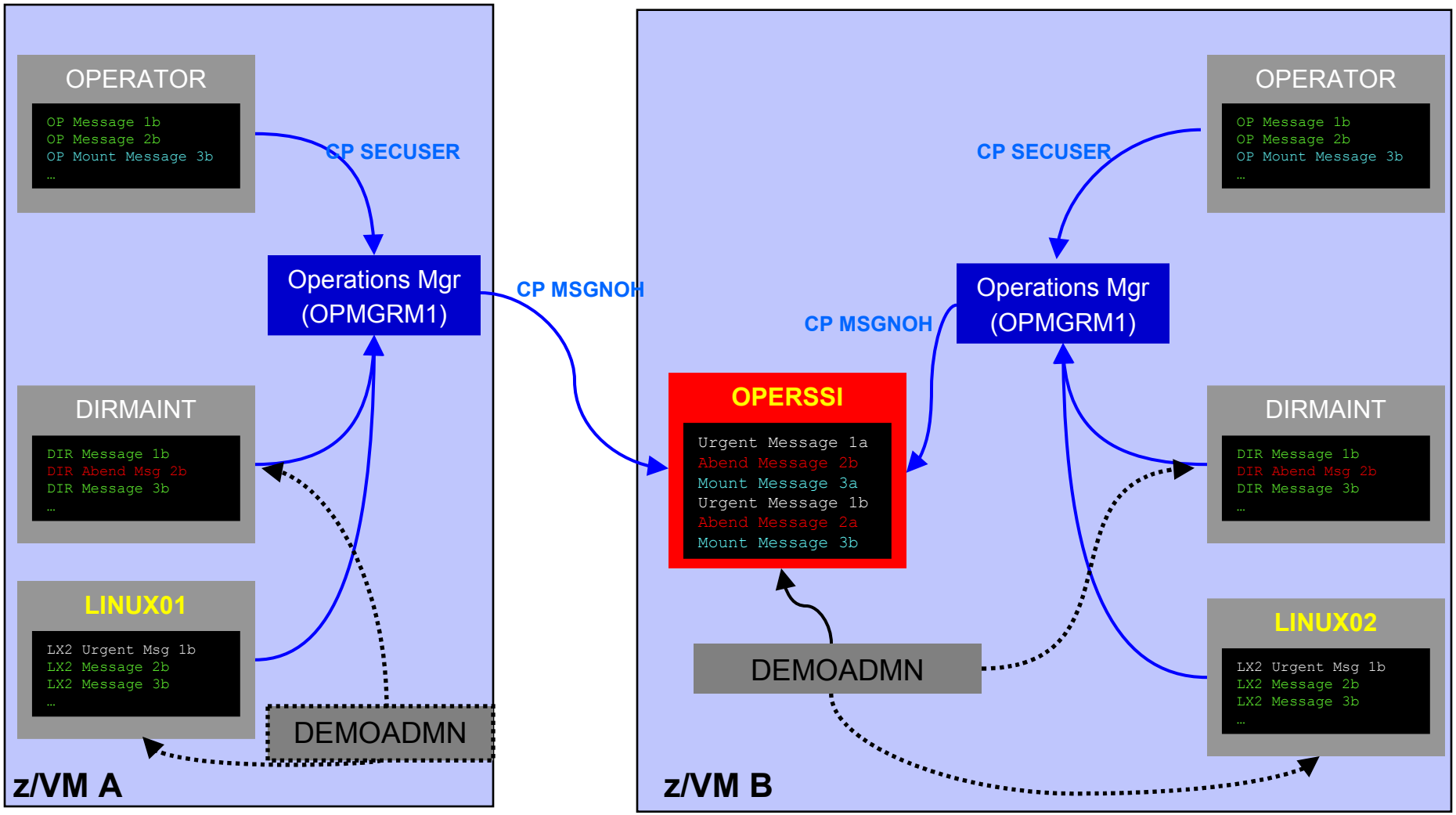
```
*
DEFTCPA NAME(LNXSYSLG),+
  TCPUSER(TCPIP),+
  TCPAPPL(GOMRSYL),+
  TCPADDR(000.000.000.000),+
  TCPPORT(00514),+
  PARM(LXSYSLOG03330417UTF8)
*
DEFTCPA NAME(LNXSYSL2),+
  TCPUSER(TCPIP),+
  TCPAPPL(GOMRSYL),+
  TCPADDR(000.000.000.000),+
  TCPPORT(00515),+
  PARM(LXSYSLG203330417UTF8)
```

