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Introduction to IBM Tivoli System z Storage Management

Visibility



*See your
Business*

Control



*Manage risk and
Compliance*

Automation



*Improve your
Business*

*Respond faster
and make better
decisions.*

*Assure quality
and reduce risk.*

*Lower costs and
build agility.*

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IBM System z Storage Solution

Unified Suite of Tightly Integrated Products

Agenda:

Introduction

How zStorage Issues Affect the Organization

Overview of IBM System z Storage Solution

IBM Tivoli System z Storage Management

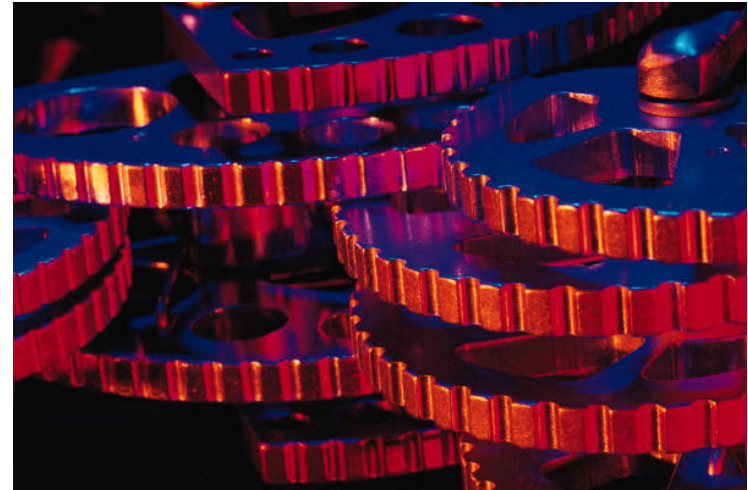
Enterprise Storage Integration

Q&A



How Does Storage Management Affect the Organization?

- ❖ **Storage affects many key operational aspects of your organization**
 - **Application performance, throughput, and availability**
 - **Effective and Efficient Storage Device Utilization**
 - **CPU Utilization & Batch Processing**
 - **DR Planning: Backup & Recovery, Data loss, Regulatory Compliance**





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IBM Tivoli System z Storage Solution



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The Value of the z Storage Solution

Application Performance

Device Management

CPU & Storage Cost

Storage Related Outages

Data Integrity

Storage Admin Productivity

❖ Monitor Application Performance

- Evaluate Storage Impact
- Alerts to problem situations
- Drill “down” or “sideways”
- Implement corrective action
- Automate appropriate response



Application Performance – Managing Workload

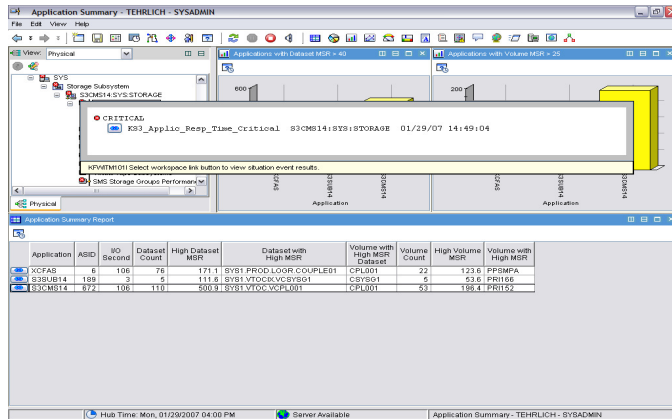
- ❖ Mainframe subsystem I/O resources become congested, affecting application performance, availability – and cost!



- ❖ IBM's zStorage Solution gives you the ability to monitor and manage the impact of storage on an application basis as well as on physical devices.

