



IBM Software

Backing Up and Restoring z/VM, a z/VM Cluster, and Linux on System z Guests

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Agenda

- **Recommended practices**
 - 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
- **Requirements for Demo Scenarios**
- **Overview of IBM products**
 - Backup and Restore Manager for z/VM
 - Tape Manager for z/VM
 - Operations Manager for z/VM
- **Backup scenarios**
 - Can be product agnostic
 - 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

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)

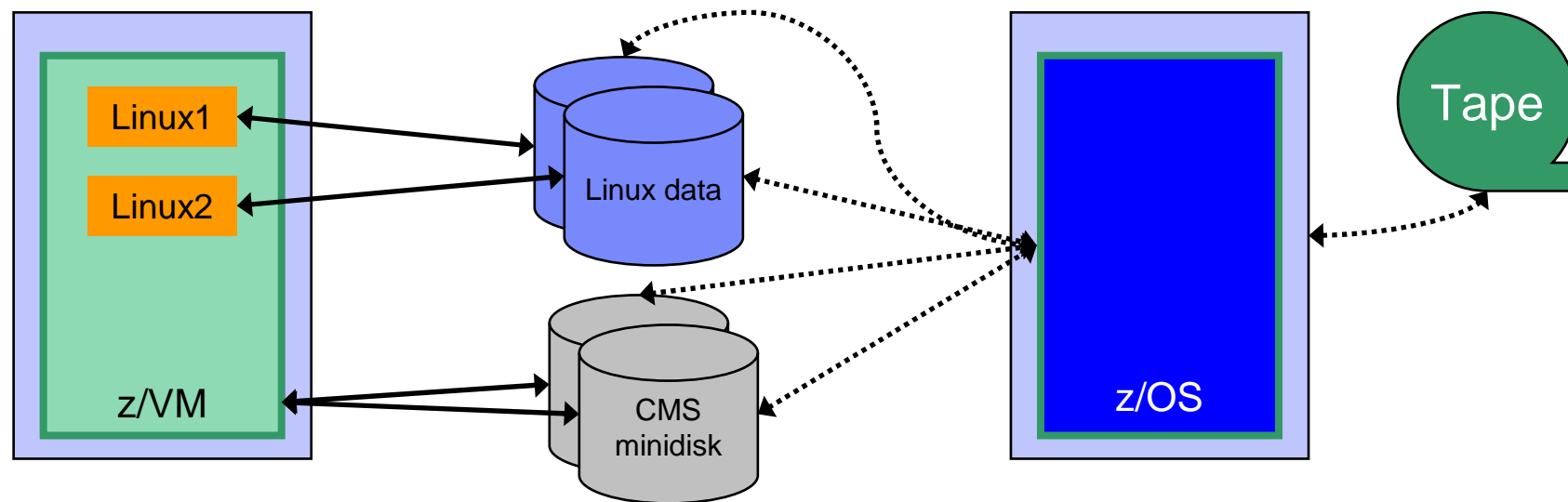
File level backup of Linux guests

- Configuration files
- Log files
- Tools

Disaster recovery of z/VM system, including Linux guest

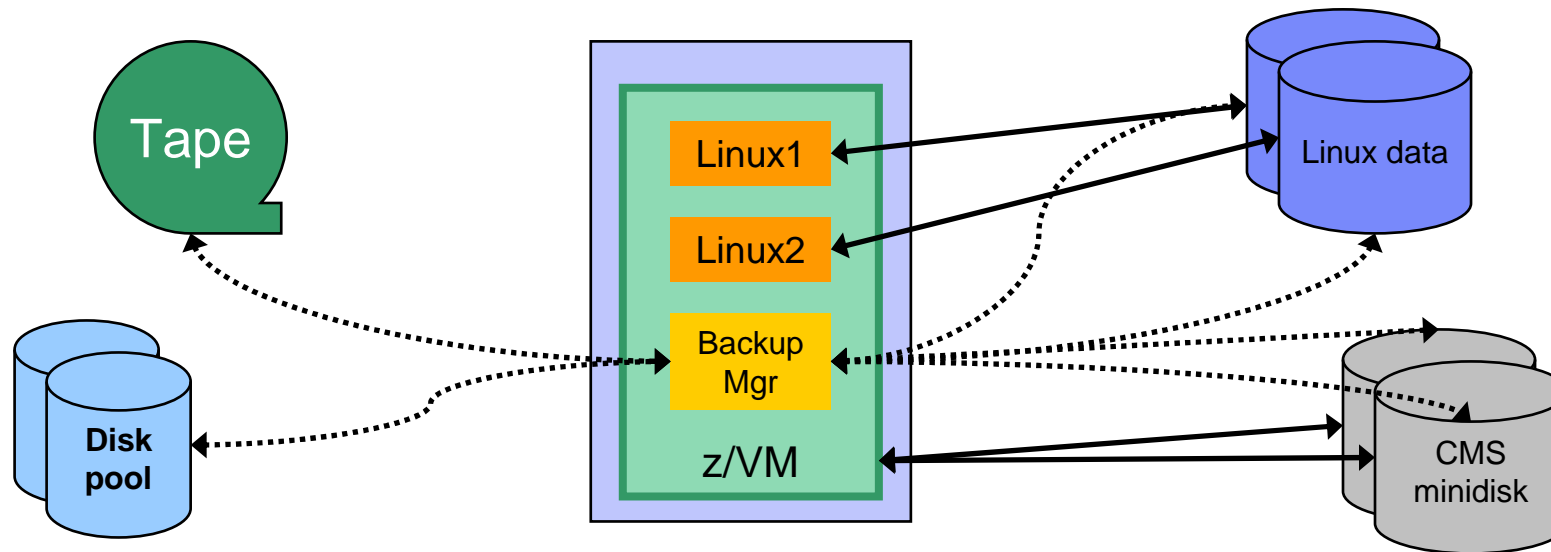
- Dependence on z/OS
versus
- Independent recovery in parallel with z/OS

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



- **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

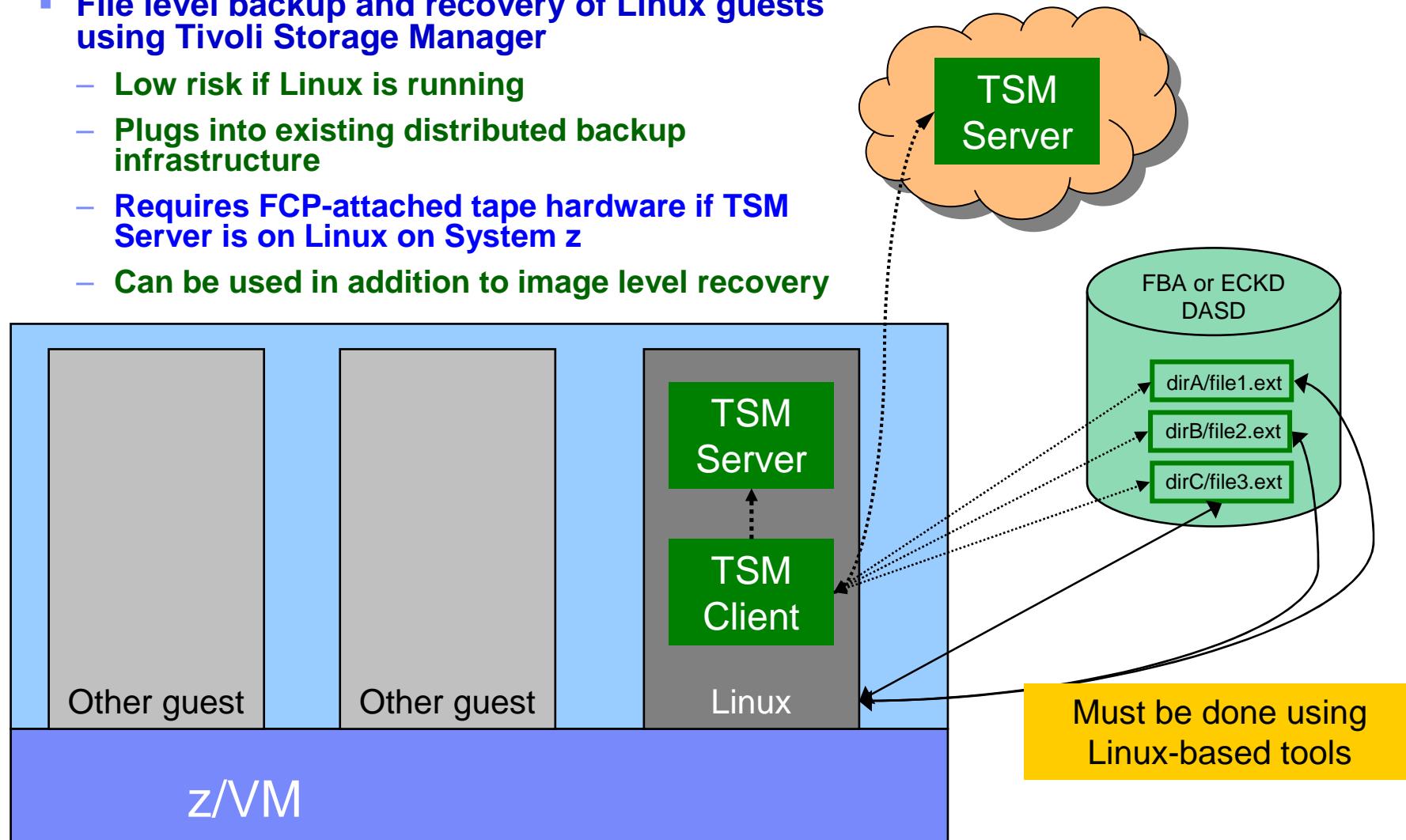
Image Level Backup/Recovery of z/VM and Linux Guests