- **Update TCP/IP configuration to allow Operations Manager to listen for UDP traffic on the specified port(s)**
  - Ports 514 and 515 used here
- **Update the Linux guest to send its syslog data to the IP address and port of your z/VM system**

Scenario 3:
Create a Central Operations Console across multiple z/VM systems **in an SSI cluster – Includes relocation of Linux guests**

- **Use Operations Manager to watch for error, warning, fatal messages on service machine consoles on one or more systems in an SSI cluster**
  - OPERATOR, DIRMAINT, TCPIP, RACF, etc.
  - Linux guests
  - Linux syslog
- **Route these messages to a central operations console on one of the z/VM systems**
- **Operations staff watches one operations console for signs of trouble across multiple z/VM systems**
  - View individual service machine consoles for more details when needed

Creating a Central Console Across Multiple Members of SSI Cluster



Single Configuration Users: LINUX01, LINUX02, OPERSSI, DEMOADMN
Multiconfiguration (IDENTITY) Users: OPERATOR, DIRMAINT, OPMGRM1

Scenario 3: Detailed Steps

- **On System B (TEST7SSI), view the "Operations Console" (user ID OPERSSI)**

```
gomcmd opmgrm1 viewcon user(operssi)
```

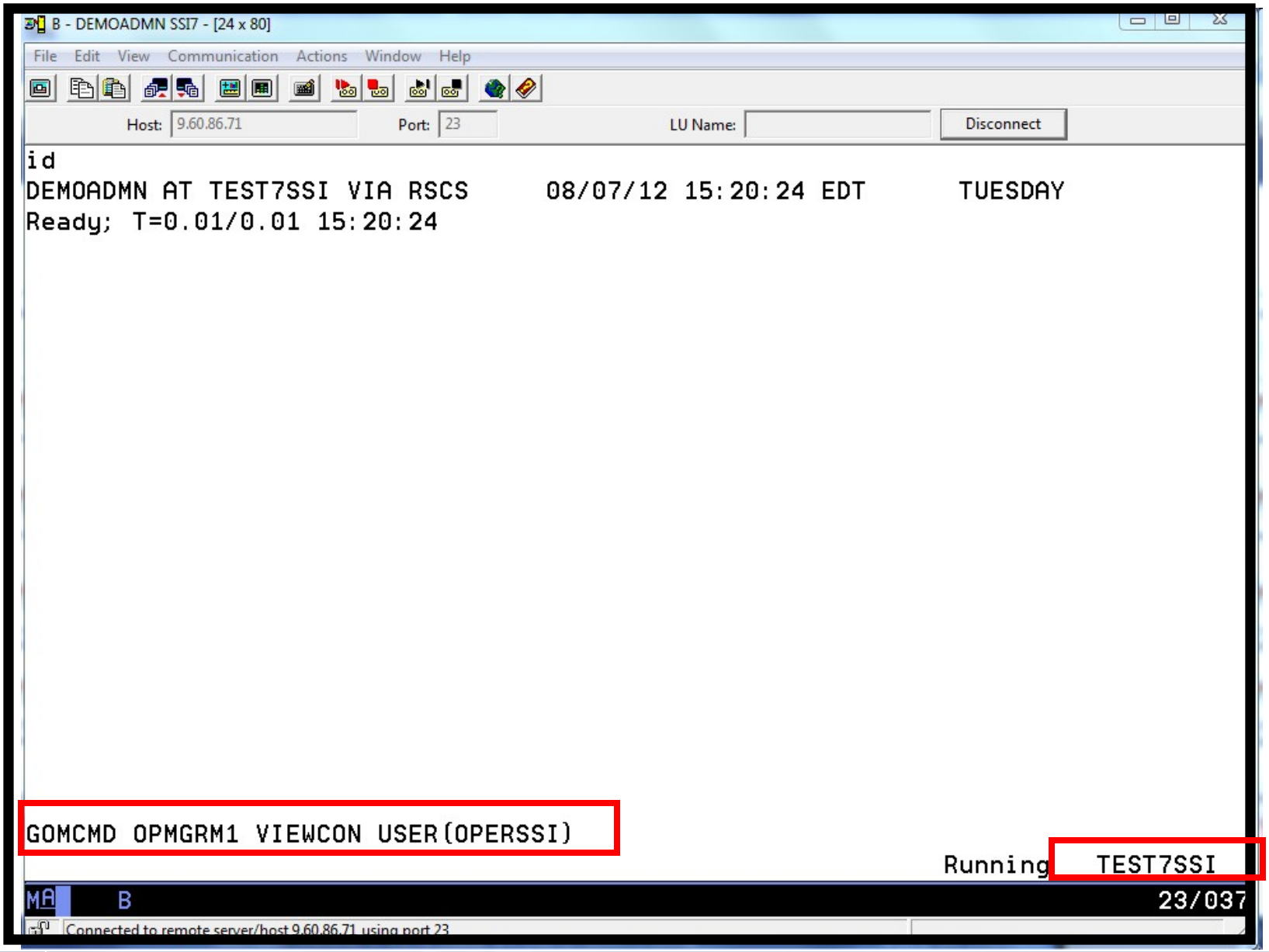
- **On System A (TEST7SSI), find a Linux guest running disconnected locally and relocate it**