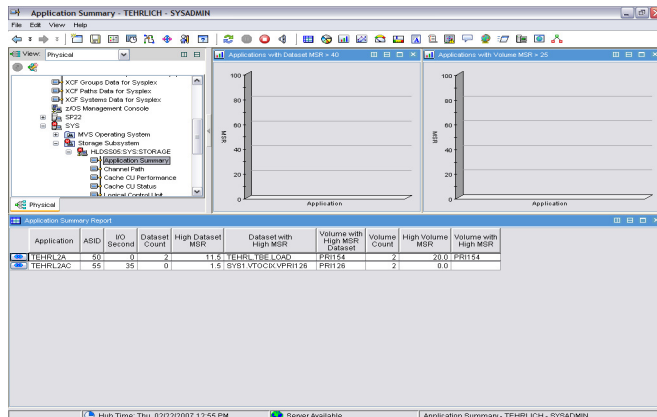
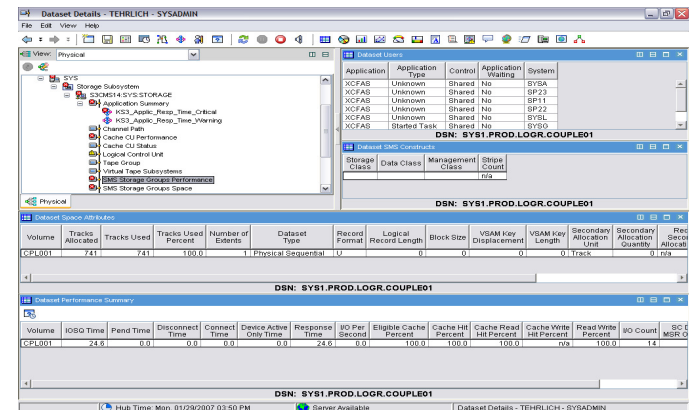


Ability to focus on workload



Application Response Time Unsatisfactory - Hover on situation icon and navigate to situation event workspace.

Data set details - Notice access across all systems.



Easily define a z/OS address space and identify all data sets being accessed and associated information to determine the health of that ASID's I/Os

The Value of the z Storage Solution

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CPU & Storage Cost

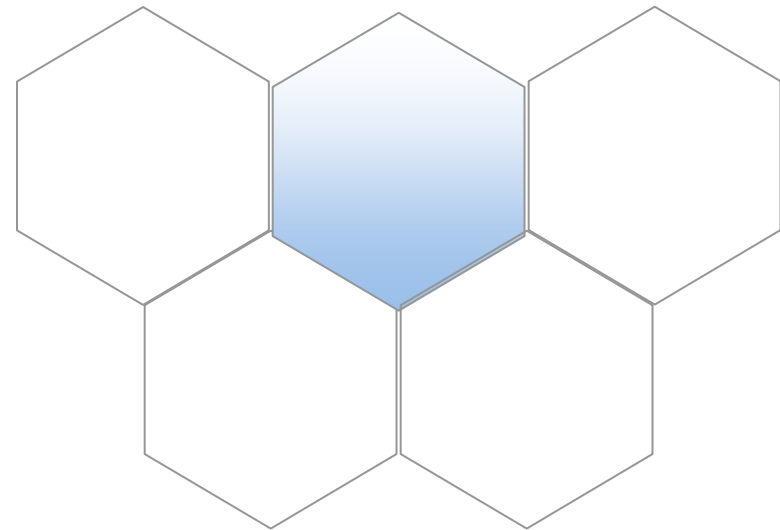
Storage-Related Outages

Data Integrity

Storage Admin Productivity

❖ Optimize your existing infrastructure...