- **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

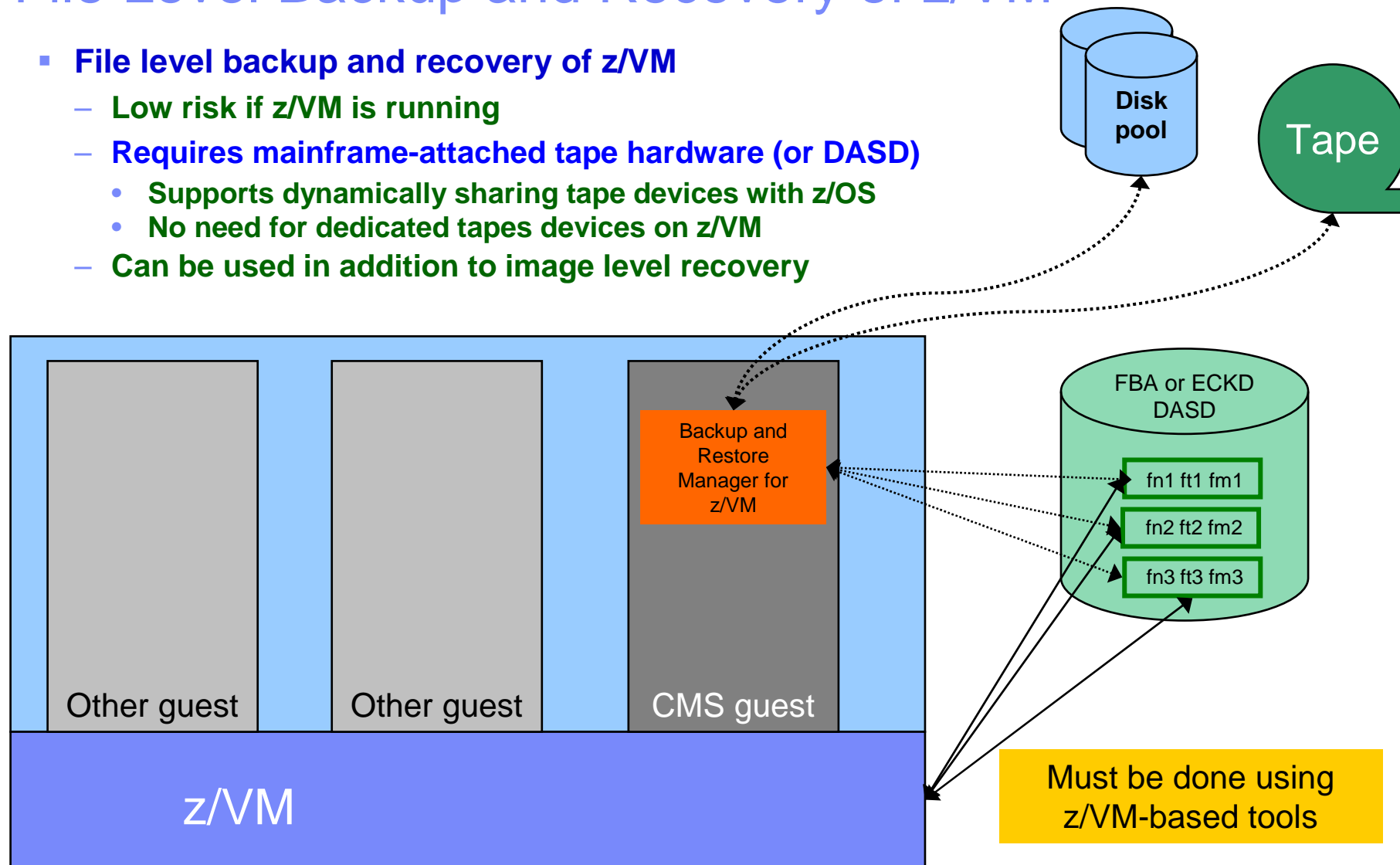
File Level Backup and Recovery of Linux Guests

- **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 be used in addition to image level 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

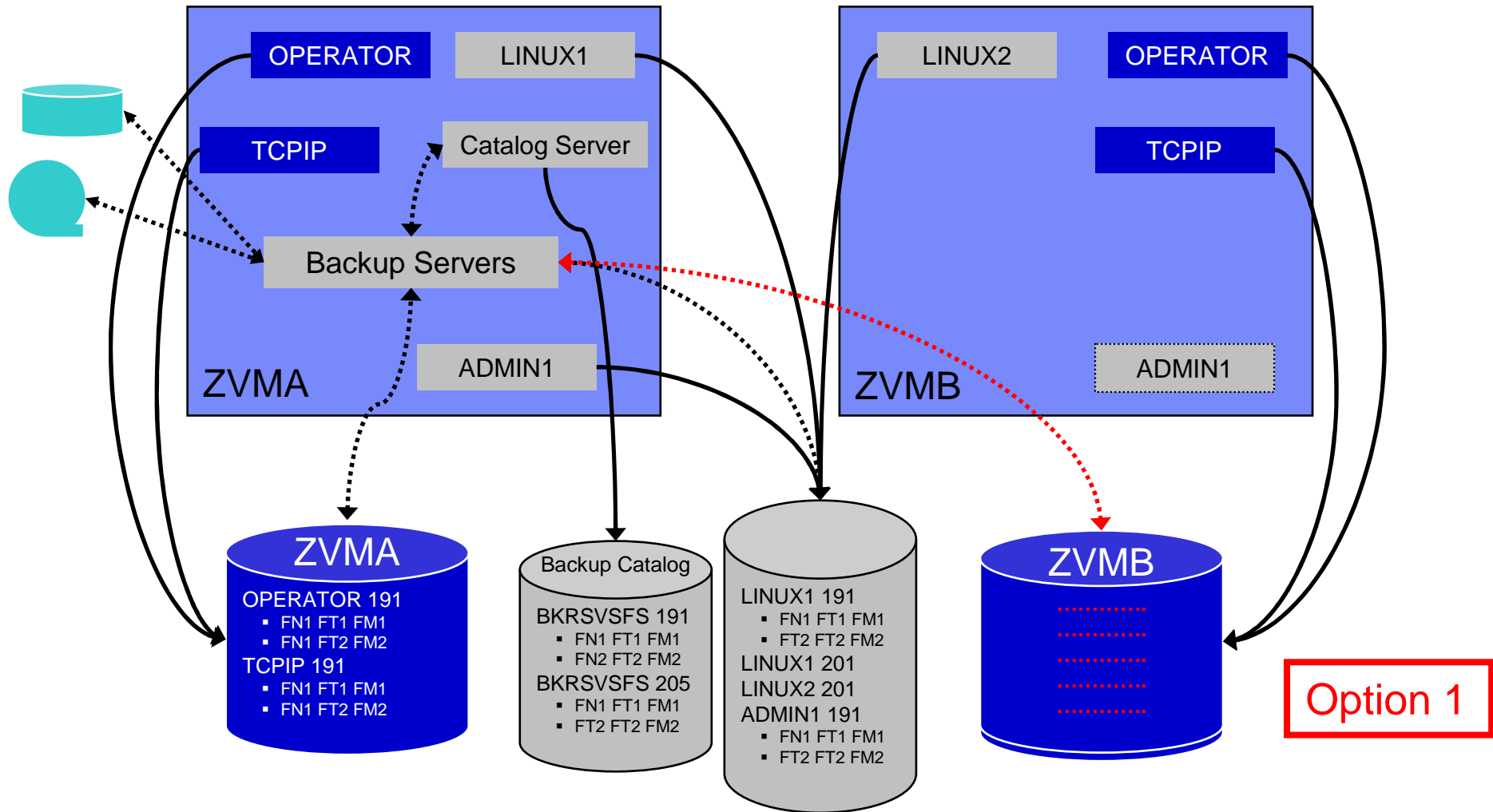
- **Using z/OS to back up and restore z/VM and Linux**
 - Useful during Linux on System z POC or early stages of Linux roll-out
 - Easy and fast to implement for existing z/OS customers
 - Provides disaster/volume level recovery
 - Concerns or issues long term as Linux workload grows or becomes critical
 - Doesn't support FCP-attached DASD
 - File level recovery of z/VM or Linux data is time consuming and manual
 - 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
 - SYNC command exists to force all I/Os to be processed
 - Linux will immediately start caching new I/Os
- **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
 - Dependent on type of application running on Linux
 - Similar to pulling the plug on a distributed Linux server, then restarting it
- **For guaranteed recovery, shut down the guest before backing it up from z/VM or z/OS**
 - Your experience may (will) vary
 - Evaluate the risk based on the application