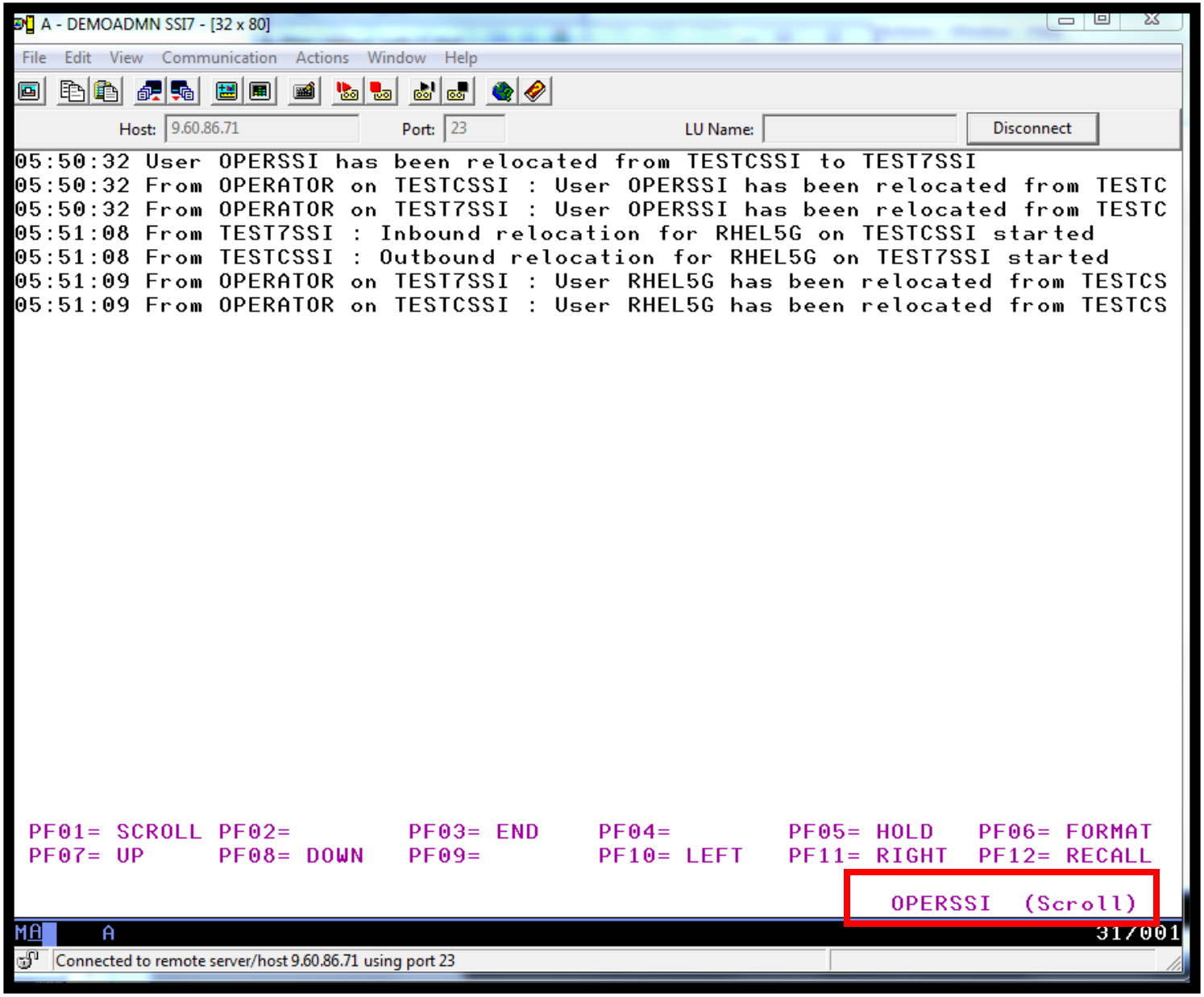
```
q names

VMRELOCATE MOVE USER RHEL5G TO TESTCSSI
```