- Eliminate common problems
- Maximize utilization
- Minimize contention

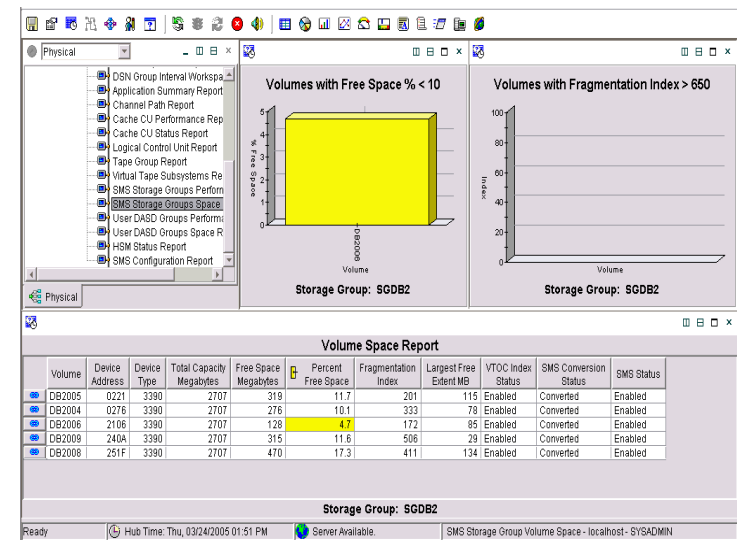


Device Management

- ❖ Device issues will cause problems in the z/OS I/O subsystem that are costly:
 - Space problems
 - DASD contention (within LPARs or Sysplexes)
 - DS8000s, PAV, striped and multivolume data sets
 - Offline (Tape) storage devices
 - Logical volumes and physical disks
 - Control Units and Cache
 - Balanced I/O subsystem from Channels down to volumes
 - New solid state devices – are they performing?
- ❖ Proactive vs. reactive
- ❖ Problem identification made easier

Managing z/OS Storage resources – Device Management

- ❖ **Mainframe STORAGE monitoring, real-time and historical reporting**
- ❖ **Powerful alerting and “Take Action” capability**
- ❖ **Mainframe storage management:**
 - **Space and Performance management**
 - **DASD**
 - **Allocation Management / X37 ABEND prevention**
 - **DFSMSshm Administration**
 - **SMS constructs**
 - **Channels (FICON), Control Units, CACHE**
 - **Tape / VTS**
 - **DFSMSrmm reporting/administration**
 - **Share Tape resources/Maximize tape utilization**
 - **Online toolkit for productivity**



The Value of the z Storage Solution

Application Performance

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CPU & Storage Cost

Storage-Related Outages

Data Integrity

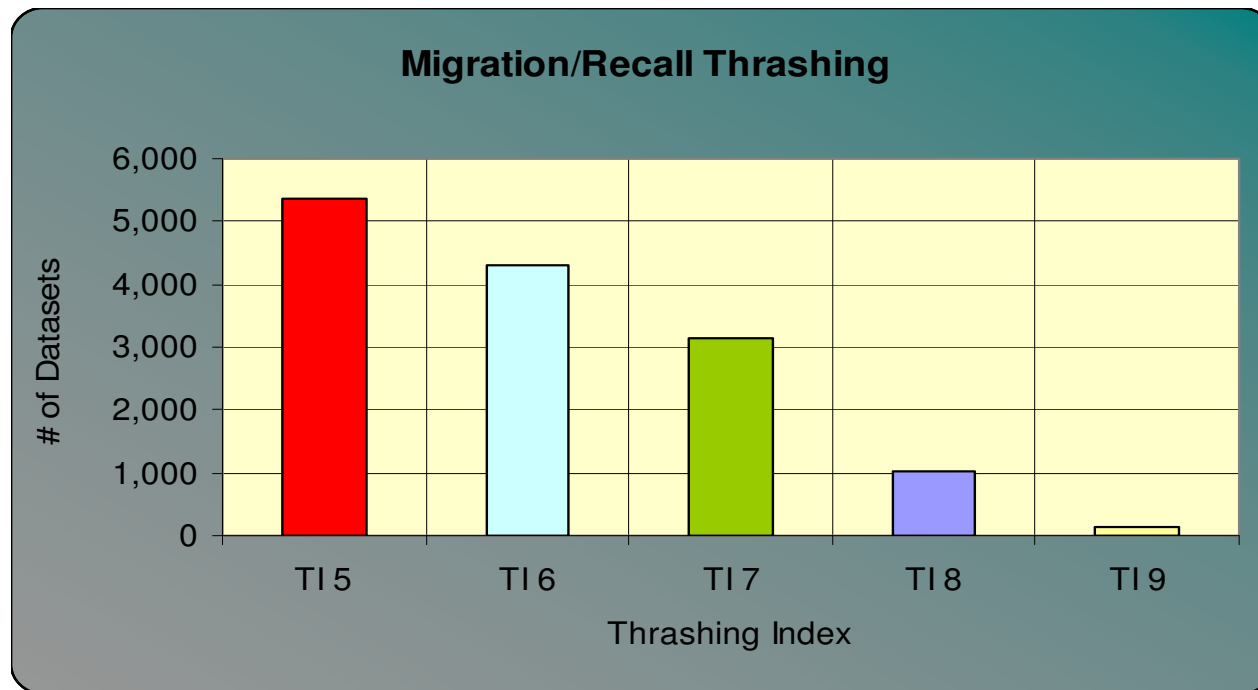
Storage Admin Productivity

- ❖ Identify and correct hidden cost drains in your HSM environment
- ❖ Optimize HSM operation
- ❖ Reduce storage requirements
- ❖ Ask whether a free HSM Health Check is right for you