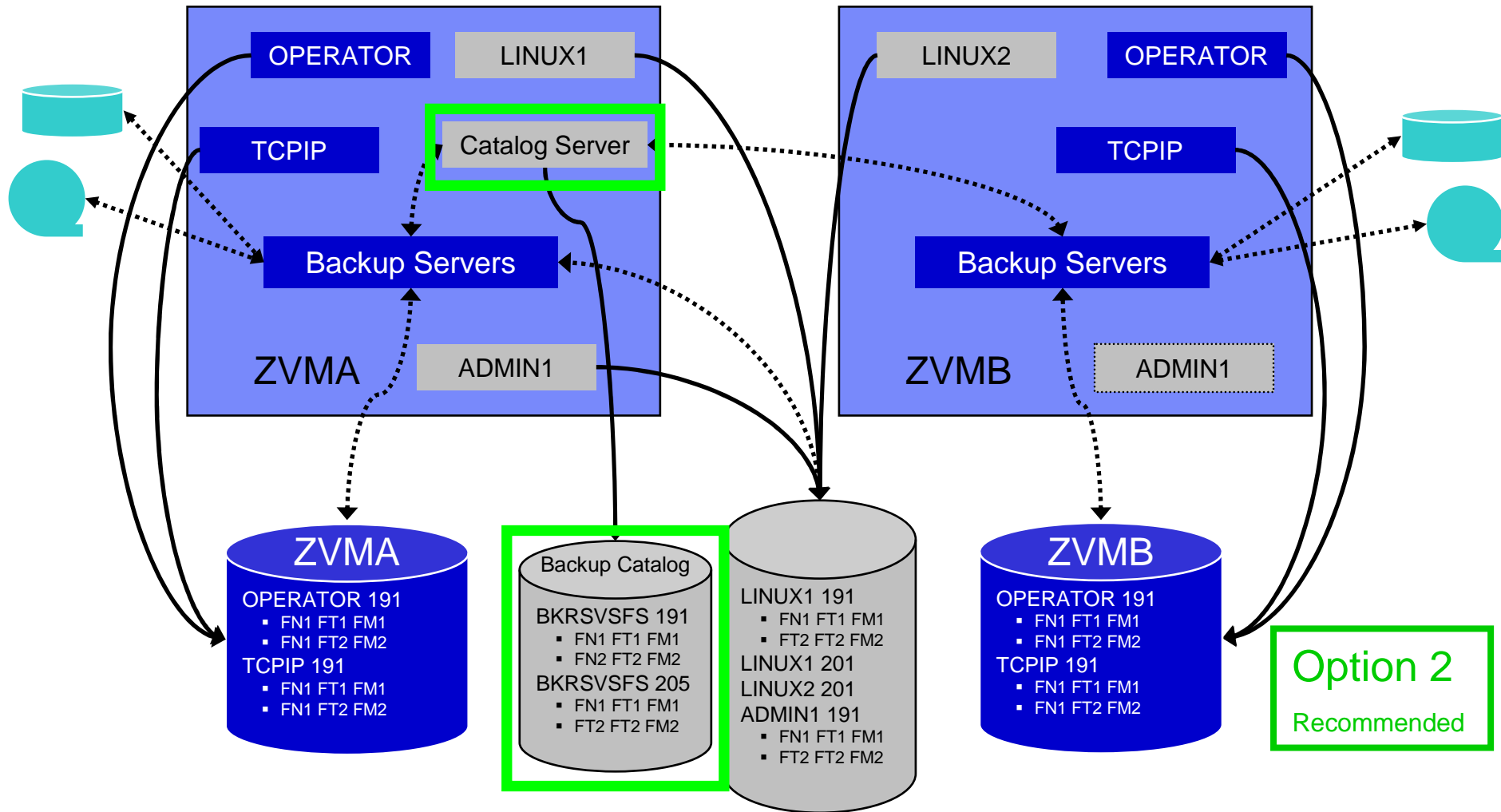
Single Config Users and MDisks
 Multiconfig / IDENTITY
 Users and MDisks

SSI Considerations for Backup and Restore



Single Config Users and MDisks
 Multiconfig / IDENTITY
 Users and MDisks

SSI Considerations for Backup and Restore



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
 - 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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Requirements

Implementing these Scenarios

Backup requirements for z/VM system

- **Define a backup job that limits the backup to a specified set of disks**
- **Customize messages that are displayed when backup is complete**
- **Invoke backup via an “API”**
- **Use a shared backup catalog across the cluster**
- **Use backup service machines on each member of the cluster**

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**
- **Schedule an action to occur immediately**
 - Or on a regular schedule
- **Chain actions (triggered by messages, schedules, etc.)**
- **Suspend and resume message rules, schedules, spool monitors, etc.**



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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

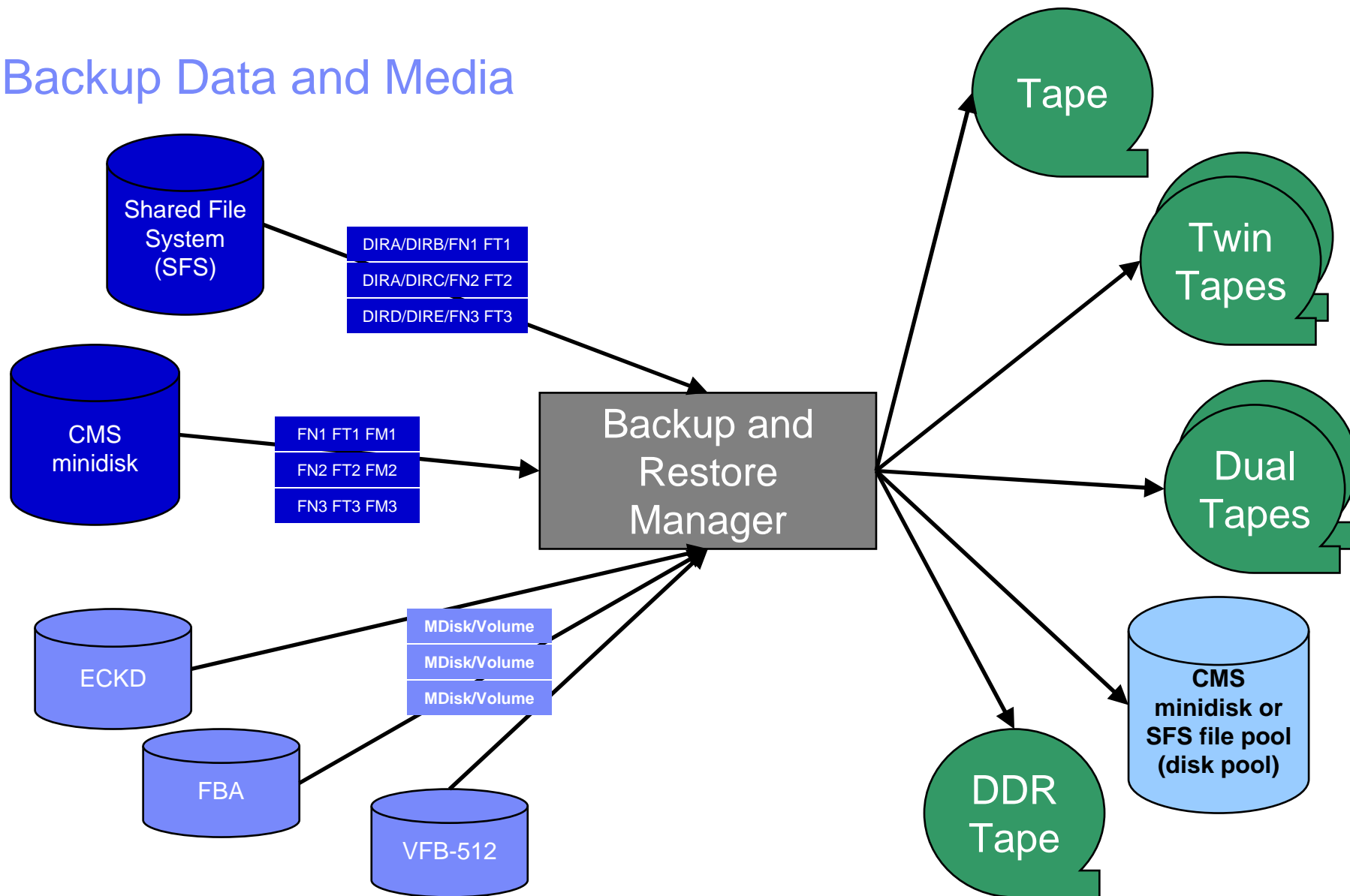
■ Restore

- Performed by users for their own data
- Extending to other users available via exit
- Performed by administrators for any data
- Selection of data to restore
 - Full screen interface or commands