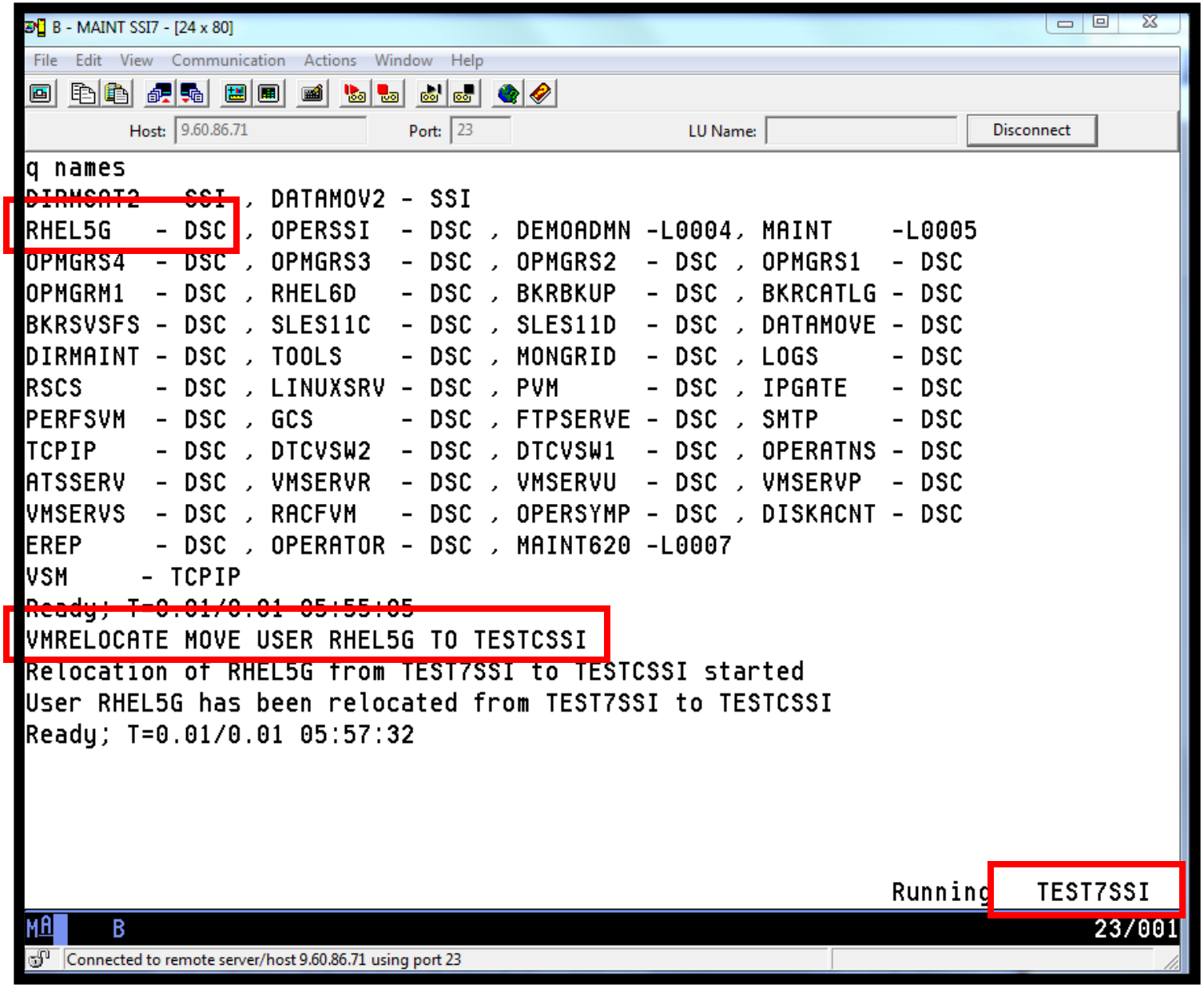
- **On System B (TEST7SSI), prepare for planned shutdown by relocating the central operations console (OPERSSI)**

