IBM Software

Options for Backing Up and Restoring z/VM and Linux Guests

SHARE Session 13488

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Agenda

- **Recommended practices and available options**
  - Backing up and restoring z/VM
  - Backing up and restoring Linux on System z
  - Backing up and restoring data in a z/VM SSI cluster
- **Overview of IBM products**
  - Backup and Restore Manager for z/VM
  - Tape Manager for z/VM
- **Backup scenarios**
  - Live demos
  - Configuration options and sample code
- **Summary and reference information**

IBM z/VM Management Solutions

- **Security**
  - RACF and zSecure Manager for z/VM
- **Performance monitoring**
  - OMEGAMON XE on z/VM and Linux
- **Backup and recovery**
  - Backup and Restore Manager for z/VM
  - Tape Manager for z/VM
  - Tivoli Storage Manager
- **Automation and operational monitoring**
  - Operations Manager for z/VM
  - Including integration with existing monitoring and alert systems

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Recommended Practices and Available Options

Recommended Practices – Backup and Recovery

Image level backup of z/VM
- Operating system

File level backup of z/VM data
- Directory information
- Configuration files
- Log files
- Tools – REXX EXECs, automation scripts, etc.

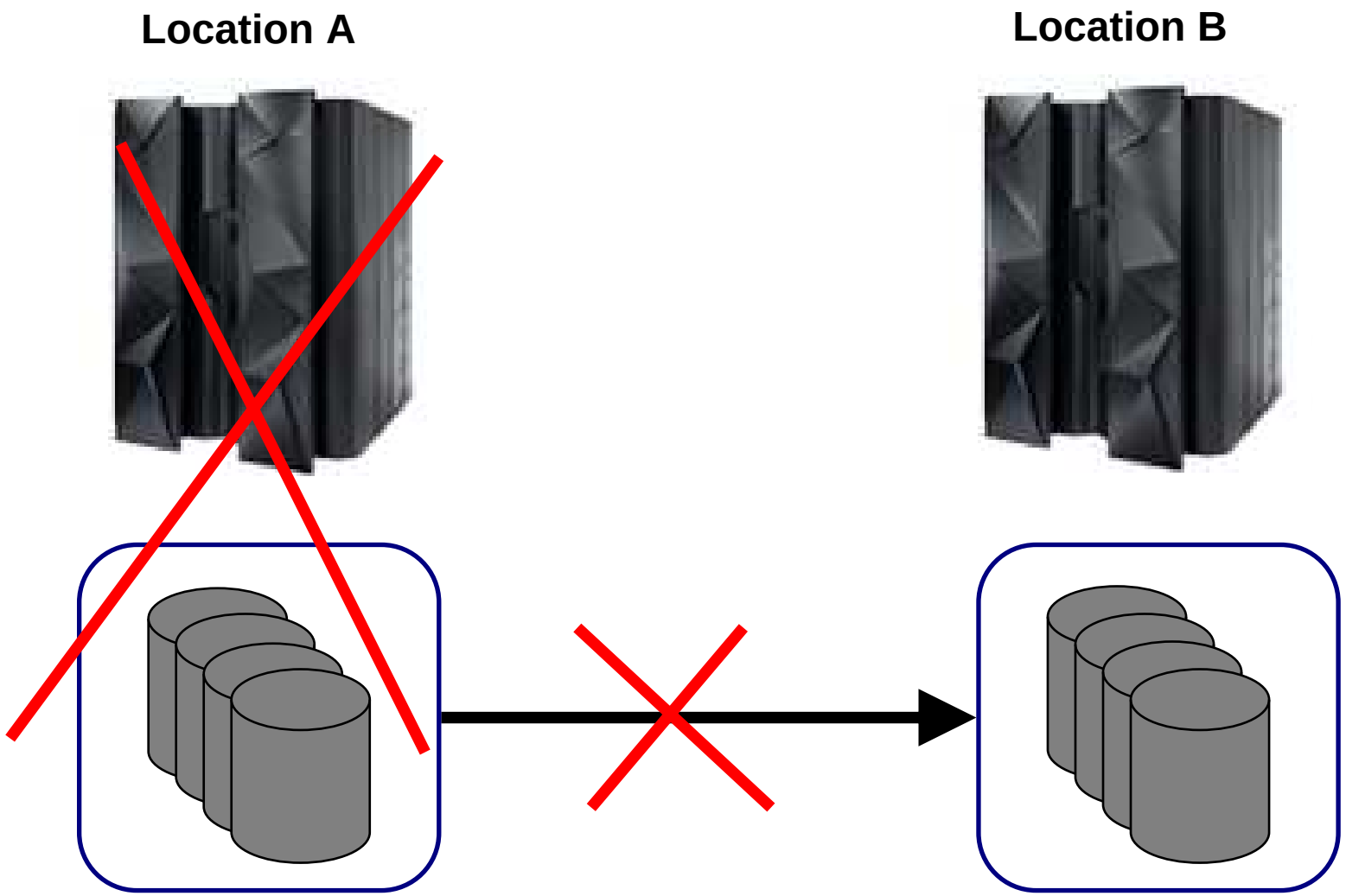
Image level backup of Linux guests
- Operating system
- Applications
- Application data (maybe)

File level backup of Linux guests
- Configuration files
- Log files
- Tools

Recovery of z/VM system, including Linux guests
- Dependence on z/OS

versus
- Independent recovery

High Availability



High Availability and Backup/Recovery are NOT the Same

Location A

Location B

Does not address operational recovery needs

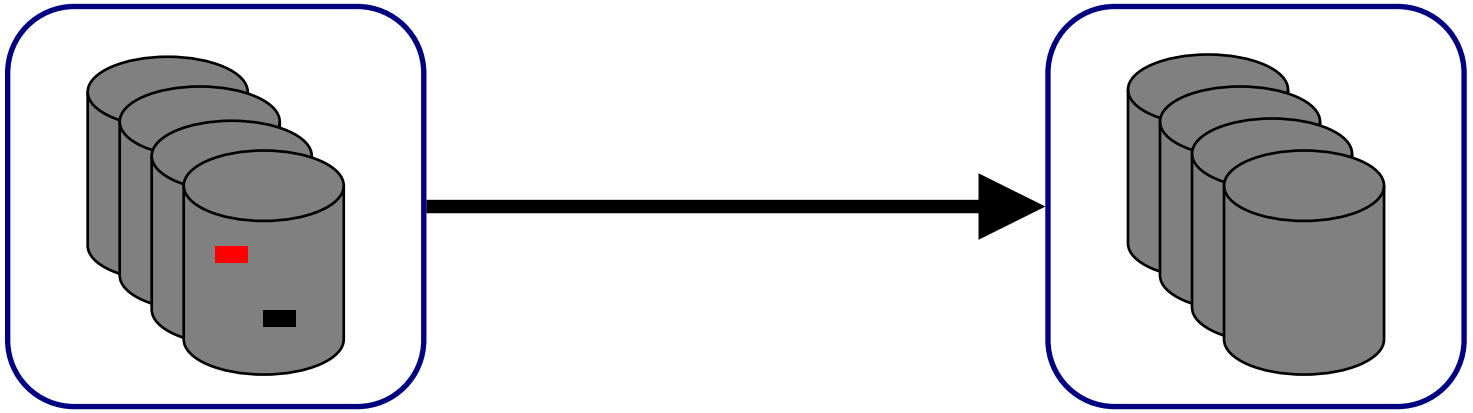


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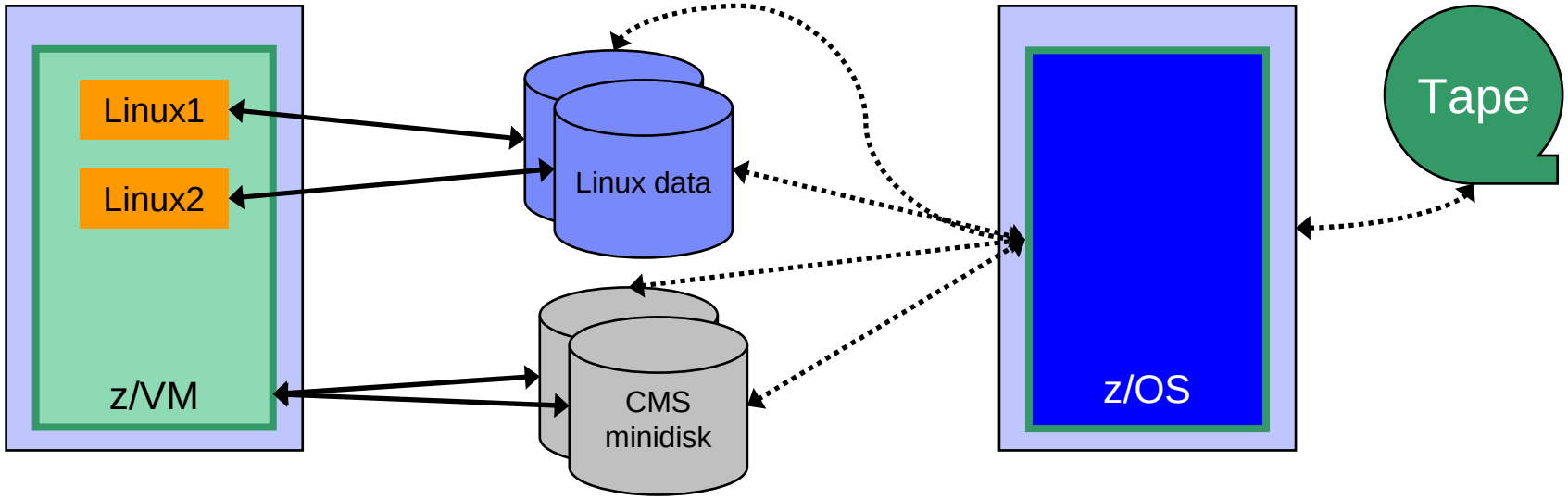
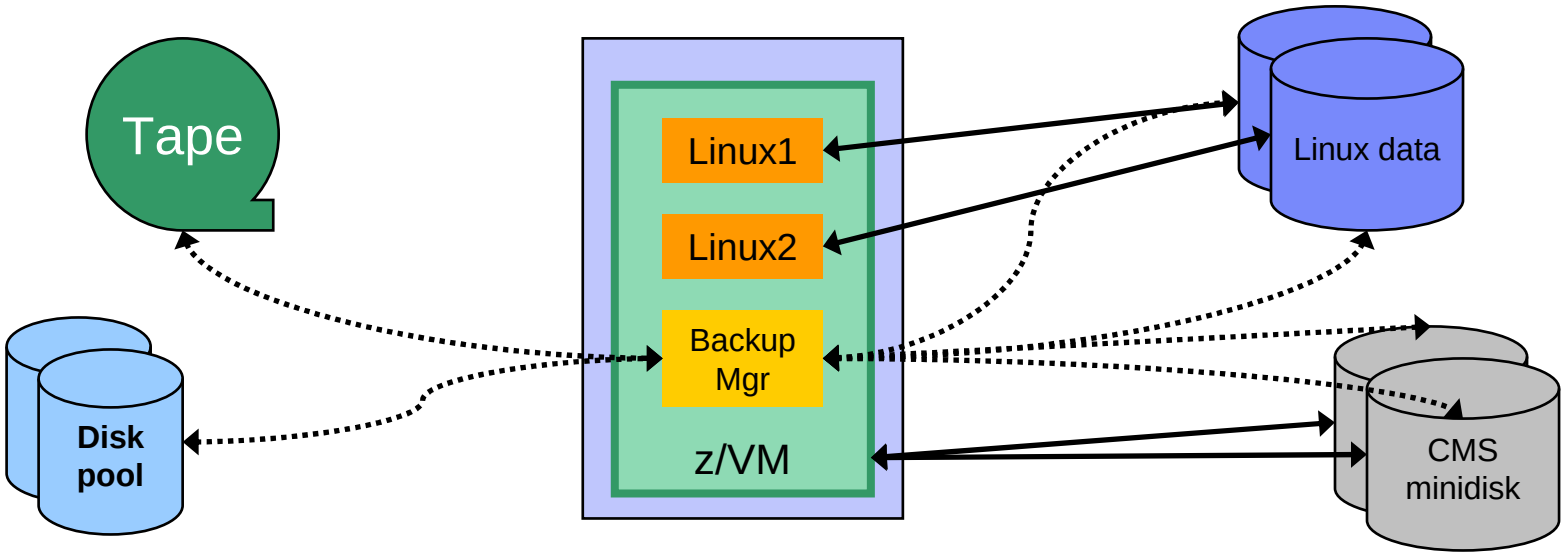
Image Level Backup/Recovery of z/VM and Linux Guests from z/OS



- **Image level backup and recovery of DASD volumes from z/OS**
  - **Existing z/OS procedures and tools in place**
  - **Use existing tape devices**
  - **Fast**
  - **Doesn't include FCP-attached DASD**
  - **Linux should be down**
  - **Dependent on z/OS for recovery**
    - **Is Linux workload critical – recovery required in parallel with z/OS in event of disaster?**
  - **Using z/OS cycles (on general purpose processors) to back up z/VM and Linux**

Image Level Backup/Recovery of z/VM and Linux Guests from z/VM



- **Image level backup and recovery of DASD volumes from z/VM**
  - **Low risk if z/VM is running**
  - **Includes FCP-attached DASD (defined to z/VM as EDEVICEs)**
  - **Linux should be down**
  - **Recovery of z/VM and Linux independent from recovery of z/OS**
    - **Critical Linux workload recovered in parallel with z/OS in event of disaster**
    - **Faster recovery of z/VM and Linux overall**
  - **Backup software required on z/VM**
    - **Use z/VM cycles on IFL processors to back up z/VM and Linux**
  - **Requires mainframe attached tape devices**
    - **Share tape devices with z/OS – does not require both systems to be up**

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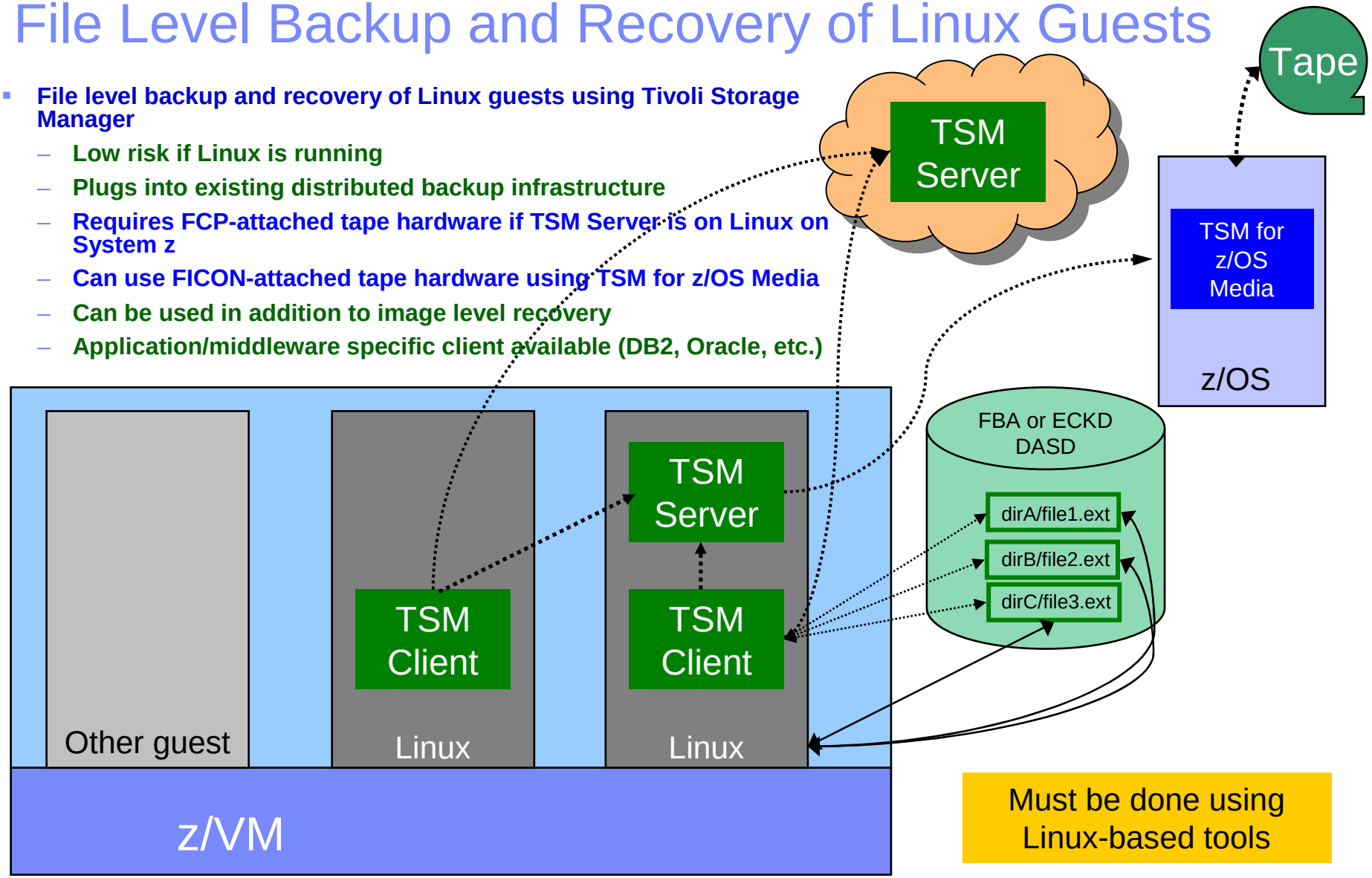
File Level Backup and Recovery of Linux Guests

- **File level backup and recovery of Linux guests using Tivoli Storage Manager**
  - **Low risk if Linux is running**
  - **Plugs into existing distributed backup infrastructure**
  - **Requires FCP-attached tape hardware if TSM Server is on Linux on System z**
  - **Can use FICON-attached tape hardware using TSM for z/OS Media**
  - **Can be used in addition to image level recovery**
  - **Application/middleware specific client available (DB2, Oracle, etc.)**



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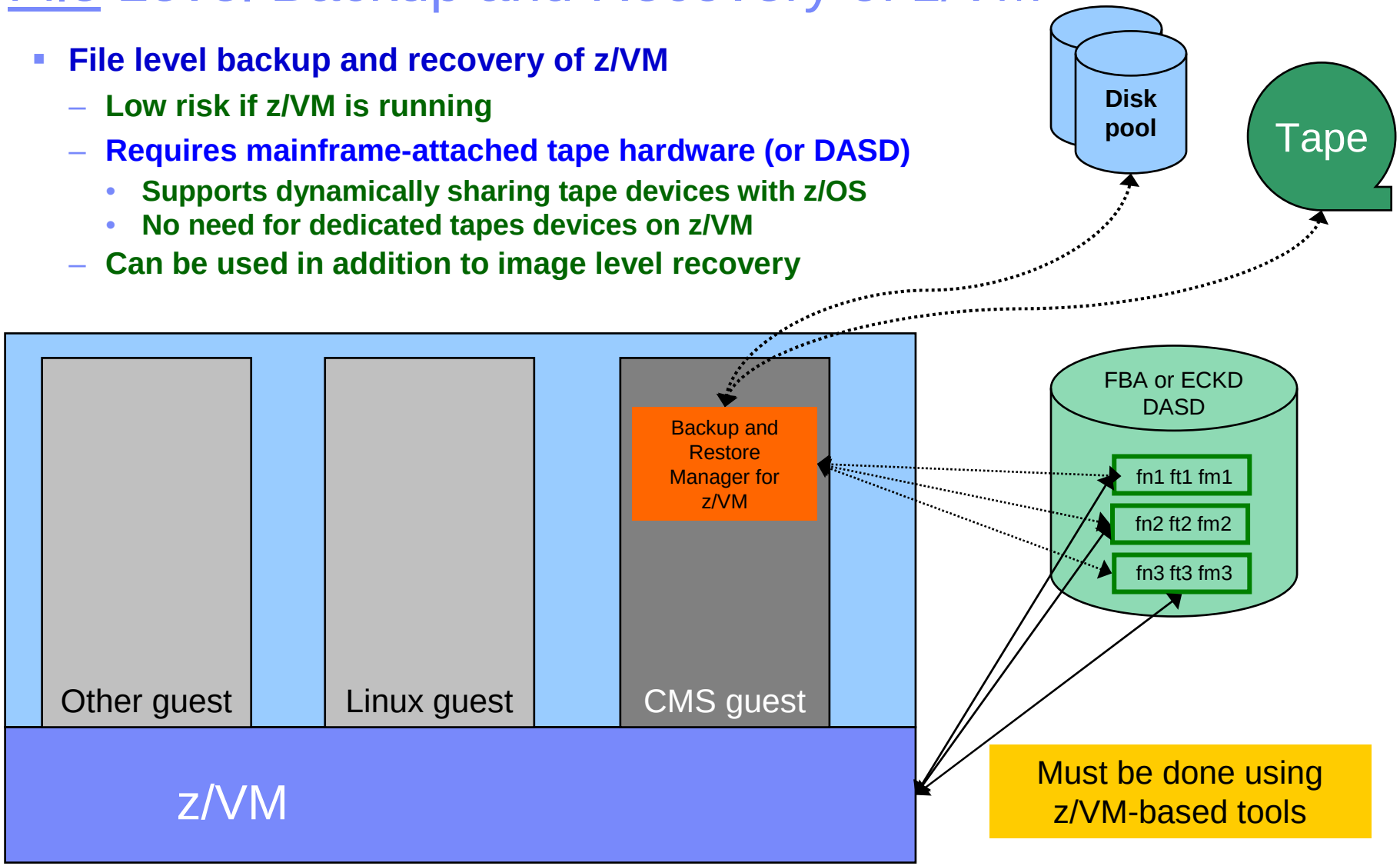
Recovery of z/VM system, including Linux guests
- Dependence on z/OS

versus
- Independent recovery

File Level Backup and Recovery of z/VM

- **File level backup and recovery of z/VM**
  - **Low risk if z/VM is running**
  - **Requires mainframe-attached tape hardware (or DASD)**
    - **Supports dynamically sharing tape devices with z/OS**
    - **No need for dedicated tapes devices on z/VM**
  - **Can be used in addition to image level recovery**



Where and How to Back Up z/VM and Linux Guests

- **Using z/OS to back up and restore z/VM and Linux**
  - Useful during Linux on System z POC or early stages of Linux roll-out
    - Easy and fast to implement for existing z/OS customers
    - Provides disaster/volume level recovery (**not** file level recovery)
  - Concerns or issues long term as Linux workload grows or becomes critical
    - Doesn't support FCP-attached DASD
    - File level recovery of z/VM or Linux data is time consuming and manual – backups only contain volume images
    - In disaster situation, z/VM and Linux must wait for z/OS recovery before beginning their recovery
    - Increased use of z/OS CPU cycles to support z/VM and Linux
- **Using native z/VM and Linux solutions for backup and recovery**
  - Supports operational errors and disaster situations
    - File level backup and recovery
    - Image level backup and recovery of FCP and FICON-attached DASD
  - Independent of z/OS
    - Backups run on (less expensive) IFLs
    - Recovery in parallel with z/OS
    - Dynamically sharing of tape devices with z/OS is still possible
      - Does not require both systems to be up

Backing Up Linux – Should the Guest Be Up or Down?

- **Linux keeps pending I/O's in memory when possible**
  - Designed for distributed platforms where I/O is assumed to be slow
- **Backup solutions that read Linux DASD volumes but run outside Linux don't have a view of these pending I/Os**
  - Data on DASD may be in inconsistent state due to pending I/Os
  - Restoring data that has been backed up while Linux is running may not yield usable results
  - SYNC command exists to force all I/Os to be processed
    - Linux will immediately start caching new I/Os
  - Dependent on type of application running on Linux
    - Similar to pulling the plug on a distributed Linux server, then restarting it
- **Reduce risk by**
  - "Right-sizing" Linux guests – don't give more memory than needed
    - Recommended for performance reasons anyway
  - Using FLASHCOPY to flash the disks and back up the flashed copy
- **For guaranteed recovery, shut down or suspend the guest before backing it up from z/VM or z/OS**
    - Your experience may (will) vary
    - Evaluate the risk based on the application

Using Suspend Before Backing Up Linux Guests …

- **SUSPEND/RESUME functions available in most recent Linux on System z distributions**
- **Similar to hibernate function in Windows**
  - Suspend
    - Completes all pending I/Os
    - Writes memory to disk
  - Resume
    - Detects suspend state
    - Reads memory from disk to restore previous state of the guest
- **Requires setup and planning**
  - Verify the effort it worth it for each type of guest
  - Otherwise, use shutdown instead of suspend

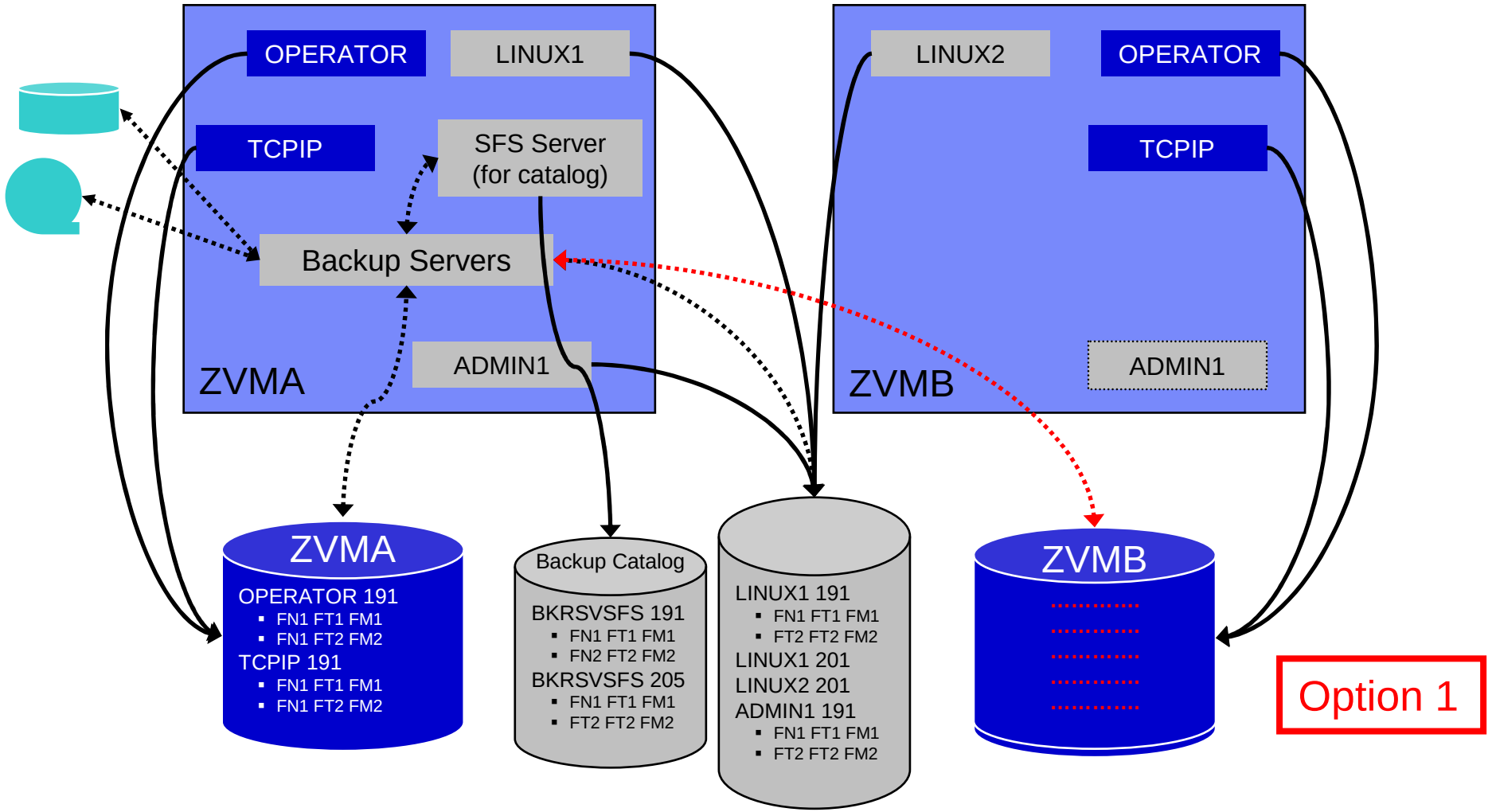
… Using Suspend Before Backing Up Linux Guests

- **Setup**
  - Specify swap disk in zipl.conf
    - Example: resume=/dev/disk/by-path/ccw-0.0.010f-part1
  - In list of swap disks
    - Specify this one with lowest priority
    - Use real disk (not VDISK)
    - Needs to have enough room for all memory of Linux guest + swap space
- **Issue suspend via one of the following:**
  - echo disk > /sys/power/state
  - CP SIGNAL SHUTDOWN
    - Must update config file on Linux to specify suspend rather than kill in response to signal shutdown
- **Reference:**
  - White paper – “Methods to pause a z/VM guest: Optimize the resource utilization of idling servers”
    - http://www.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP101981

Single Config Users and MDisks

Multiconfig / IDENTITY Users and MDisks

SSI Considerations for Backup and Restore



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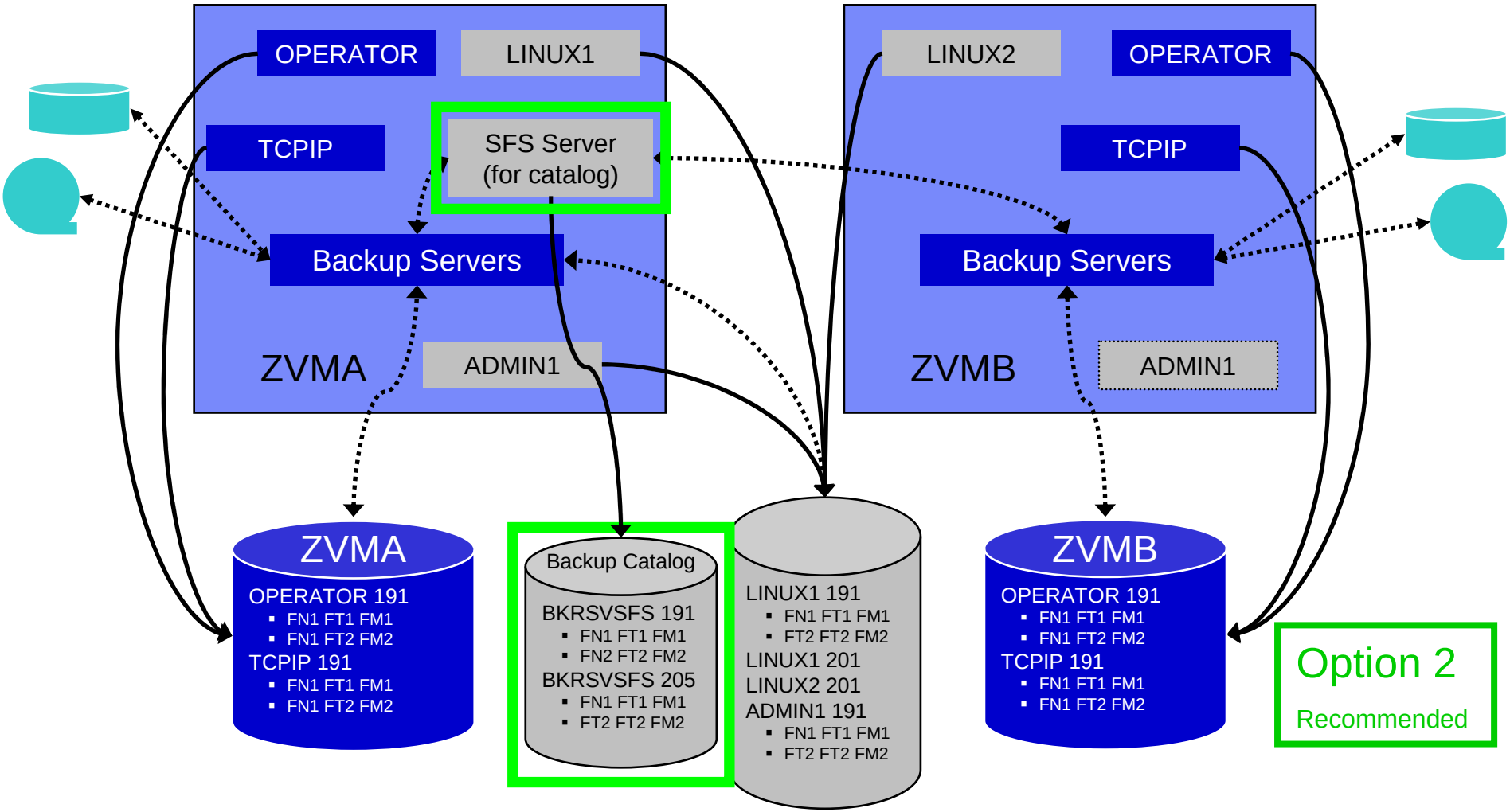

SSI Considerations for Backup and Restore

- **Backup Manager service machines on any member can see all minidisks of single configuration users**

- **Backup Manager service machines on any member can see all minidisks of local multiconfiguration (IDENTITY) users**
  - Can not see minidisks of IDENTITY users on other members
  - Can only see DASD volumes (if shared/available) of IDENTITY users on other members

- **Recommendation**
  - Create Backup Manager service machines as IDENTITY users on each member
    - BKRBKUP, BKRCATLG, BKRWRKnn
  - Create one single configuration user for SFS server/filepool for the backup catalog
    - Configure as SSI (or REMOTE) in DMSPARMS file
    - Allows single configuration users to restore their own data when logged onto any member
  - Create multiple backup jobs
    - One job for all single configuration users – only run it from one member
    - For multiconfiguration (IDENTITY) users
      - One job per member
      - Use a unique job name on each member
      - Run the member specific job on that member's backup server

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Managing Backup and Recovery

Backup and Restore Manager for z/VM

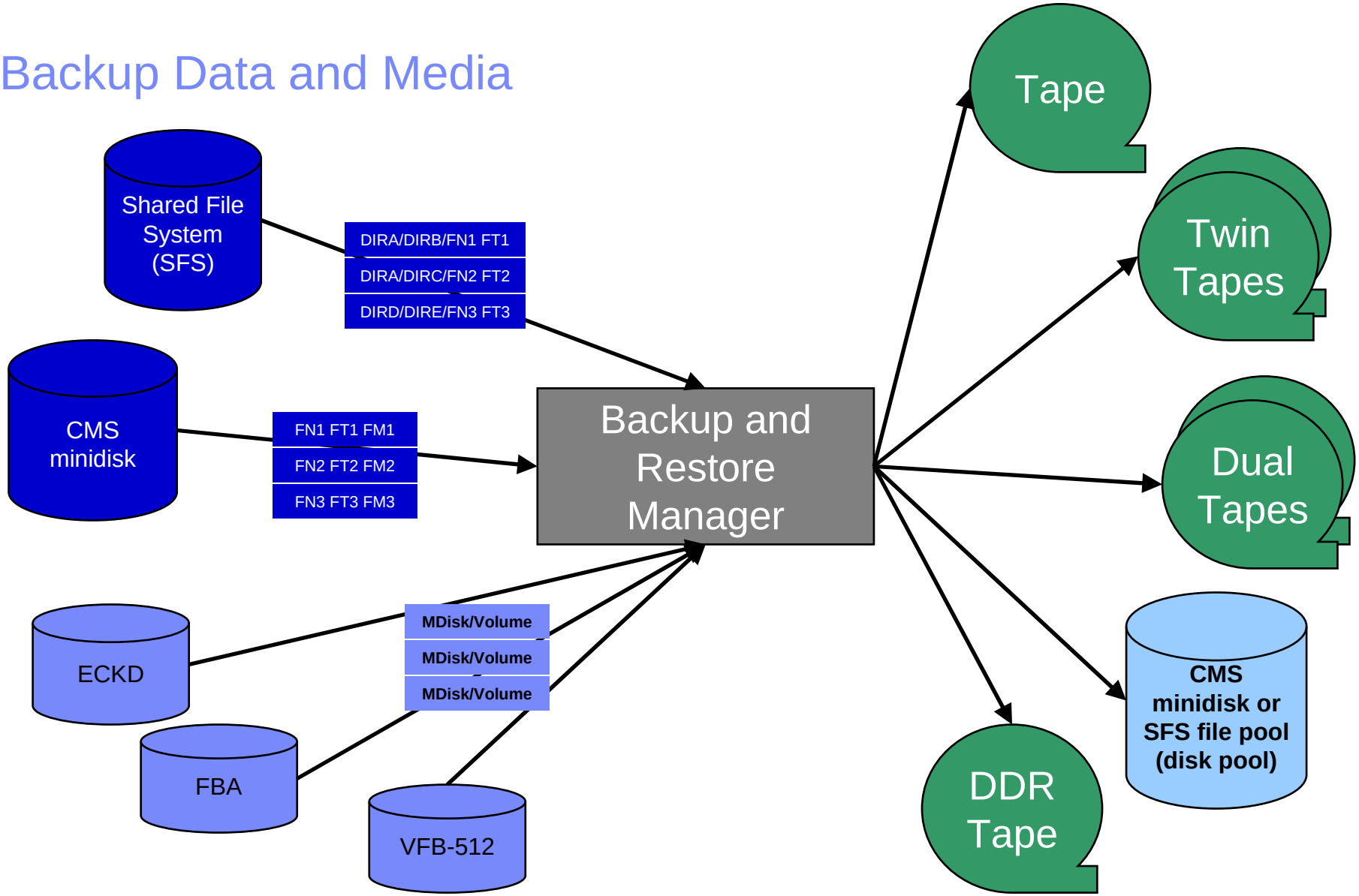
Product Overview

- **Backup**
  - Requested by administrators
  - Full or incremental
  - Flexible selection of disks and files to back up
  - Review job before submitting for backup
- **Restore**
  - Restore data via full screen interface or commands
  - Performed by users for their own data
  - Extending to other users available via exit
  - Performed by administrators for any data