DFSMSHsm

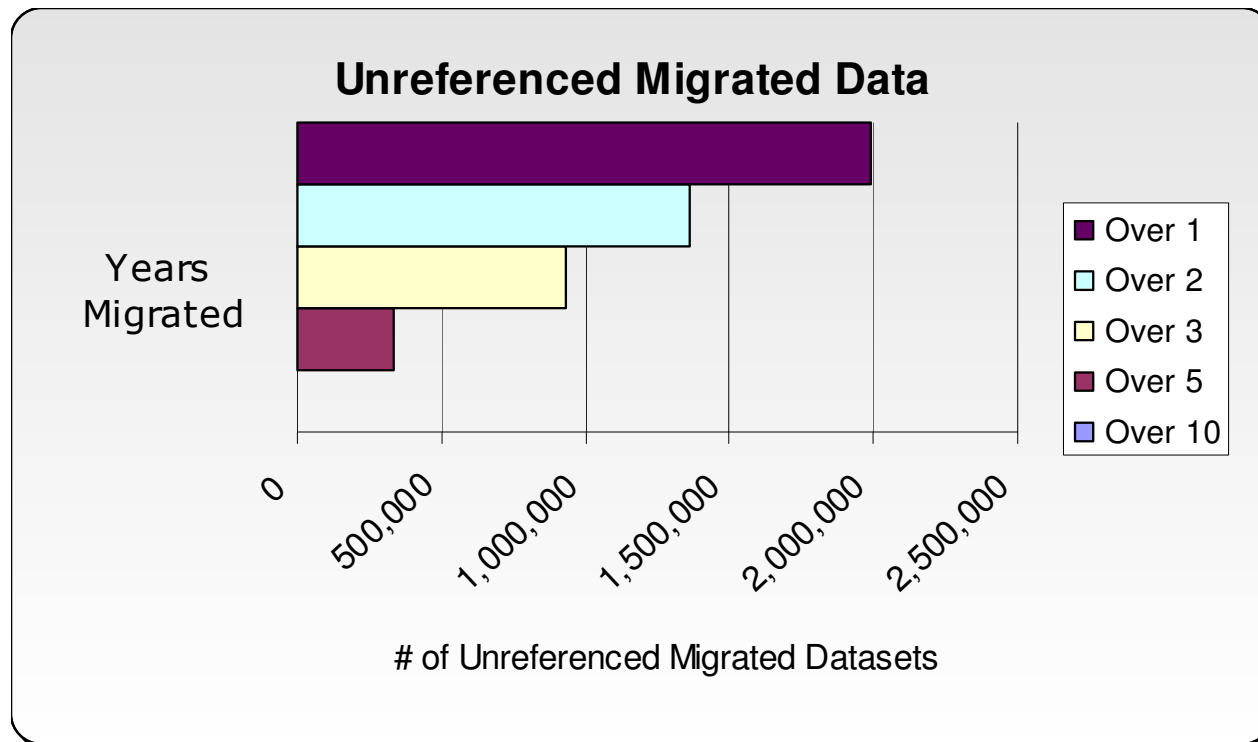
- ❖ Aggressive or outdated migration policies can result in overhead that can actually make life cycle management more expensive than doing nothing at all!