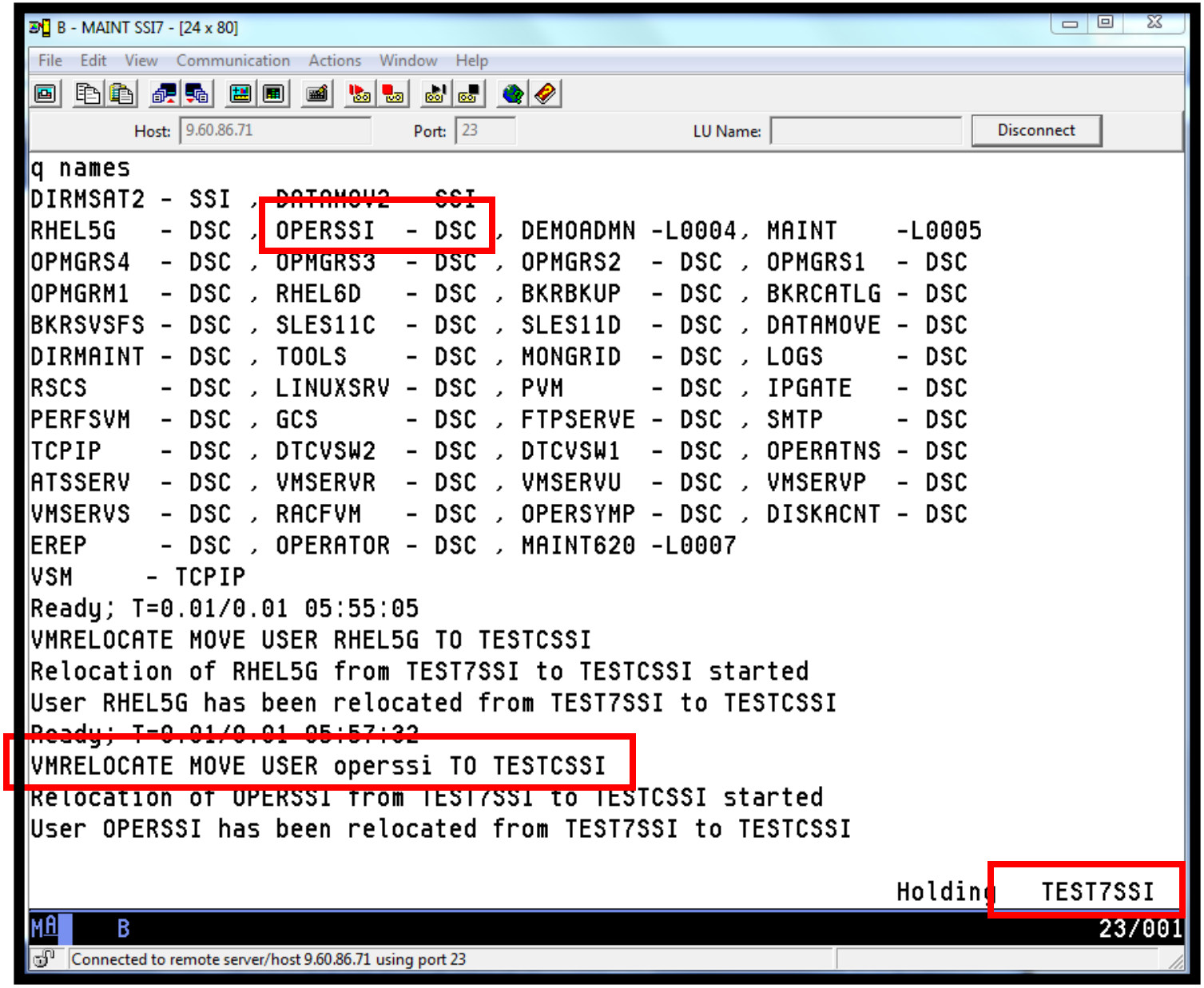
```
VMRELOCATE MOVE USER OPERSSI TO TESTCSSI
```