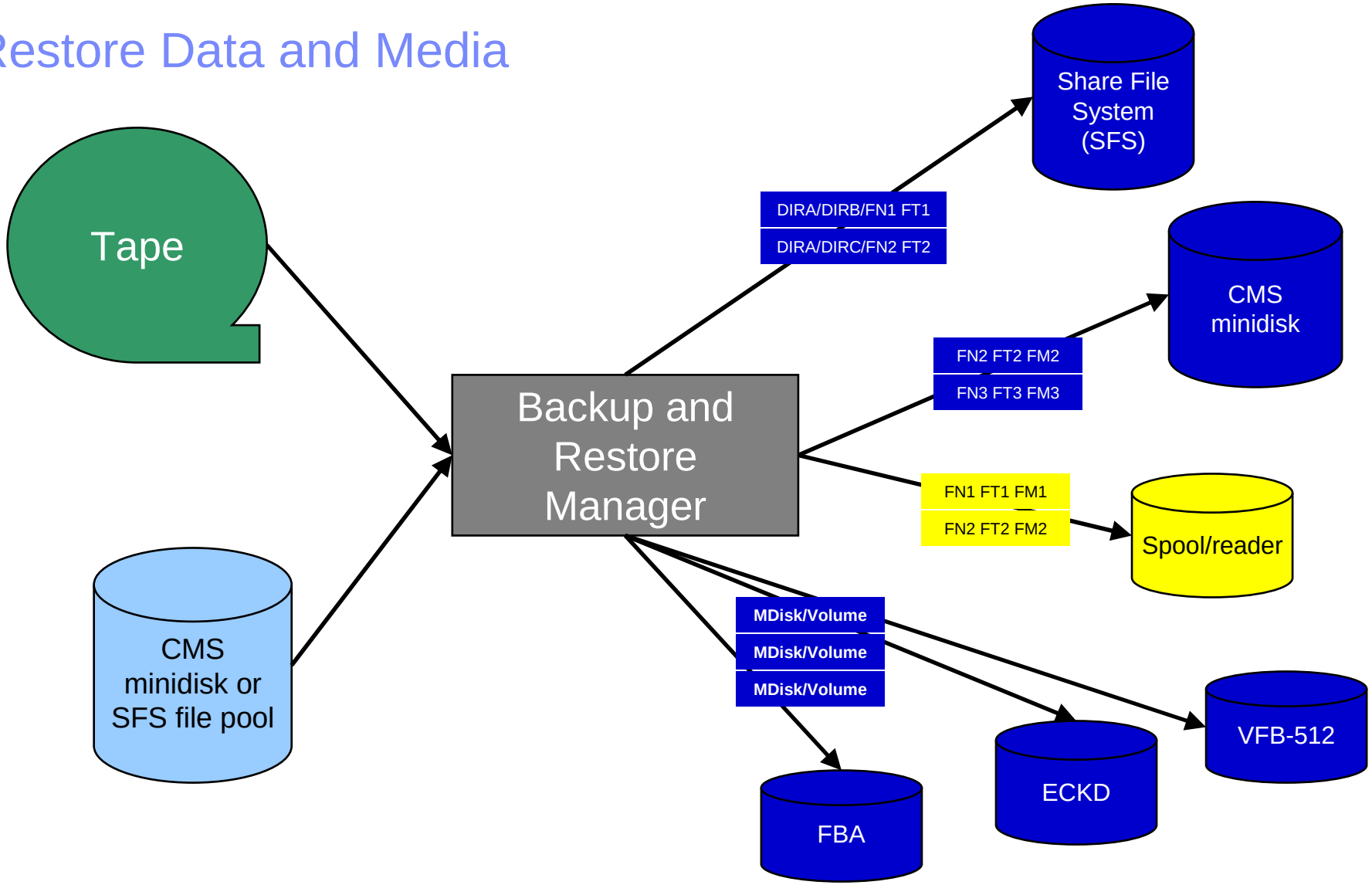
Catalog in Shared File System (SFS) – presentation on web site for installation and setup

- **Integration with Tape Manager for z/VM**
- **Optional compression of data during backup via exits**
  - **Call your own compression algorithm**
  - **Use IBM provided routine**
- **Encryption available via exits**
  - **Call your own routine**
  - **Use vendor-written routine, such as V/Soft Software's Encrypt/Backup for z/VM**
  - **Use encryption capable tape devices**

Backup Data and Media



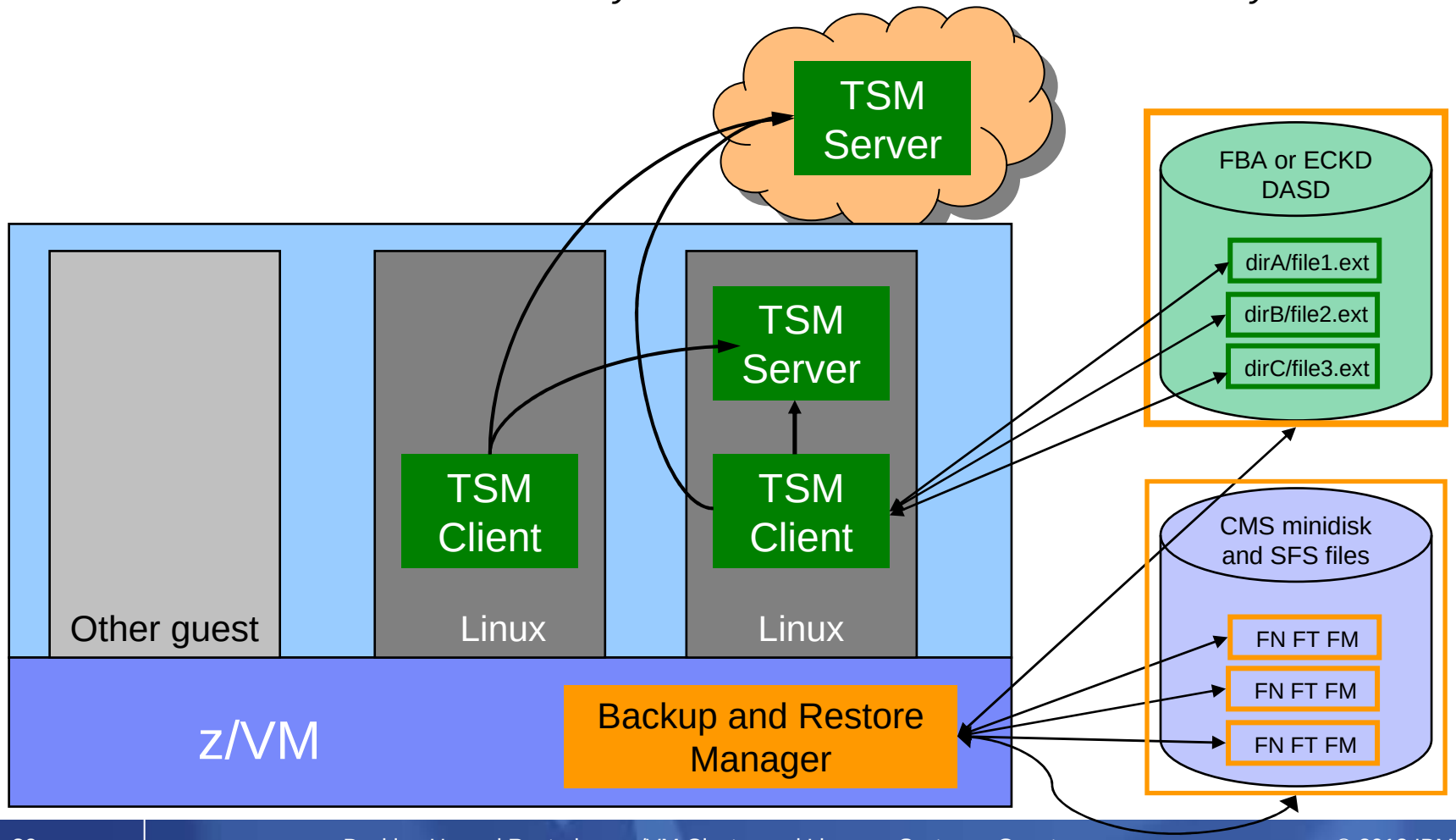
Restore Data and Media



Backup and Restore Manager and Linux Guests

Using Backup and Restore Manager with Tivoli Storage Manager

Choose the solution that meets your needs – or combine for file recovery and DR



Key Benefits

- **System backups available for Disaster Recovery**
  - Option to restore using DDR or Backup and Restore Manager
  - Manage retention of DR backups
  - Retrieve a list of tapes associated with a specific backup
    - Pull list for movement to off-site storage
- **Guest backups available for restoring to a previous state or level**
- **Backups of user data available for**
  - Restoring to a previous state or level
  - Replacing files accidentally erased or corrupted
- **Users restore their own data**
  - No administrator interaction required

Key Benefits Cont…

- **Flexible selection of data to back up**
  - Include/exclude
    - Minidisks, directories
    - Real device addresses or volsers
    - Extents
  - Mask by filename, filetype, or SFS path
  - Review a defined backup job before submission
- **Management of backup data**
  - Retention set as part of the backup job
  - Automatic aging and pruning of the backup catalog
    - Including associated tapes and disk pools
  - View/query the list of expired backups
- **Reduced backup window with concurrent processing**
  - Multiple worker service machines sharing the job
  - Suggest one worker service machine for each available tape drive

Defining a Backup Job

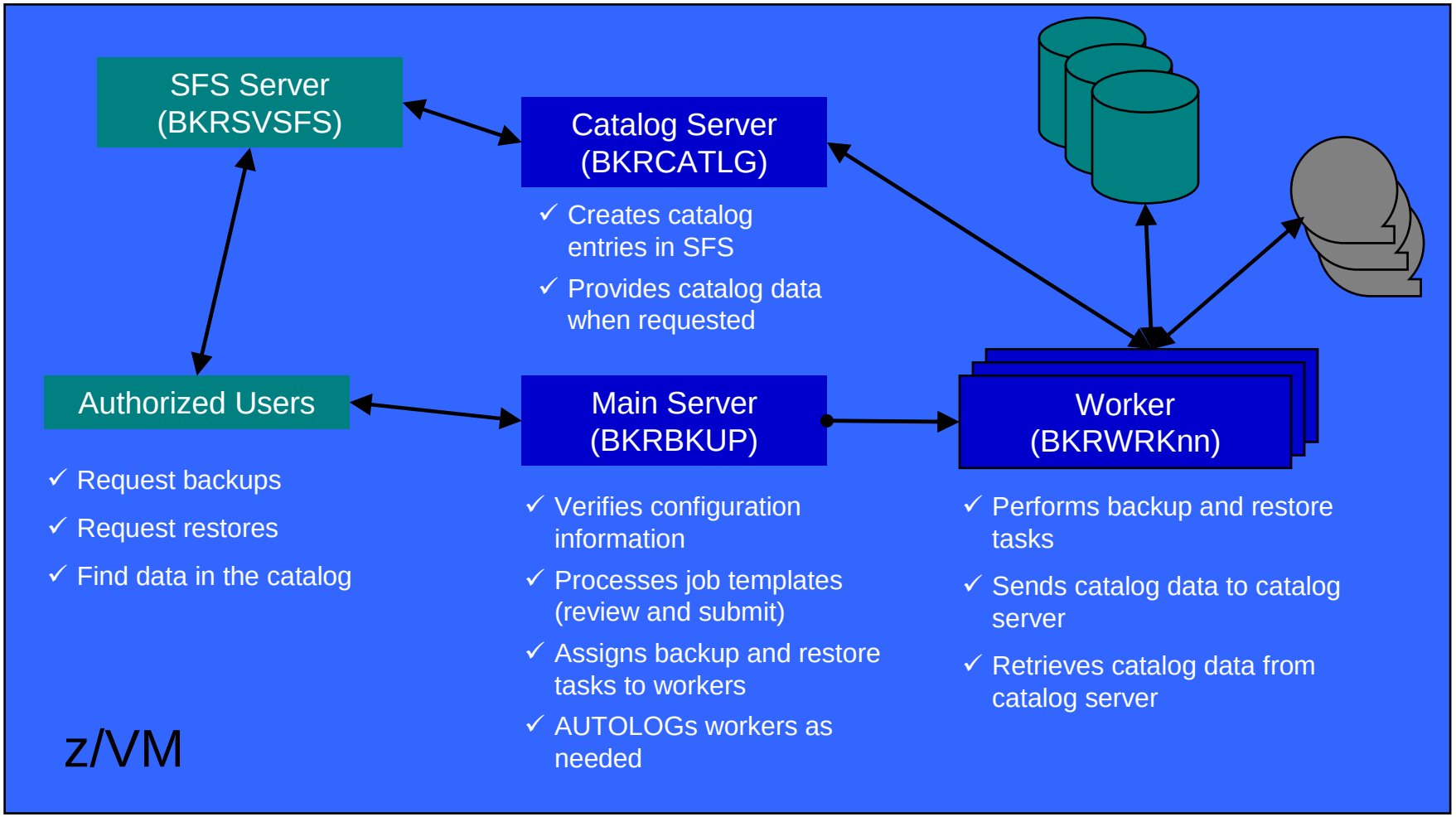
```
/* Include/Exclude definitions                                        */
/*********************************************************************/
  FUNCTION  MEDIATYPE   OWNER      VDEV VOLUME DEVTYPE       START          END           SIZE
|----------|----------|--------|--|----|------|--------|--|----------|--|----------|--|-------|
 INCLUDE    MINIDISK   *        =  *    *      *        =  *          =  *          =  *
 EXCLUDE    MINIDISK   *LNX*    =  *    *      *        =  *          =  *          =  *
 EXCLUDE    MINIDISK   MAINT    =  0123 *      *        =  *          =  *          =  *
 EXCLUDE    MINIDISK   MAINT    =  0124 *      *        =  *          =  *          =  *
 EXCLUDE    MINIDISK   *        =  *    *      *        =  *          =  END        =  *
 EXCLUDE    MINIDISK   *        =  *    *      *        =  *          =  *          >  3300
 INCLUDE    MINIDISK   MAINT    =  012* *      *        =  *          =  *          =  *

  FUNCTION  MEDIATYPE  ADDRESS
|----------|----------|---------|
 INCLUDE    RDEVICE    900-90F
 EXCLUDE    RDEVICE    *B

  FUNCTION  MEDIATYPE  VOLSER
|----------|----------|------|
 INCLUDE    RDEVVOL    610*

  FUNCTION  MEDIATYPE  POOLNAME  OWNER   FS
|----------|----------|--------|--------|---|
 INCLUDE    SFS        VMSYSU:  *        SFS
 EXCLUDE    SFS        VMSYSU:  VMSERVU  SFS
```

Backup and Restore Manager Architecture – non-SSI



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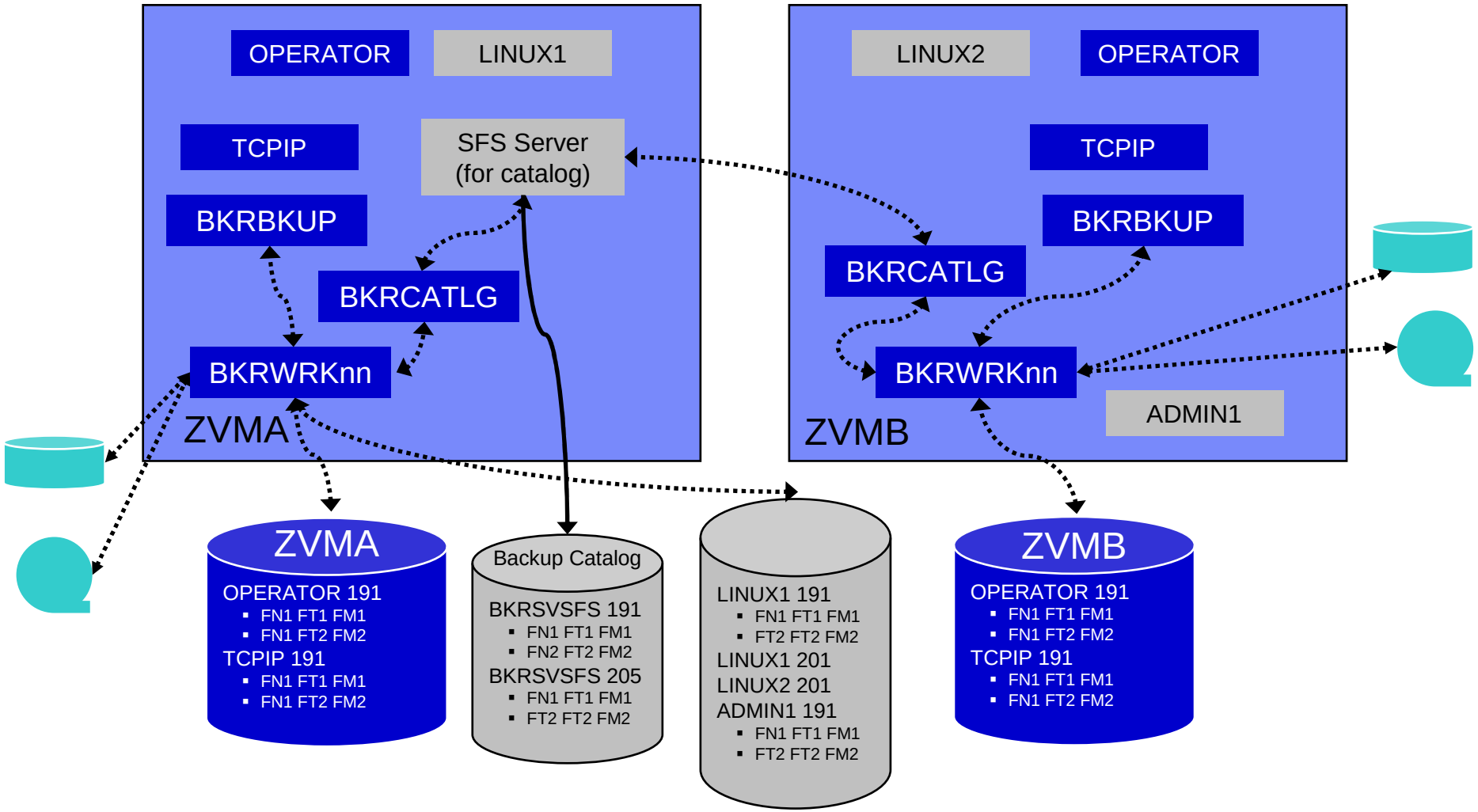
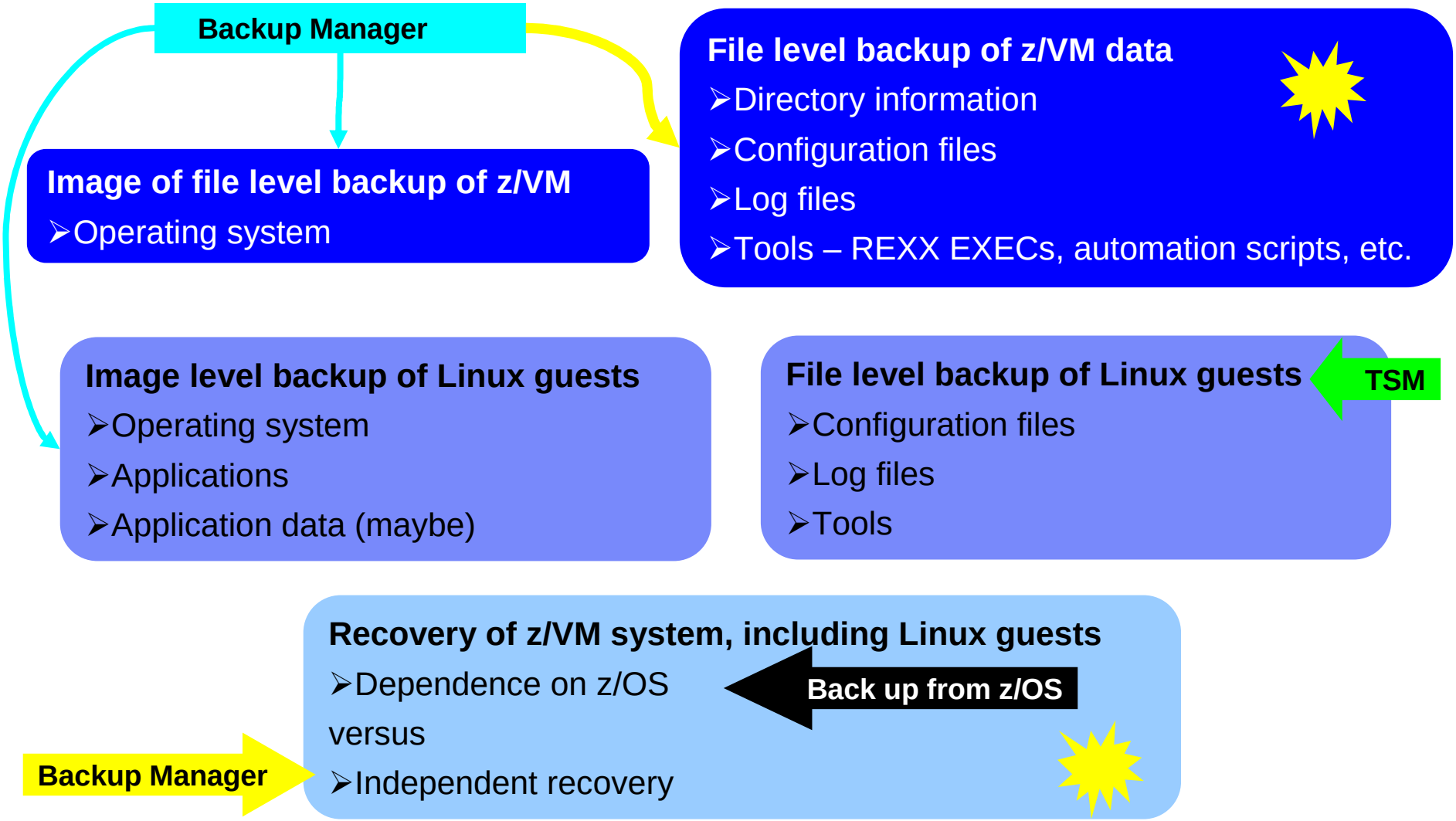
Backup and Restore Manager Architecture – SSI



Recommended Practices – Backup and Recovery



Summary

- **Use Backup and Restore Manager to**
  - Perform file-level backups of z/VM data
  - Perform image level backups of non-z/VM guest data
    - Use Tivoli Storage Manager for file level backups of Linux
  - Perform disaster recovery backups of entire system
  - Easily find and restore data as needed
  - Automatically manage retention of backup data
  - Carefully plan for SSI configurations

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Managing Tapes and Tape Devices
Tape Manager for z/VM

Product Overview

- **Manage tapes**
  - Define tapes in a catalog, including:
    - Free or used
    - Retention/expiration information
    - ATL/VTS or manual mount
    - Data Security Erase
  - Group tapes together into pools
    - Ownership and access control
    - Media type

- **Manage devices**
  - Define available devices
    - Dedicated or assignable
  - Group devices together into device pools
    - ATL/VTS or manual mount
    - Any other grouping you choose
      (read only vs. write, location, etc.)
  - Share devices with other systems

- **Manage mount requests**
  - Volume specific and scratch requests
    - Standard Label
    - Non-Label
    - Bypass Label Processing

Key Benefits

- **Effective management of tapes in ATL or VTS**
  - Granular access control
  - Expiration processing
  - Notification for low threshold for tape resources
  - Interacts with IBM devices through DFSMSRMS on z/VM
  - Interacts with STK devices through STK Host Software Component for VM, or STK VM Client
- **Improved accuracy of manual tape processing**
  - Granular access control
  - Automated interface to Operator for manual mounts
  - Internal label verification at attach/give and detach (SL only)
  - Read/Write verification at attach/give
- **Integrated management of z/OS and z/VM tapes using DFSMSrmm on z/OS**
  - Optionally use RMM on z/OS as the tape catalog for z/VM and z/OS tapes
  - Tapes, access control, and retention managed by the existing RMM catalog
  - Accessible via Tape Manager on z/VM
  - Tapes managed by RMM
  - Devices managed by Tape Manager
  - Not available for STK libraries

Data Security Erase (DSE)

- **Erase (sensitive) data before tape is reused**
- **Option to enable DSE at tape pool or individual tape level**
  - DSE-enabled flag included in each catalog entry
- **DSE-enabled tapes marked as DSE-ready when freed**
- **Tape Manager DSE utility (TMDSE) executed on a separate user ID**
  - Started manually or automatically with Operations Manager
  - Queries the catalog to find all tapes with DSE-ready flag on
  - Mounts each tape
    - Verifies volume label if possible
      - Configuration option to perform DSE on NL tapes or not
    - Erases tape
    - Turns off DSE-ready flag in catalog
  - Tape is now available for scratch unless its HOLD flag is on

Tape Manager in Standard Mode

Tape Manager Machine (TMTMM)

- ✓ Reads configuration files at startup
- ✓ Interacts with users and applications
- ✓ Manages the tape catalog

Device Manager Machine (TMDMM)

- ✓ Interacts with real tape devices
- ✓ Attaches/gives drives to end users/applications
- ✓ Verifies volume labels
- ✓ Verifies read/write status

Library Manager Machine (TMLM1)

- ✓ Interacts with DFSMSRMS or STK software to handle library mounts
- ✓ Handles volume specific and scratch requests
- ✓ One for each RMS or STK server

Command Manager Machine (TMCMM)

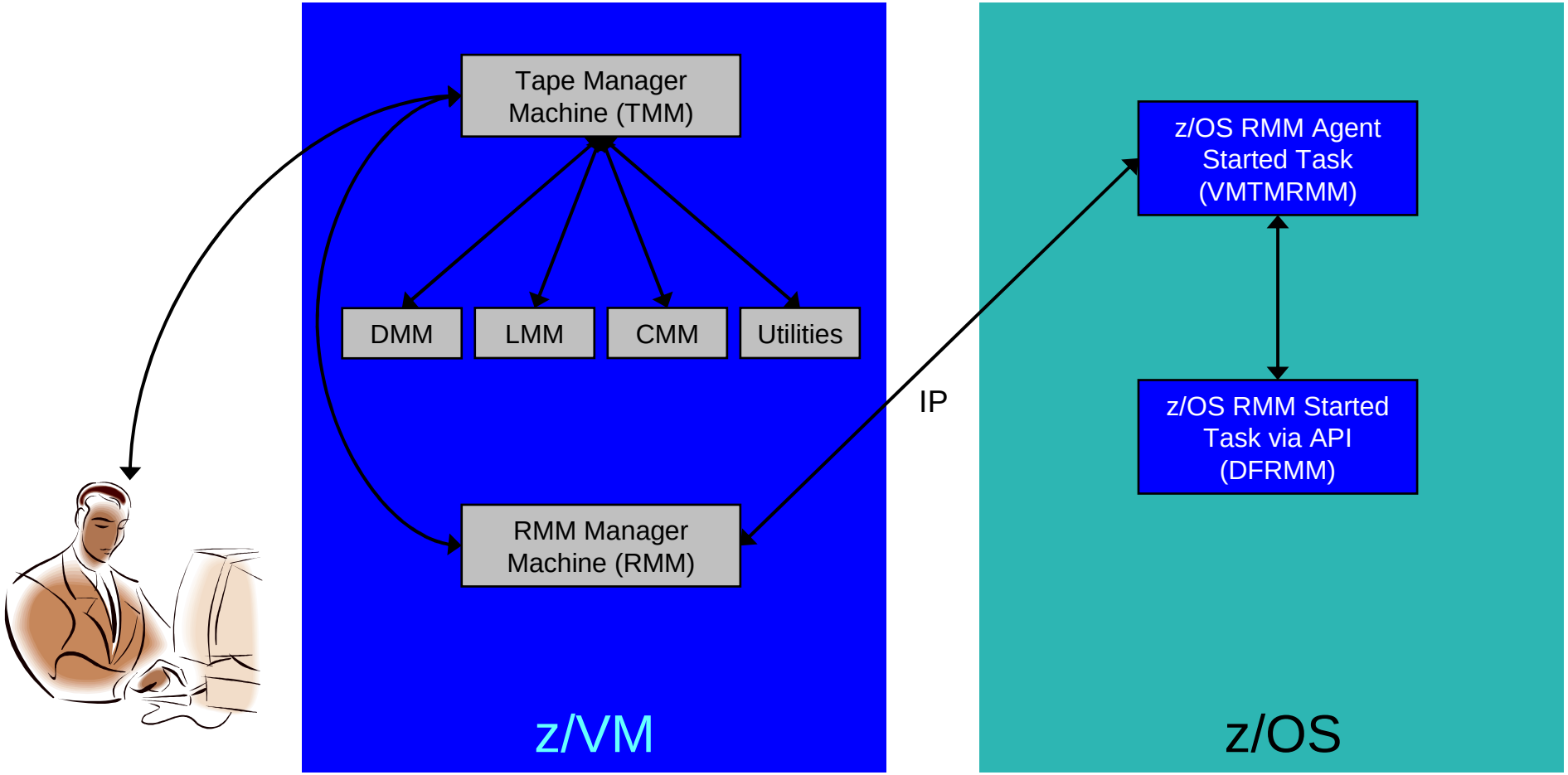
- ✓ Supports subcommand processing in user exit

Customer defined (optional)

- ✓ Data Security Erase utility
- ✓ ATL synchronization utility
- ✓ Catalog verification utility

z/VM

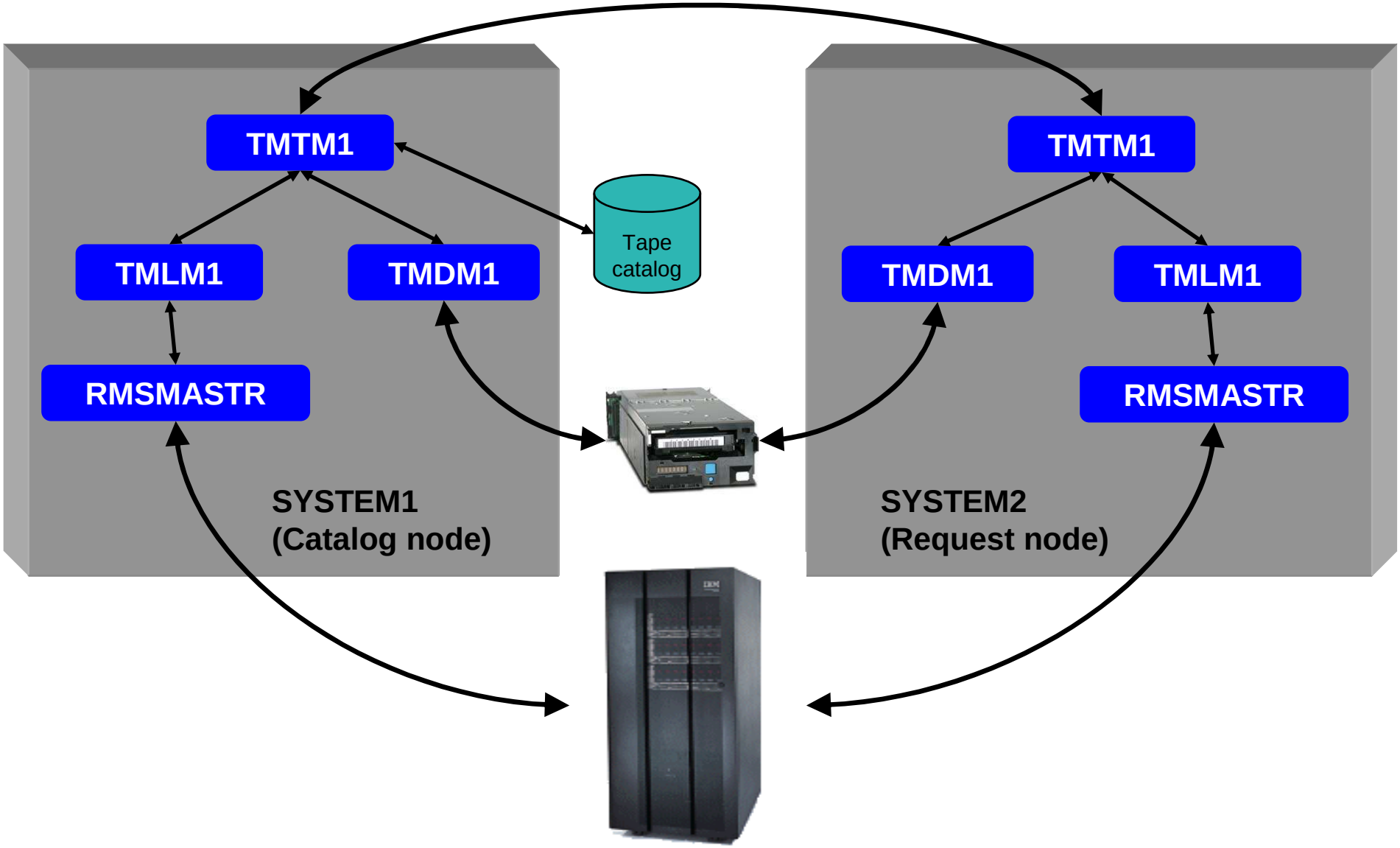
Tape Manager in RMM Mode



Support for One Tape Catalog Across Multiple z/VM Systems

- **One “catalog node”**
  - Responsible for the tape catalog contents
- **Multiple “request nodes”**
  - Manage requests on the local system
  - Communicate with catalog node to read or update catalog data
- **One catalog used by multiple z/VM systems**
  - No longer need to create a catalog on each z/VM system, each with its own range of volsers
  - All z/VM systems share one catalog
- **IP used for communication between systems**

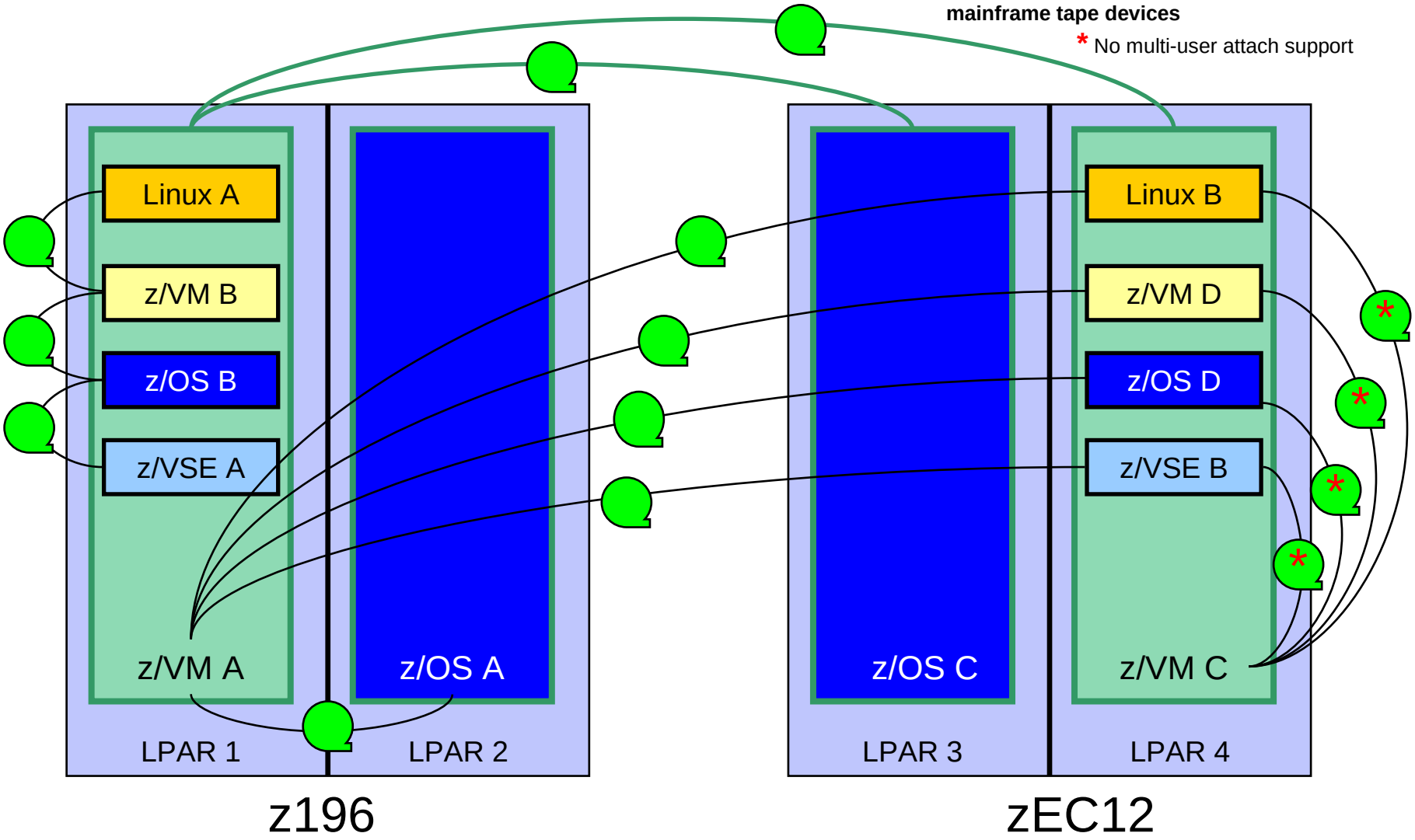
Communication Between Service Machines and Systems



Dynamically Share Tape Devices

- **z/VM systems with IBM Tape Manager**
- **z/OS systems with IBM Automated Tape Allocation Manager**
- **Linux systems with software supporting mainframe tape devices**

* No multi-user attach support



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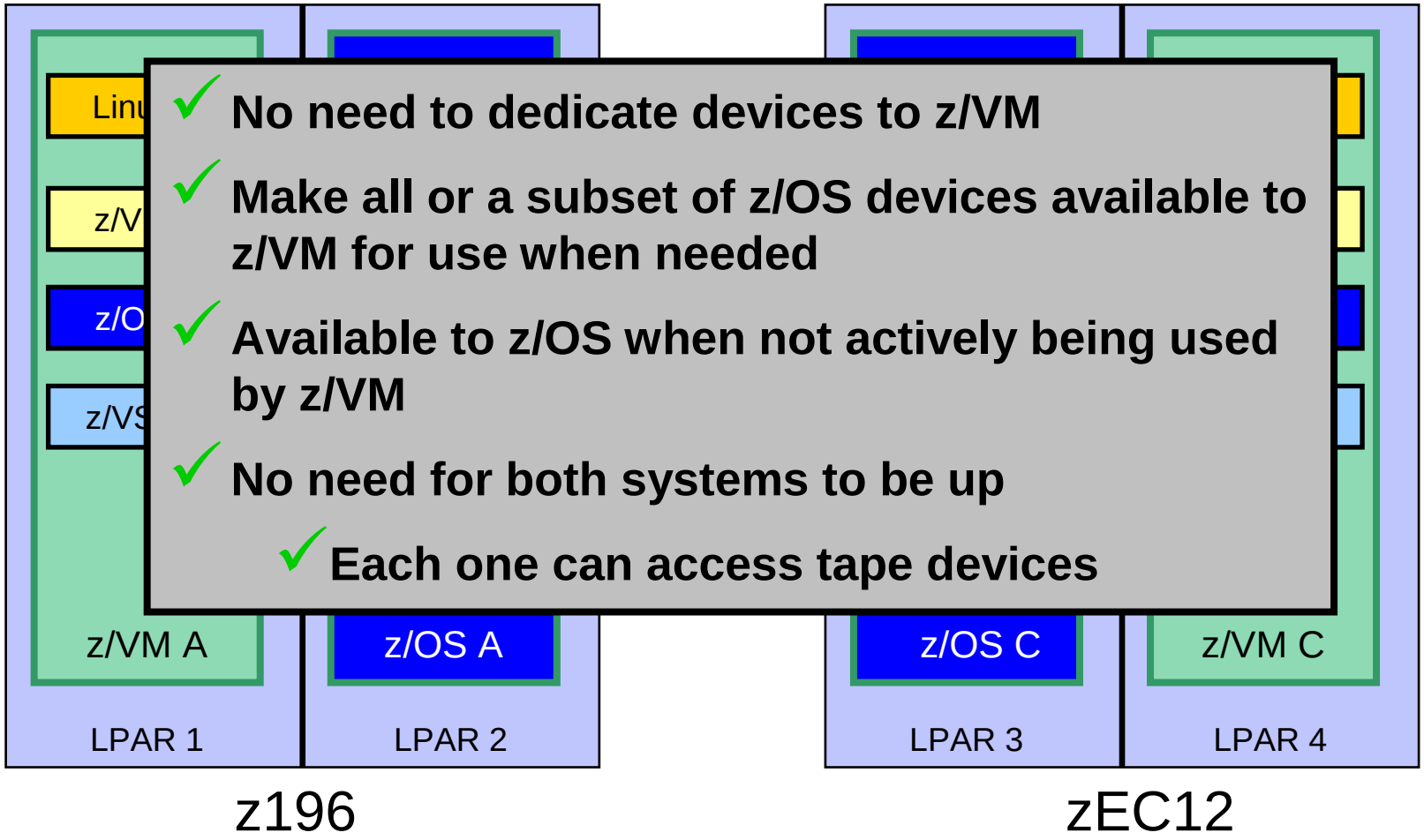