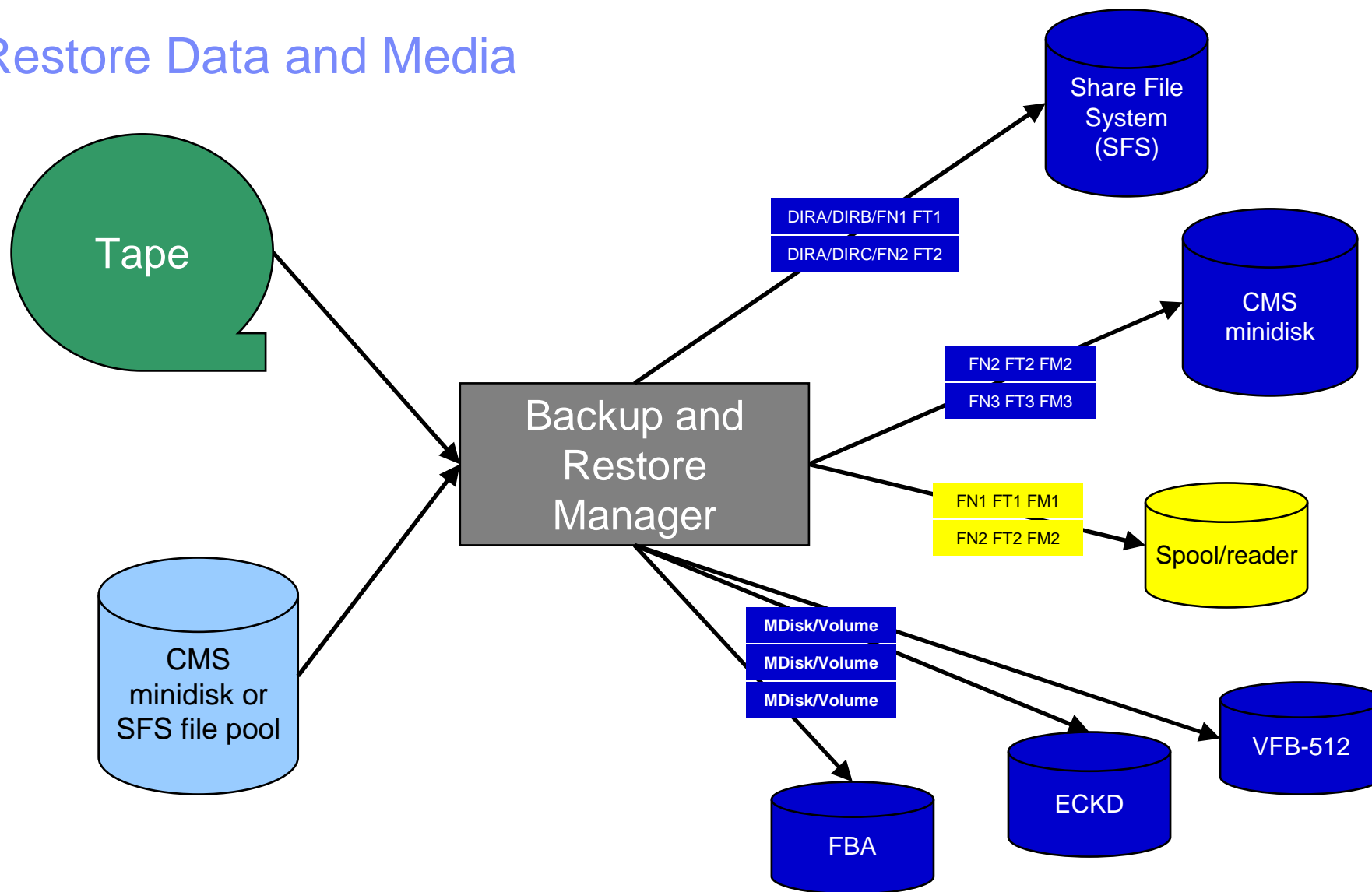
Catalog in Shared File System (SFS) – presentation on web site for installation and setup

- **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



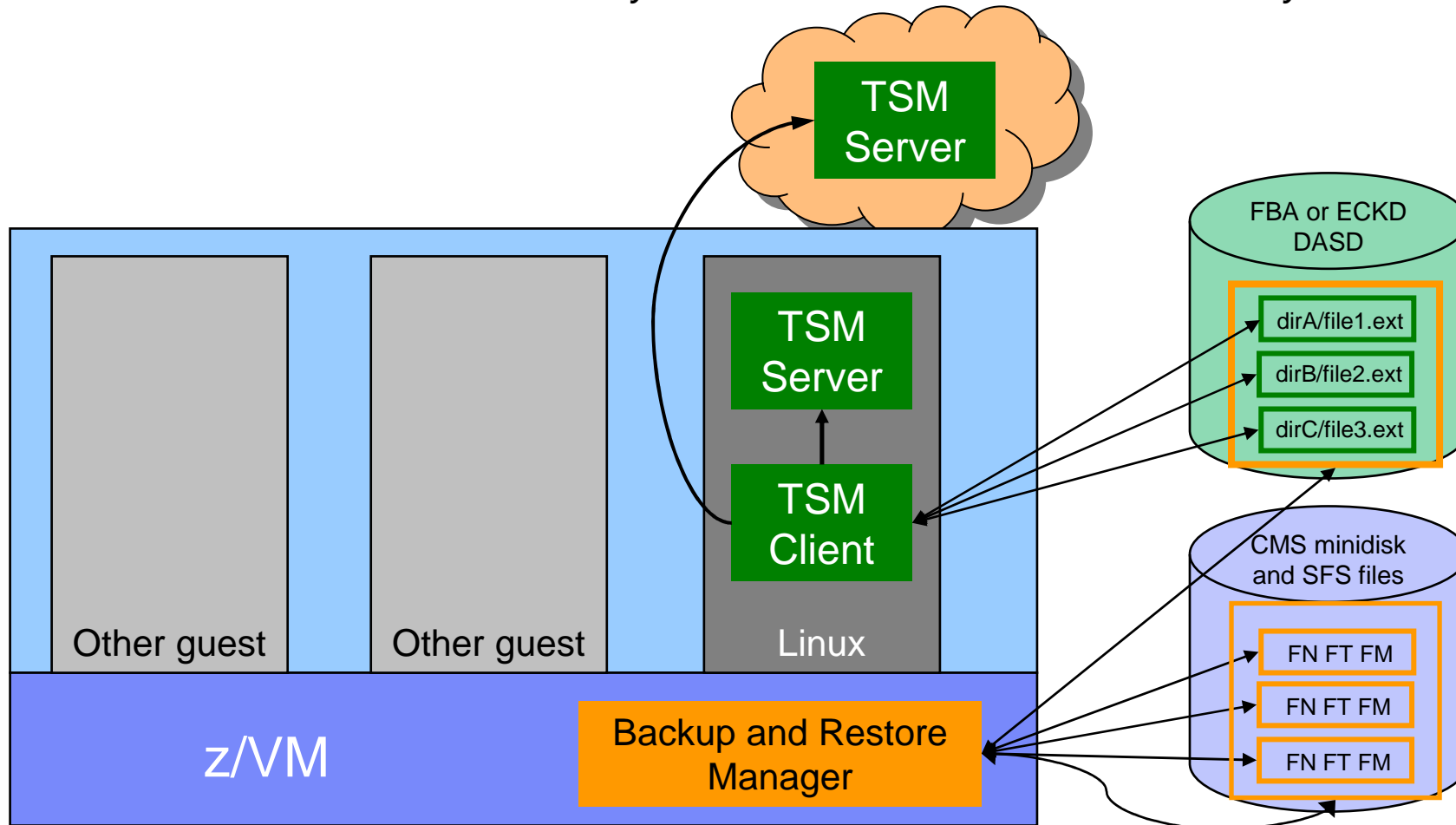
Restore Data and Media



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* *    *          = *      = *      = *