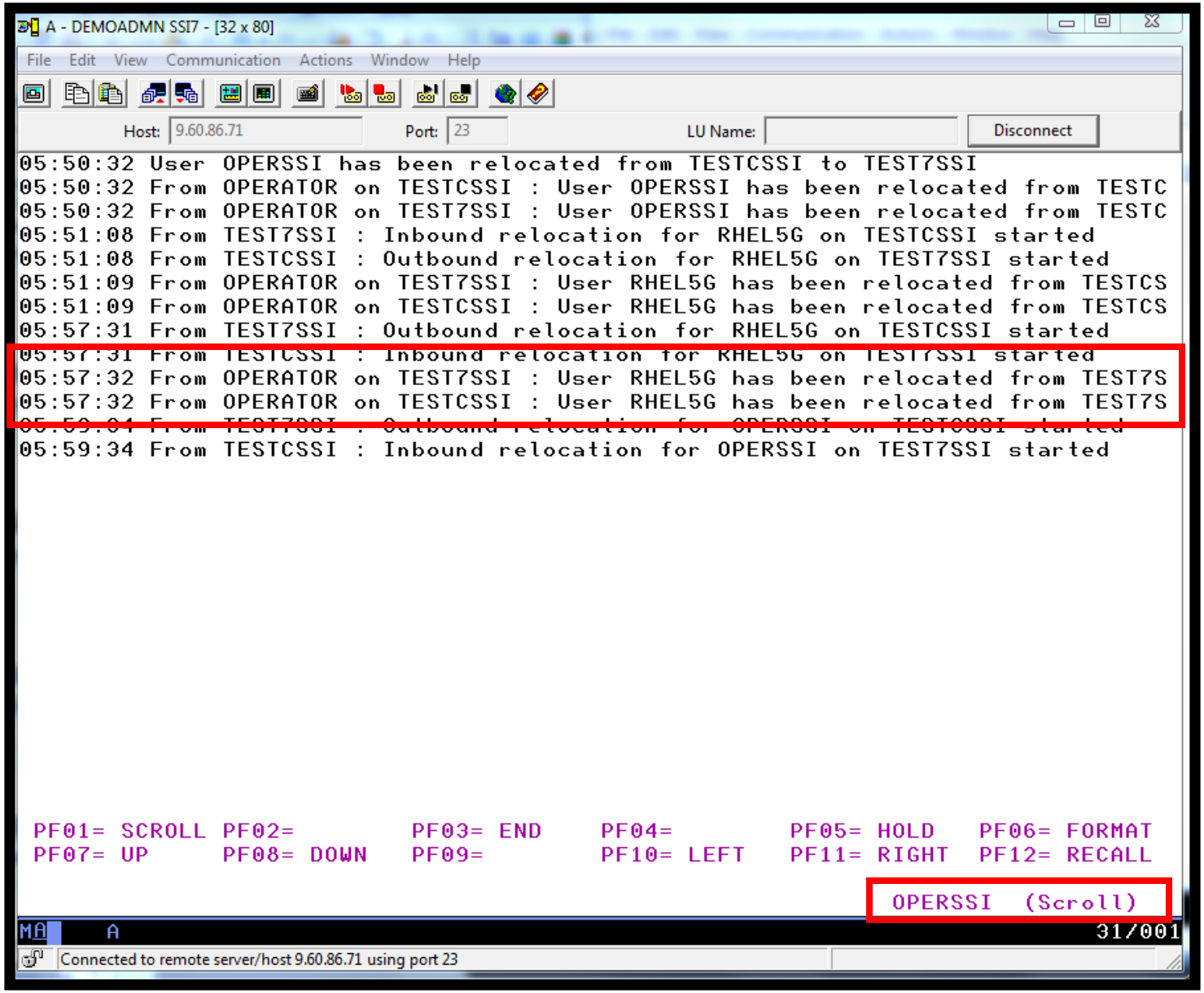
- **Note the messages received on OPERSSI on TEST7SSI from OPERATOR on both TESTCSSI and TEST7SSI indicating RHEL5G was relocated**
- **Note the message received on OPERSSI on TESTCSSI indicating OPERSSI has been relocated**