- ✓ **No need to dedicate devices to z/VM**
- ✓ **Make all or a subset of z/OS devices available to z/VM for use when needed**
- ✓ **Available to z/OS when not actively being used by z/VM**
- ✓ **No need for both systems to be up**
- ✓ **Each one can access tape devices**

Summary

- **Use Tape Manager to**
  - Manage and share devices
  - Manage tape volumes
    - Access control
    - Retention
    - Data Security
  - Improve accuracy of mount requests

Summary

- **Management of z/VM systems with Linux guests requires monitoring and management tools**
- **IBM solutions exist**
  - OMEGAMON XE on z/VM and Linux
  - zSecure Manager for z/VM
  - Operations Manager for z/VM
  - Tape Manager for z/VM
  - Backup and Restore Manager for z/VM
  - Archive Manager for z/VM
- **Demos are available**

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 paper and presentation on Backup and Restore Manager website (Library page)**
  - Getting Started with Installation, including SFS server creation and installation of Backup Mgr
    - z/VM V6.2 (and later)
    - z/VM V6.1 and earlier
  - Backing up z/VM and Linux on System z – Tivoli Storage Manager vs Backup Manager

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Demonstration Scenarios

Backup Demos Available (Including Automation)

A. **Perform an incremental backup**

B. **Find and restore a file from the backup catalog**

C. **Backup and restore single and multiconfiguration users in an SSI environment**

D. **Automatically shut down, back up, and restart a Linux guest**

E. **Suspend and resume a Linux guest**

F. **Reviewing a disaster recovery backup**

G. **Reviewing other ways to find data in the backup catalog**

Scenario A:
Performing an Incremental Backup

- **Administrator previously performed a full backup**
- **Incremental job defined, using last full backup as its base**
- **Change a file on user's A-disk**
- **Submit incremental job for review**
- **Submit incremental job for backup processing**
- **Use Operations Manager to monitor backup servers**

Scenario B:
Restoring Files from Backup

- **Full and incremental backups performed previously**
- **User accidentally erases or corrupts a file**
- **User restores the file from backup**
  - Full screen interface to see all files available in backup
    - Including multiple “versions” of the same file
  - Filters and sorting available to easily find the needed file
  - Request restore directly to disk or to reader
- **No administrator intervention required**

Scenario C:
Backup and Restore Single and Multiconfiguration Users in SSI

- **Two member SSI cluster**
  - TEST7SSI, TESTCSSI
- **Three backup jobs for full backups**
  - USERFULL – all single configuration users across the SSI cluster
    - Always run from TEST7SSI (required (for now))
  - IDSSI7FL – all multiconfiguration (IDENTITY) users on TEST7SSI
    - Always run from TEST7SSI (required)
  - IDSSICFL - all multiconfiguration (IDENTITY) users on TESTCSSI
    - Always run from TESTCSSI (required)
- **Three similar jobs for incremental**
- **Restore files in multiple ways**
  - Single configuration users
    - Restore to disk or reader from any member of the cluster
  - Multiconfiguration users
    - Restore to disk from the local member
    - Restore CMS files to reader from any member

Scenario D: Scheduling Image Backups of Linux Guests

- **Initiated or scheduled by Operations Manager**
  - Schedule defined in Operations Manager to initiate backups at specific times/intervals
  - Action associated with each schedule
    - Linux guest is shut down
    - Operations Manager watches for shutdown complete
    - Sends request to Backup and Restore Manager to back up the specific DASD/minidisks associated with the guest
      - Alternatively use FLASHCOPY to copy DASD, restart guest, then perform backup of copy of DASD.
    - Operations Manager watches for backup complete message
    - Restarts Linux guest
  - Guest is down for minimum time required for backup

Scenario E: Suspend and Resume a Linux Guest

- **From DEMOADMN, view the console of the Linux guest**

```
gomcmd opmgrm1 viewcon user(rhel6d)
```

- **From MAINT, suspend a Linux guest using CP SIGNAL SHUTDOWN**

```
cp signal shutdown rhel6d within 90
```

- **On DEMOADMN, note the guest suspending and logging off**
- **From MAINT, resume a Linux guest**

```
cp xautolog rhel6d
```

- **On DEMOADMN, note the guest resuming**

Scenario F:
Reviewing a Disaster Recovery Backup

- **Create a backup job based on sample provided**
- **Perform image backup of DASD volumes for Disaster Recovery (DR) purposes**
  - Can include z/VM and Linux guests
- **Output of backup is a DDR tape**
  - Compatible with DDR for restore at recovery site
- **Submit DR job for review**
- **Review output of review processing**

Scenario G:
Reviewing data in the Backup catalog for recovery

- **Various backup jobs have previously been submitted and completed**
- **Full screen interfaces available for searching the backup catalog and finding data available for recovery**
  - BKRLIST
    - Useful when looking for a specific file or set of files owned by a specific user ID
    - Users with ADMIN authority beware of size
      - Use parameters to narrow the search
  - BKRUSER
    - Useful when looking for backup jobs associated with a specific user ID
  - BKRJOB
    - Useful when looking for backup jobs by job name
  - BKRVOL
    - Useful when looking for backup jobs associated with a specific DASD volume

IBM Software

Demonstration Scenarios
Screenshots

Scenario A:
Performing an Incremental Backup

- **Administrator previously performed a full backup**
- **Incremental job defined, using last full backup as its base**
- **Change a file on user's A-disk**
- **Submit incremental job for review**
- **Submit incremental job for backup processing**
- **Use Operations Manager to monitor backup servers**

Scenario A: Detailed Steps

- **From a z/VM user ID, change a file**

```
xedit b b a
```

- **From an authorized z/VM user ID, submit a backup job for review**

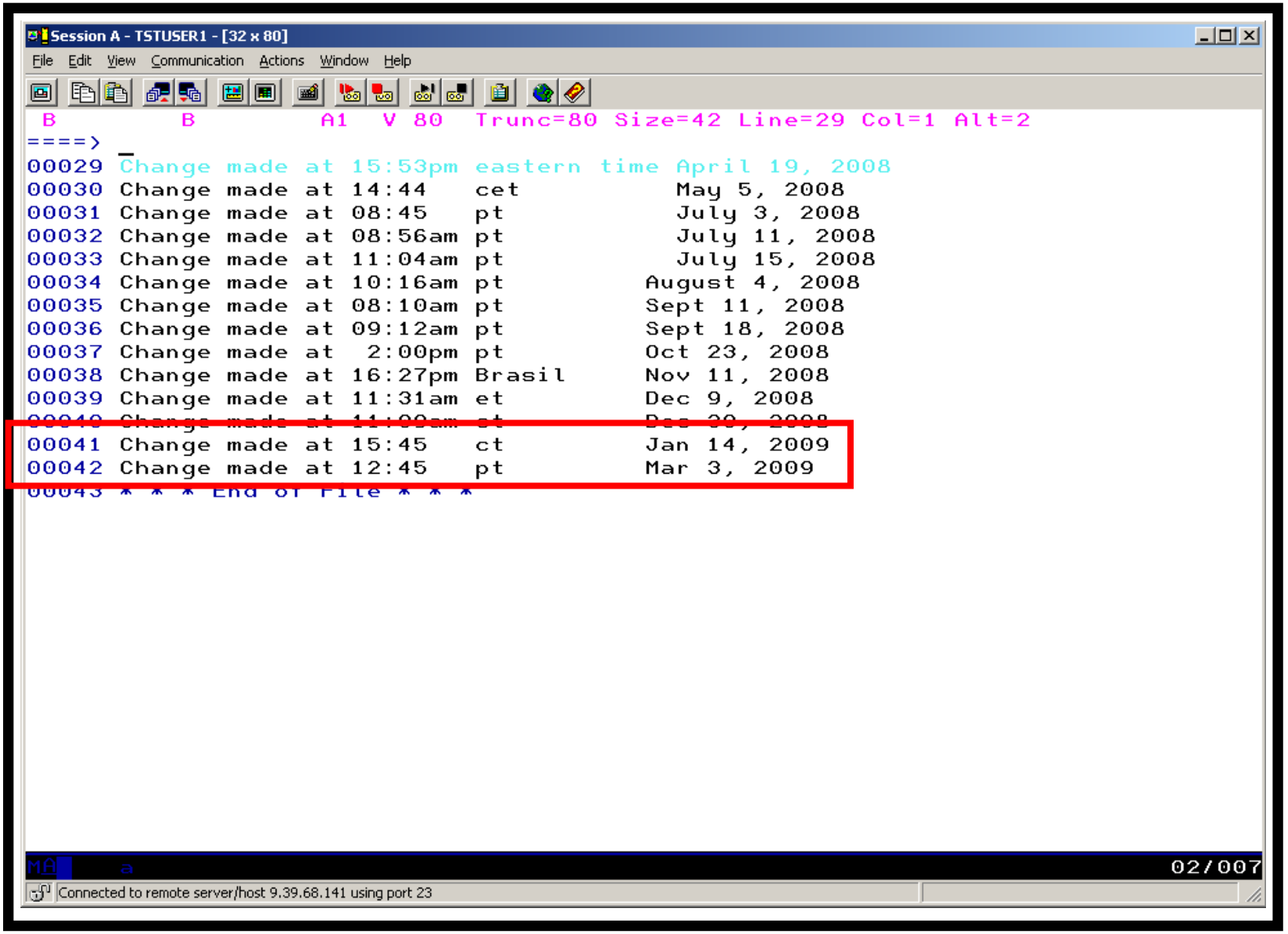
```
smsg bkrbkup review increm01
```

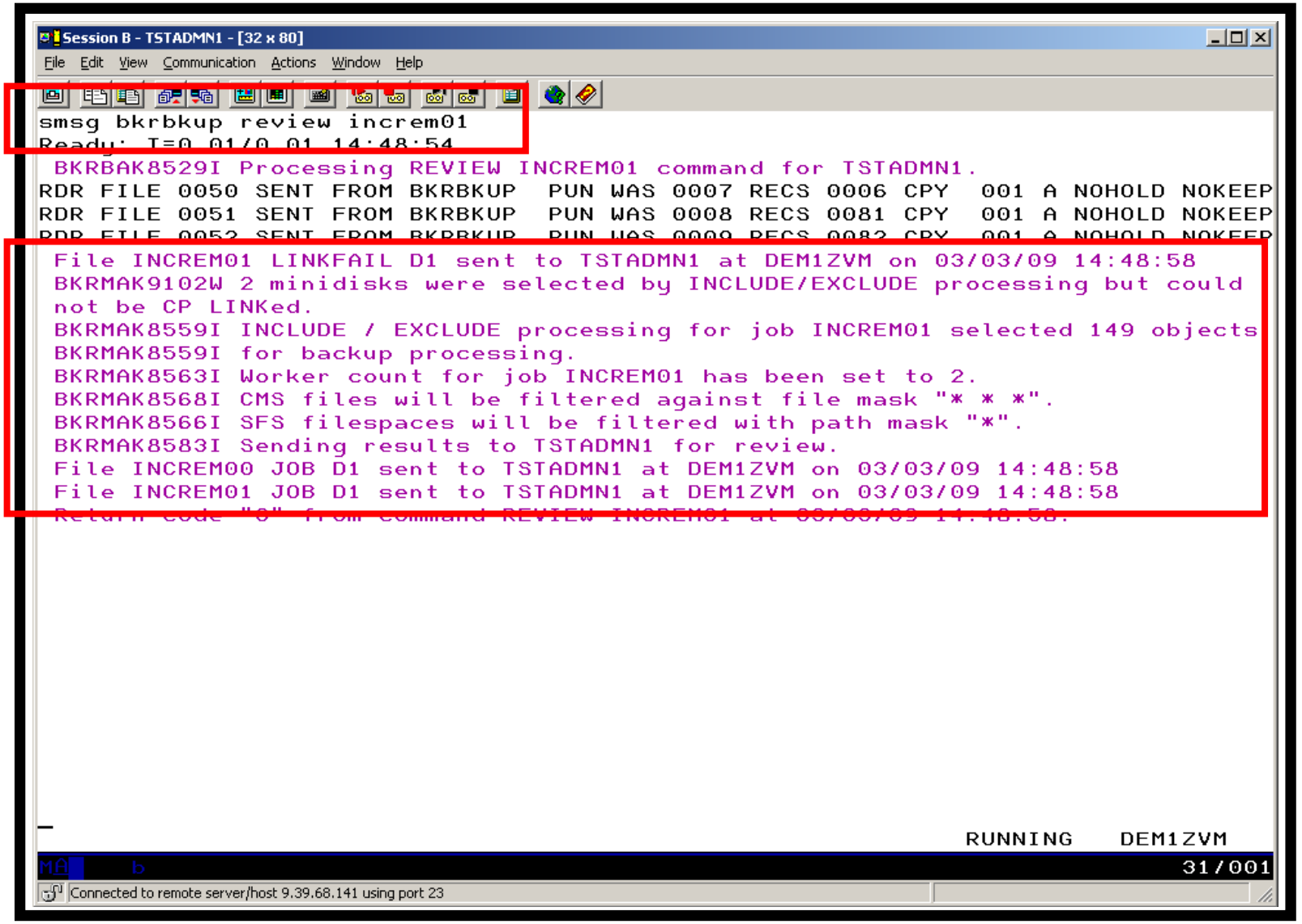
- **Review the resulting files in the reader (LINKFAIL and JOB files)**
- **From an authorized z/VM user ID, submit a backup job for backup processing**

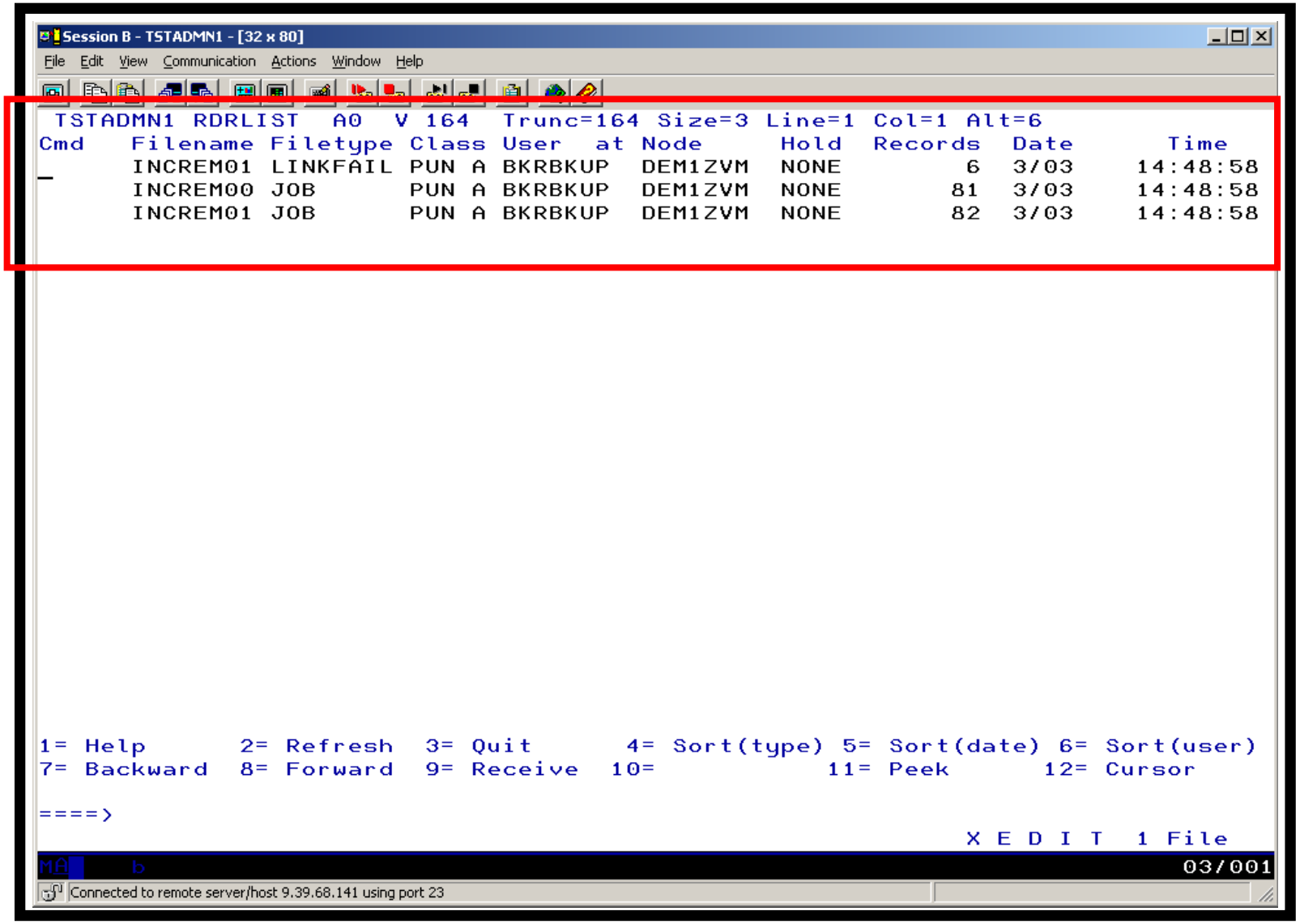
```
smsg bkrbkup submit increm01
```

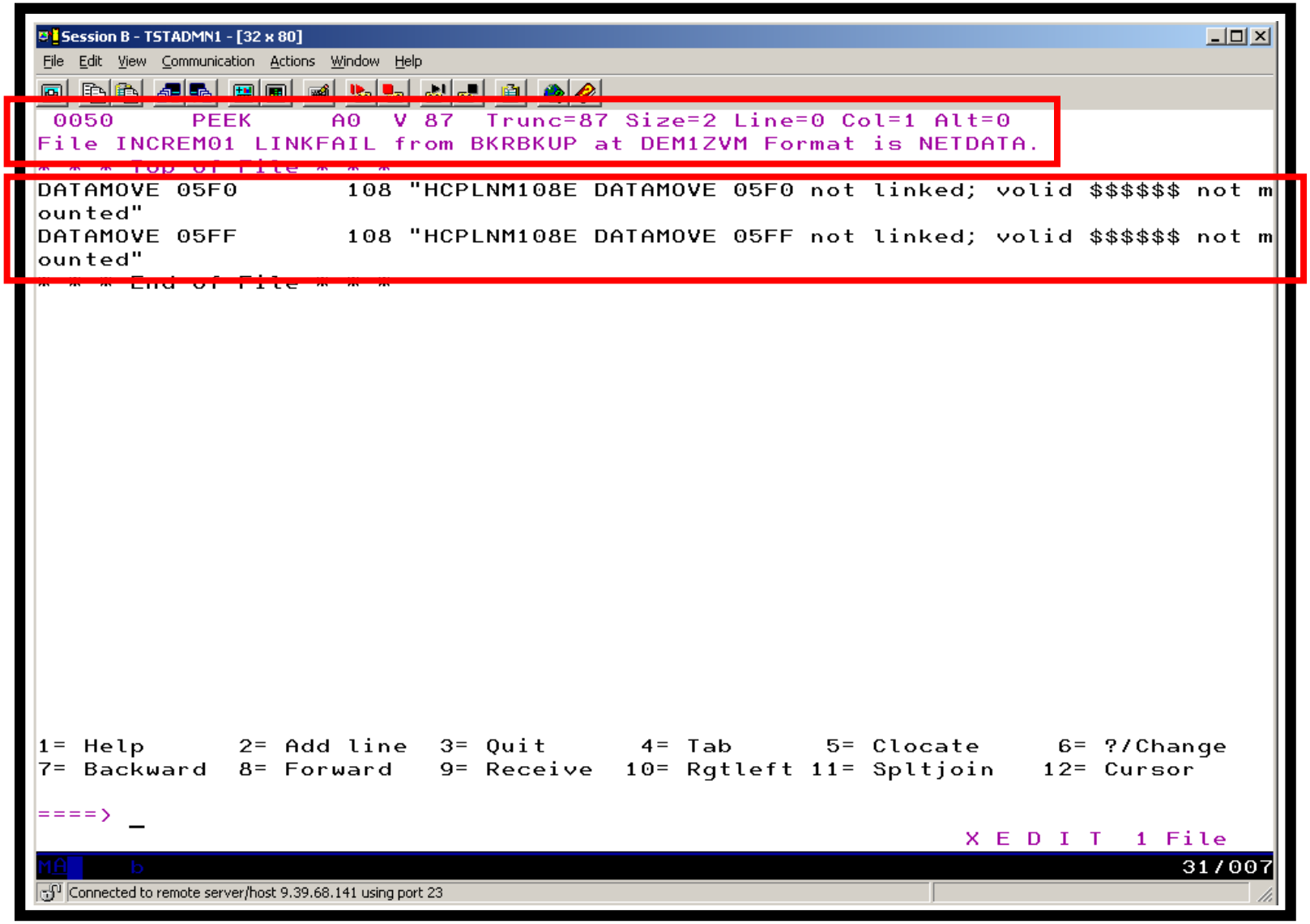
- **View the console of the backup servers to see the processing**

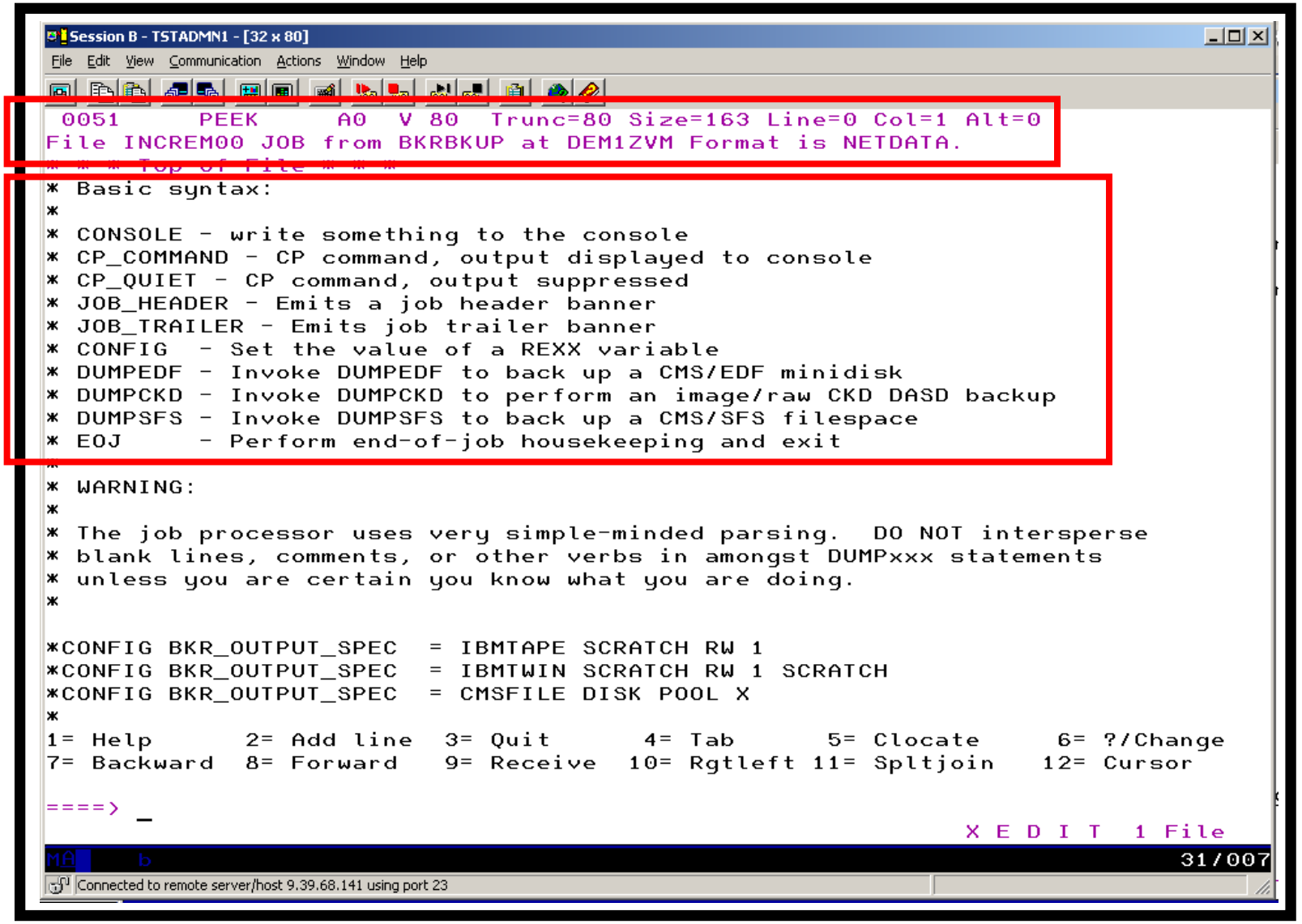
```
gomcmd opmgrm1 viewcon user(backup)
```

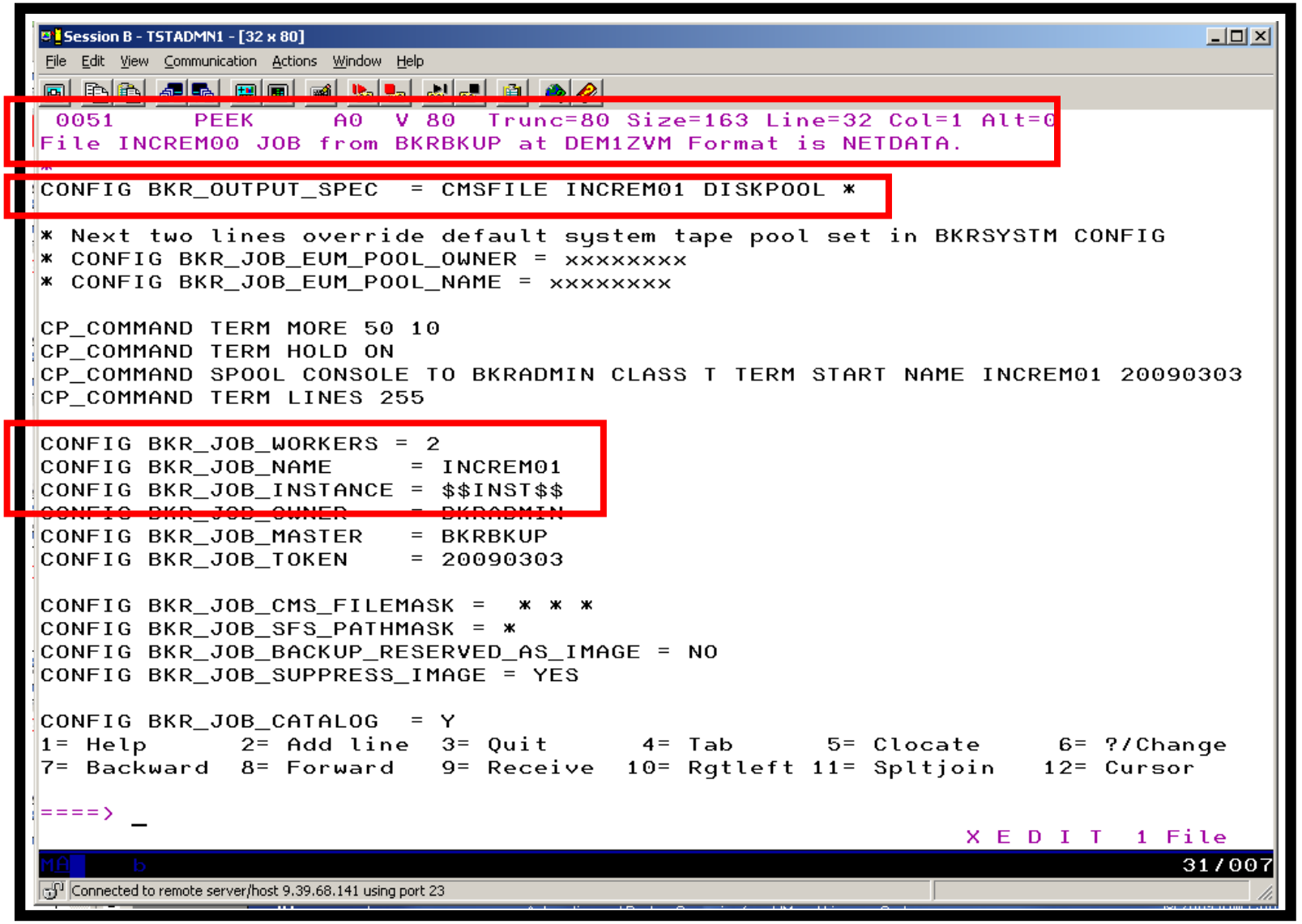


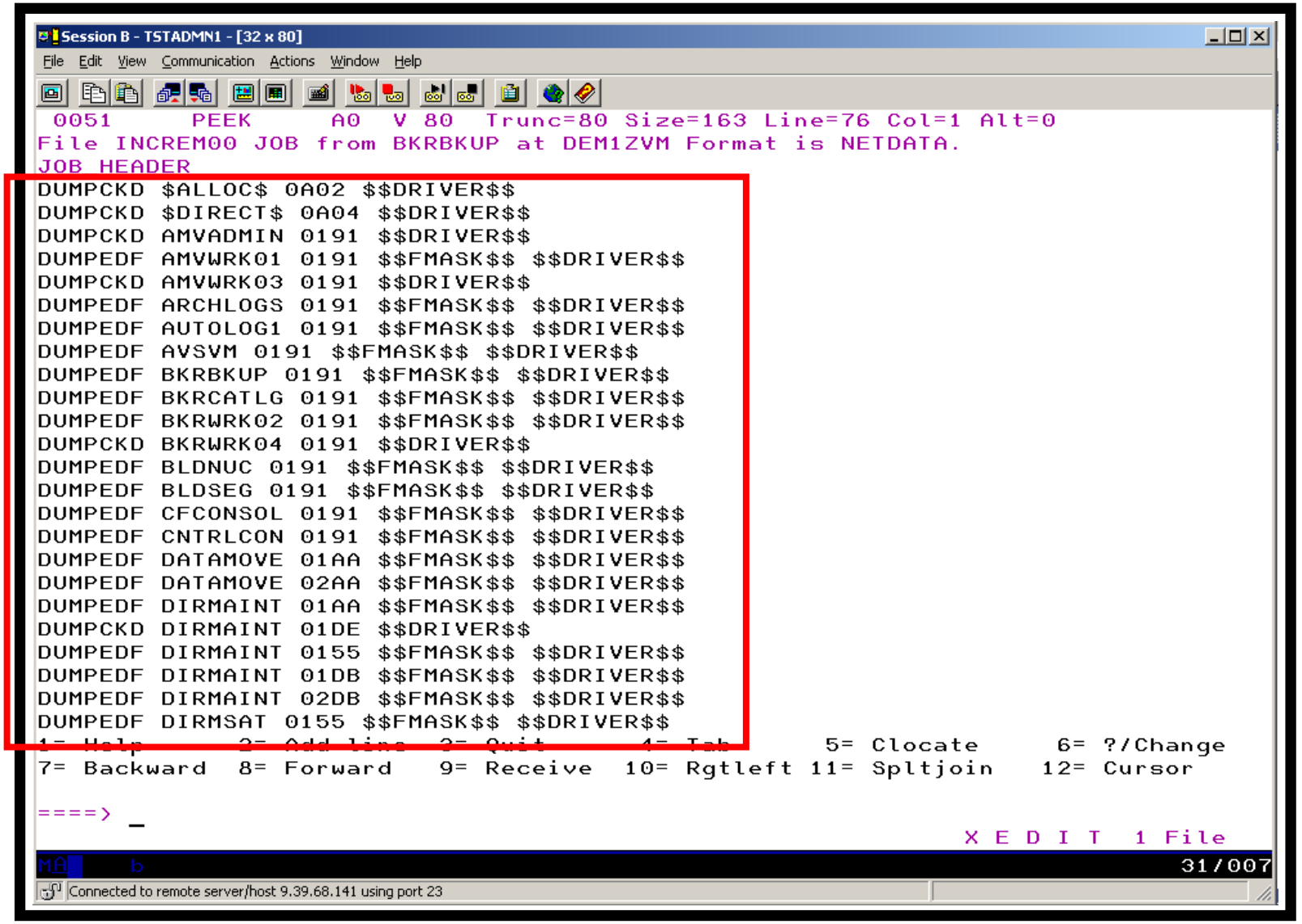


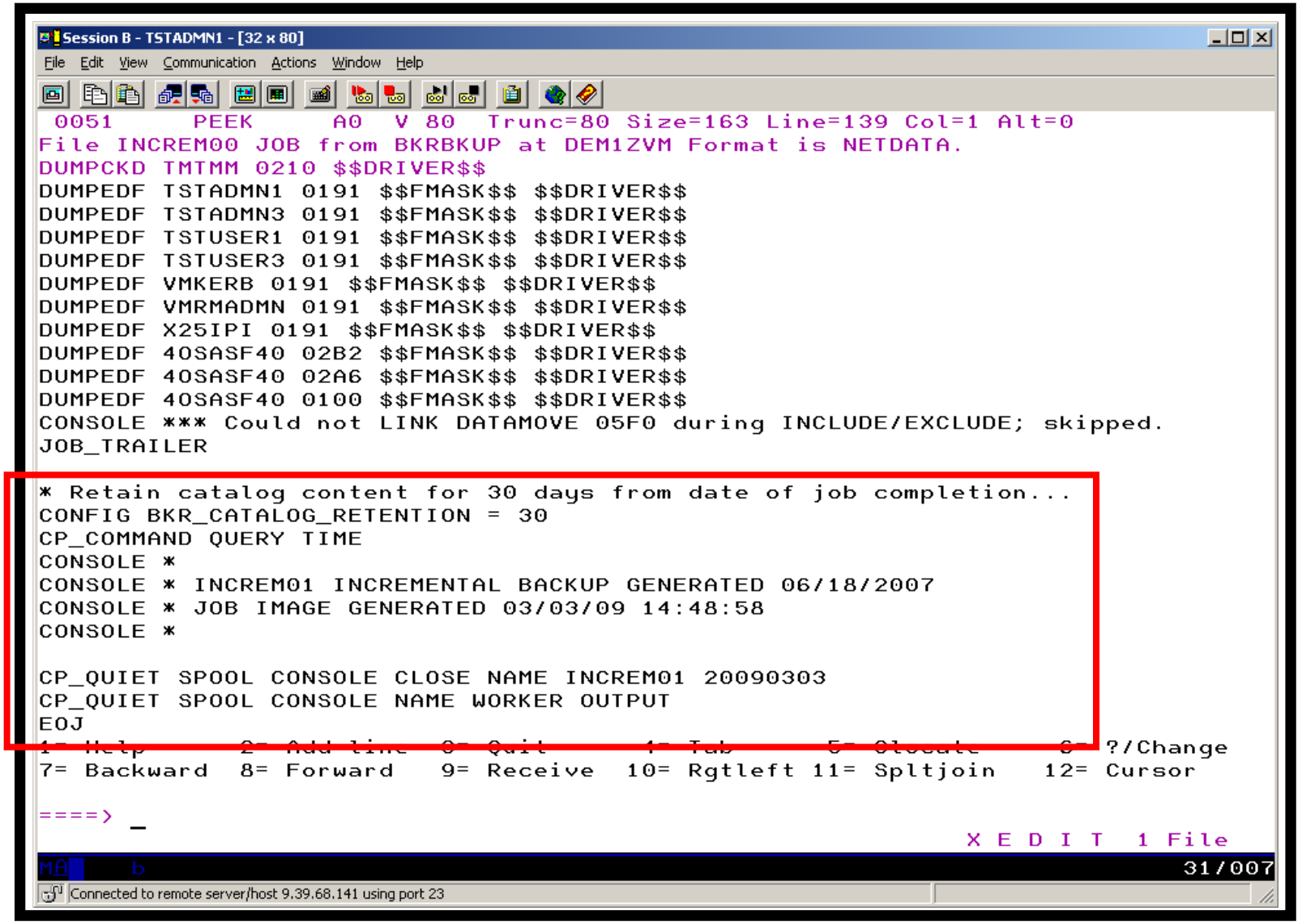


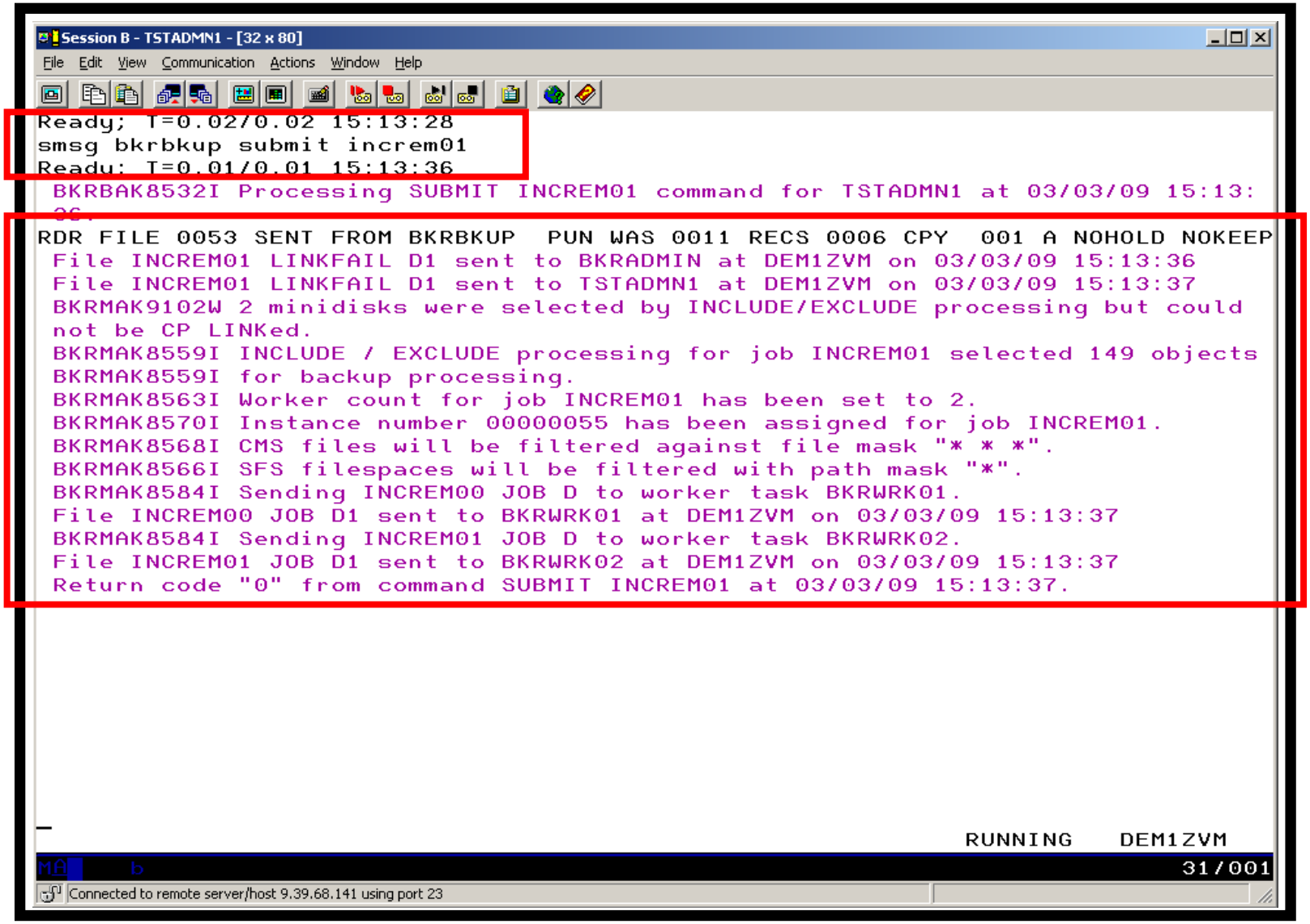


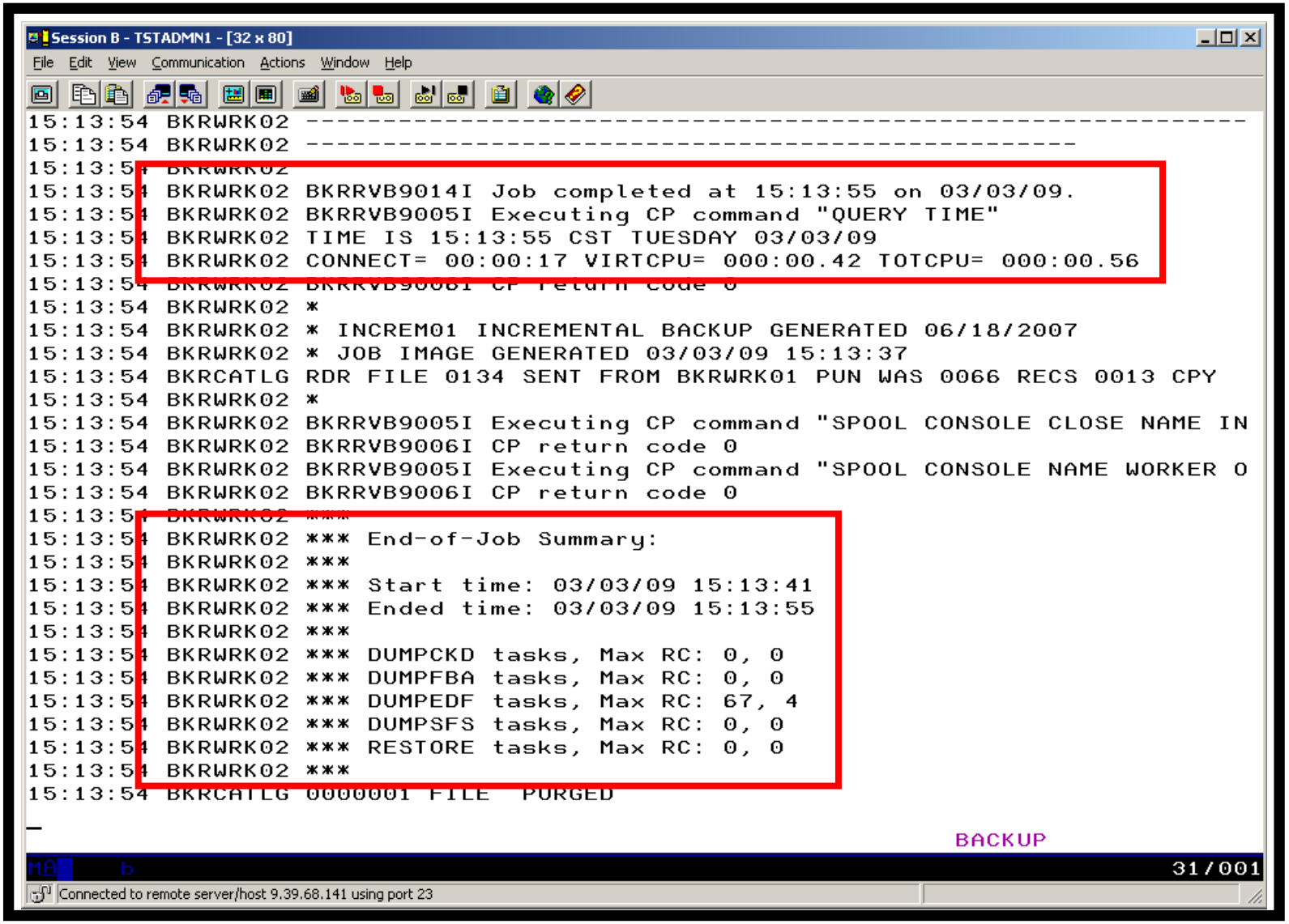












Scenario B:
Restoring Files from Backup

- **Full and incremental backups performed previously**
- **User accidentally erases or corrupts a file**
- **User restores the file from backup**
  - Full screen interface to see all files available in backup
    - Including multiple “versions” of the same file
  - Filters and sorting available to easily find the needed file
  - Request restore directly to disk or to reader
- **No administrator intervention required**