- ❖ IBM's zStorage solution can identify and help correct these issues, even providing what-if analysis so you can preview migration policy changes before committing them.
- ❖ Batch job execution can be improved by optimizing migration – reduced waiting for data

DFSMSHsm

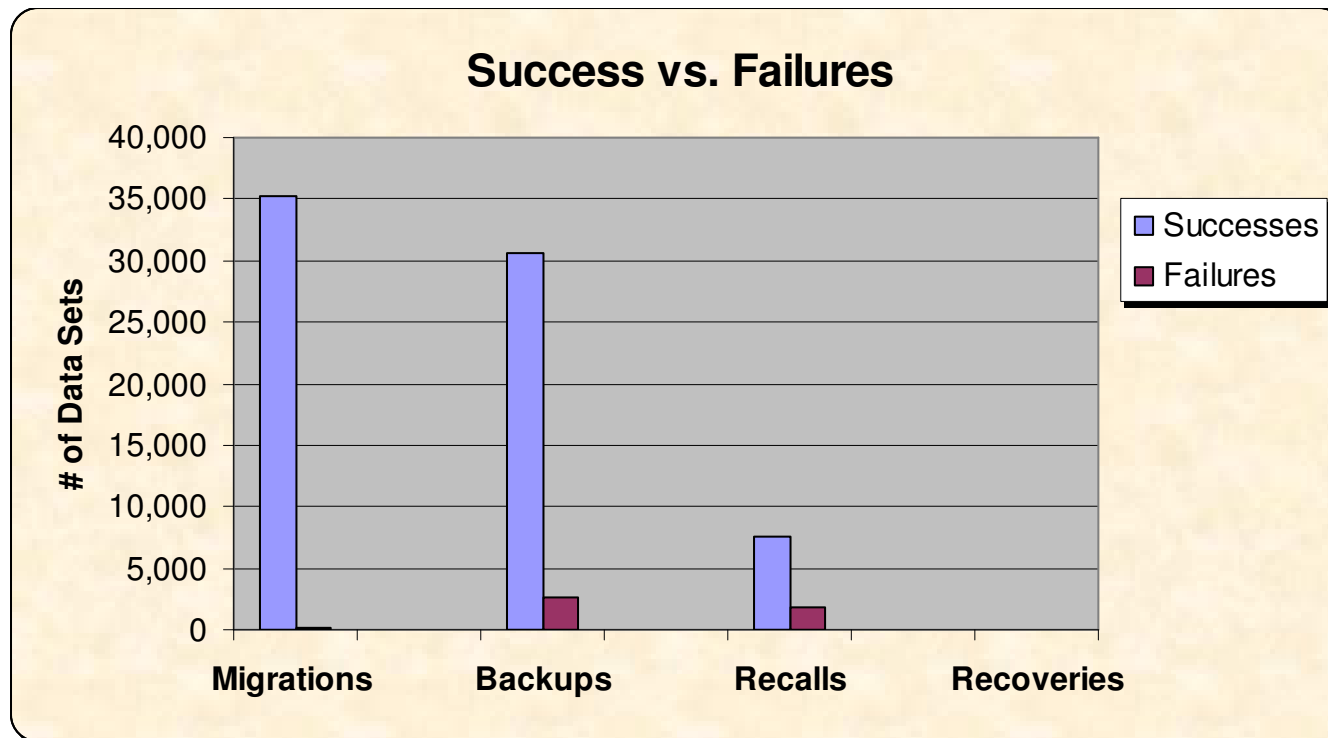
- ❖ Over time this processing can result in huge quantities of old, unreferenced data being managed by DFSMSHsm



- ❖ This old, unreferenced data can be eliminated, freeing up storage resources!

DFSMSHsm

- ❖ Nightly execution cycles can churn on errors that are lost in the “haystack” of work



- ❖ The IBM Tivoli zStorage Solution can pinpoint and in many cases automatically correct the underlying issues that cause the failures that sap CPU resources.

The Value of the z Storage Solution

Application Performance

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Storage-Related Outages

Data Integrity

Storage Admin Productivity

❖ Catalog Issues can cause outages

- Catalog Failures – rare but deadly
- Needed Catalog maintenance (merge, split, reorg, etc) can cause application downtime
- Recovery delays can be costly