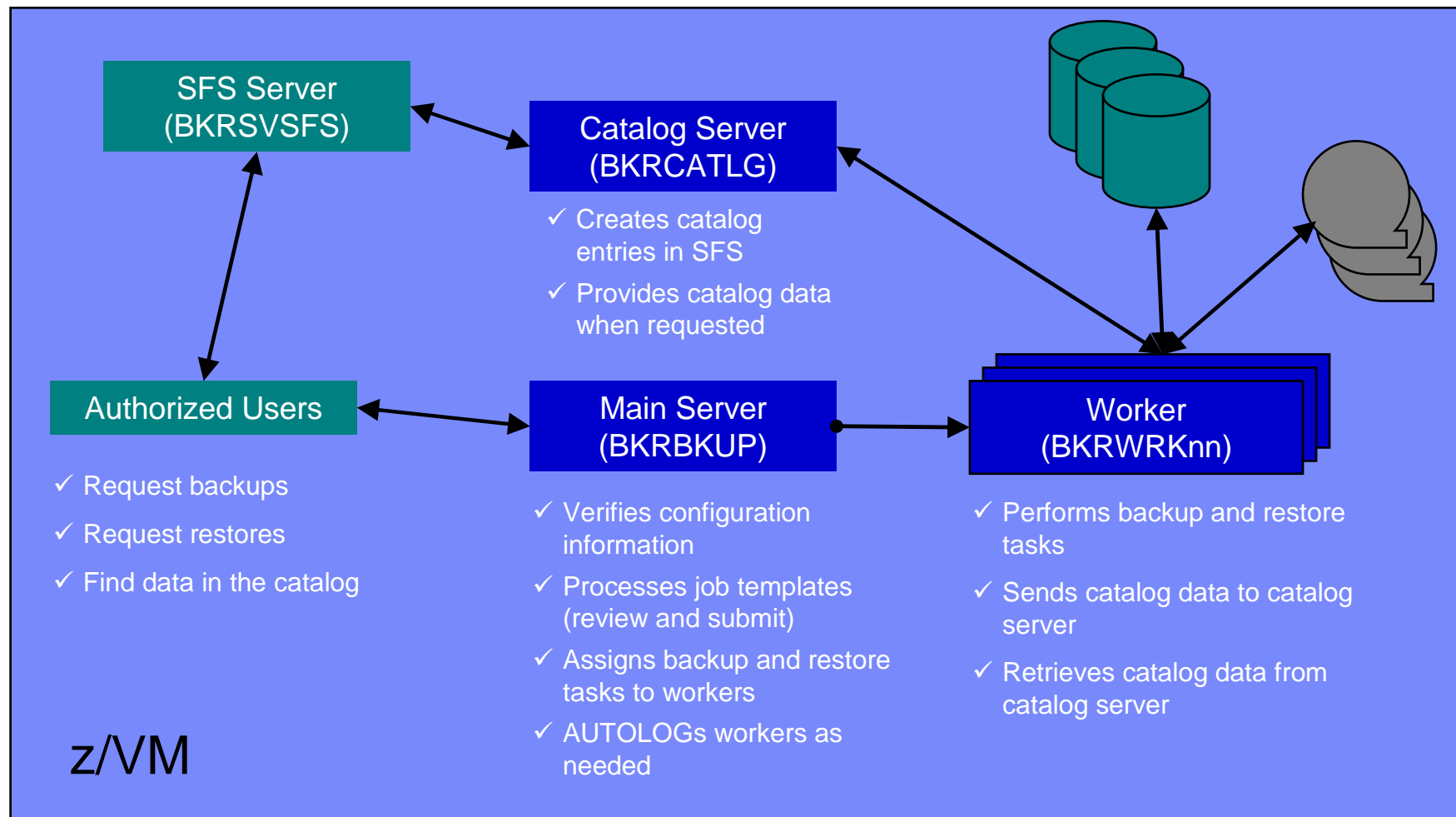
  FUNCTION  MEDIATYPE  ADDRESS
  |-----|-----|-----|
  INCLUDE   RDEVICE    900-90F
  EXCLUDE   RDEVICE    *B