Scenario B: Detailed Steps

- **From a z/VM user ID, view all catalog data you own**

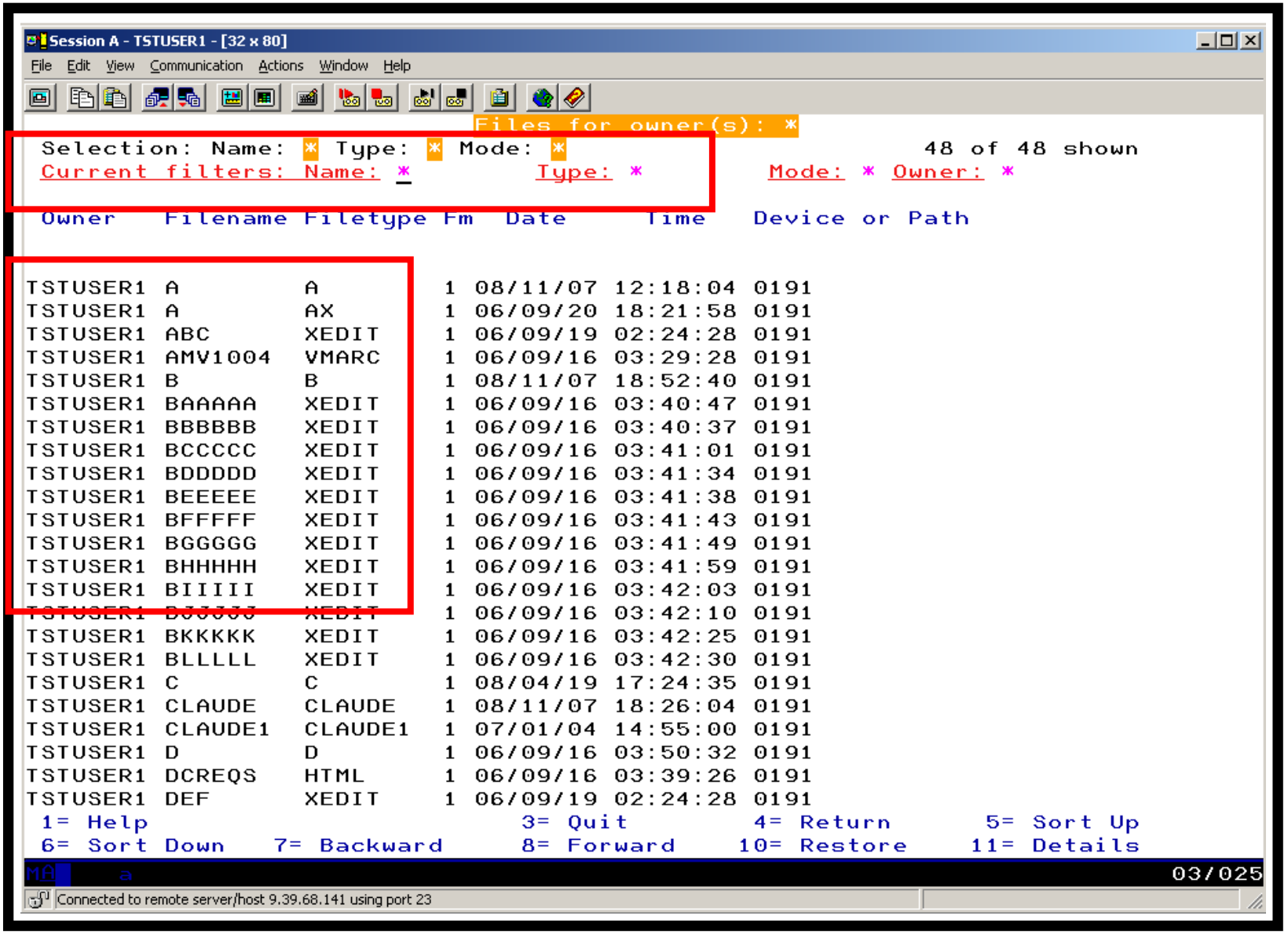
```
bkrlist
```

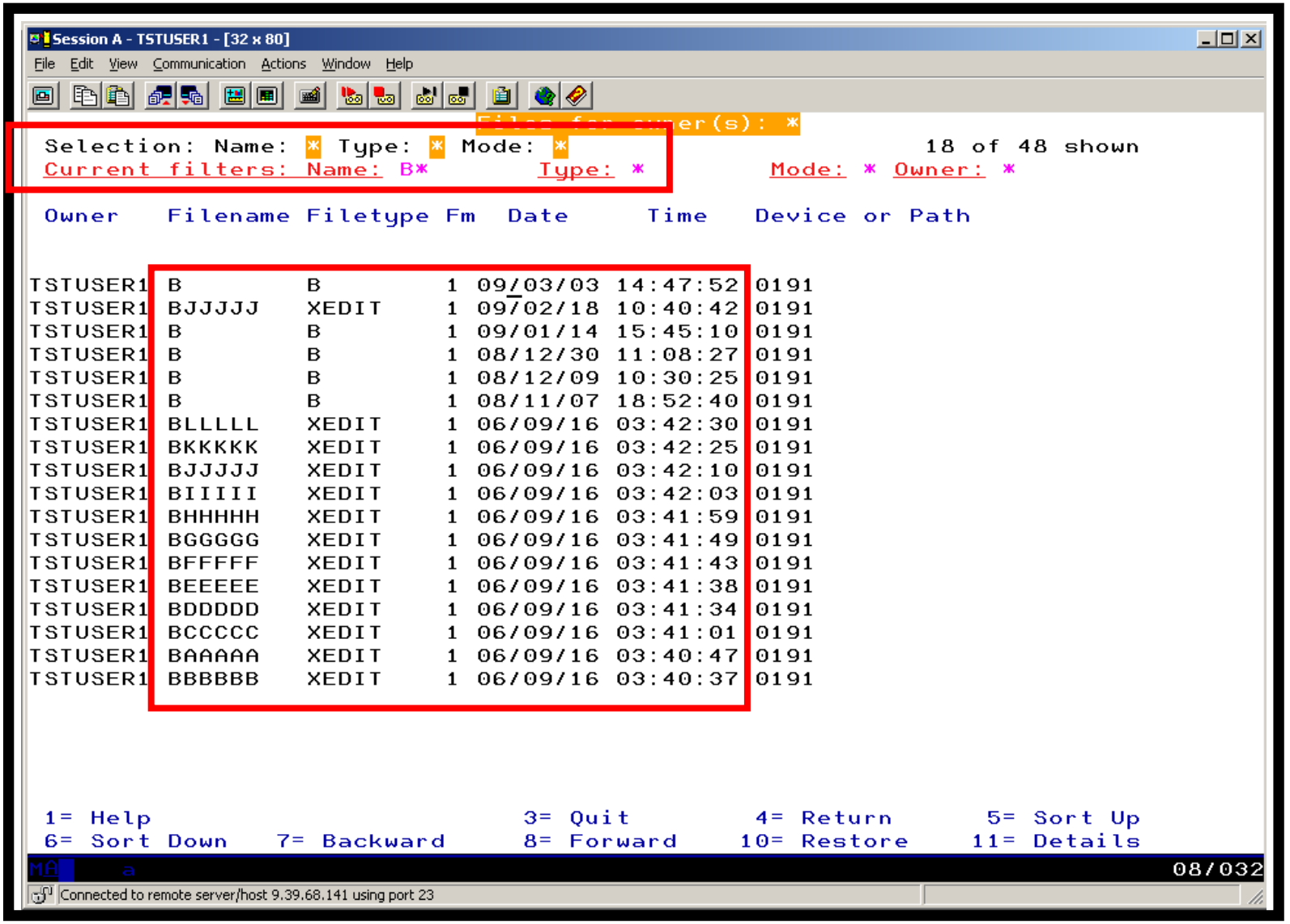
- **Use the filters to find the file you want to restore**
- **Put the cursor on the file and hit F10**
- **Specify the user ID to whom the file should be sent and hit F10**
- **Look at the reader of that user ID to see the restored file and a copy of the console during the restore processing**

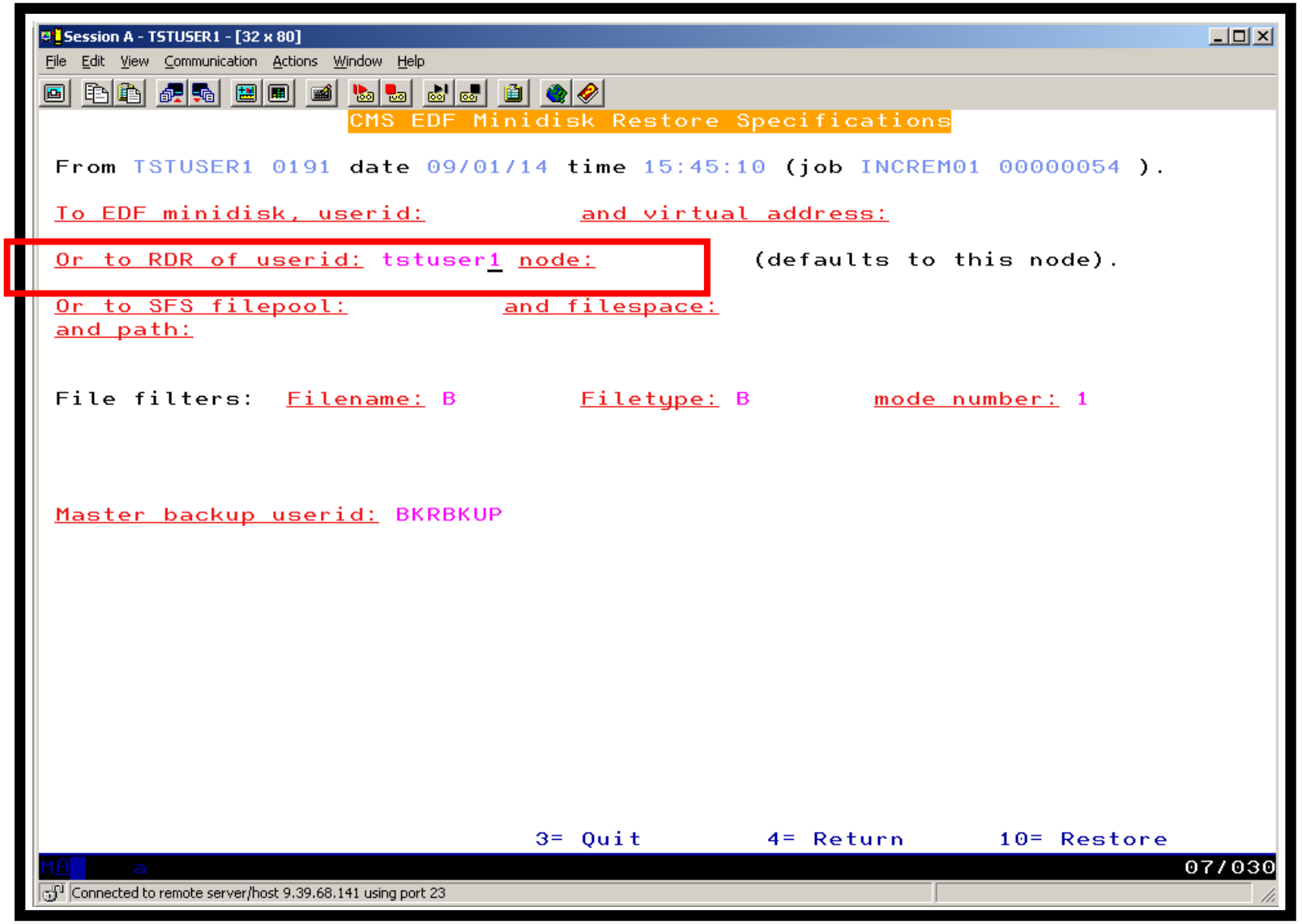
```
rdrlist
```

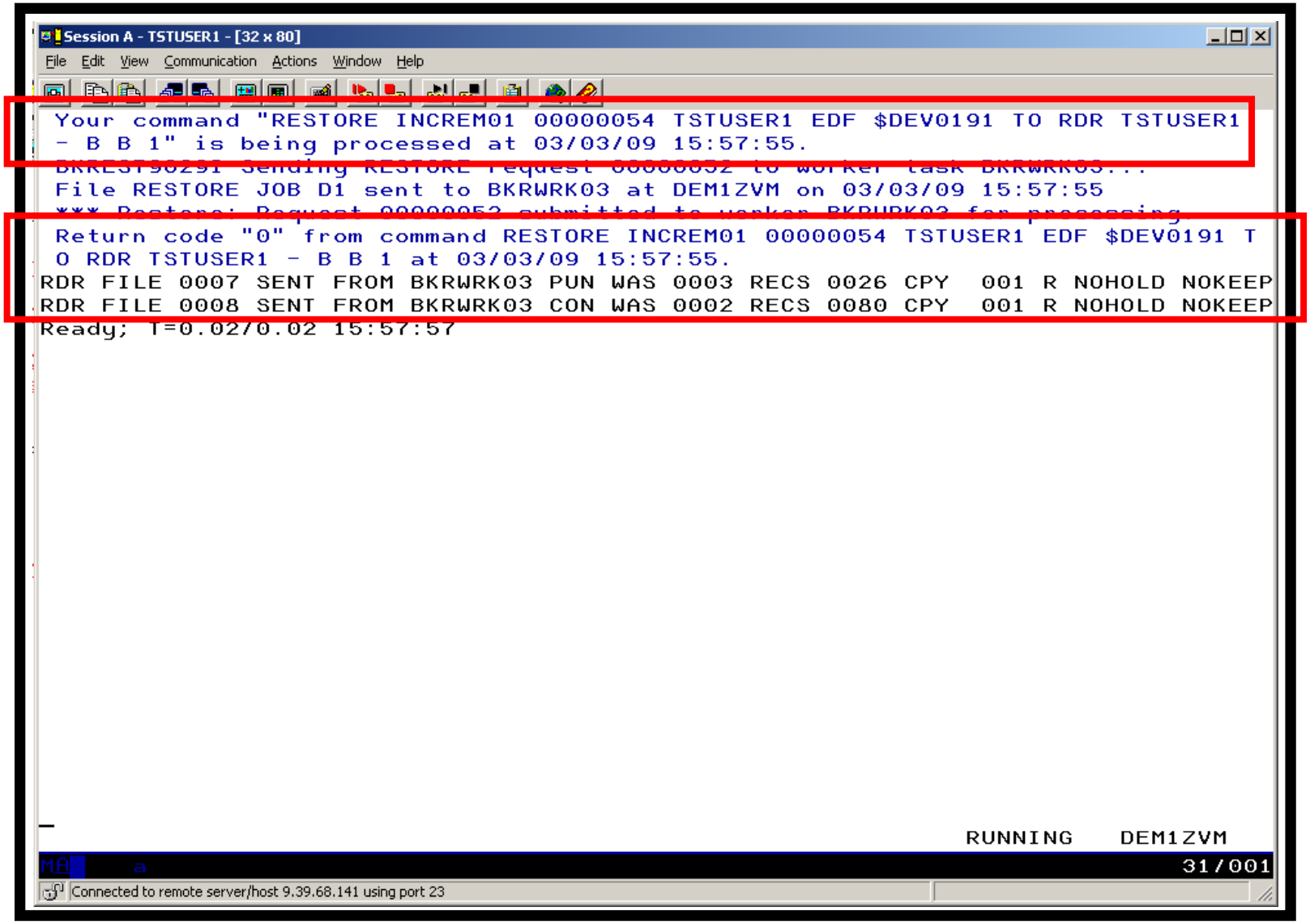
- **View the contents of the file to verify it's the correct version**

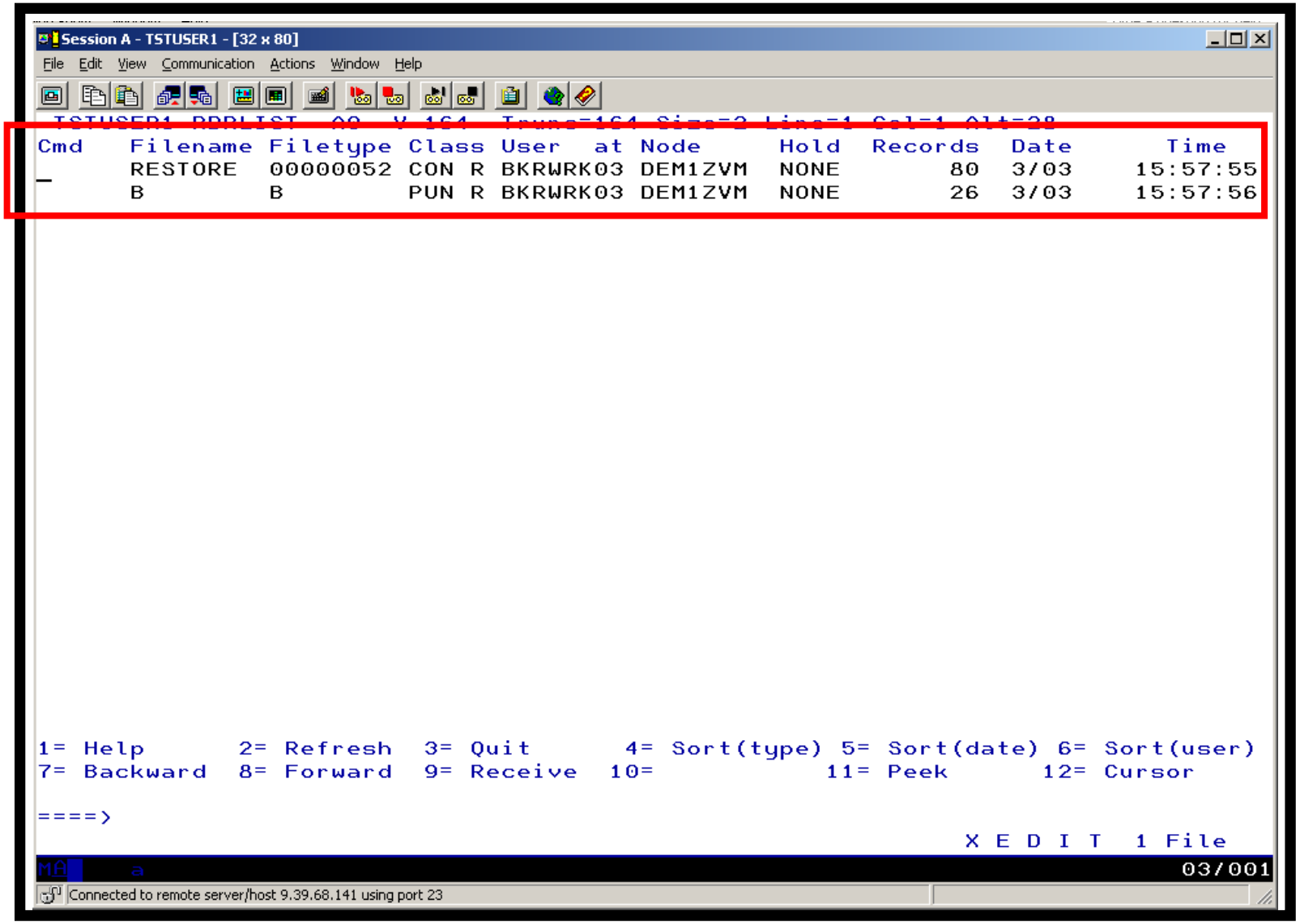
```
peek
```

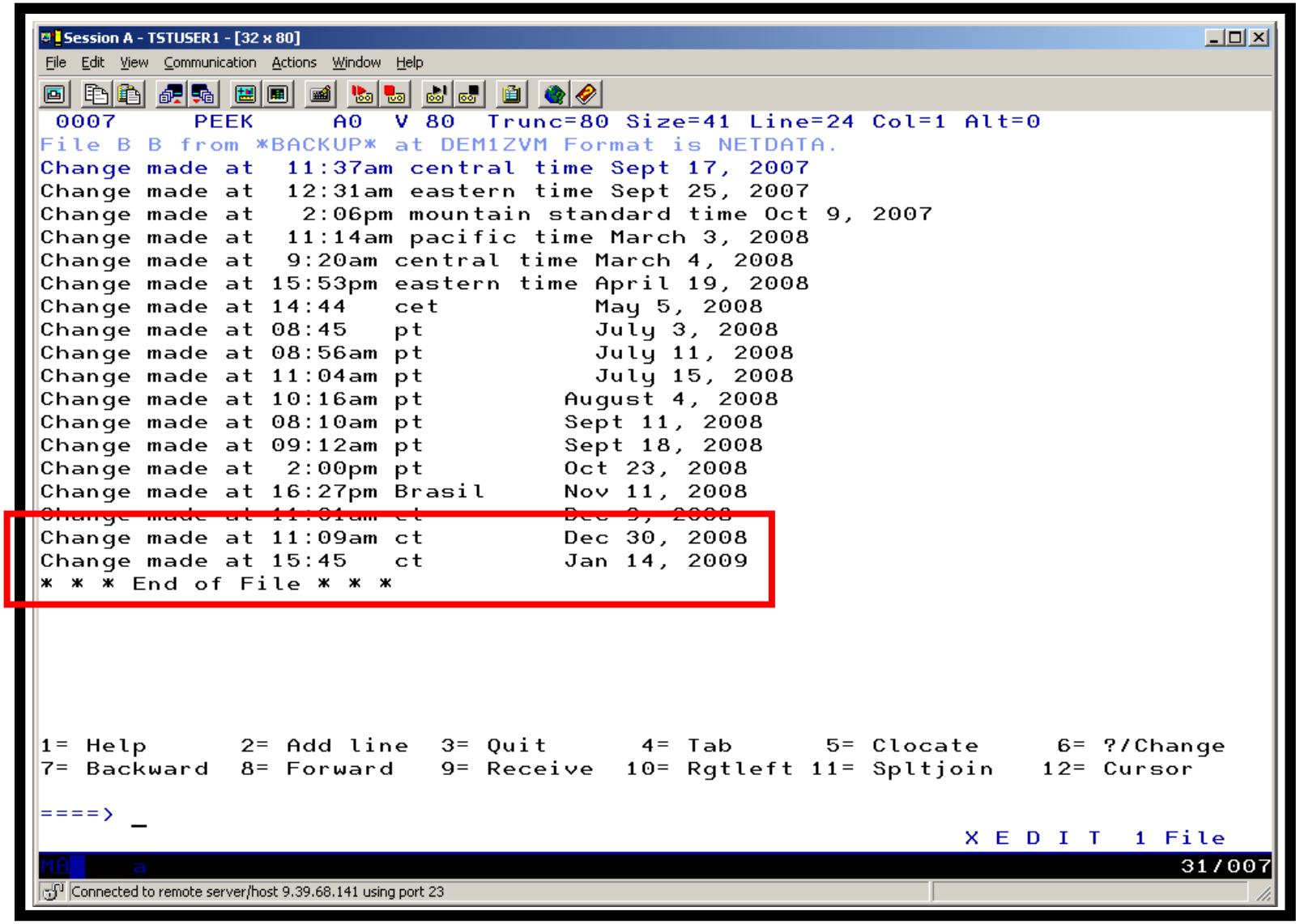












Scenario C:
Backup and Restore Single and Multiconfiguration Users in SSI

- **Two member SSI cluster**
  - TEST7SSI, TESTCSSI
- **Three backup jobs for full backups**
  - USERFULL – all single configuration users across the SSI cluster
    - Always run from TEST7SSI (required (for now))
  - IDSSI7FL – all multiconfiguration (IDENTITY) users on TEST7SSI
    - Always run from TEST7SSI (required)
  - IDSSICFL - all multiconfiguration (IDENTITY) users on TESTCSSI
    - Always run from TESTCSSI (required)
- **Three similar jobs for incremental**
- **Restore files in multiple ways**
  - Single configuration users
    - Restore to disk or reader from any member of the cluster
  - Multiconfiguration users
    - Restore to disk from the local member
    - Restore CMS files to reader from any member

Scenario C: Detailed Steps

- **From a Backup Manager admin ID (DEMOADMN) on TEST7SSI, view all catalog data for multiconfiguration user OP1**

```
bkruser
```

- **Use the filters to find all files for OP1's 191 disk**
  - Note files exist from both TEST7SSI and TESTCSSI
- **F4 to return and then find all files for single configuration user DEMOADMN**
  - Note files only exist in the USERxxxx jobs – not member specific
- **Update a file on OP1 191 disk**

```
link op1 191 333 mr
acc 333 z
x test op1 z
Add a new line to the file
file
rel z (det
```

- **Similarly update a file on DEMOADMN 191 disk**

```
x test demoadmn a
```

- **Perform a review of the incremental backup for multiconfiguration users on TEST7SSI**

```
smsg bkrbkup review idssi7in
```

Scenario C: Detailed Steps

- **Perform a backup for multiconfiguration users on TEST7SSI**

```
smsg bkrbkup submit idssi7in
```

- **View the console of the worker(s) assigned**

```
gomcmd opmgrm1 viewcon user(bkrwrkxx)
```

- **Perform a backup for single configuration users in the TEST7SSI and TESTCSSI cluster**

```
smsg bkrbkup submit userincr
```

- **When jobs are complete find the updated test files for OP1 and DEMOADMN in the catalog**

```
bkrlist
```

- **Once a file is chosen, use F10 to restore the file to the reader**
- **View the files in the reader**

```
rdrlist
```

- **Logoff DEMOADMN (do not disconnect – must logoff)**

```
logoff
```

Scenario C: Detailed Steps

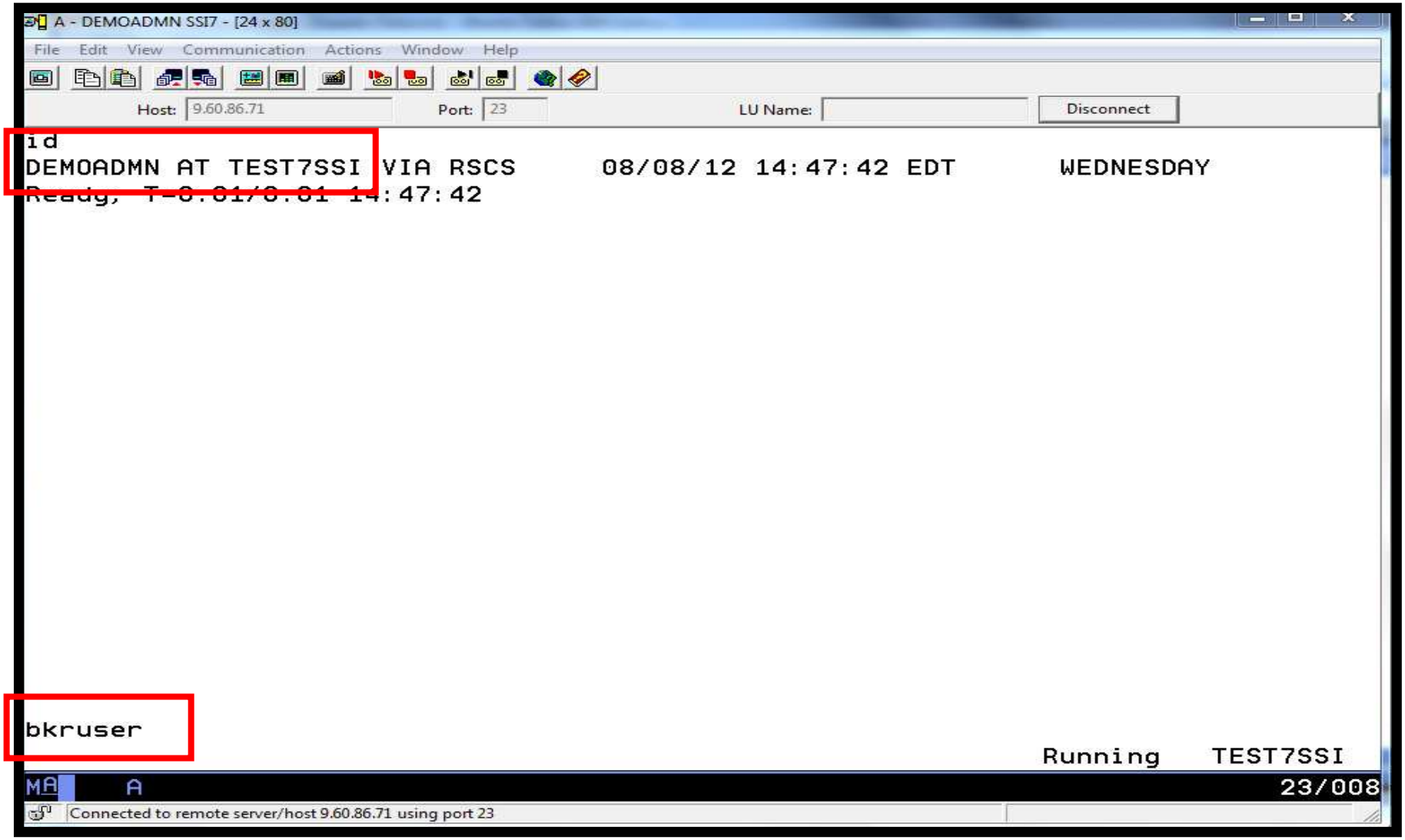
- **Logon DEMOADMN on the other member of the cluster TESTCSSI**
- **Find the test files for DEMOADMN in the catalog**

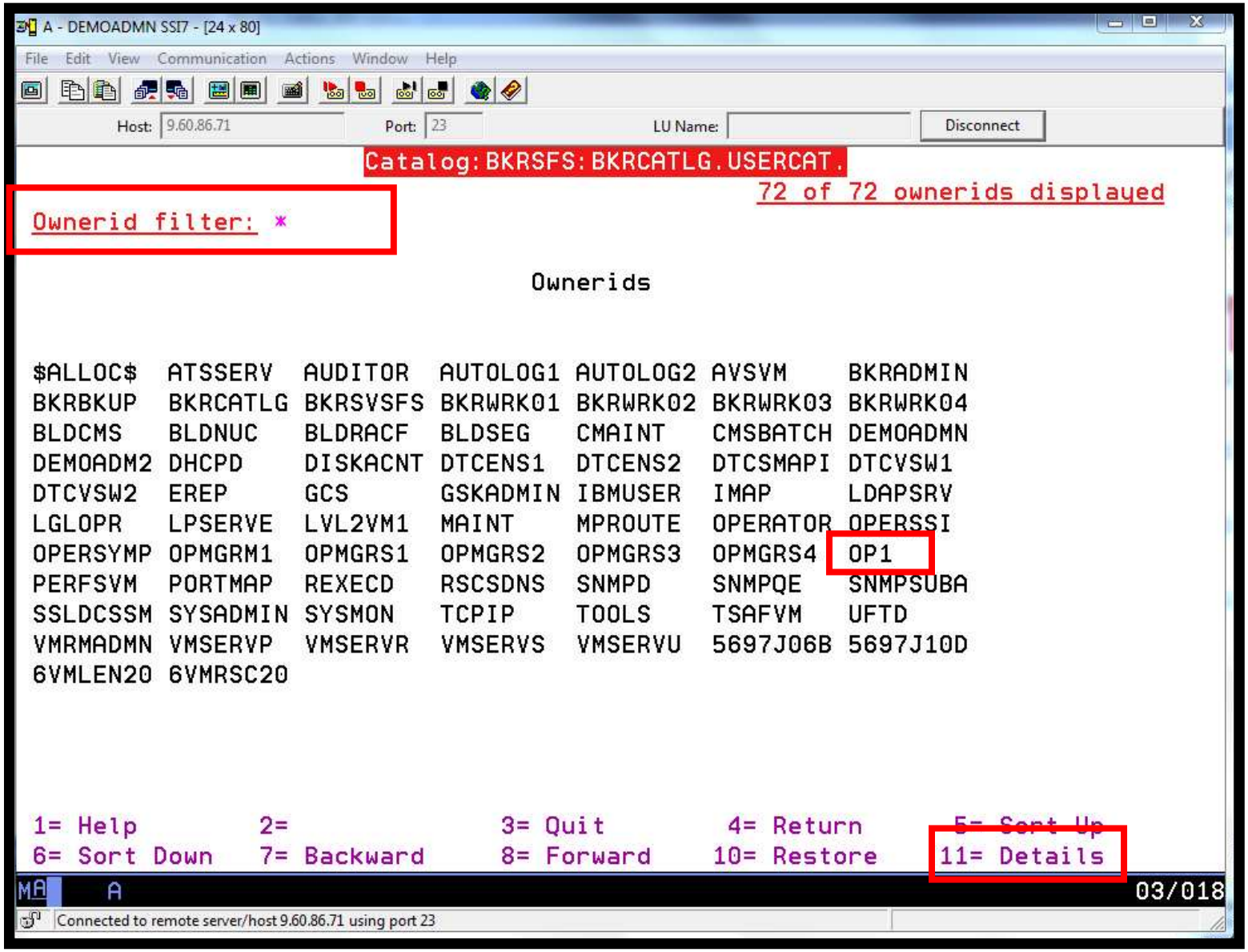
```
bkrlist
```

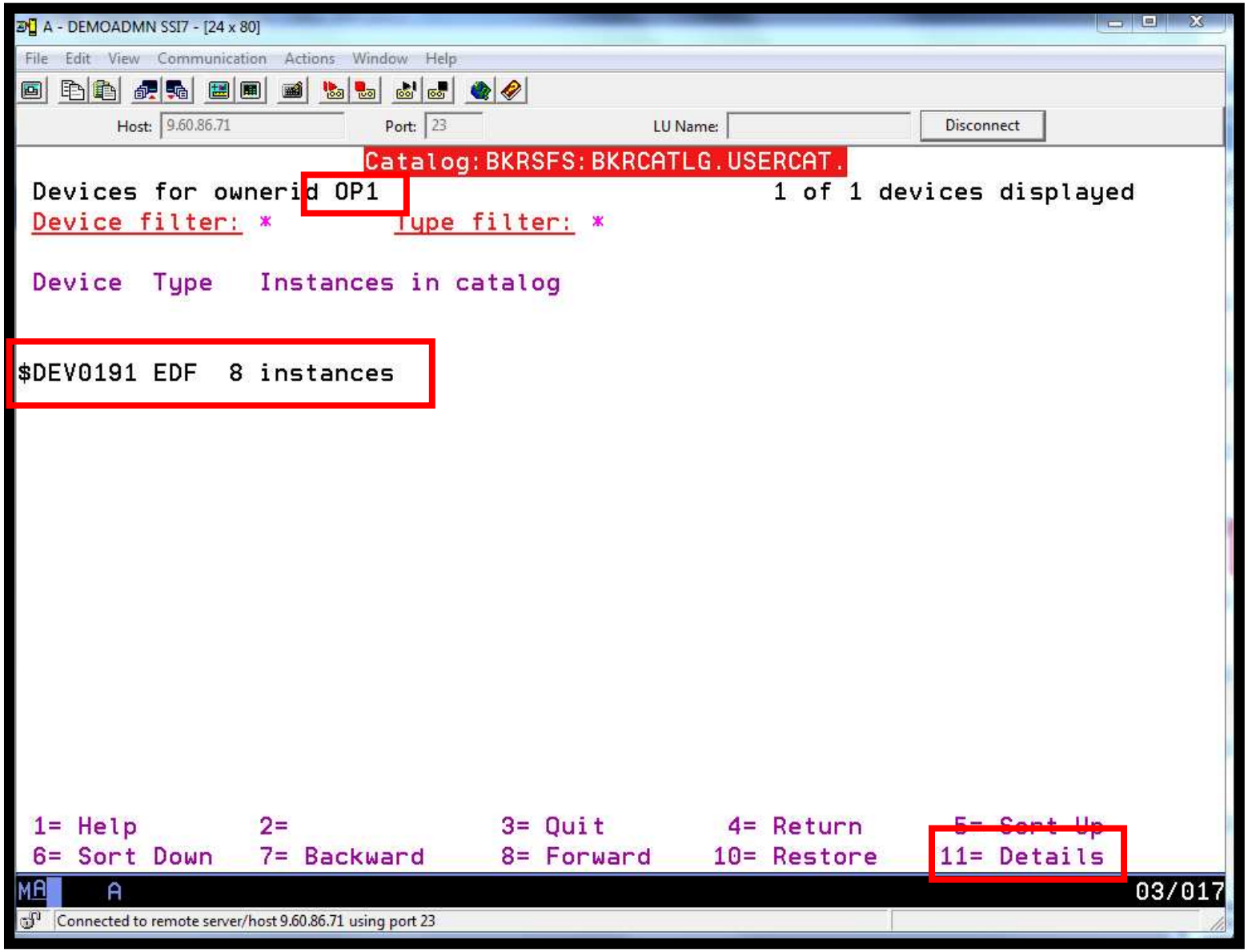
- **Once a file is chosen, use F10 to restore the file to the reader**
- **View the files in the reader**