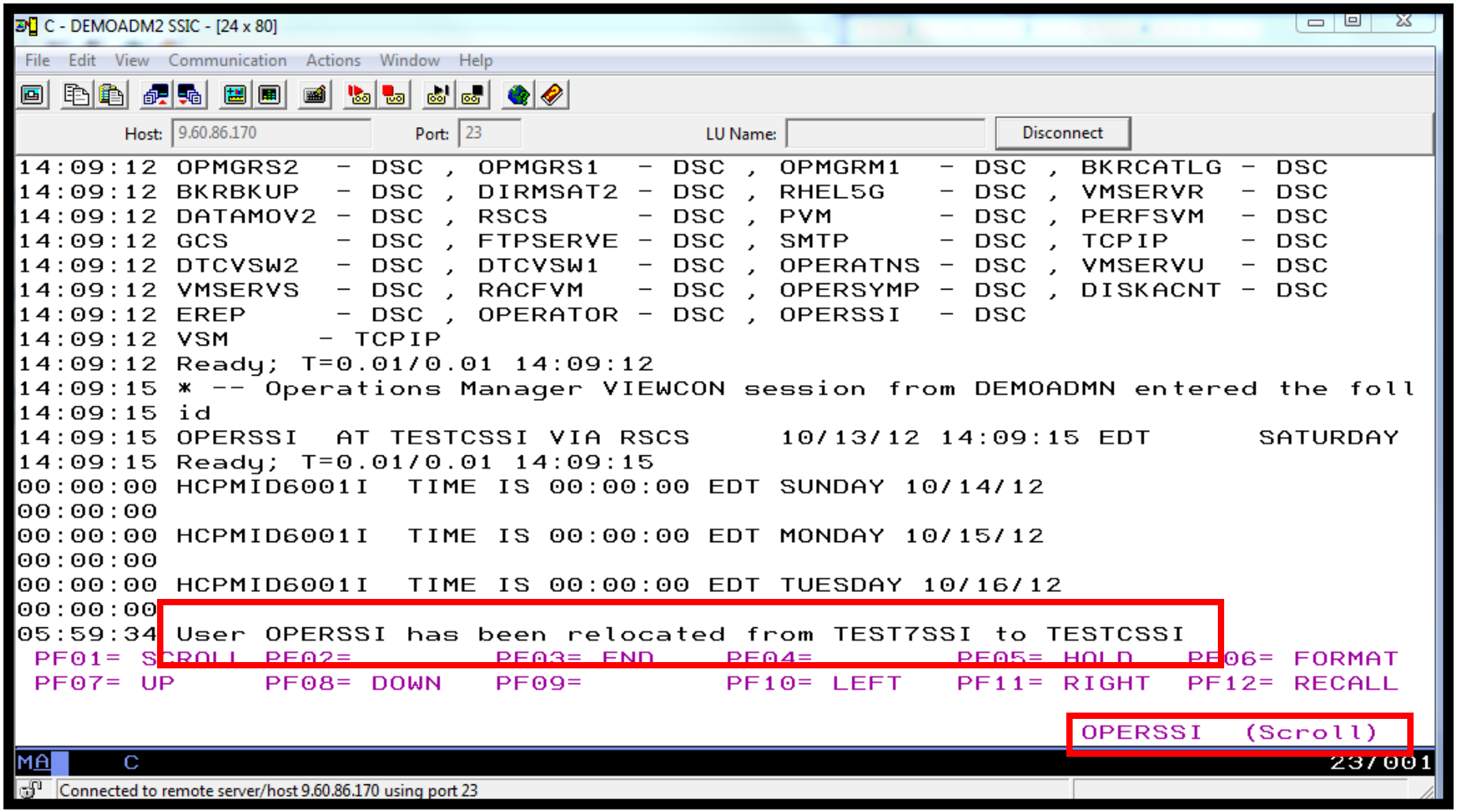












Scenario 3: How Do You Do That?

Event monitor in Operations Manager:

```
*
*** Notify OPERSSI console when relocations started
DEFEMON NAME(RELOC),+
  TYPE(9,10),+
  ACTION(RELOC)
```

Action in Operations Manager:

```
*
DEFACTN NAME(RELOC),+
  COMMAND(EXEC MSG2OPER &u &3 &4 &5 junk),+
  ENV(LVM)
```

Scenario 3: How Do You Do That?

MSG2OPER EXEC (excerpts):

```
/*  Send a message to a central console OPERSSI for SSI cluster     */
/*                                                                  */
trace r
Address Command
Parse arg userid euser event sourcesys msgtext

/* Get local TCP/IP hostname */
parse value Search_TCPIP_Data("hostname") with getrc tcphostname .
if getrc > 4 then tcphostname = "unknown_host_name"

if userid = '_GOMEMON' then
  do
    if event = 9 then
      msgtext = 'Outbound relocation for' euser 'on' sourcesys 'started'
    else
      msgtext = 'Inbound relocation for' euser 'on' sourcesys 'started'
    'CP MSGNOH OPERSSI AT TEST7SSI From' tcphostname ':' msgtext
  end
```

धन्यवाद
Hindi

多謝
Traditional Chinese

감사합니다
Korean

Спасибо
Russian

Gracias
Spanish

Thank You
English

شكرا
Arabic

Obrigado
Brazilian Portuguese

Danke
German

多谢
Simplified Chinese

Grazie
Italian

Merci
French

நன்றி
Tamil

ありがとうございました
Japanese

ขอบคุณ
Thai