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

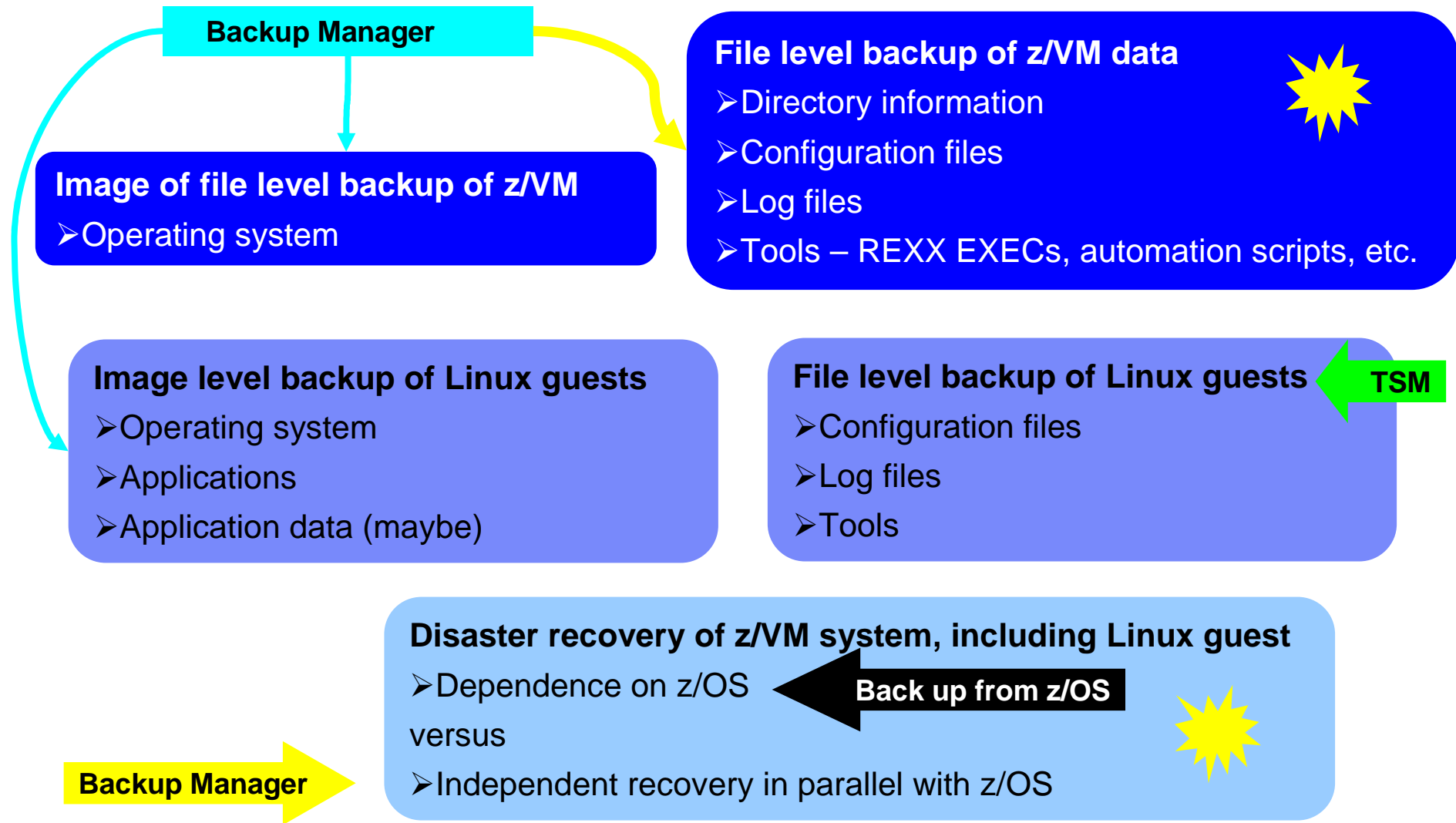
  FUNCTION  MEDIATYPE  POOLNAME  OWNER    FS
  |-----|-----|-----|-----|---|
  INCLUDE   SFS        VMSYSU:  *        SFS
  EXCLUDE   SFS        VMSYSU:  VMSERVU SFS

```

Backup and Restore Manager Architecture – non-SSI



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

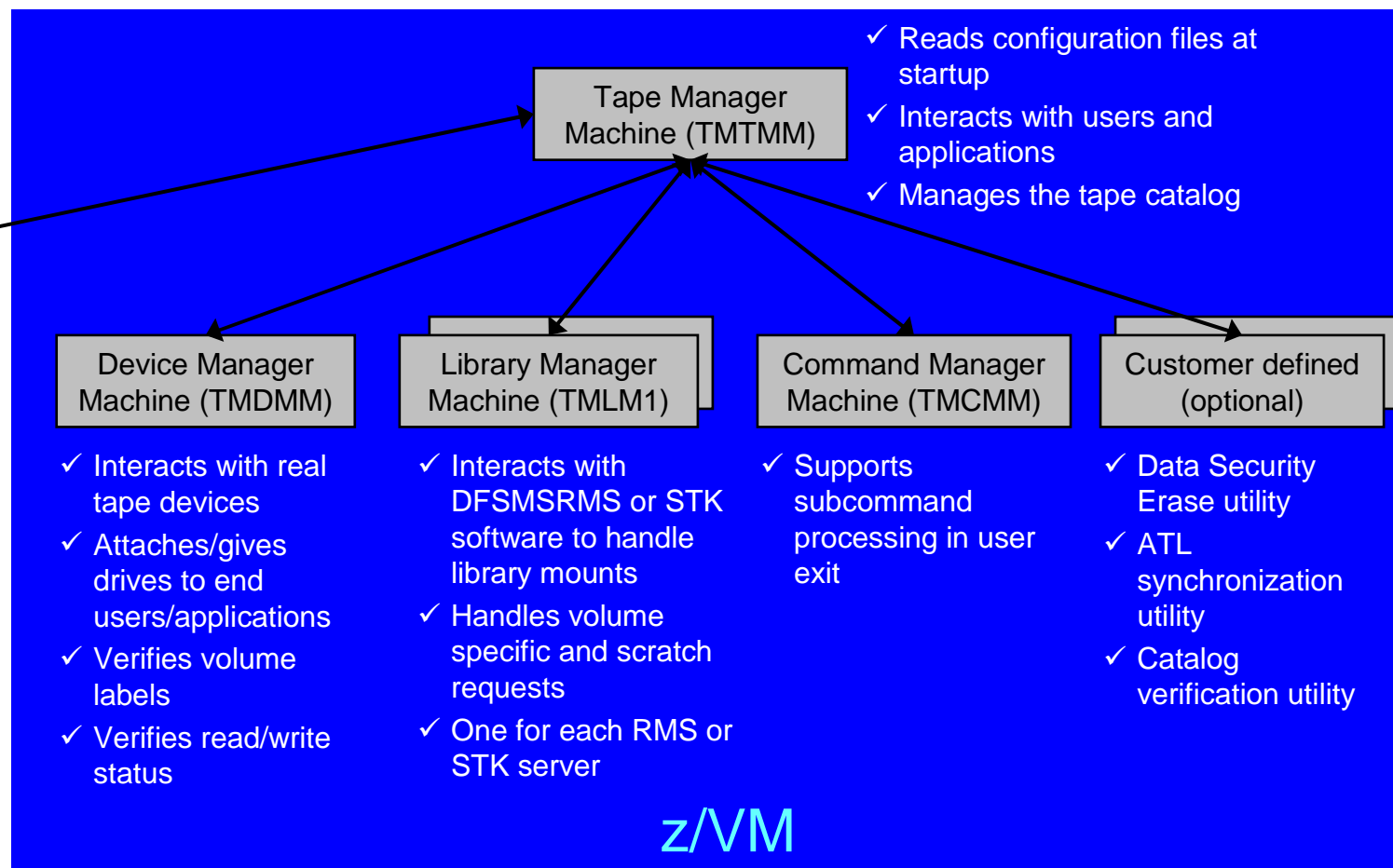
- **Improved accuracy of manual tape processing**
 - Granular access control
 - Automated interface to Operator for manual mounts
 - Internal label verification at attach/give and detach (SL only)
 - Read/Write verification at attach/give

- **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

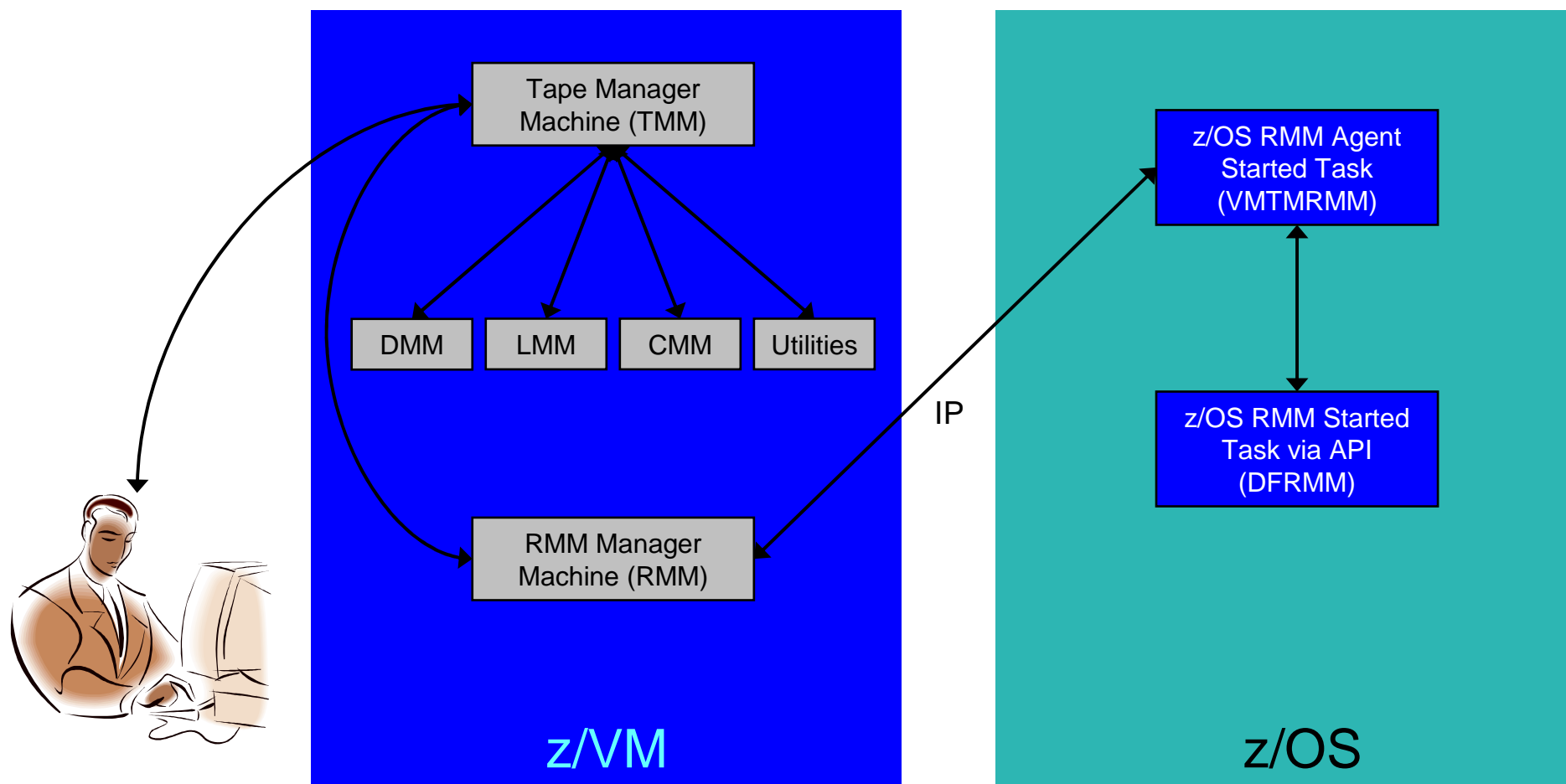
Data Security Erase (DSE)

- **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



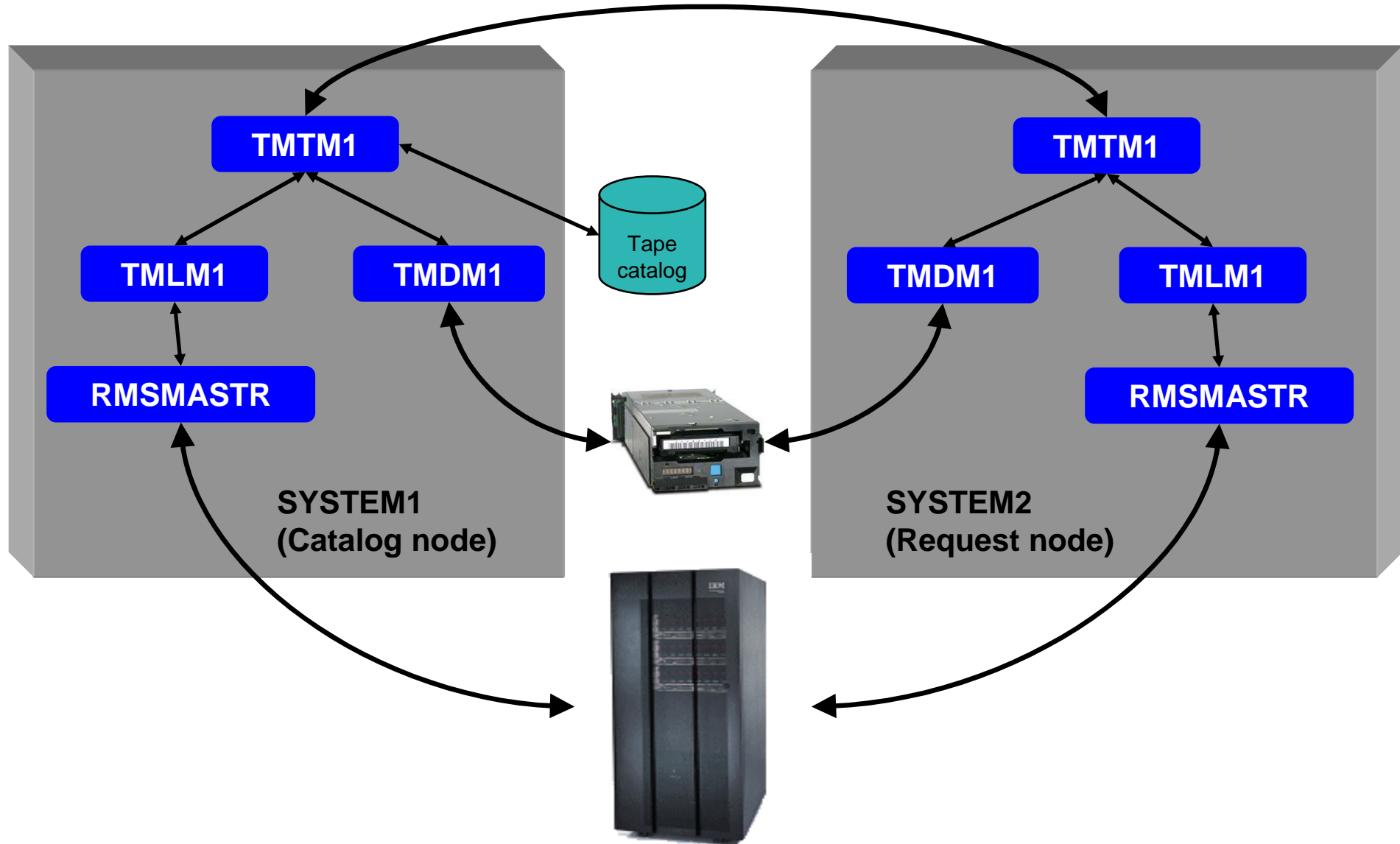