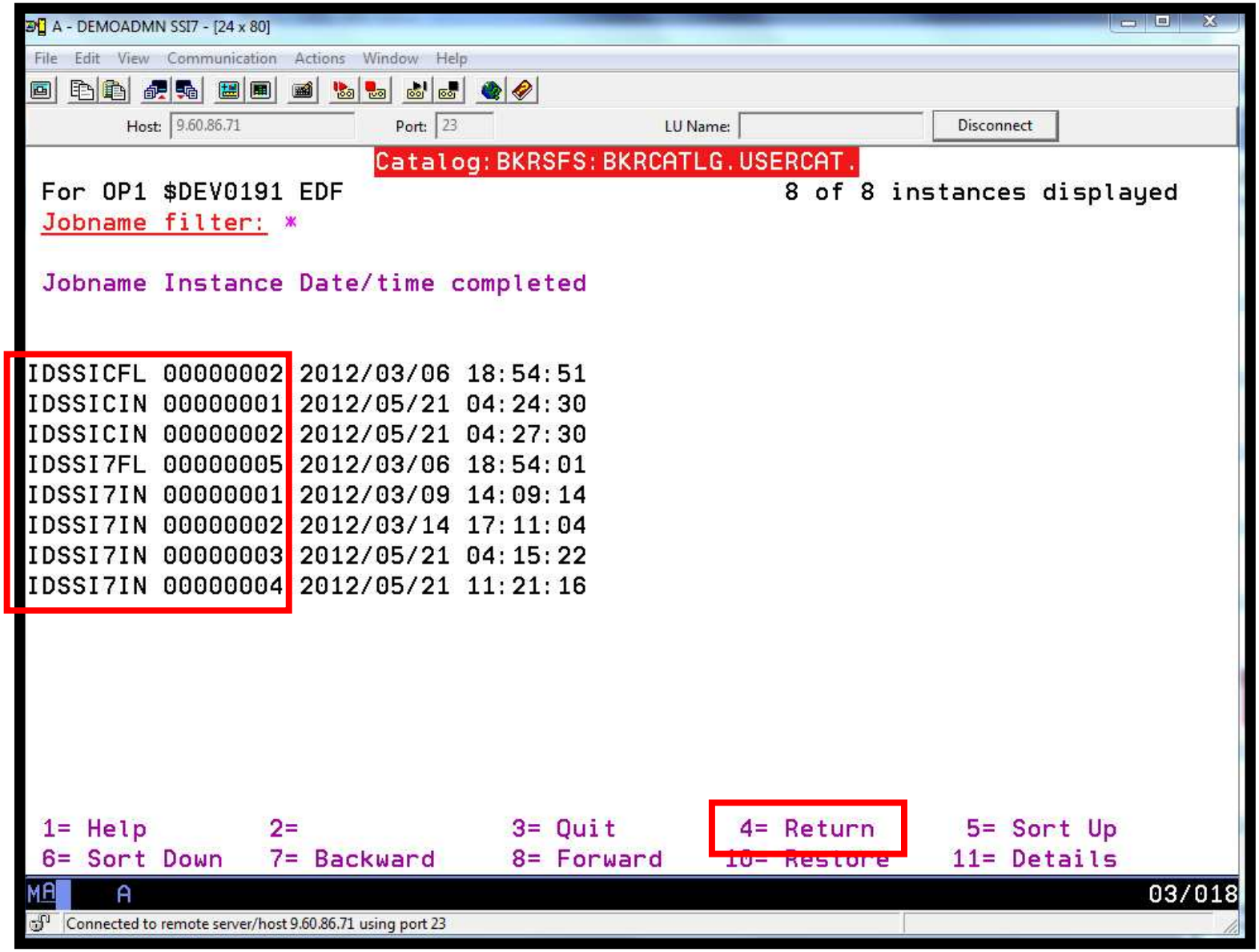
```
rdrlist
```

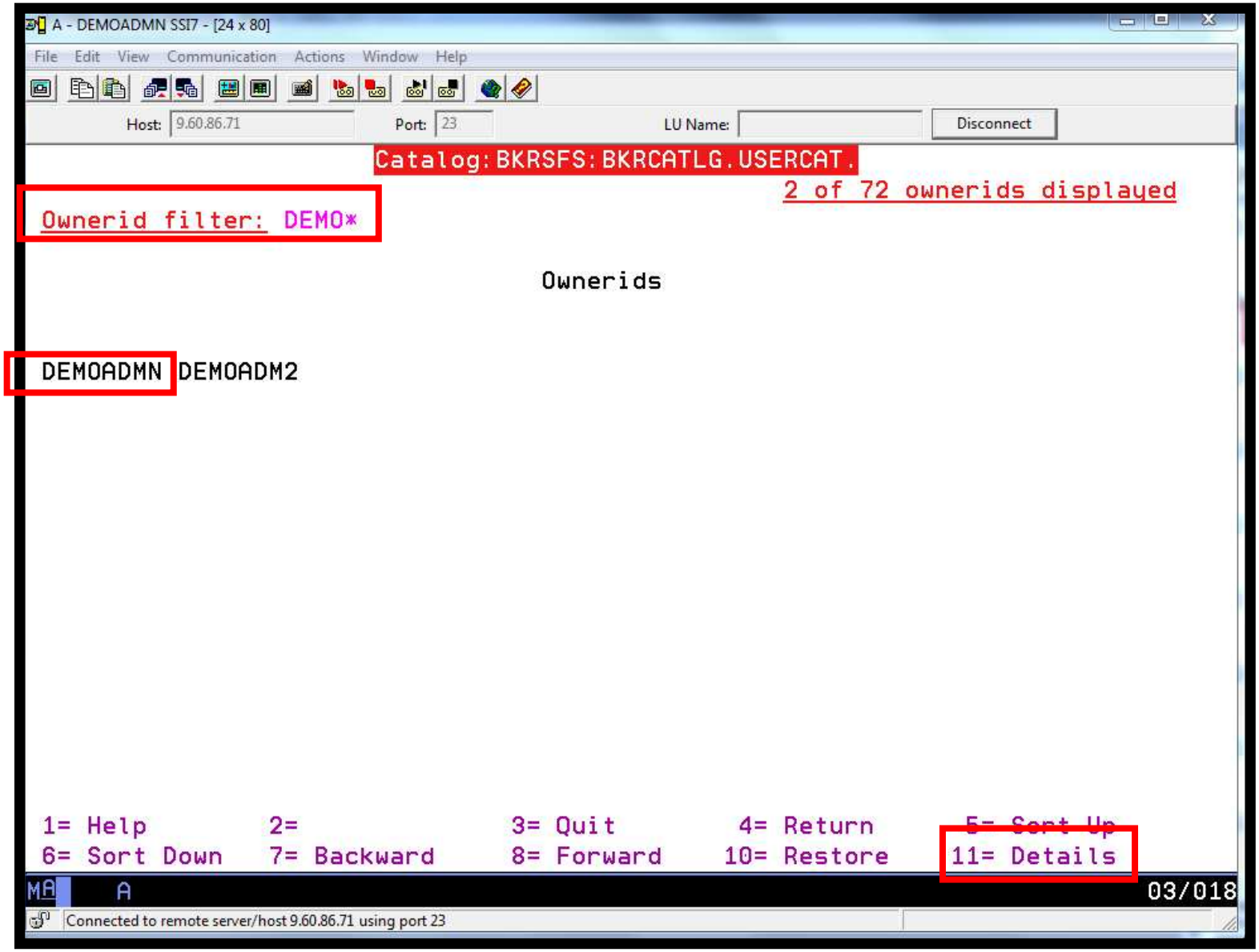
- **Notice you can restore files for DEMOADMN from either member of the cluster**

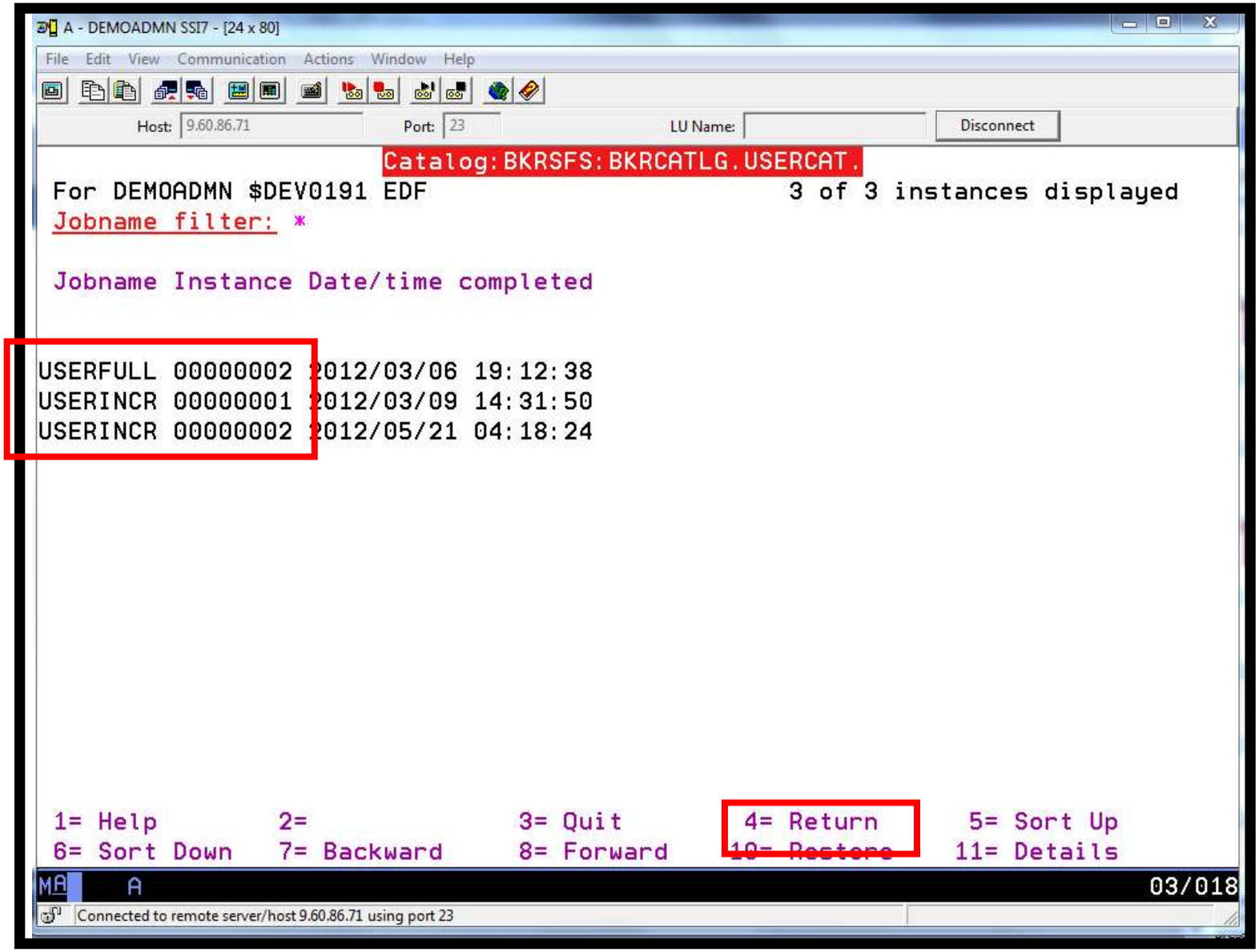


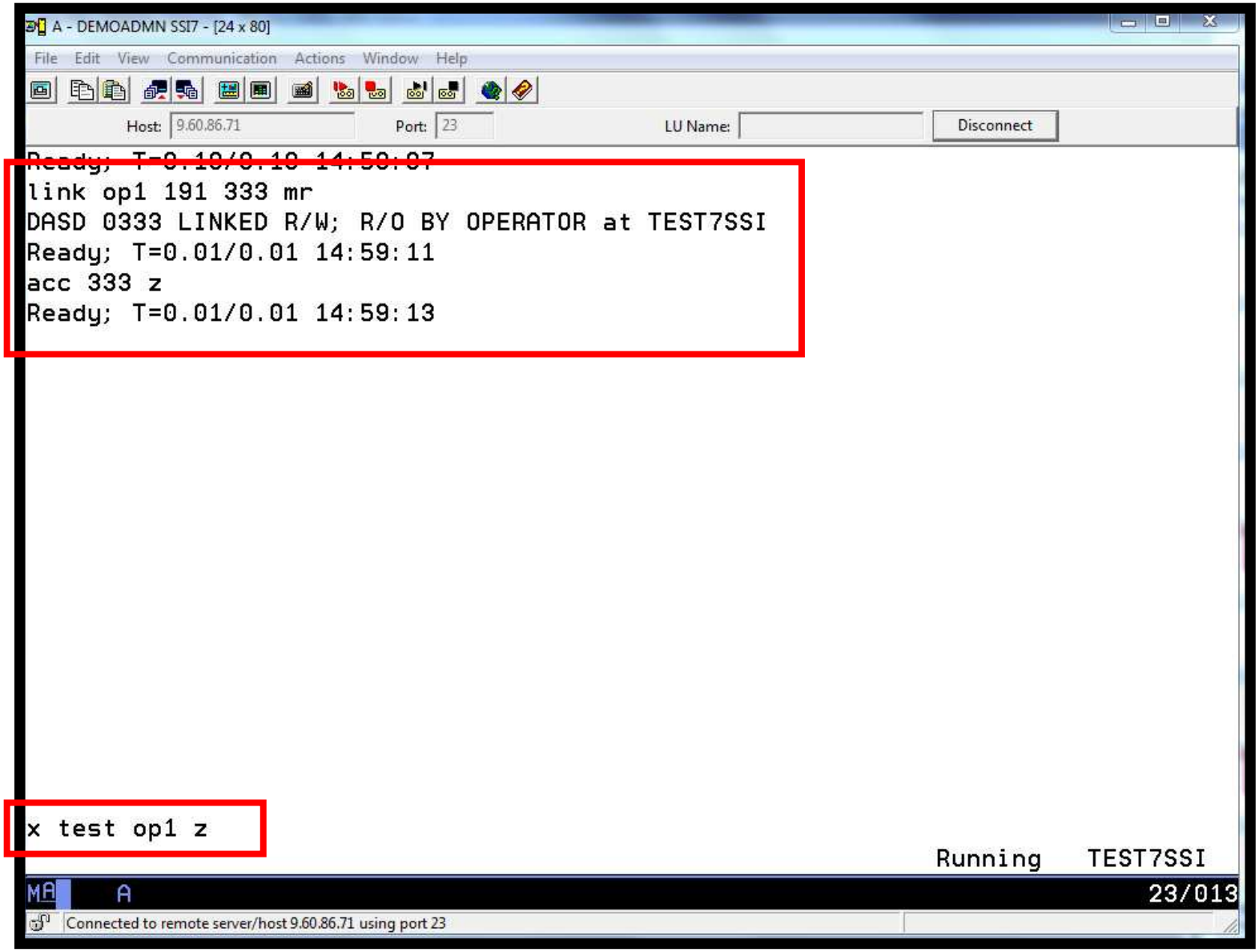


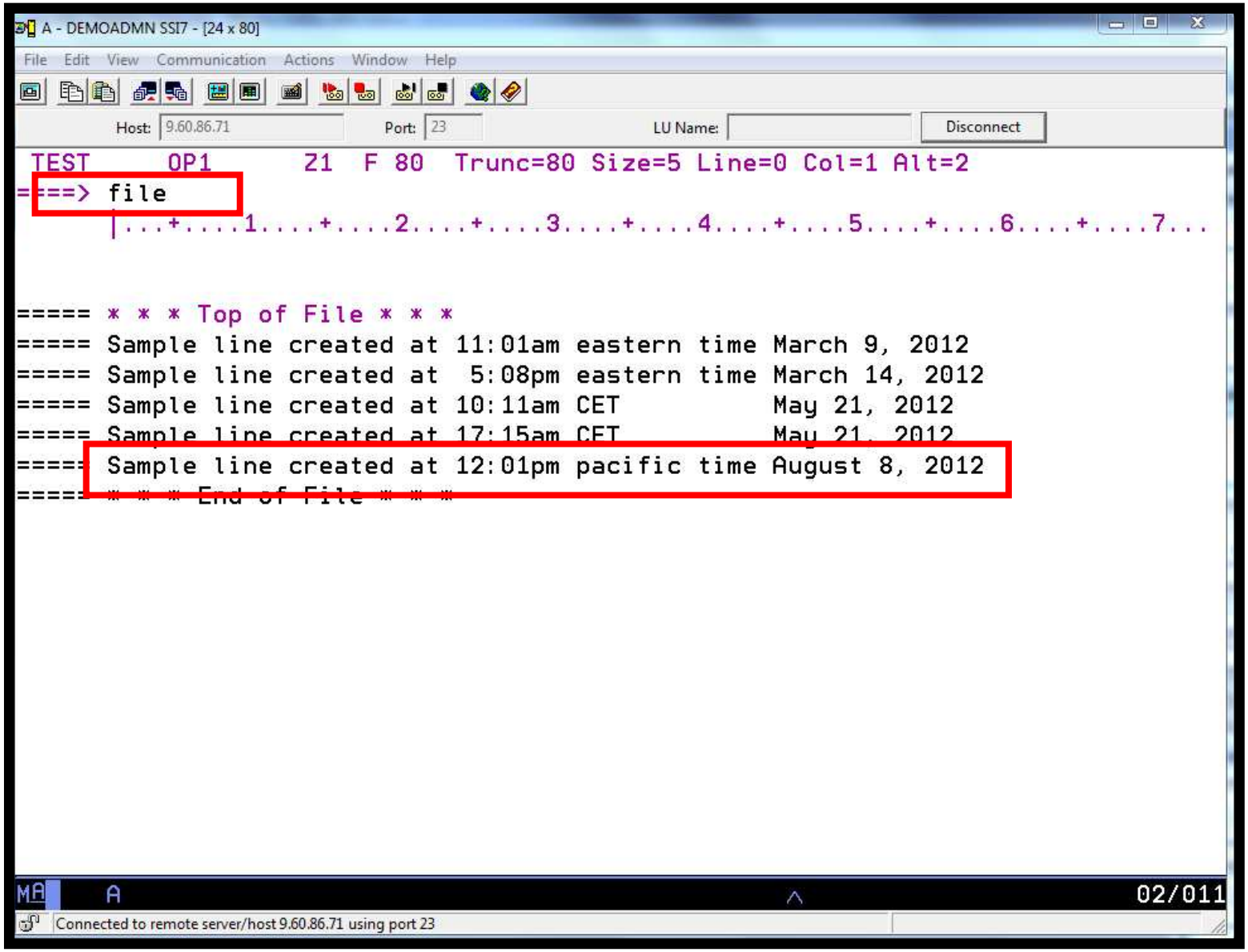


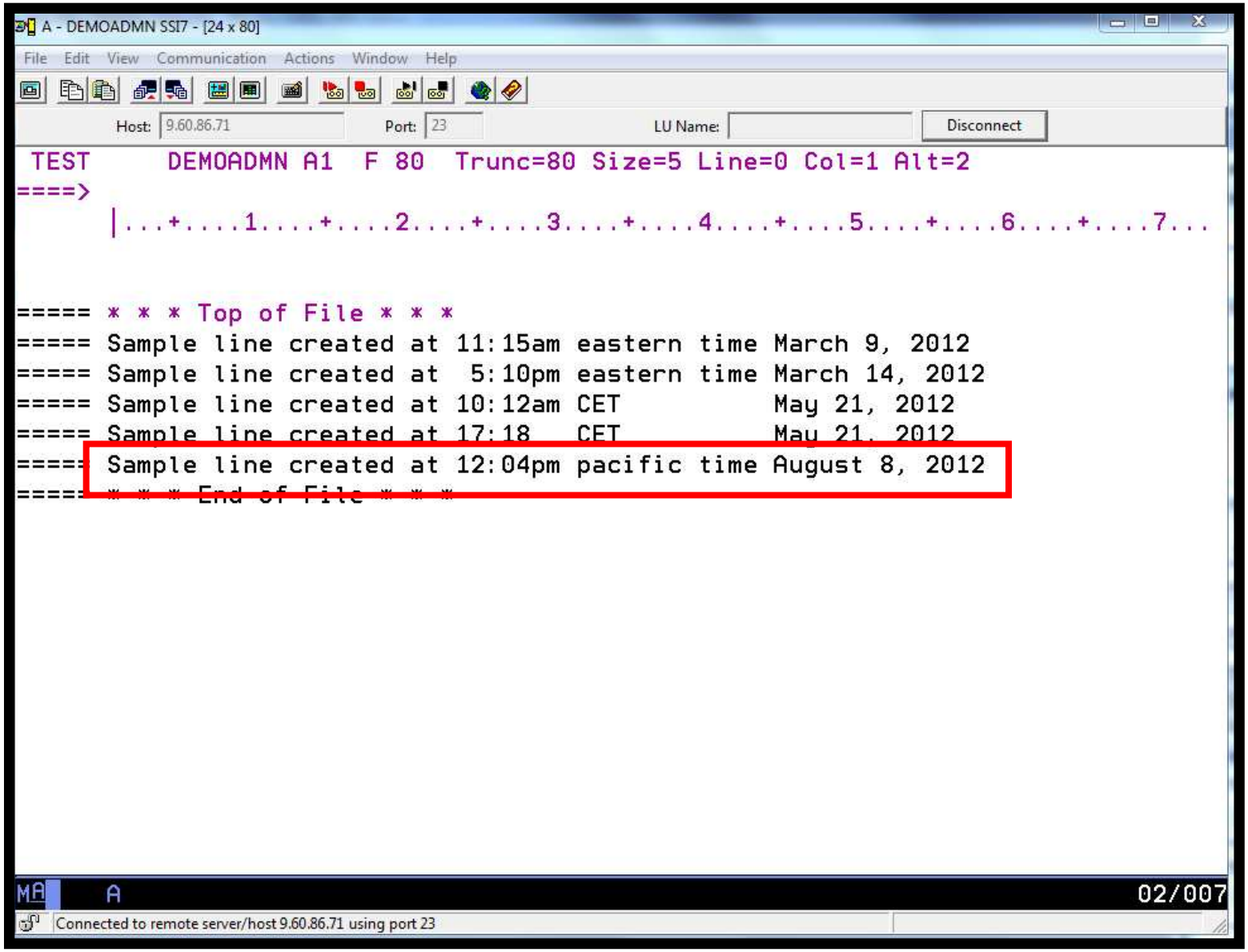


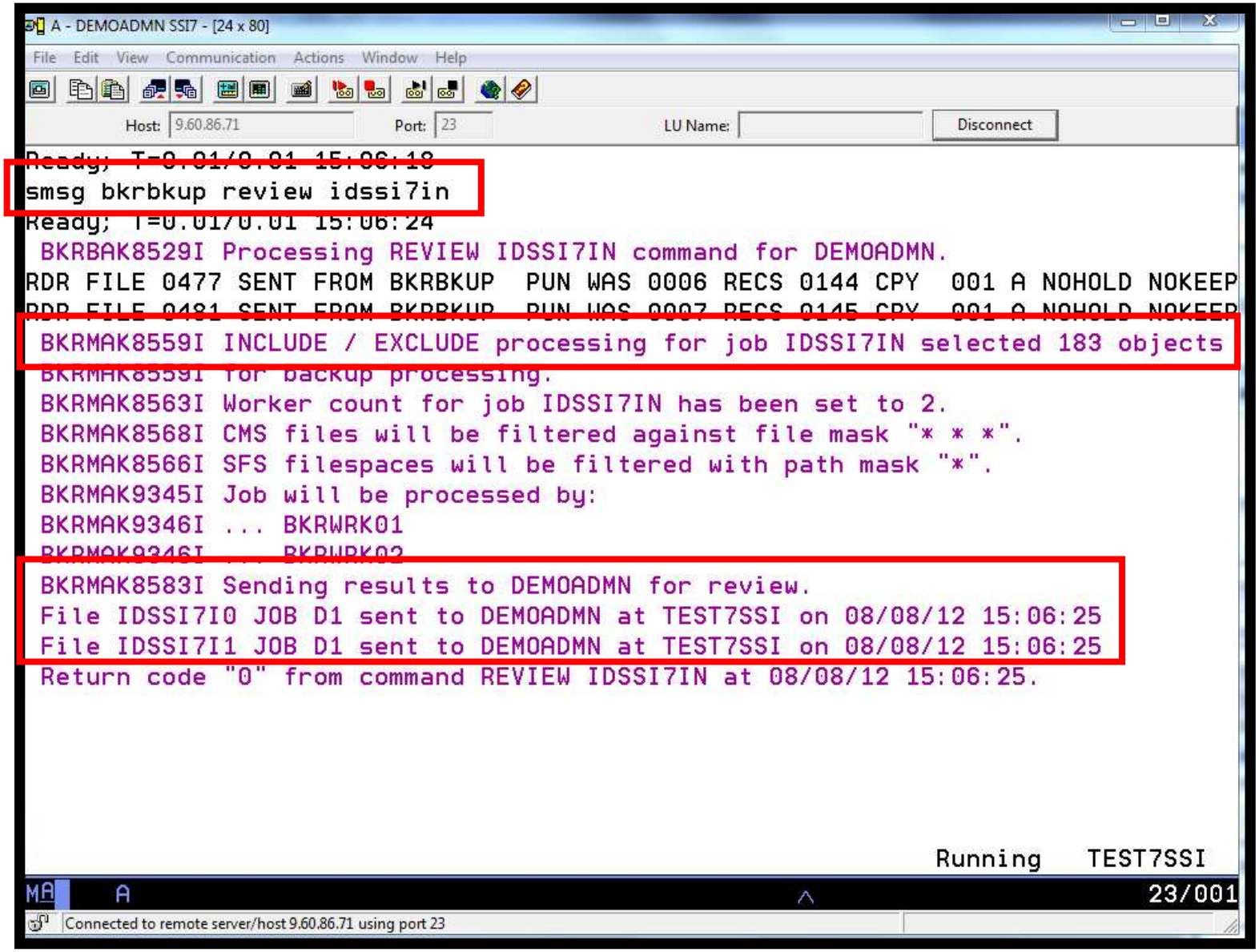


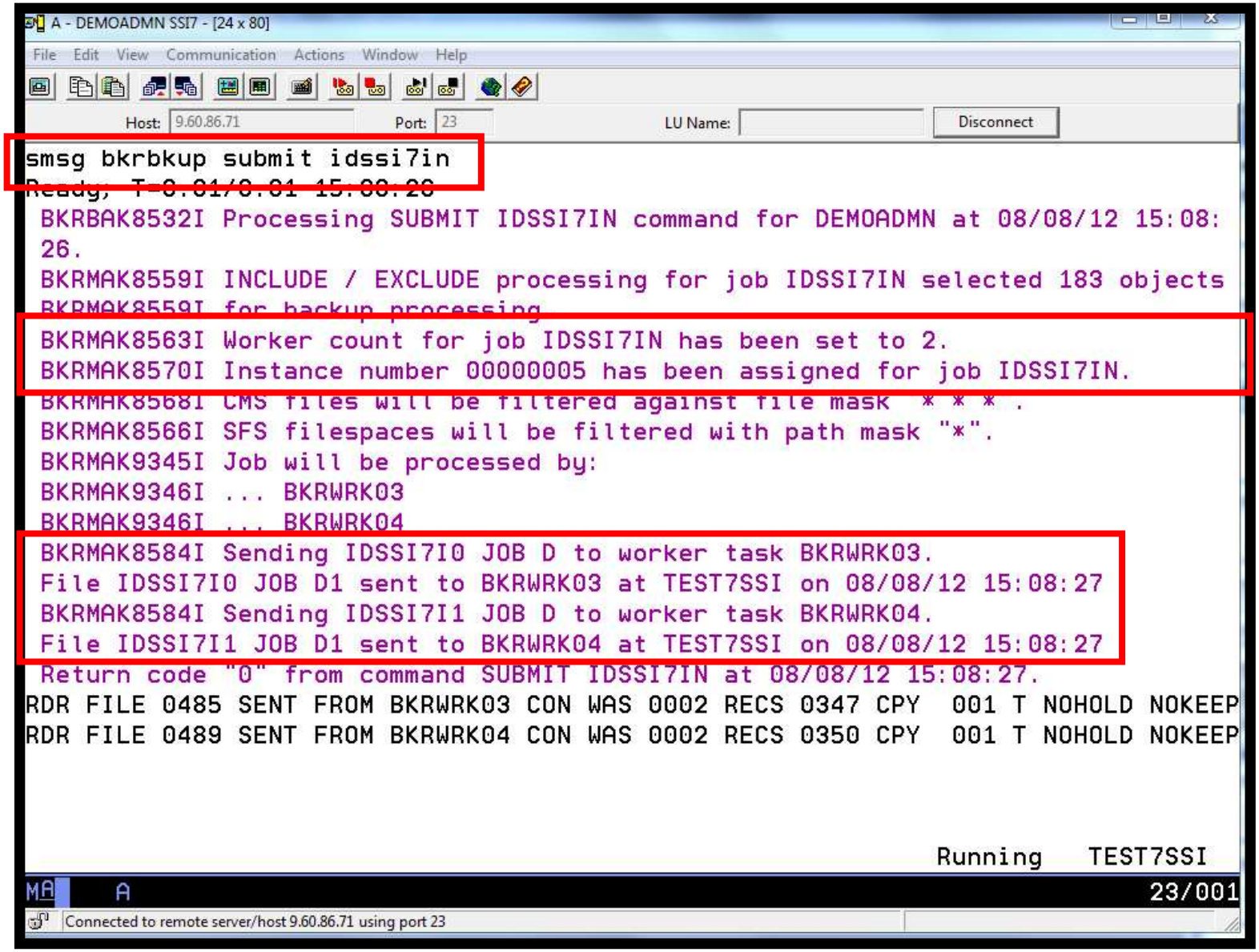


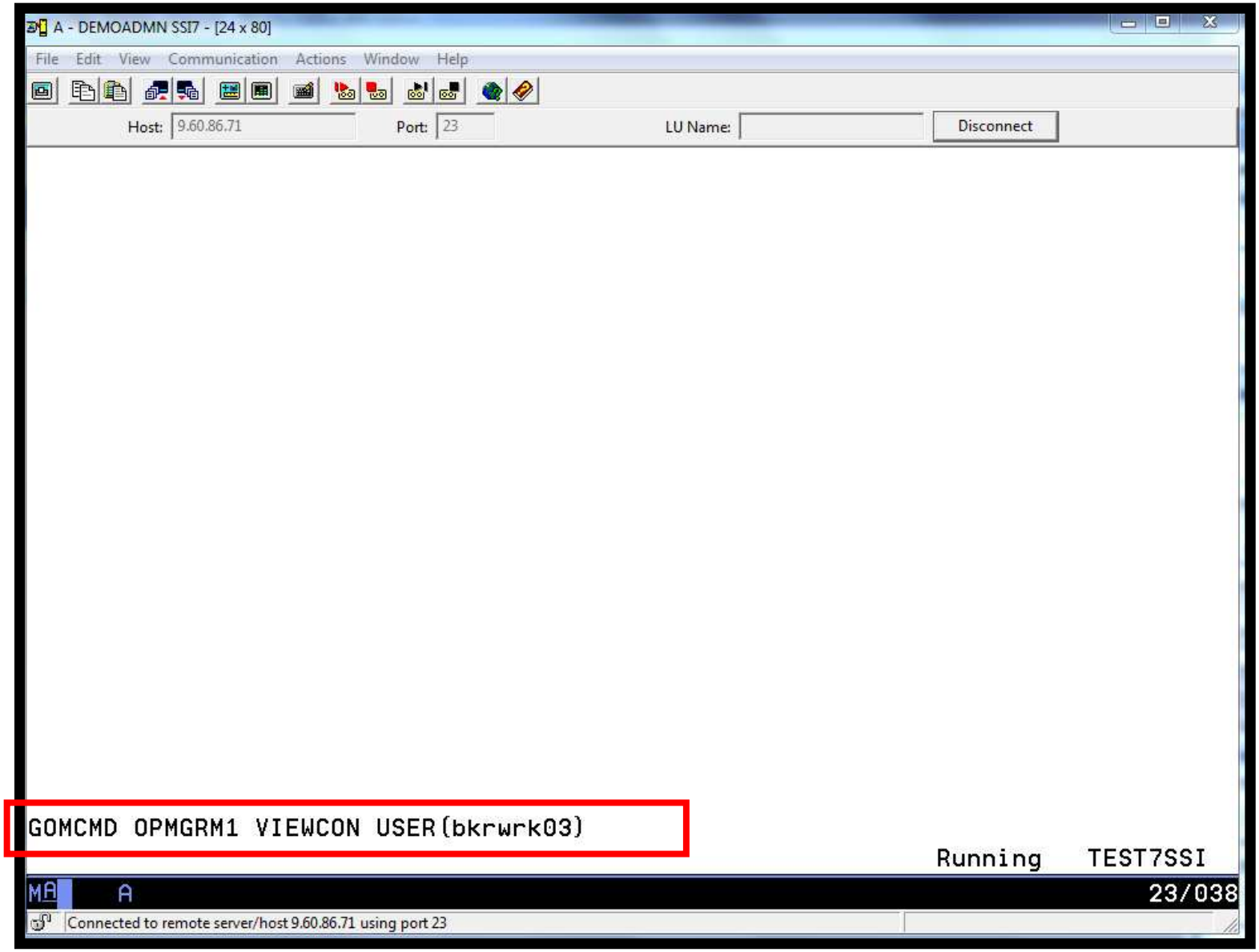


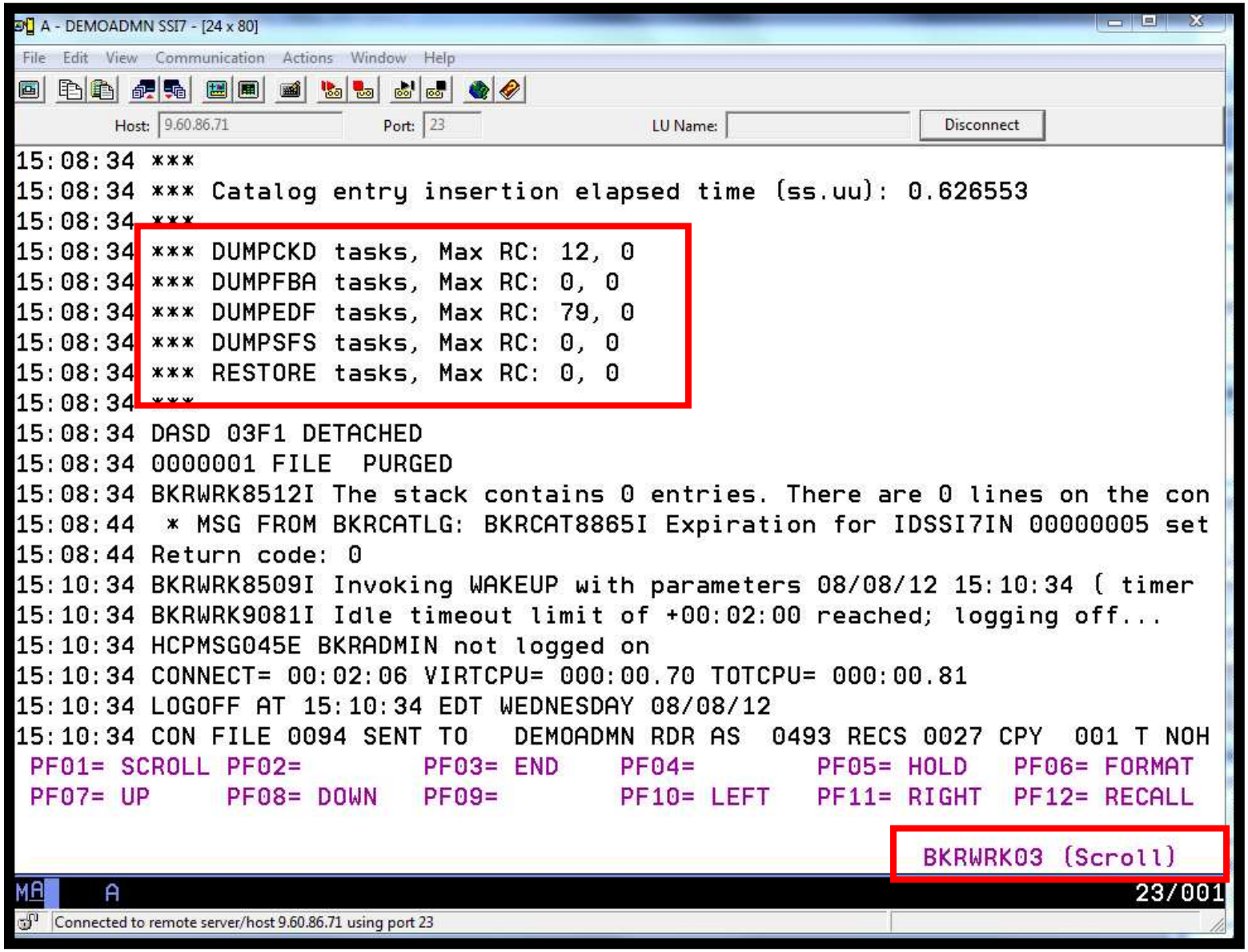


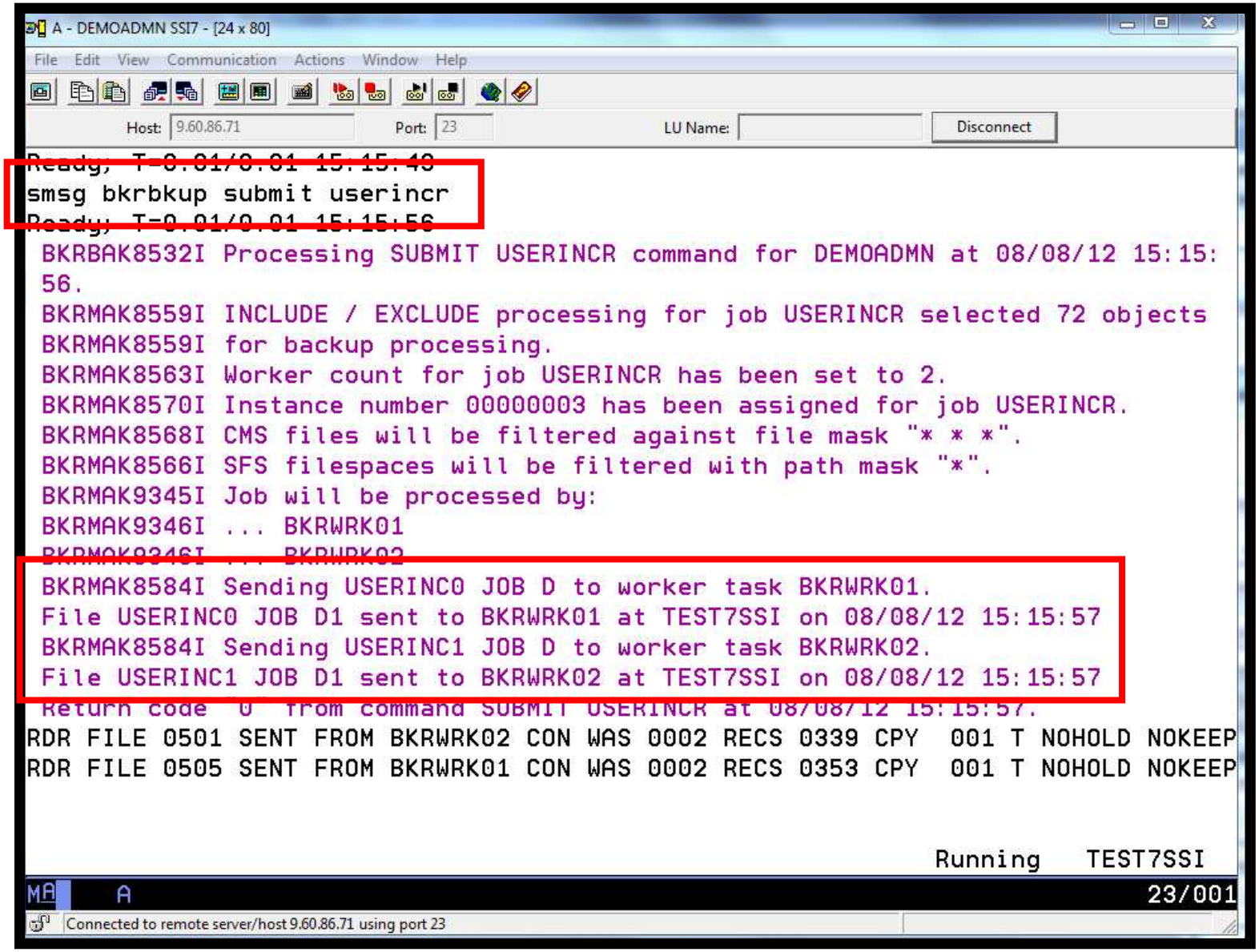


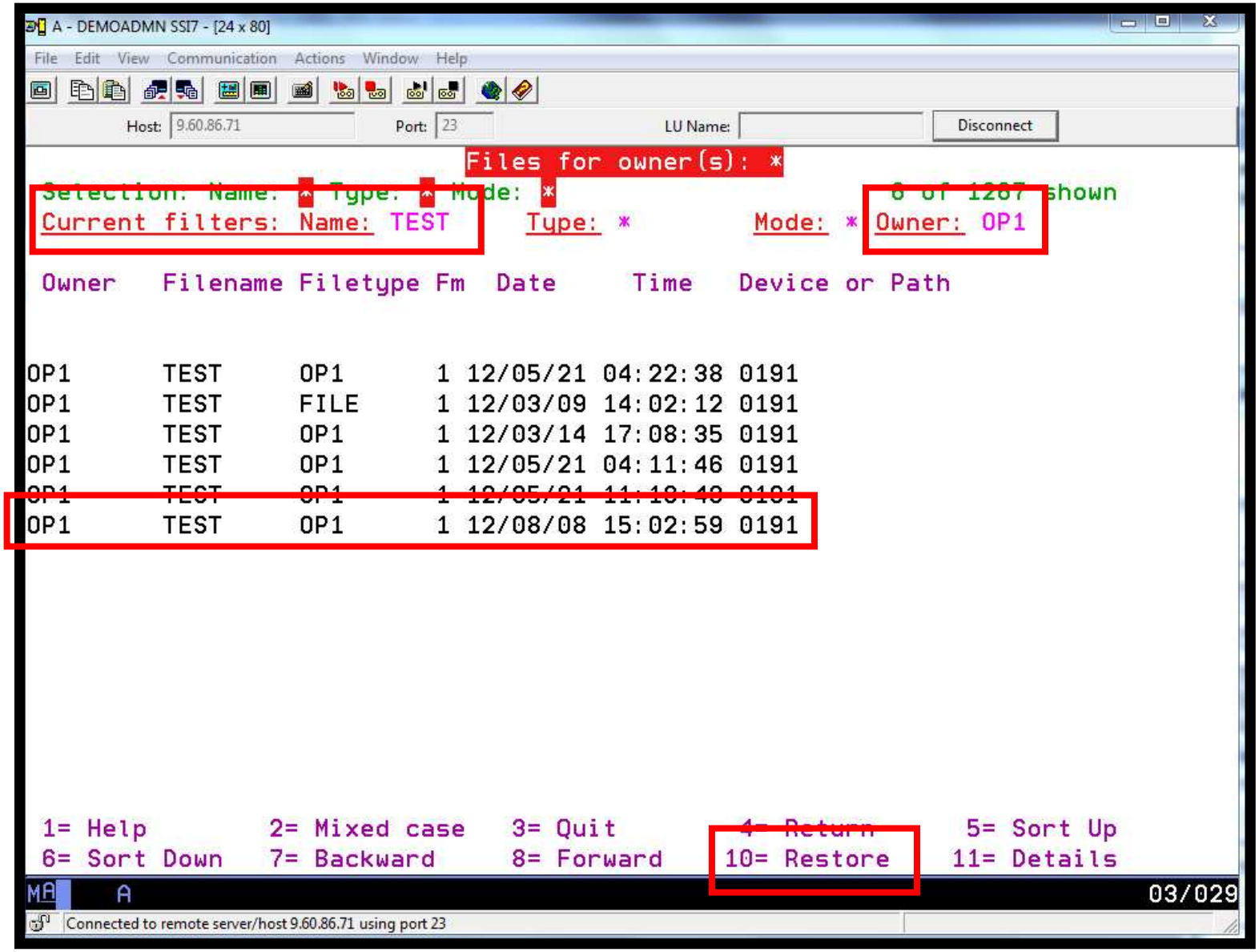


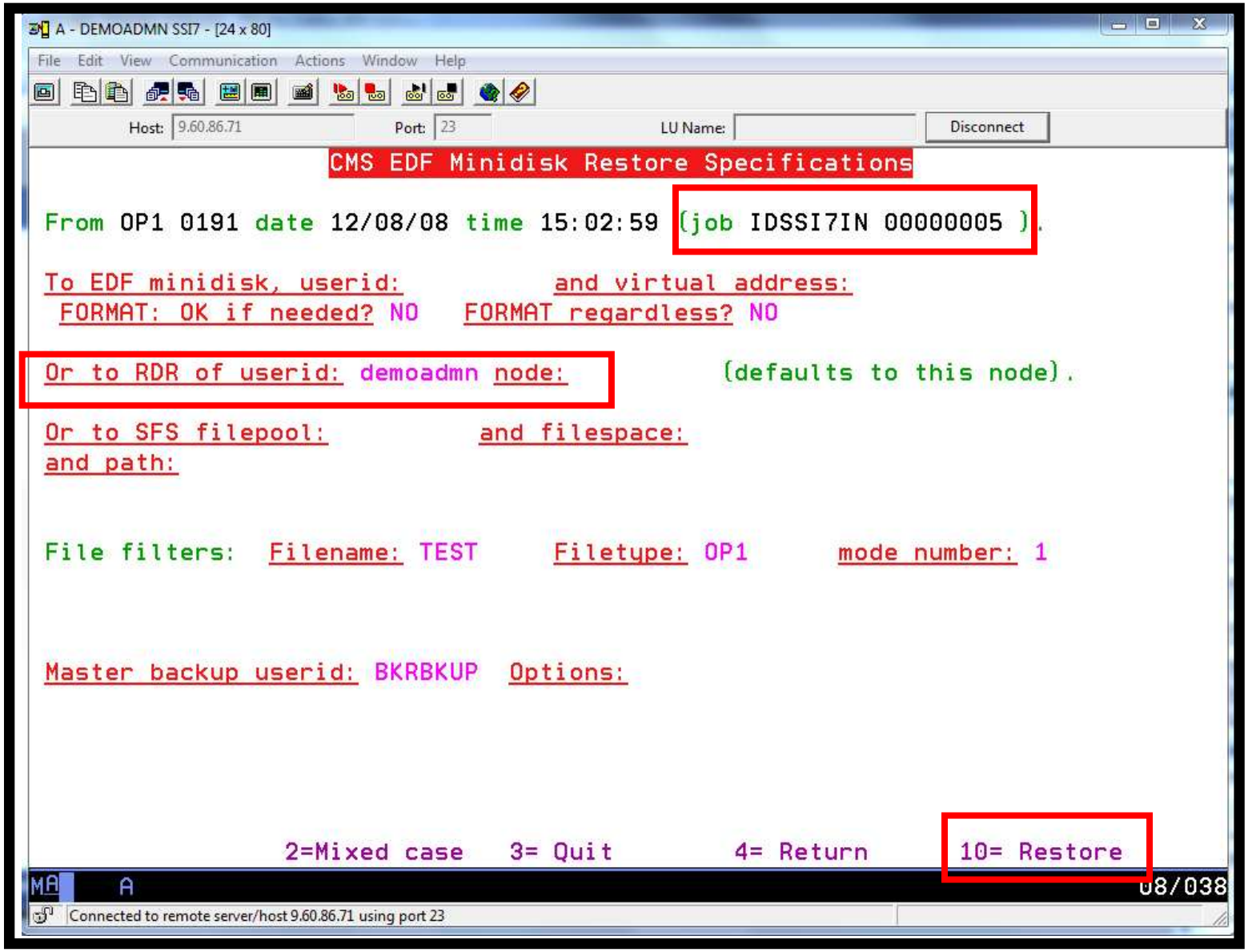


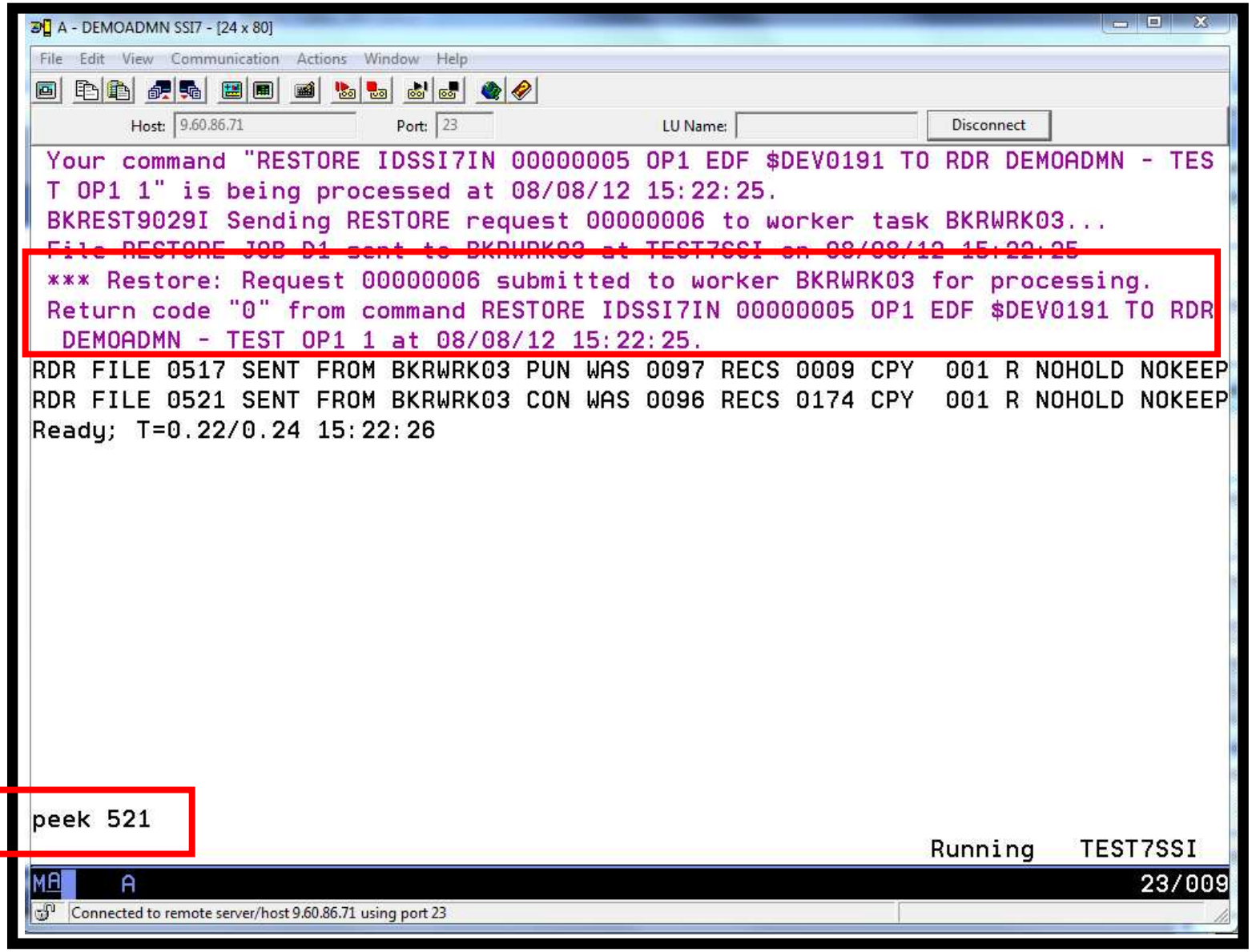


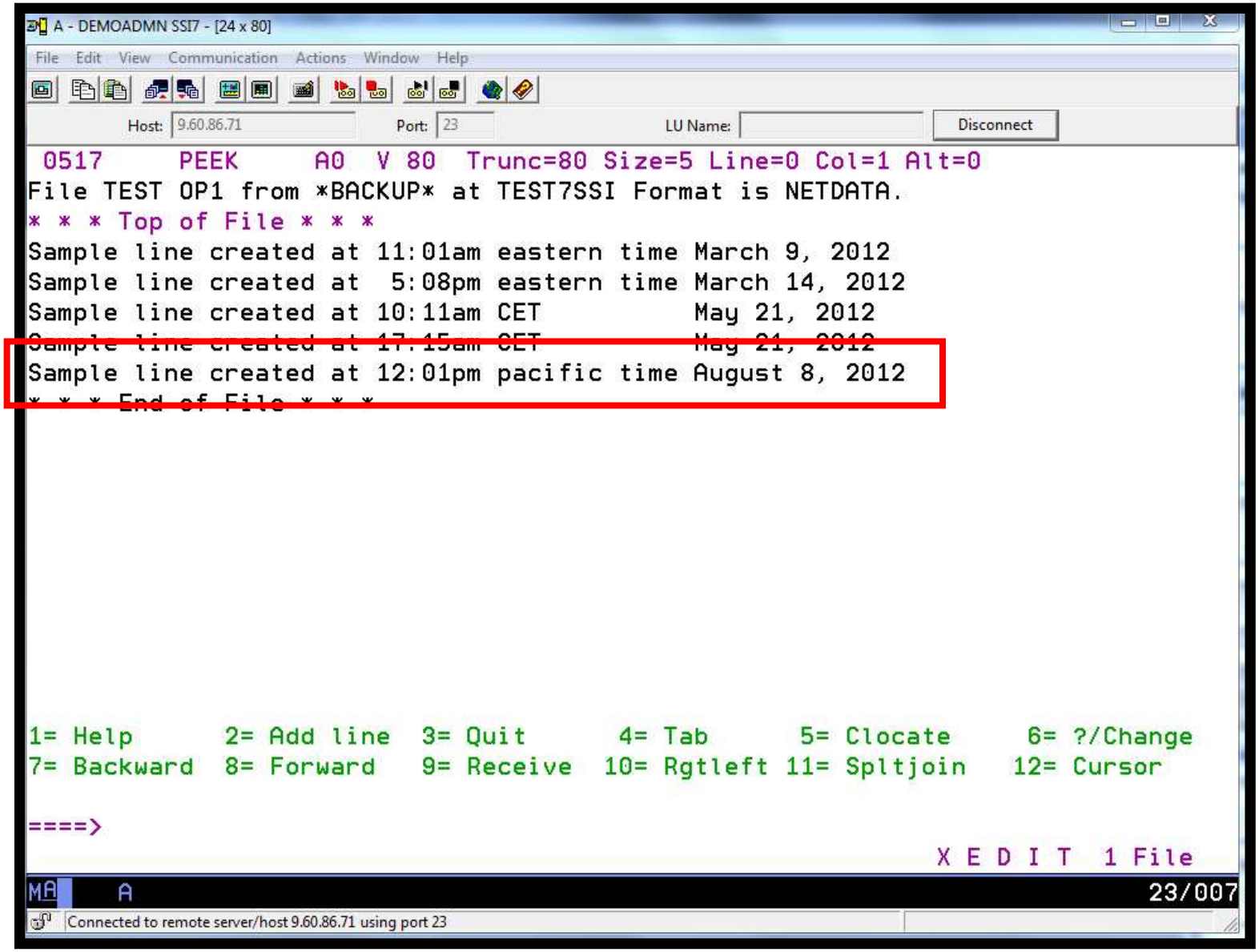


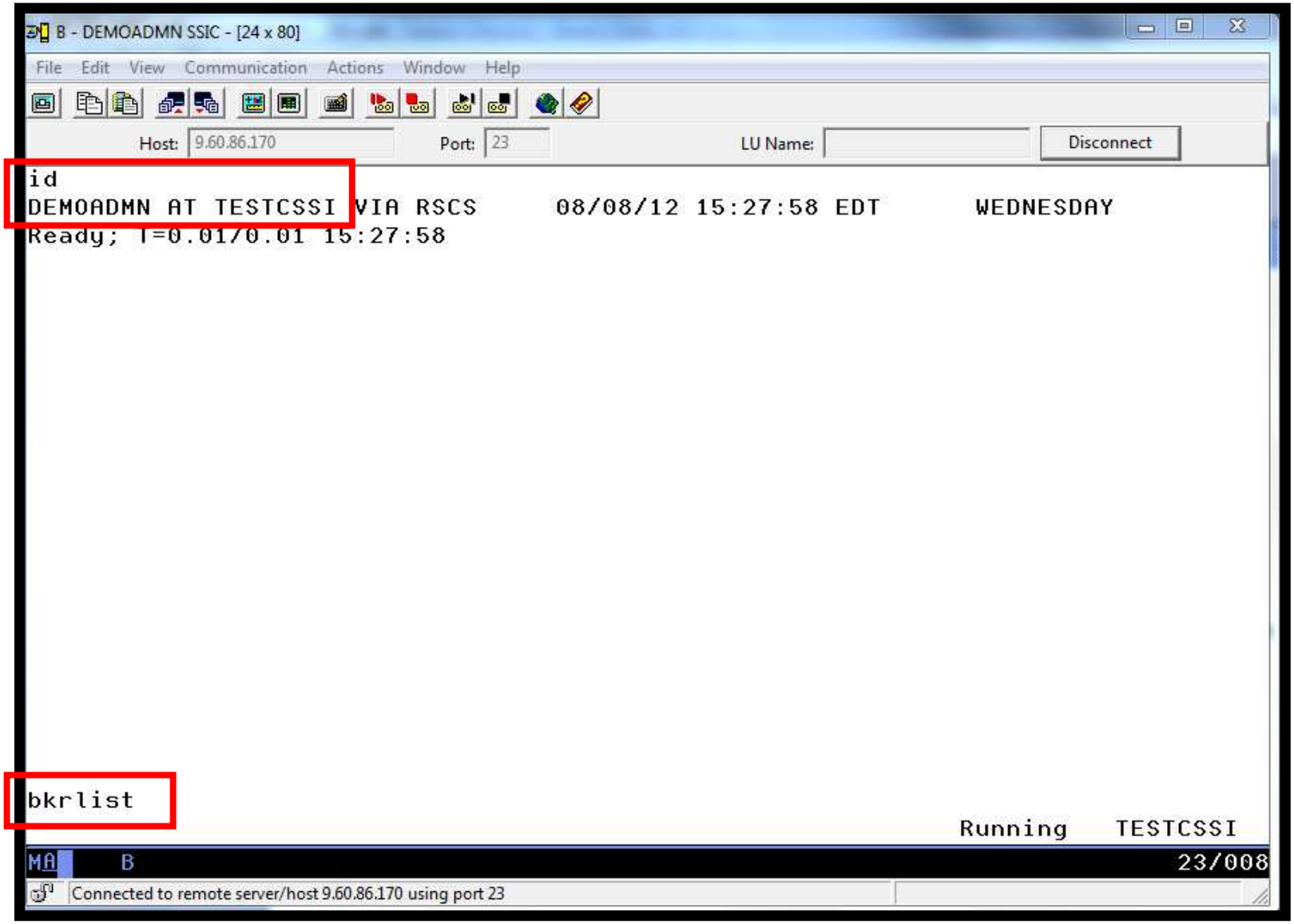


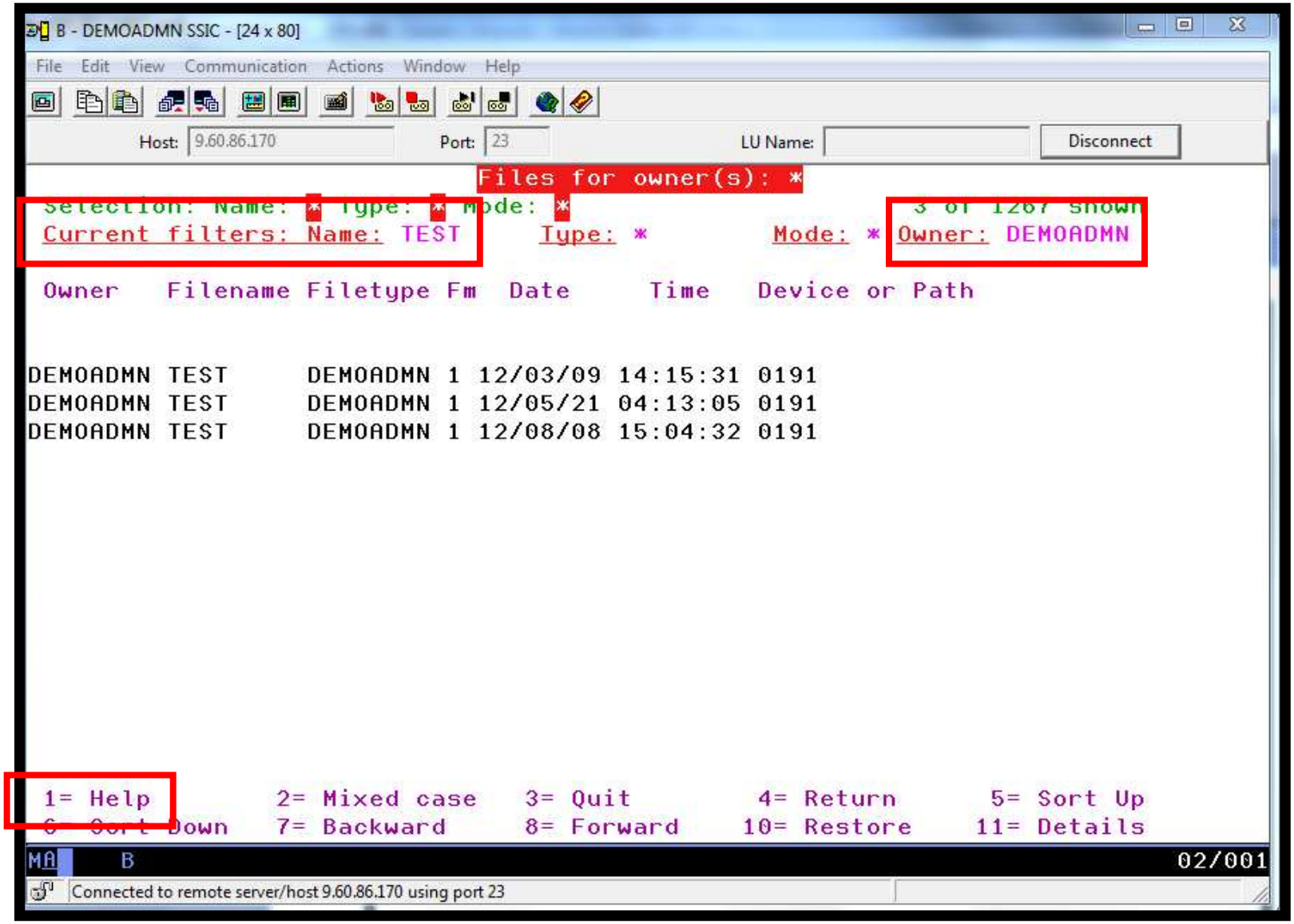












Scenario D: Scheduling Image Backups of Linux Guests

- **Initiated or scheduled by Operations Manager**
  - Schedule defined in Operations Manager to initiate backups at specific times/intervals
  - Action associated with each schedule
    - Linux guest is shut down
    - Operations Manager watches for shutdown complete
    - Sends request to Backup and Restore Manager to back up the specific DASD/minidisks associated with the guest
      - Alternatively use FLASHCOPY to copy DASD, restart guest, then perform backup of copy of DASD.
    - Operations Manager watches for backup complete message
    - Restarts Linux guest
  - Guest is down for minimum time required for backup

Scenario D: Detailed Steps

- **Define a schedule to start the automated backup process**

```
gomcmd opmgrm1 defschd name(demo),action(stoplnx),when(now)
```

- **View the Operations Manager log to see the schedule trigger**

```
gomcmd opmgrm1 viewlog
```

- **View the console of the Linux guest to see it shut down**

```
gomcmd opmgrm1 viewcon user(omeglnx1)
```

- **View the console of the backup server to see the backup start**

```
gomcmd opmgrm1 viewcon user(bkrbkup)
```

- **Find the worker that has been assigned and view its console**

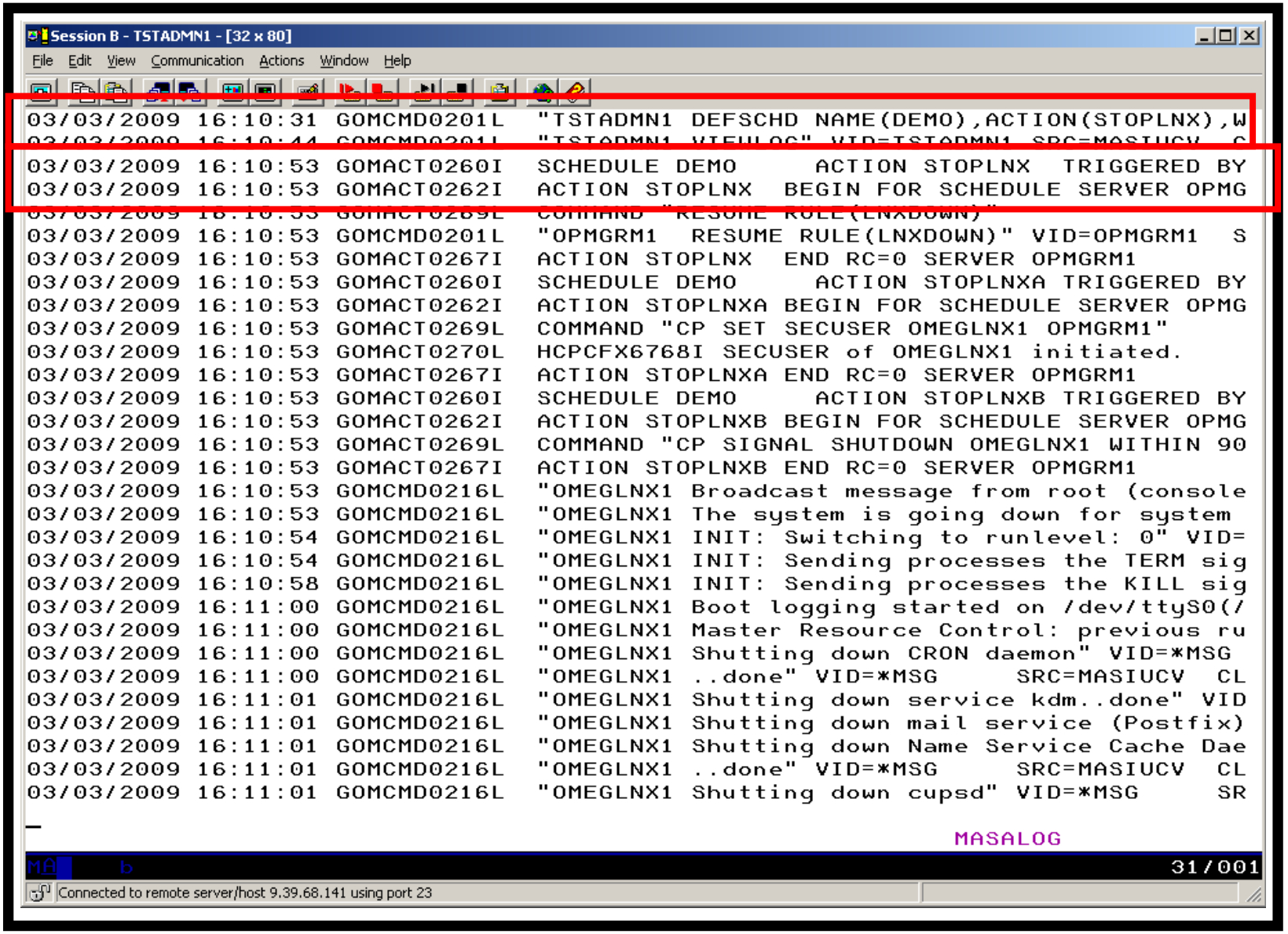
```
gomcmd opmgrm1 viewcon user(bkrwrkxx)
```

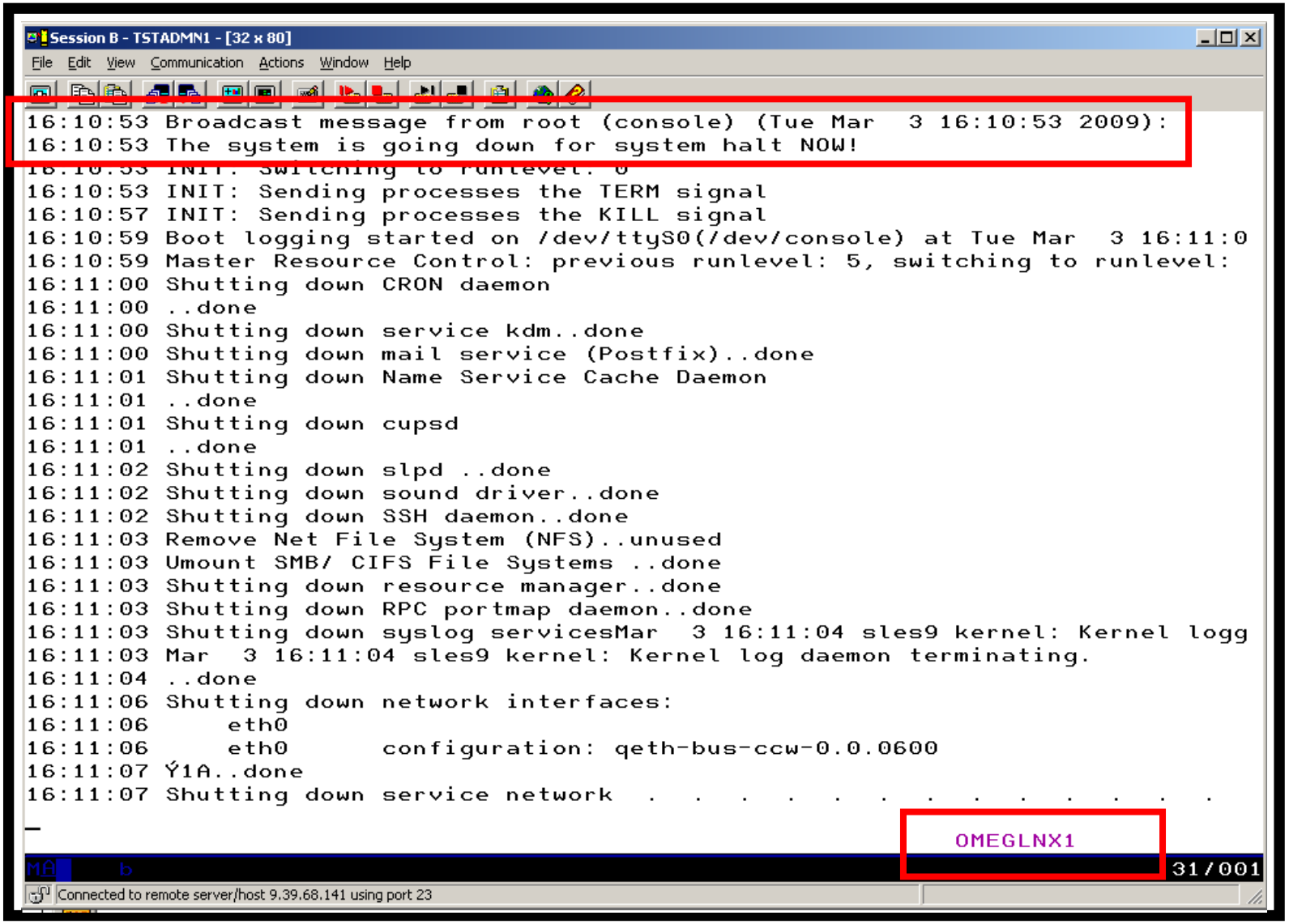
- **View the console of the Linux guest to see it restart**

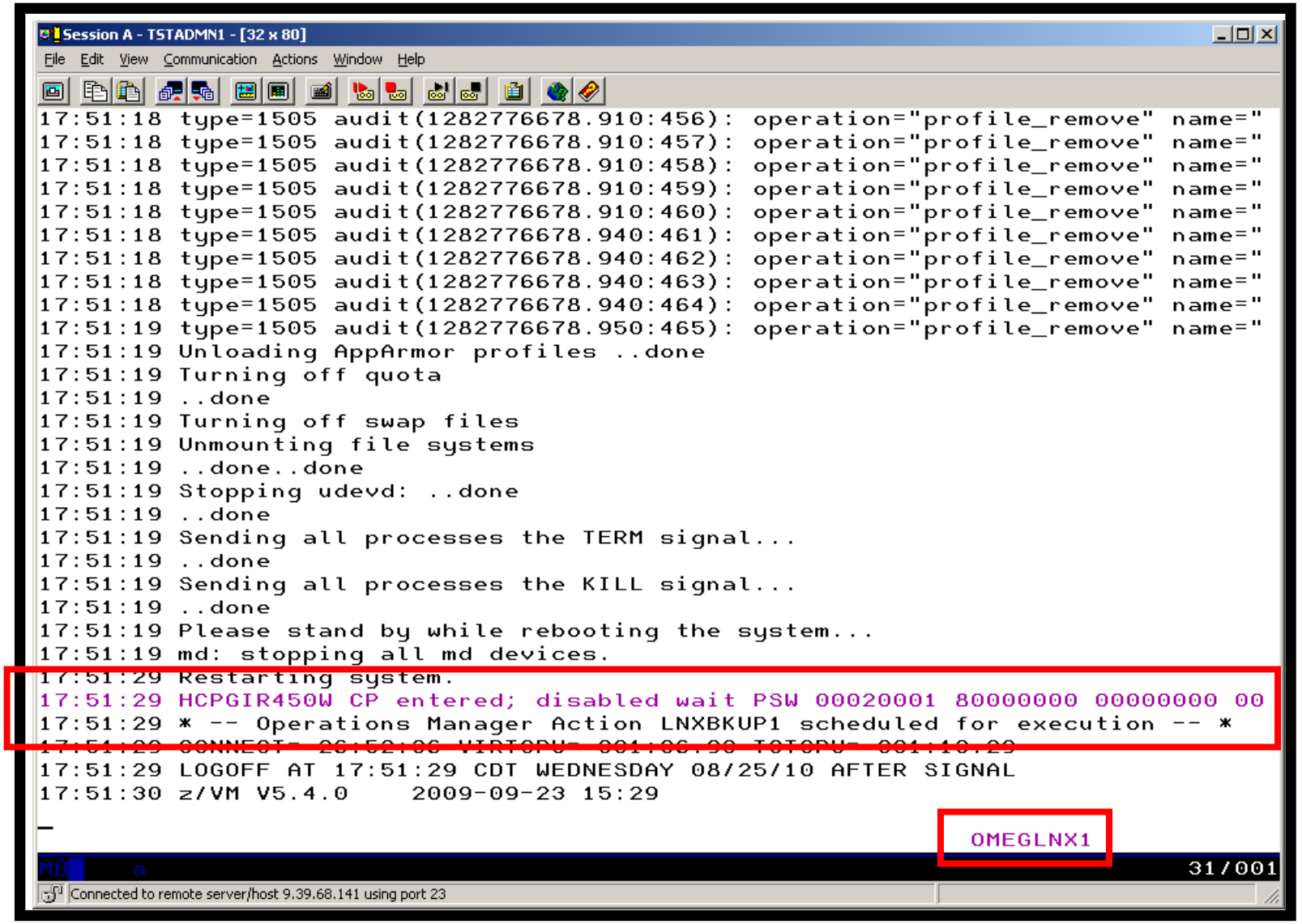
```
gomcmd opmgrm1 viewcon user(omeglnx1)
```