Tape Manager in RMM Mode



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**

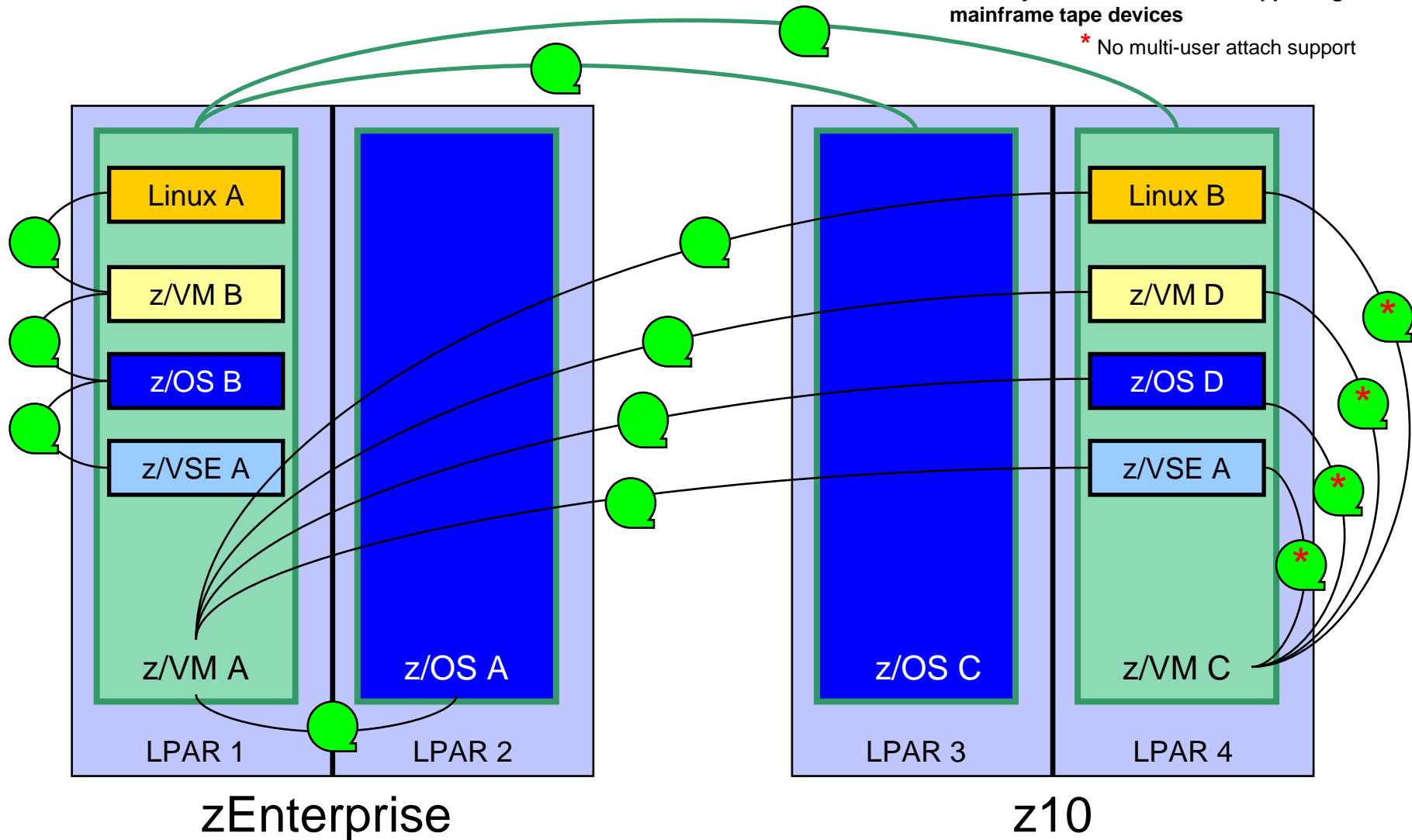
Communication Between Service Machines and Systems



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

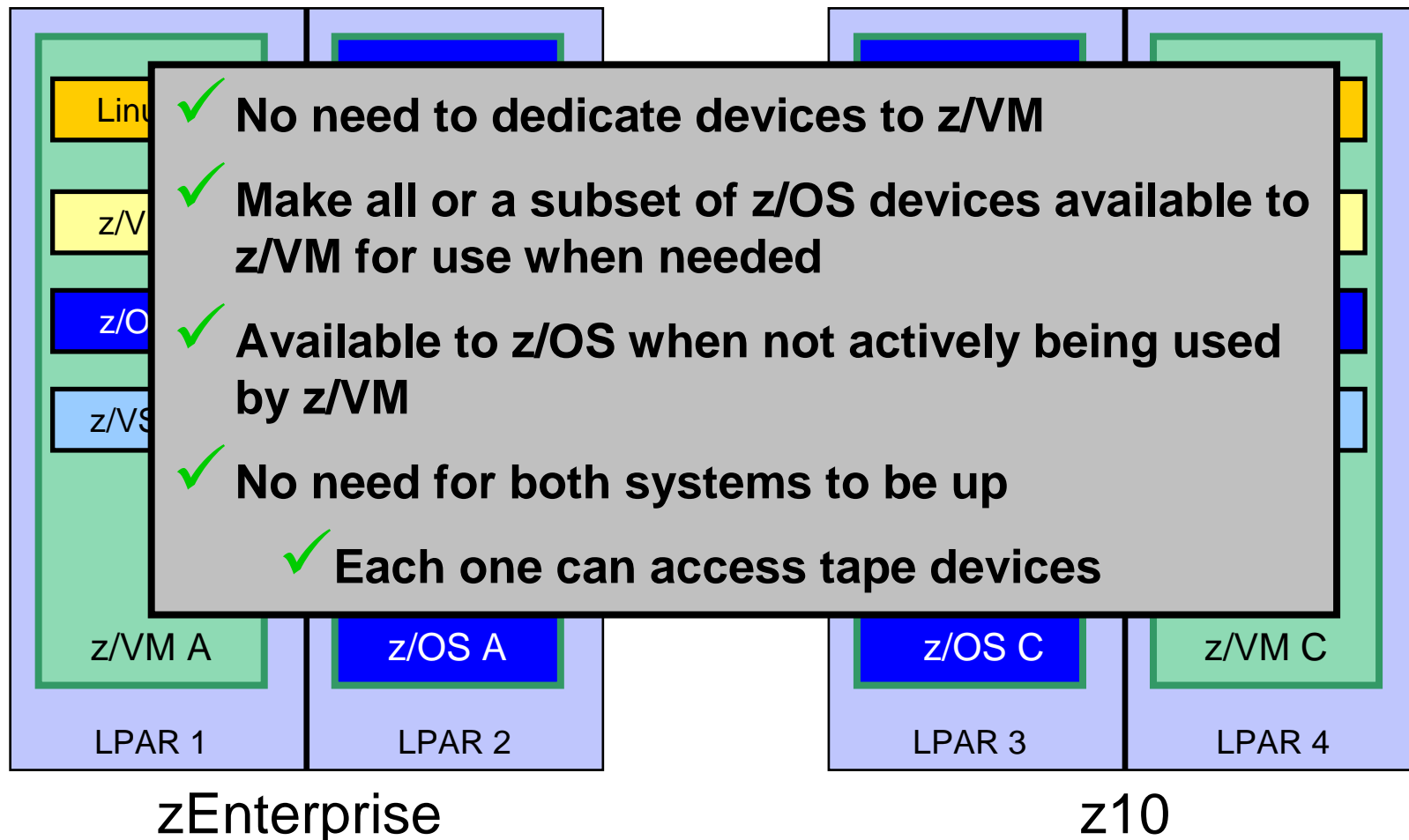
* No multi-user attach support



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



Summary

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



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Automating Operations
Operations Manager for z/VM

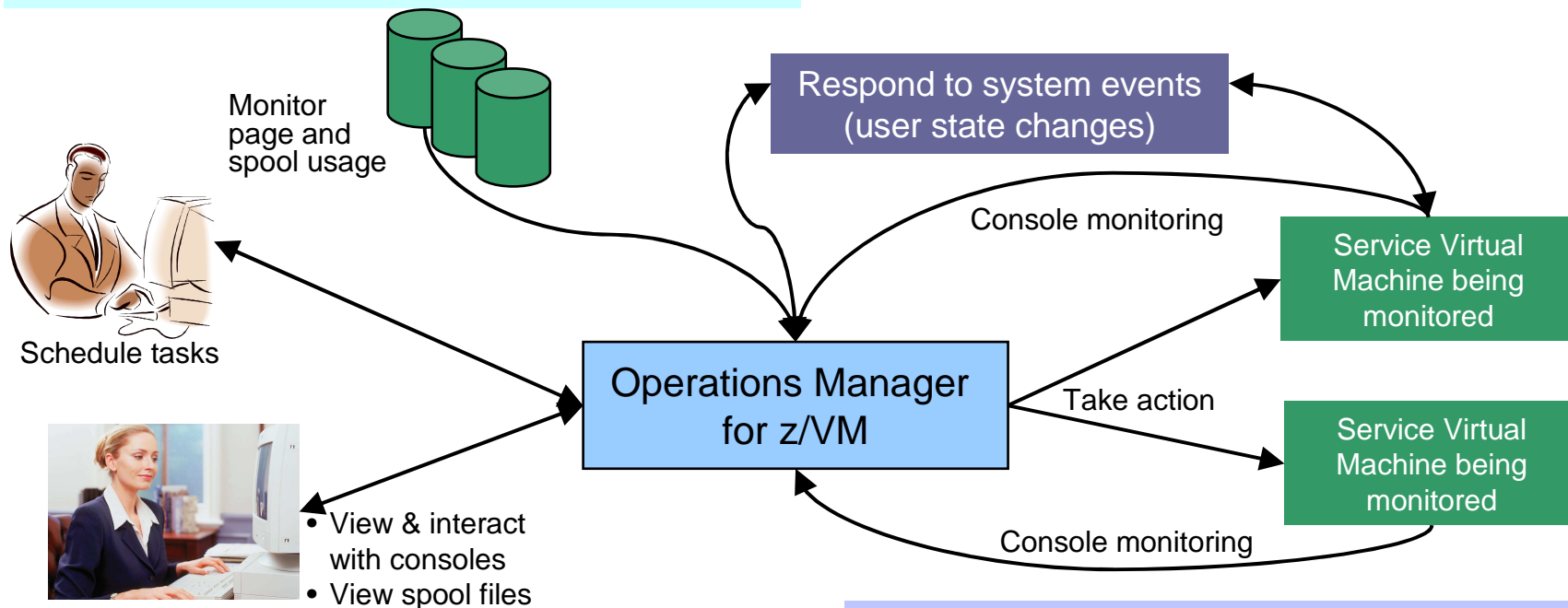
Operations Manager for z/VM

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



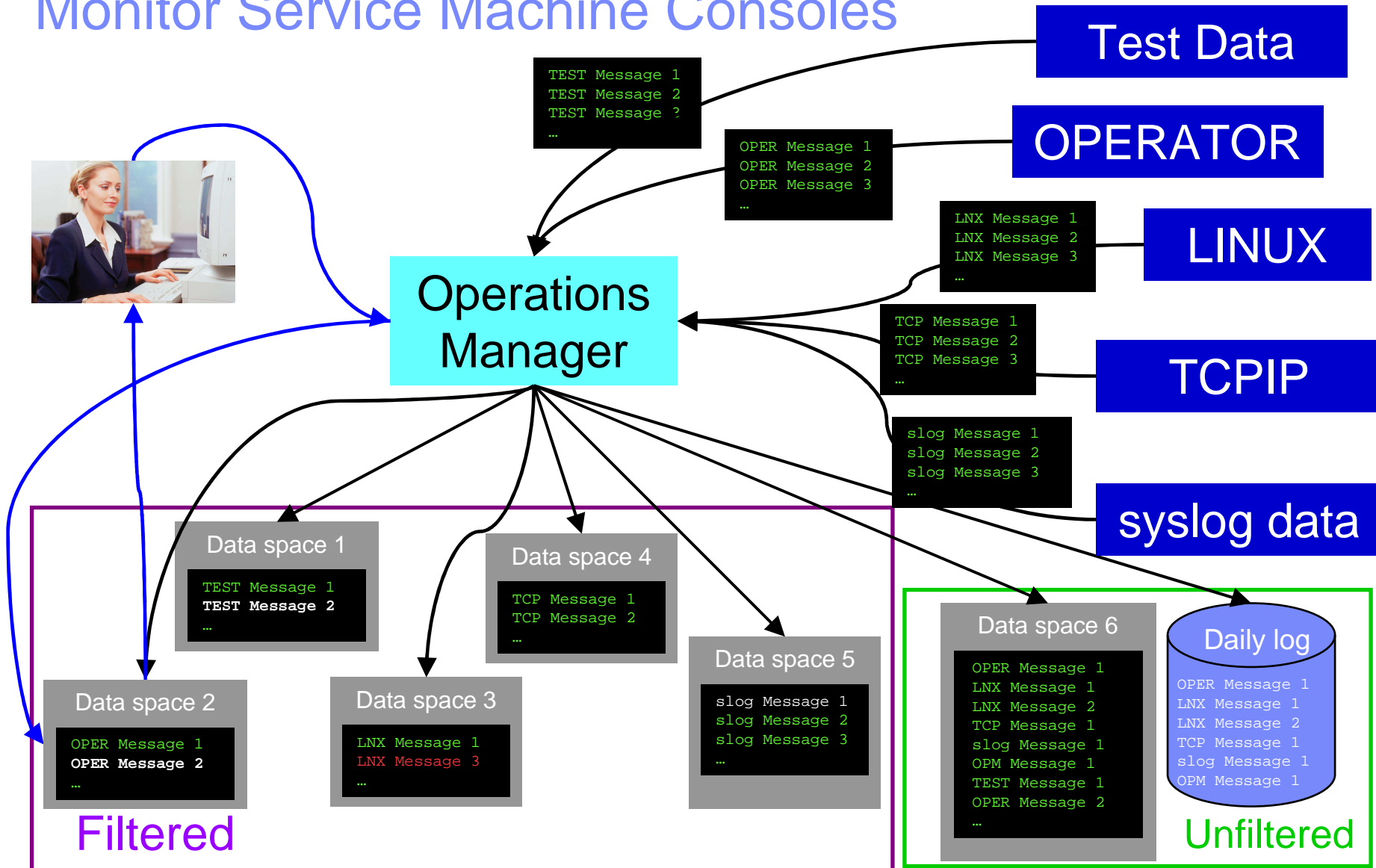
Automation

- 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.

Monitor Service Machine Consoles



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**

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

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 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
- **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
 - 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)

- 16. Perform an incremental backup**
- 17. Find and restore a file from the backup catalog**
- 18. Backup and restore single and multiconfiguration users in an SSI environment**
- 19. Automatically shut down, back up, and restart a Linux guest**
- 20. Reviewing a disaster recovery backup**
- 21. Reviewing other ways to find data in the backup catalog**

धन्यवाद

Hindi

多謝

Traditional Chinese

감사합니다

Korean

Спасибо

Russian

Gracias

Spanish

شكراً

Arabic

Thank You

English

Obrigado

Brazilian Portuguese

Grazie

Italian

Danke

German

多谢

Simplified Chinese

Merci

French

நன்றி

Tamil

ありがとうございました

Japanese

ขอบคุณ

Thai