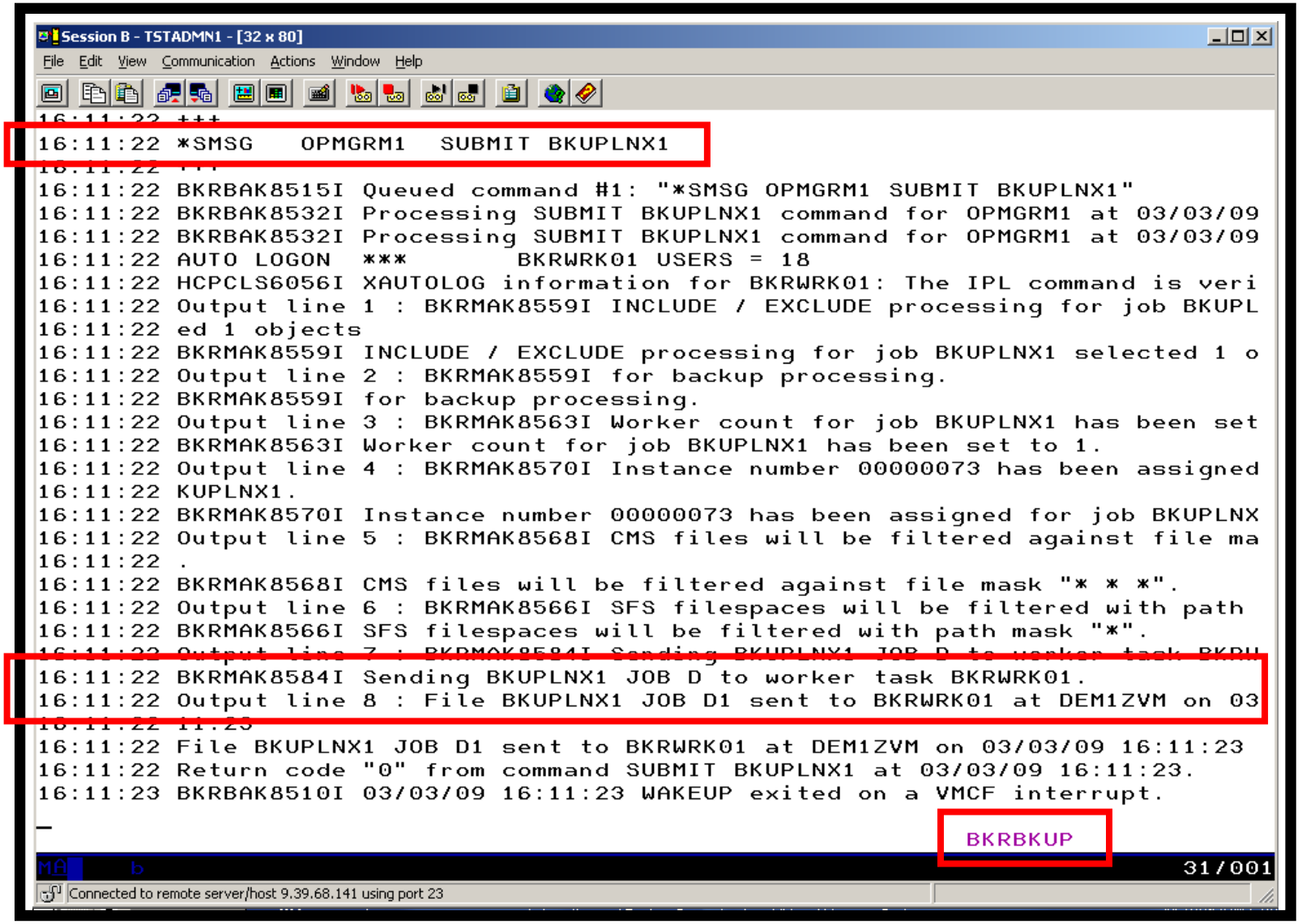
- **View the backup catalog to see the completed job**

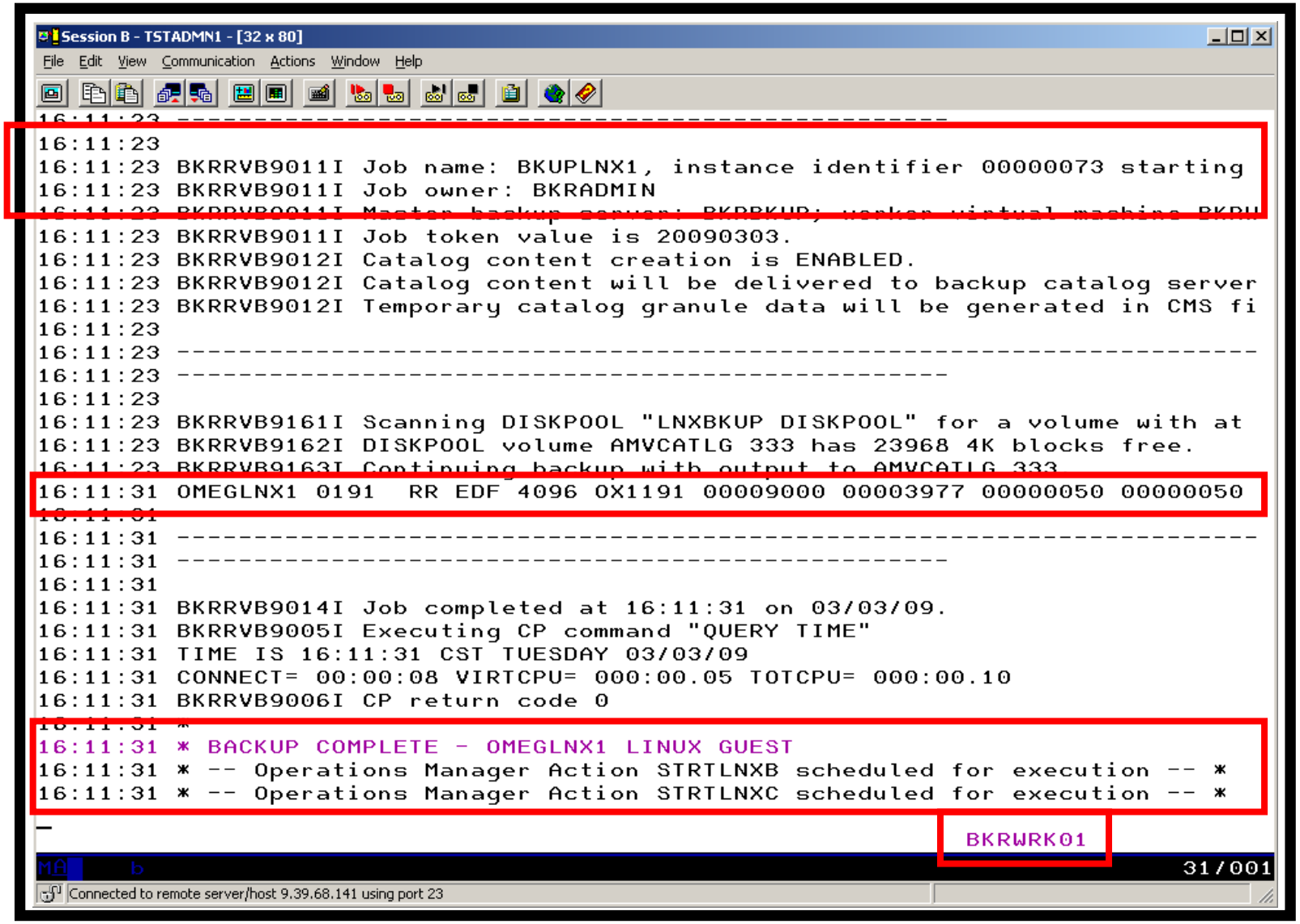
```
bkrjob
```

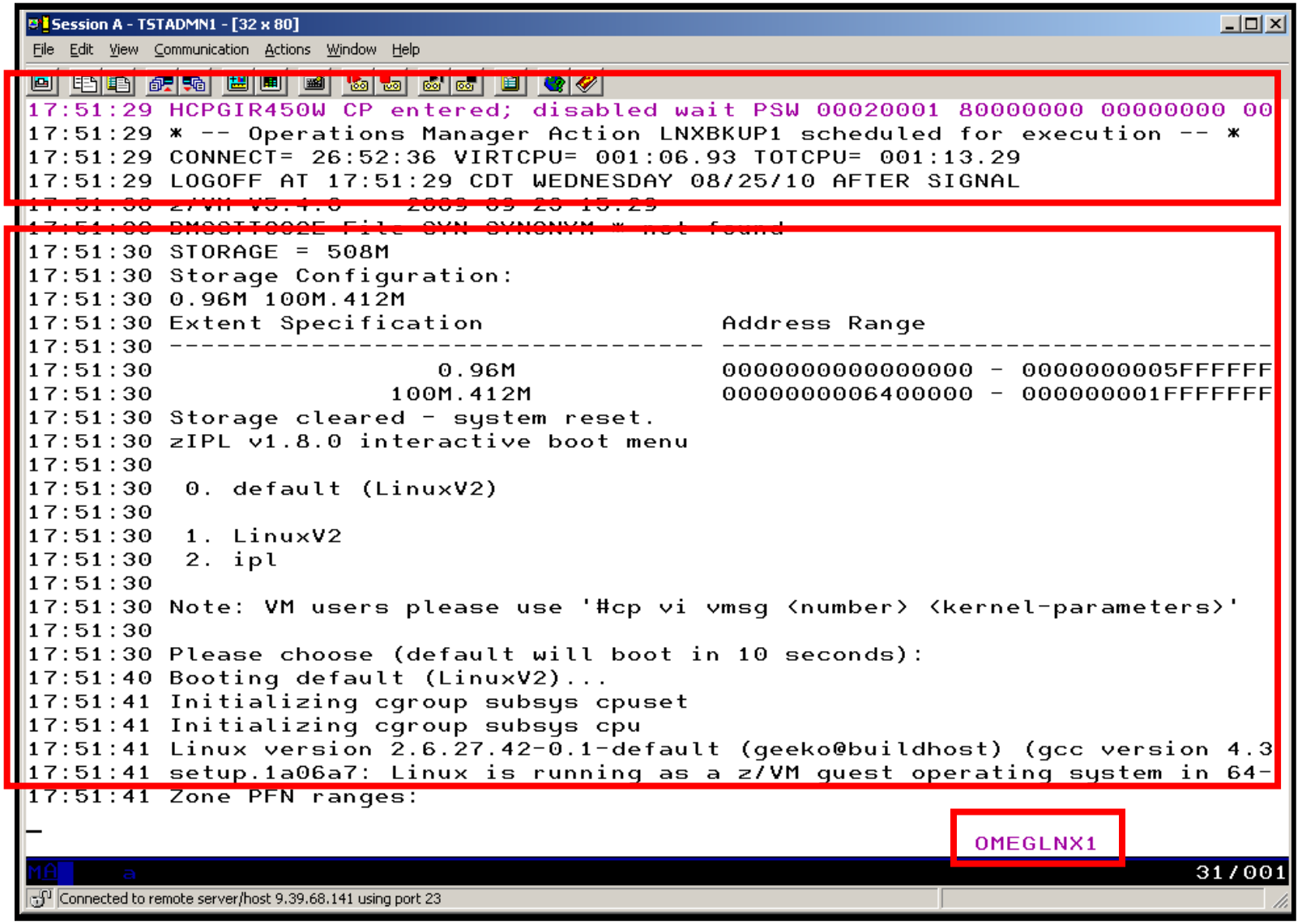


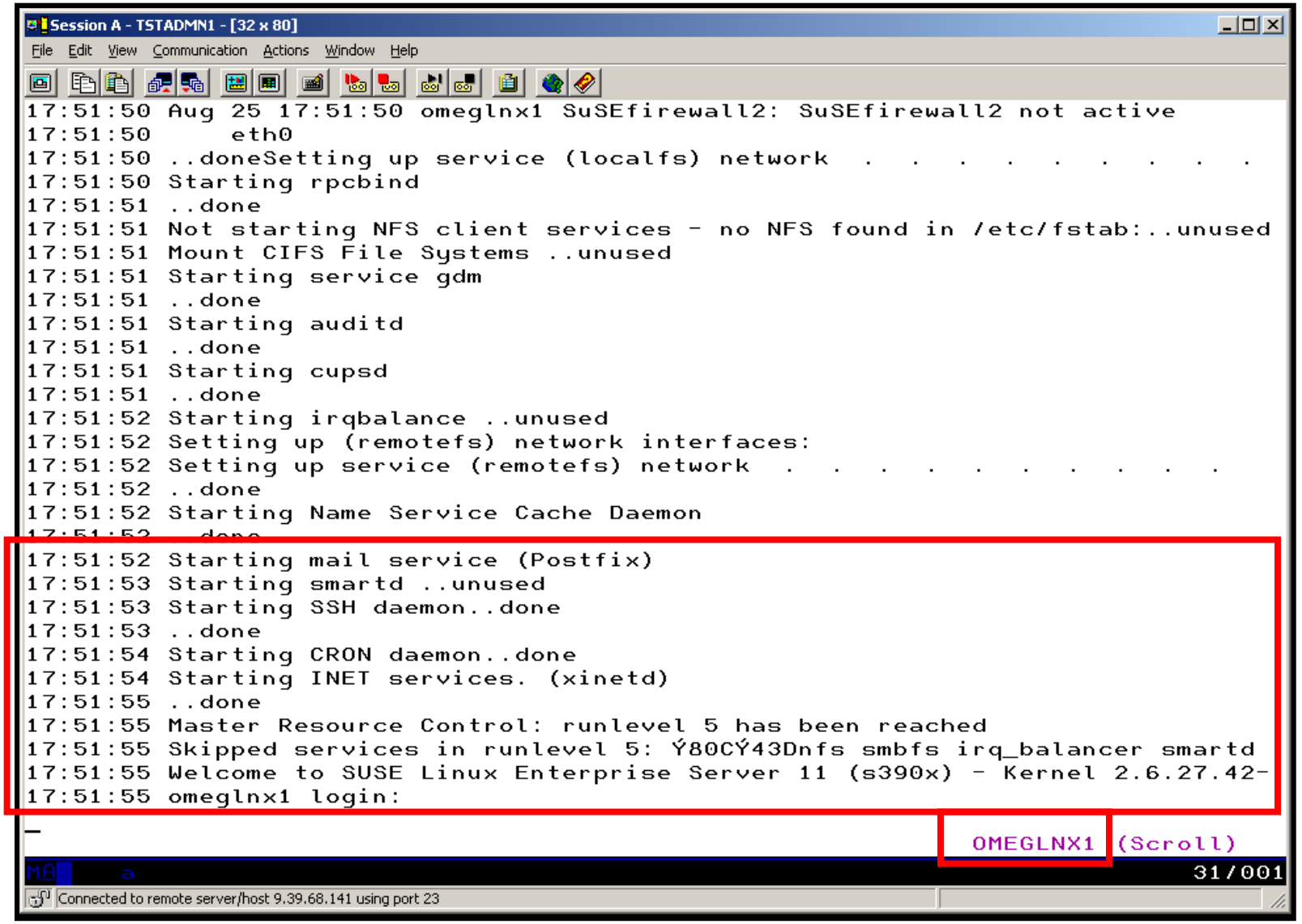












Scenario D: How Do You Do That?

Console rule in Operations Manager:

```
*
* Watch for shutdown complete message on Linux guest
DEFRULE NAME(LNXDOWN),+
  MATCH(*HCPGIR450%*),+
  USER(OMEGLNX1),+
  ACTION(LNXBKUP)
* Turn off the rule in general
SUSPEND RULE(LNXDOWN)
```

Scenario D: How Do You Do That?

Chain of actions in Operations Manager, triggered by schedule

```
*
* Start of guest backup scenario, resume rule for guest shutdown msg
DEFACTN NAME(STOPLNX),+
  COMMAND('RESUME RULE(LNXDOWN)'),+
  ENV(GOM),+
  NEXTACTN(STOPLNXA)
*
* Change SECUSER to Operations Manager before shutting it down
DEFACTN NAME(STOPLNXA),+
  COMMAND(CP SET SECUSER OMEGLNX1 OPMGRM1),+
  ENV(LVM),+
  NEXTACTN(STOPLNXB)
*
* Action to shut down Linux guest in prep for backup
DEFACTN NAME(STOPLNXB),+
  COMMAND(CP SIGNAL SHUTDOWN OMEGLNX1 WITHIN 90),+
  ENV(LVM)
```

Scenario D: How Do You Do That?

Chain of actions and rules in Operations Manager:

```
* Highlight message and submit backup job for a specific Linux guest
DEFACTN NAME(LNXBKUP),+
  INPUT(AHI),+
  NEXTACTN(LNXBKUPB)
*
DEFACTN NAME(LNXBKUPB),+
  COMMAND(CP SMSG BKRBKUP SUBMIT BKUPLNX1),+
  ENV(LVM)
*
* Define all Backup Manager workers as a group
DEFGROUP NAME(BKRWRKRS),+
  USER(BKRWRK0*)
*
* Restart Linux guest when Backup is complete
DEFRULE NAME(BKUPDONE),+
  MATCH(*BACKUP COMPLETE - OMEGLNX1*),+
  GROUP(BKRWRKRS),+
  ACTION(STRTLNX)
```

Scenario D: How Do You Do That?

Suspend rule in Operations Manager (don't back up the guest every time it is shut down)

```
* Suspend rule for backing up Linux guest
DEFACTN NAME(DELBKUP),+
  COMMAND(SUSPEND RULE(LNXDOWN)),+
  ENV(GOM)
```

Scenario E: Suspend and Resume a Linux Guest

- **From DEMOADMN, view the console of the Linux guest**

```
gomcmd opmgrm1 viewcon user(rhel6d)
```

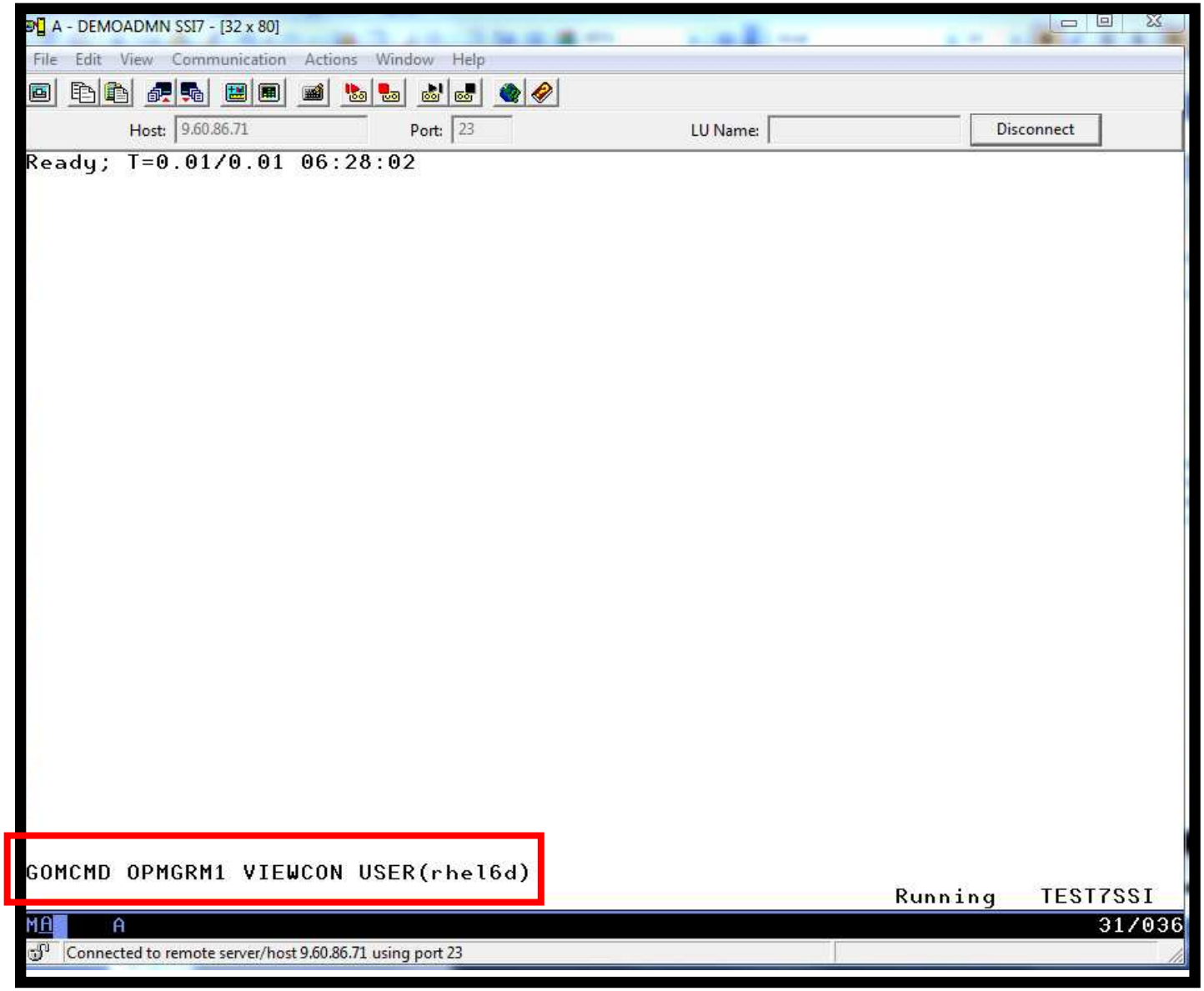
- **From MAINT, suspend a Linux guest using CP SIGNAL SHUTDOWN**

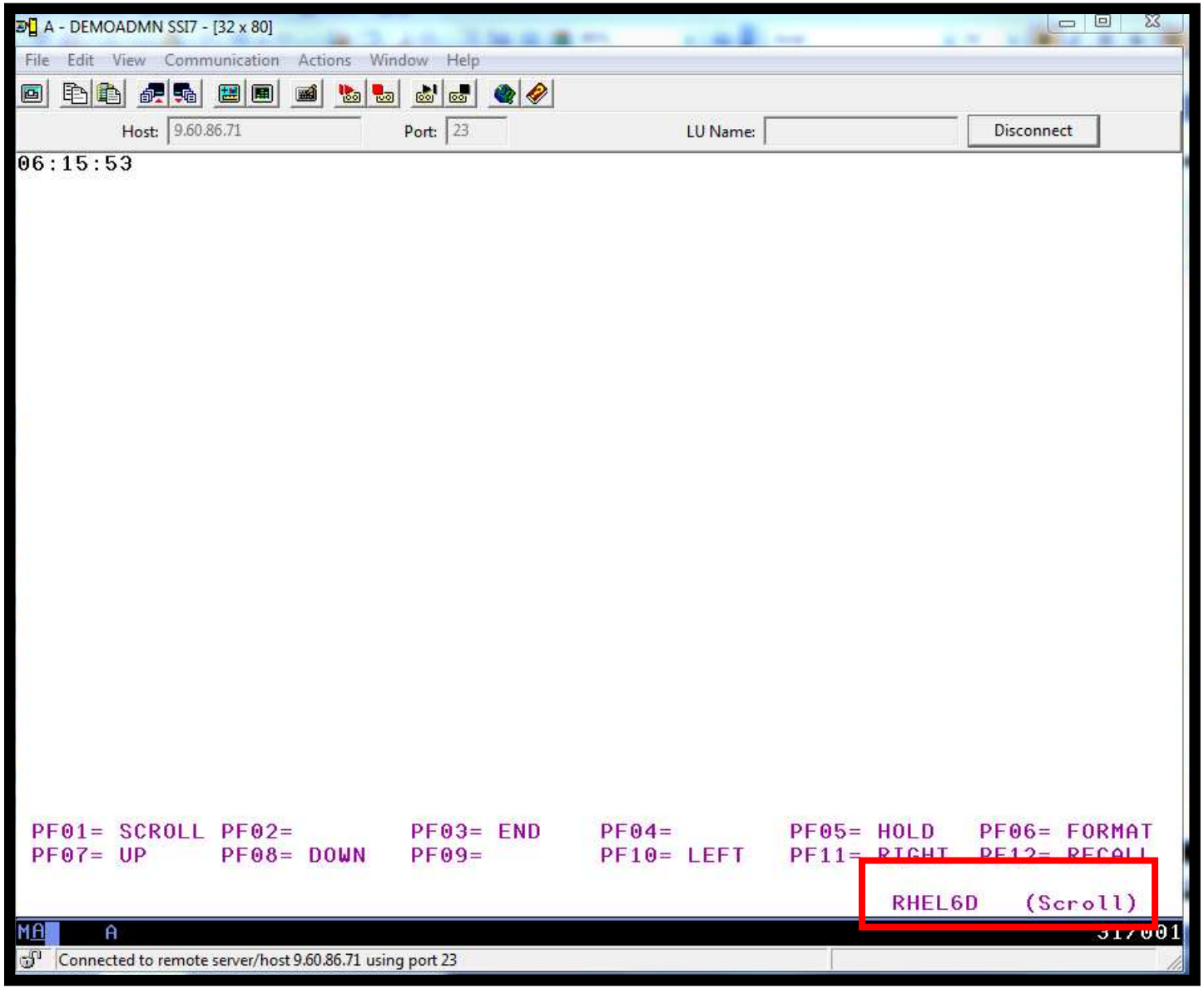
```
cp signal shutdown rhel6d within 90
```

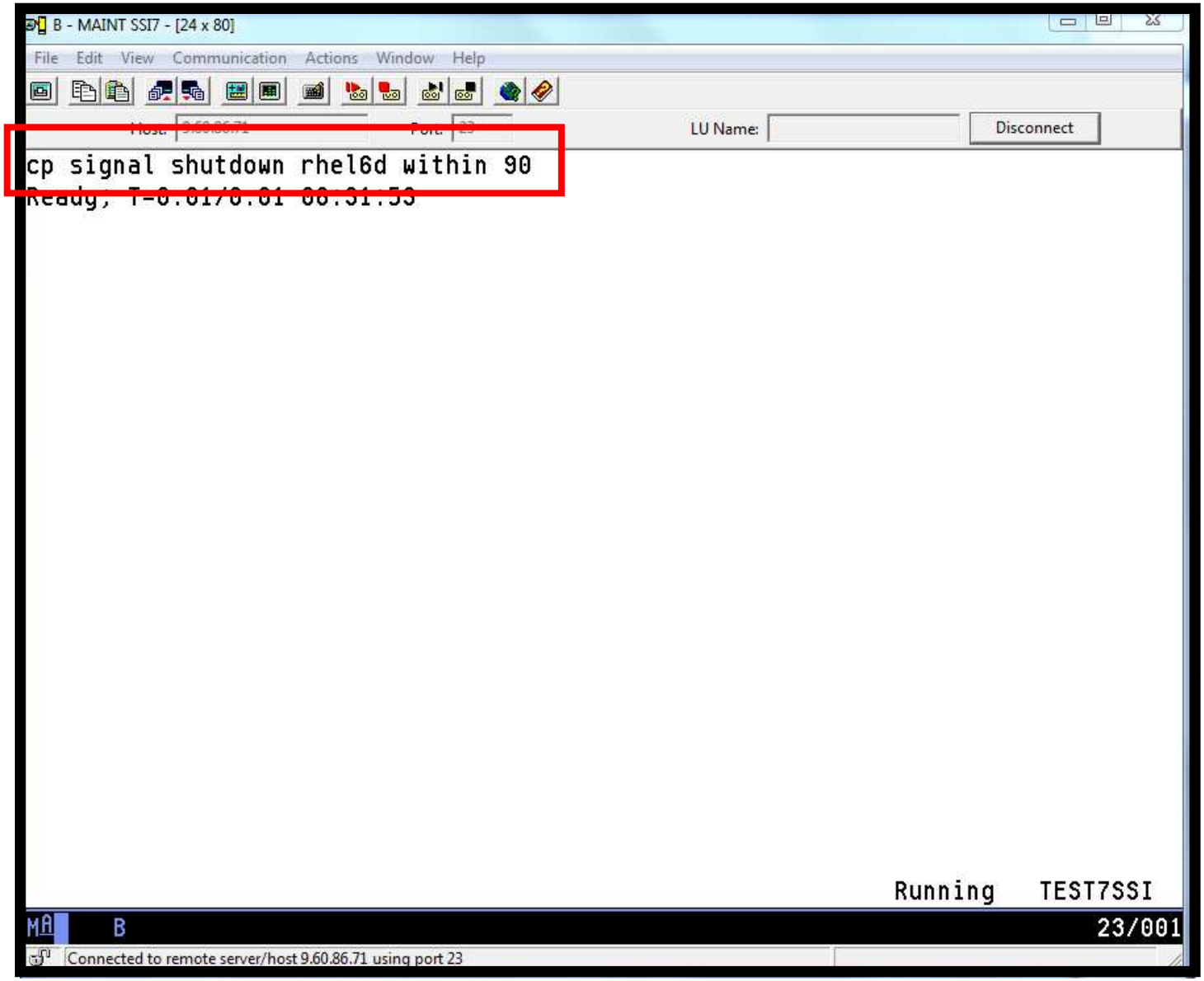
- **On DEMOADMN, note the guest suspending and logging off**
- **From MAINT, resume a Linux guest**

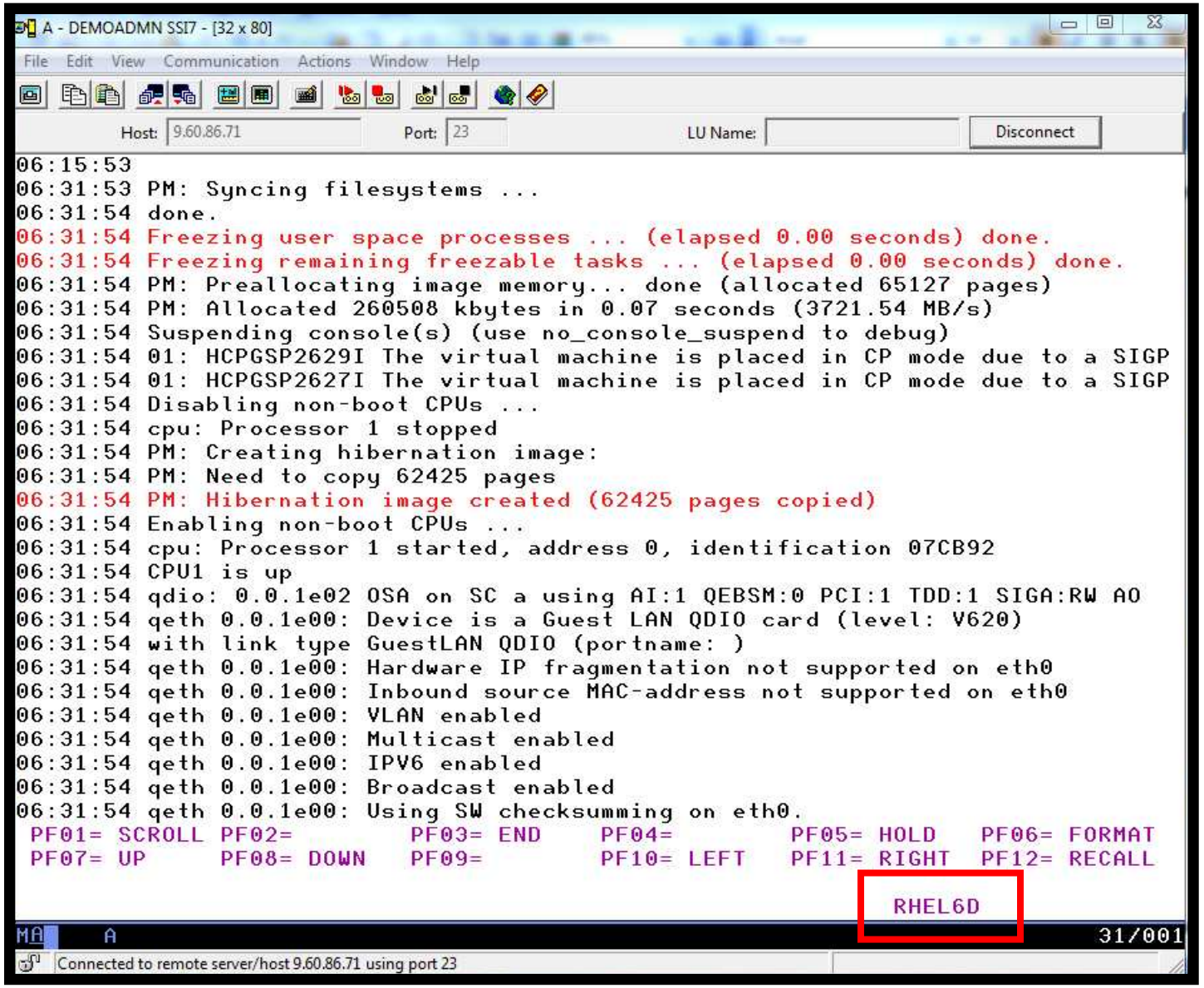
```
cp xautolog rhel6d
```

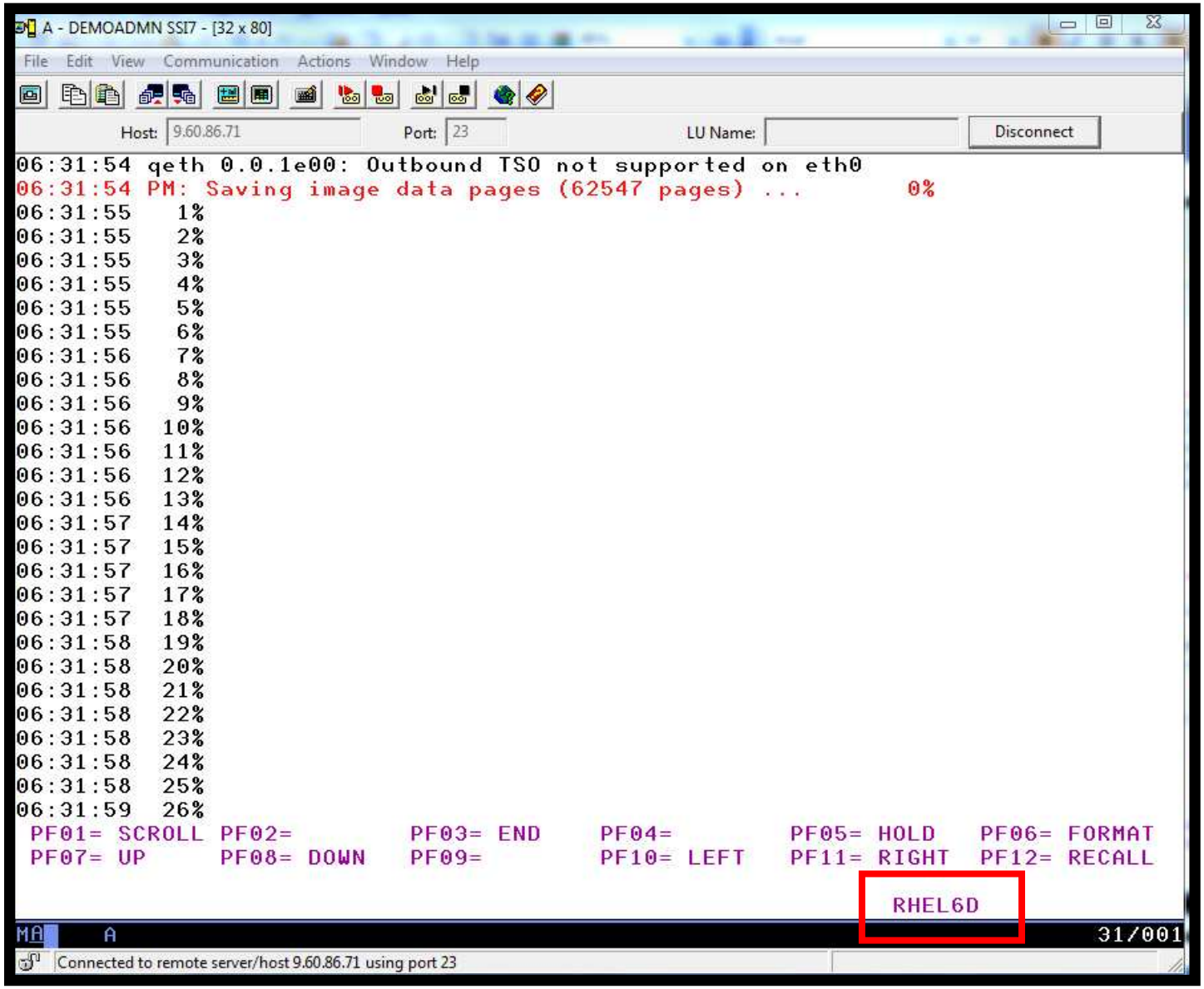
- **On DEMOADMN, note the guest resuming**

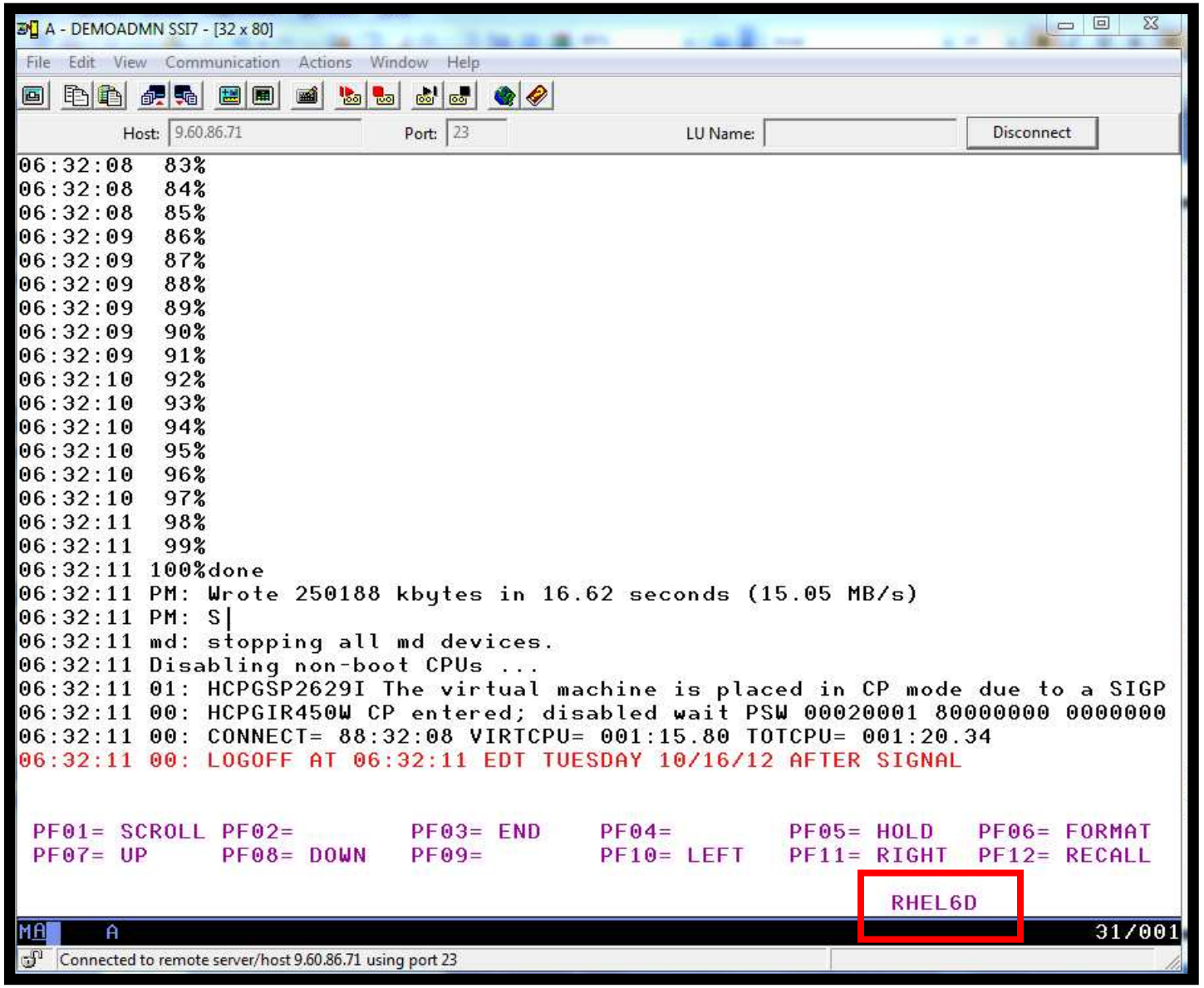


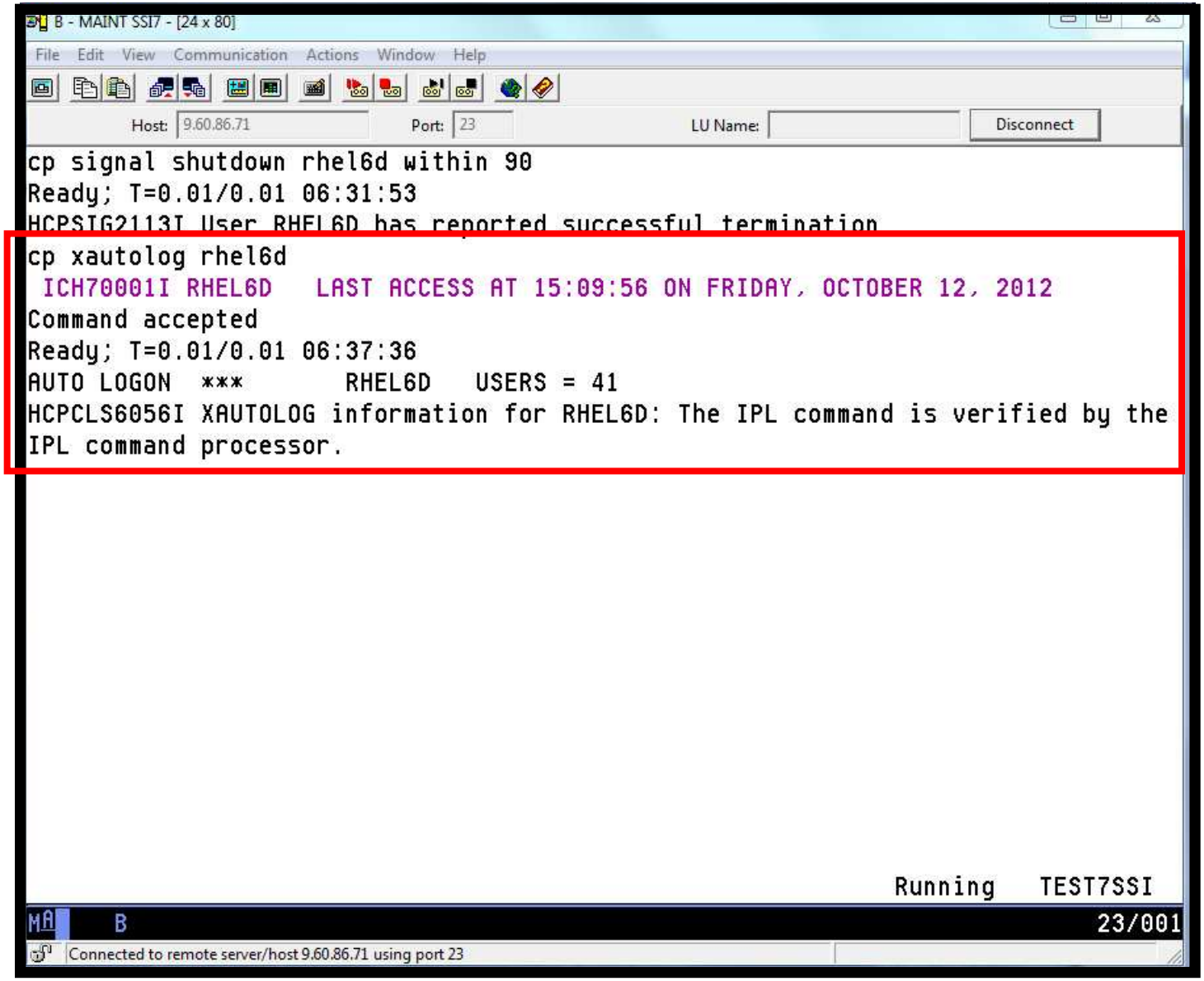


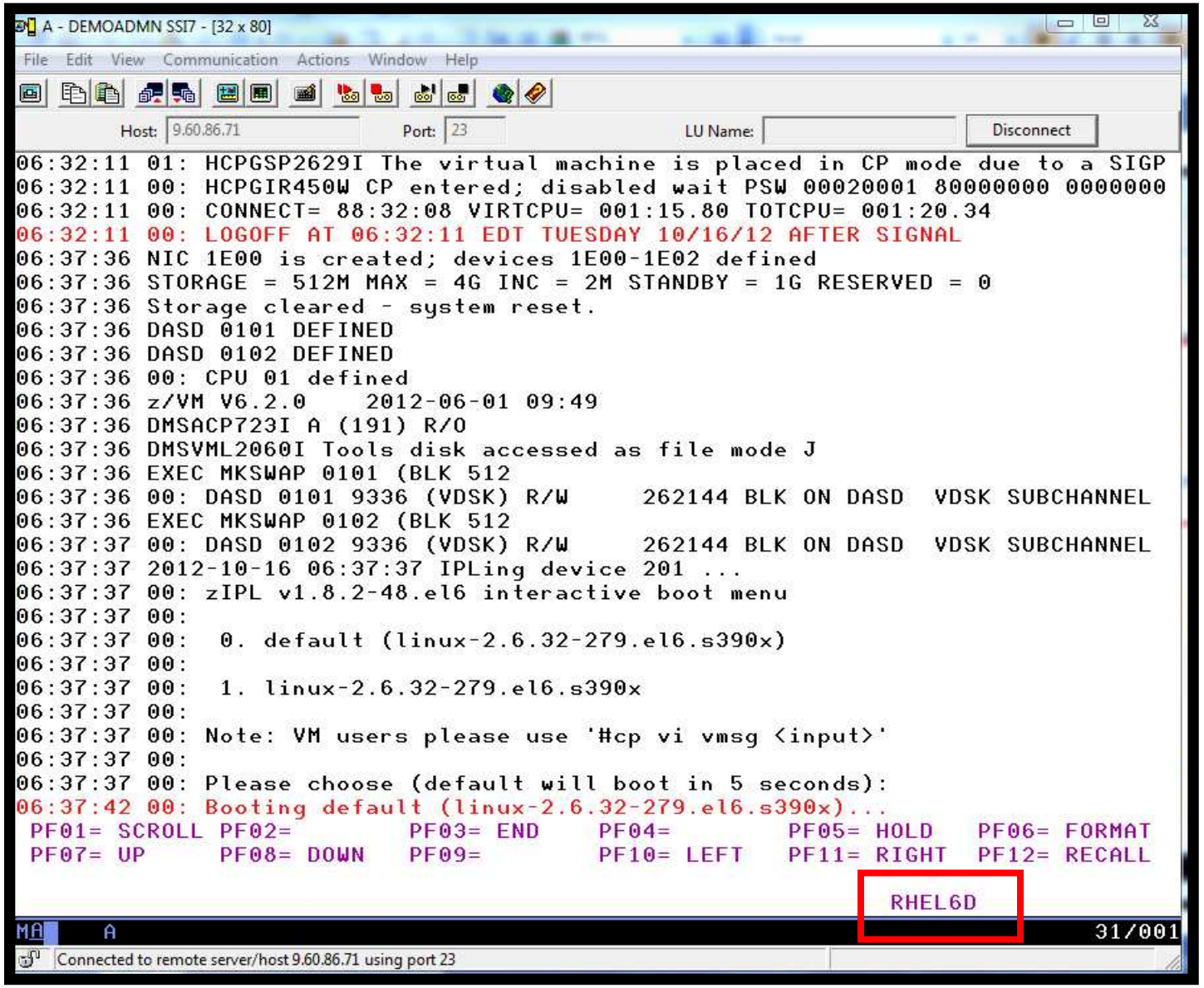


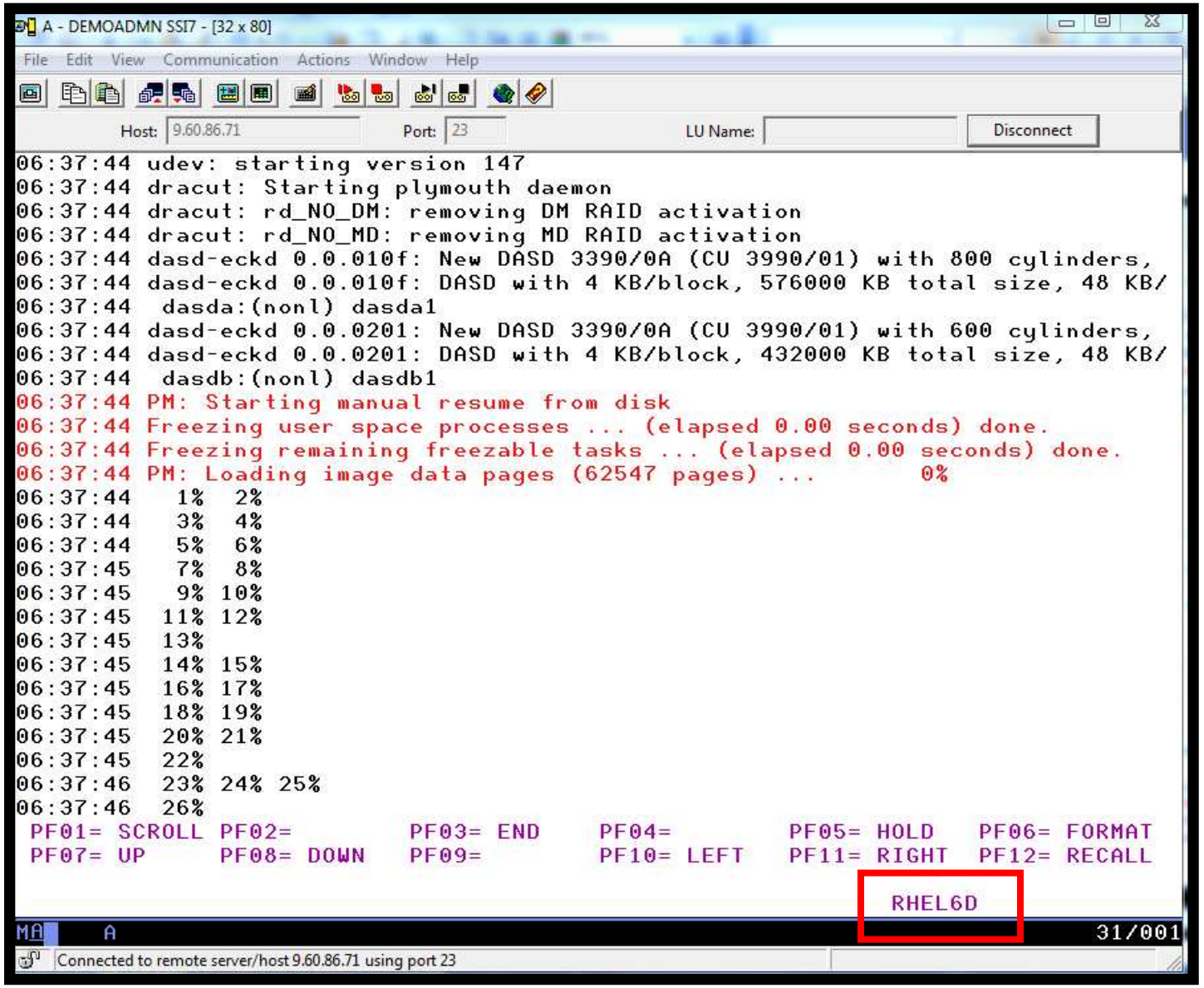


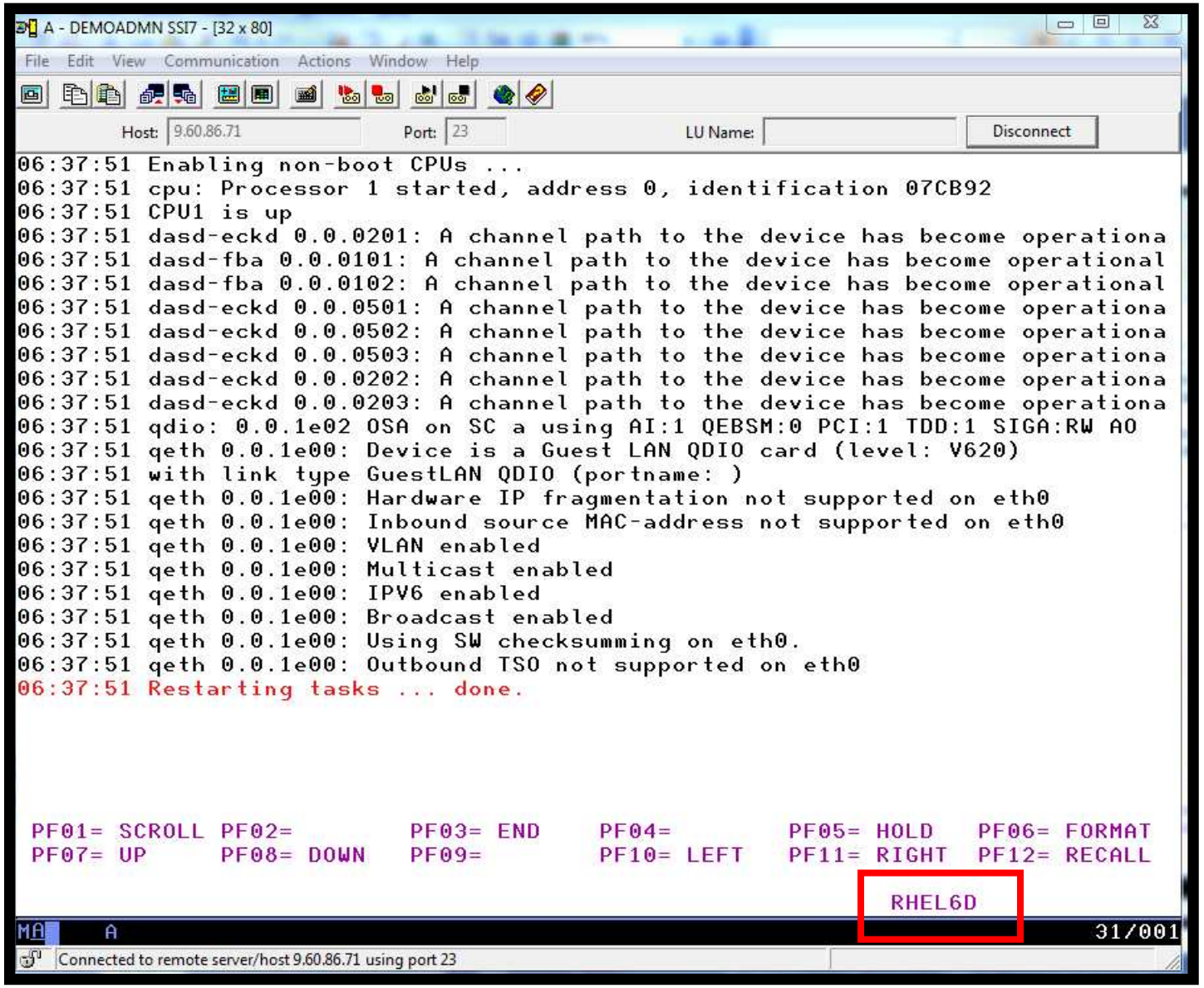












Scenario E: How Do You Do That?

- **Define swap space in /etc/fstab**

```
/dev/disk/by-path/ccw-0.0.010f-part1 swap
```

- **Enable suspend/resume and define swap space to use for it in zipl.conf**

```
resume=/dev/disk/by-path/ccw-0.0.010f-part1
```

- **Define suspend as response to signal shutdown (via control-alt-delete.conf)**

```
script
/bin/echo disk > /sys/power/state || /sbin/shutdown -h -t 4 now
end script
```

Scenario F:
Reviewing a Disaster Recovery Backup

- **Create a backup job based on sample provided**
- **Perform image backup of DASD volumes for Disaster Recovery (DR) purposes**
  - Can include z/VM and Linux guests
- **Output of backup is a DDR tape**
  - Compatible with DDR for restore at recovery site
- **Submit DR job for review**
- **Review output of review processing**

Scenario F: Detailed Steps

- From an authorized z/VM user ID, copy the sample DDR template from the sample disk to a new backup job
- Edit the new job and make necessary changes

```
xedit ddrdemo template c
```

- If not using SFS for templates disk, tell Backup Manager to reaccess the disk

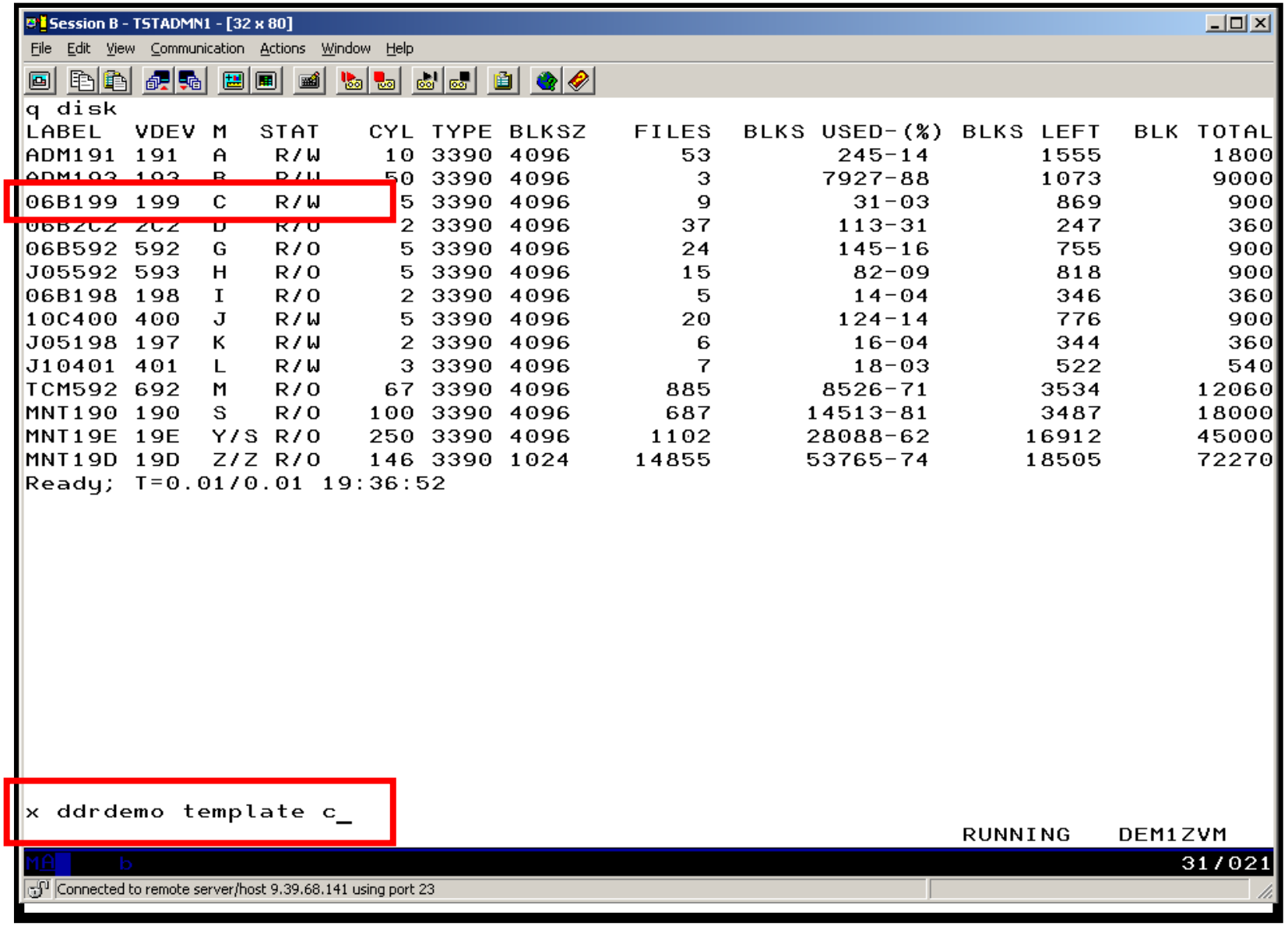
```
smsg bkrbkup cms acc 199 e/e
```

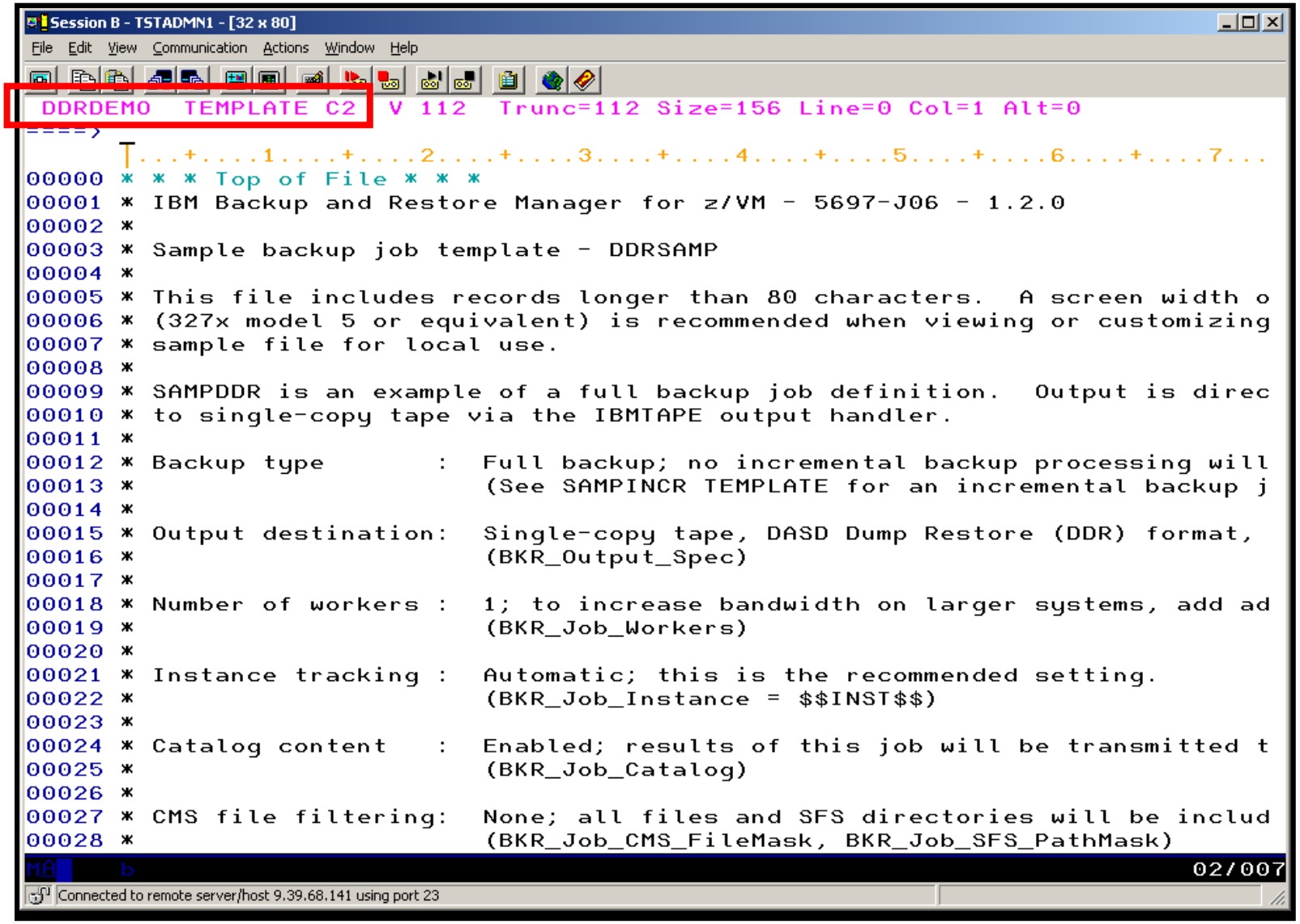
- From an authorized z/VM user ID, submit the backup job for review processing

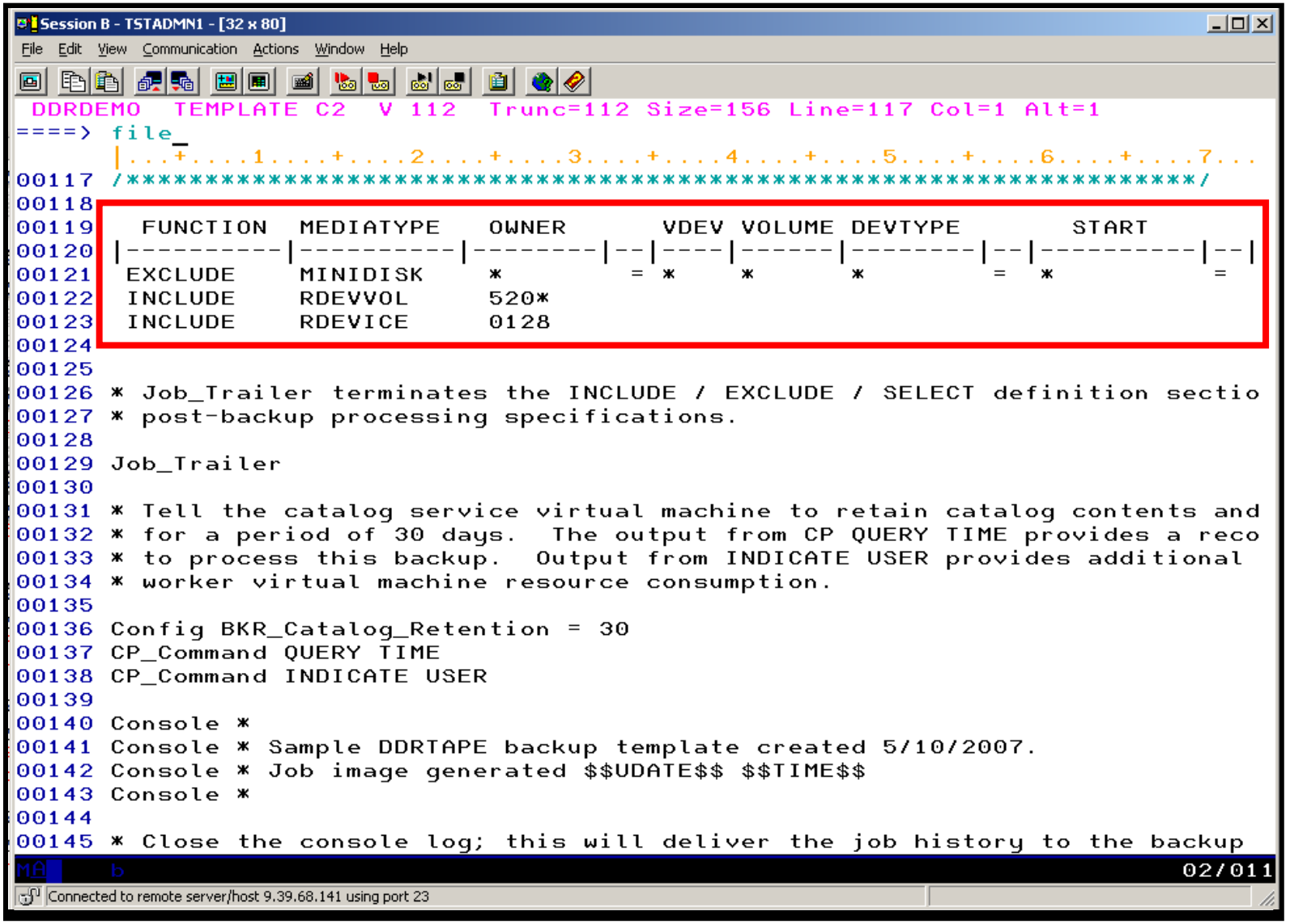
```
smsg bkrbkup review ddrdemo
```

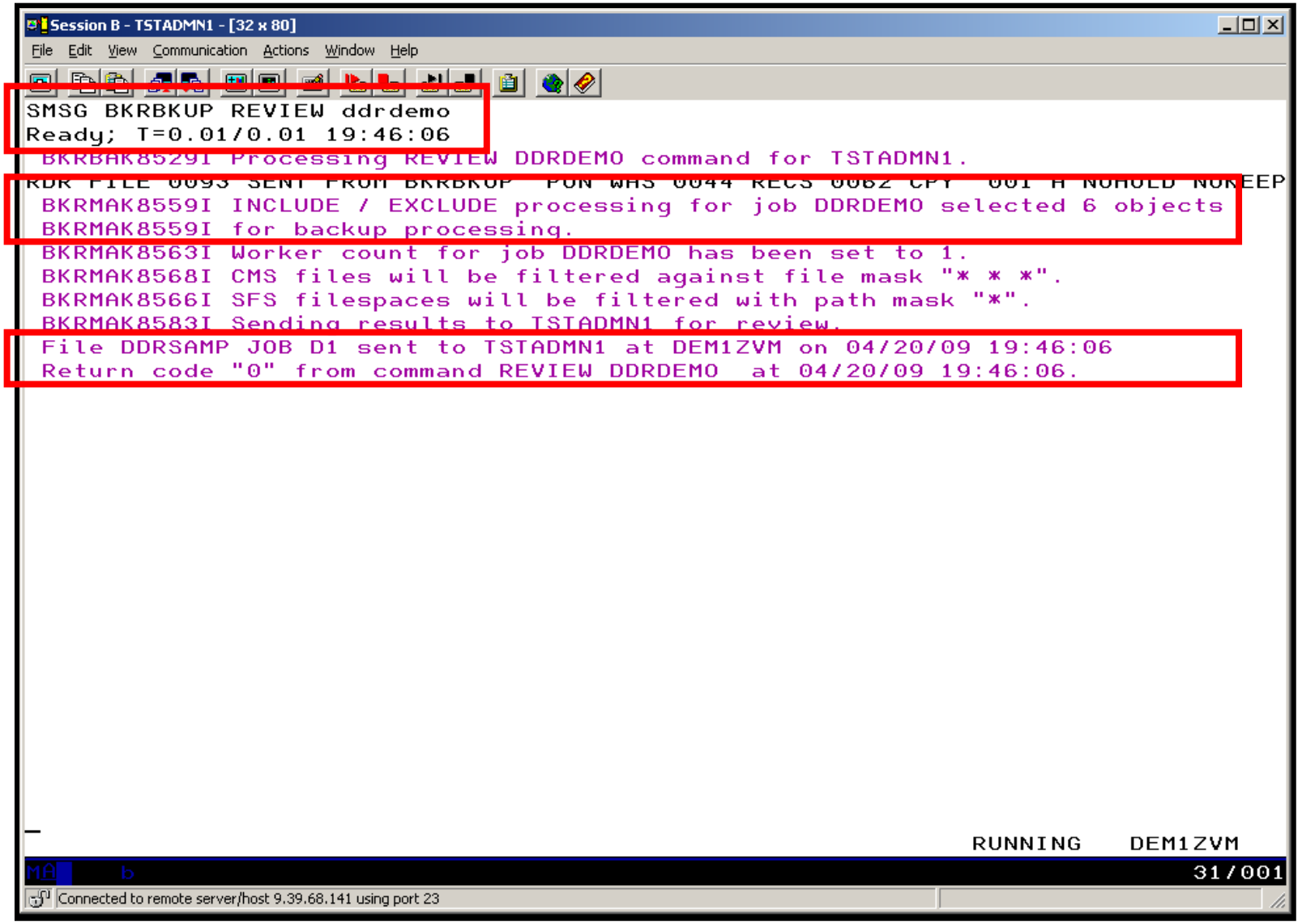
- View the file(s) returned to you by Backup Manager

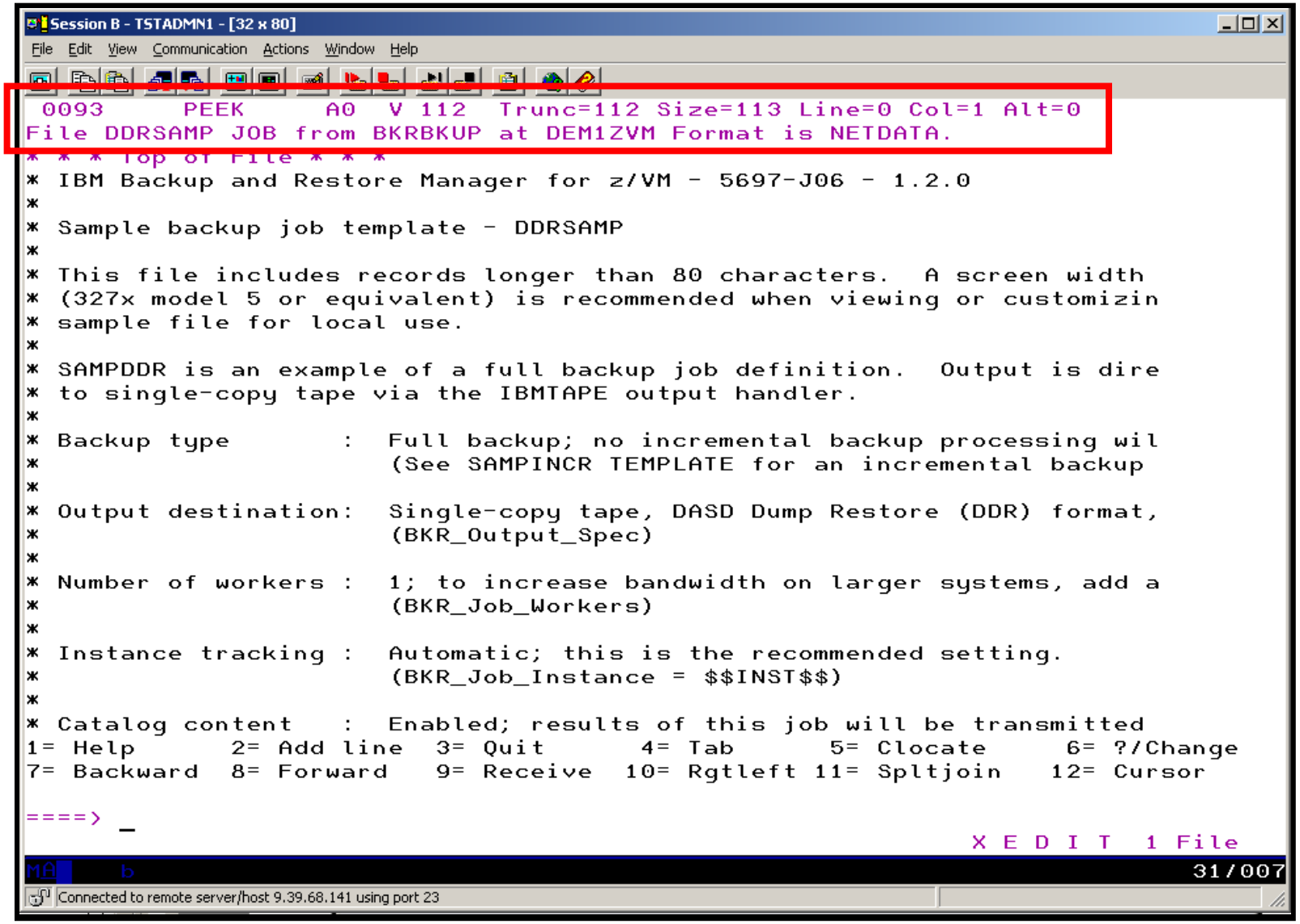
```
peek <rdrfile>
```

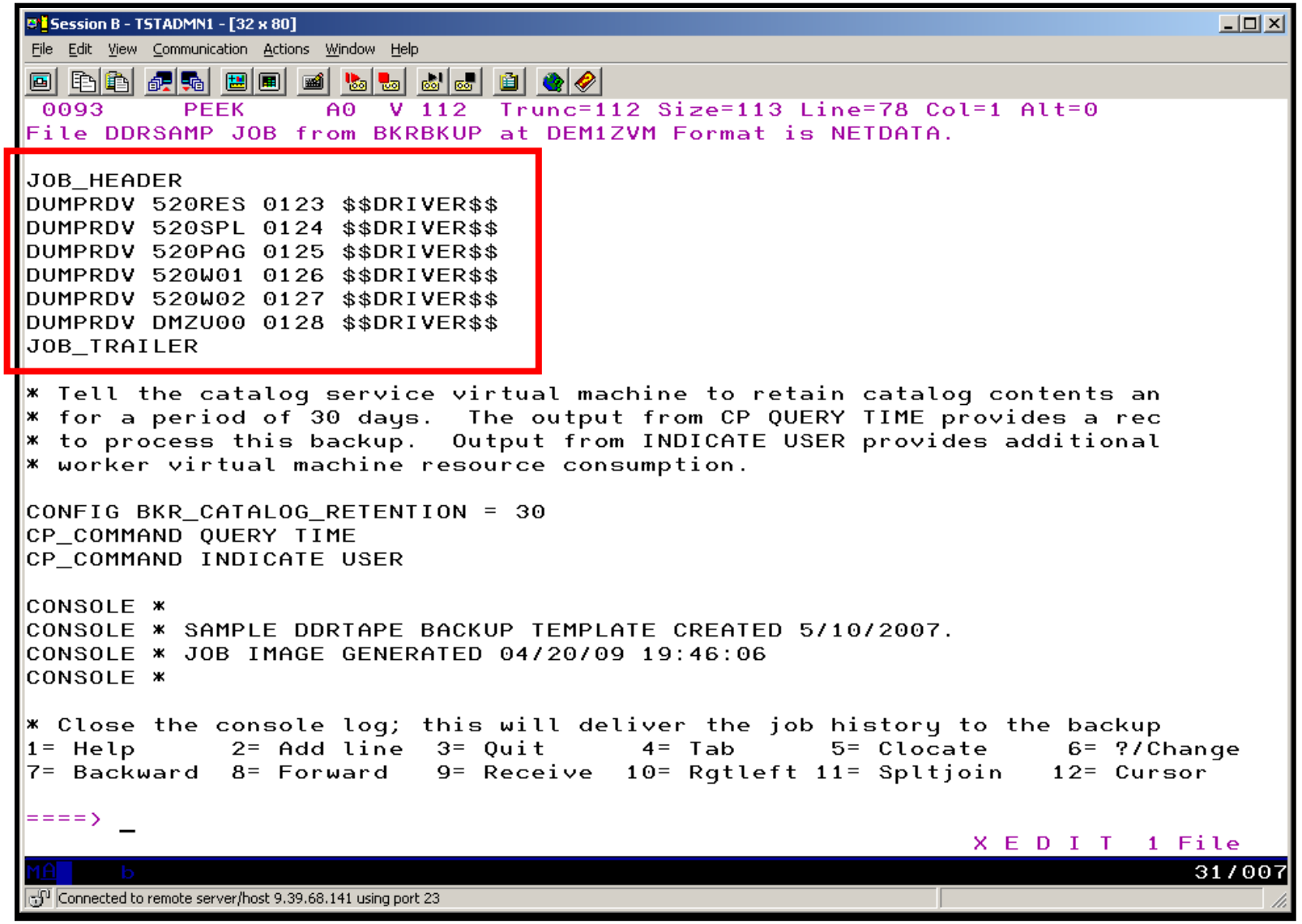












Scenario G:
Reviewing data in the Backup catalog for recovery

- **Various backup jobs have previously been submitted and completed**
- **Full screen interfaces available for searching the backup catalog and finding data available for recovery**
  - BKRLIST
    - Useful when looking for a specific file or set of files owned by a specific user ID
    - Users with ADMIN authority beware of size
      - Use parameters to narrow the search
  - BKRUSER
    - Useful when looking for backup jobs associated with a specific user ID
  - BKRJOB
    - Useful when looking for backup jobs by job name
  - BKRVOL
    - Useful when looking for backup jobs associated with a specific DASD volume

Scenario G: Detailed Steps

- **From an authorized z/VM user ID, issue one of the following commands to browse the catalog**

```
bkrlist
bkruser
bkrjob
bkrvol
```

- **Use F11 to drill down through details**
- **Use F10 to restore data**

धन्यवाद
Hindi

多謝
Traditional Chinese

감사합니다
Korean

Спасибо
Russian

Gracias
Spanish

Thank You
English

شكراً
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