Common Scenario

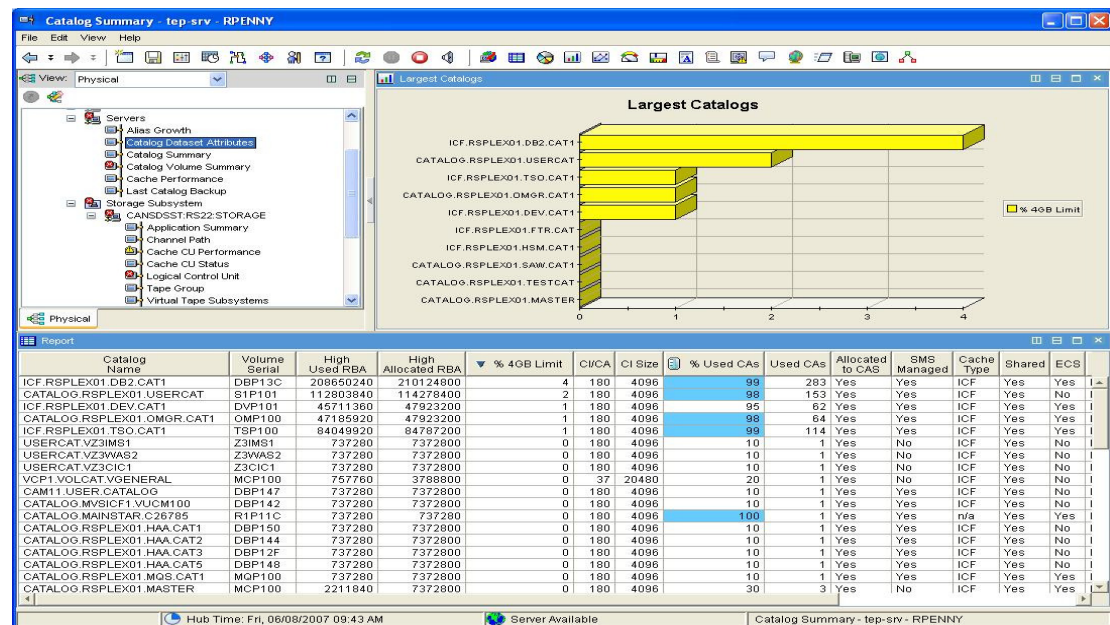
| | # Data Sets | % of Total | Cumulative % | # Aliases |
|--------------------------|-------------|------------|--------------|-----------|
| SYS1.USR2.DEV.CATALOG | 683,027 | 43% | 43% | 51 |
| SYS1.TST1.DEV.CATALOG | 274,644 | 17% | 60% | 293 |
| SYS1.TST3.DEV.CATALOG | 193,212 | 12% | 72% | 222 |
| SYS1.PRD1.DEV.CATALOG | 118,877 | 8% | 80% | 665 |
| SYS1.DBNT.DEV.CATALOG | 84,756 | 5% | 85% | 78 |
| SYS1.DBTD.DEV.CATALOG | 65,727 | 4% | 89% | 206 |
| SYS1.DEV.PXCJ | 39,841 | 3% | 92% | 11 |
| SYS1.TST2.DEV.CATALOG | 35,037 | 2% | 94% | 230 |
| SYS1.GRP.DEV.CATALOG | 30,174 | 2% | 96% | 33 |
| SYS1.ENV.DEV.CATALOG | 29,173 | 2% | 98% | 15 |
| SYS1.USR4.DEV.CATALOG | 10,336 | 1% | ... | 2,898 |
| SYS1.USR3.DEV.CATALOG | 7,242 | 1% | ... | 1,807 |
| SYS1.USR1.DEV.CATALOG | 6,484 | <1% | ... | 980 |
| SYS1.DRD.CATALOG | 2,099 | <1% | | 23 |
| SYS1.DFHSM.DEV.CATALOG | 1,595 | <1% | | 1 |
| SYS1.CADISK1.DEV.CATALOG | 355 | <1% | | 3 |
| SYS1.LOGR.DEV.CATALOG | 187 | <1% | | 5 |
| SYS1.DEV.CPYCROSS | 137 | <1% | | 1 |
| SYS1.PLEX.DEV.CATALOG | 48 | <1% | | 2 |
| SYS1.CADISK2.DEV.CATALOG | 5 | <1% | | 2 |

| | | | | |
|-------------------------------|------------------|--------------------------------|---------------------|---------------------|
| Number of catalogs: | 20 | <u>Largest Catalogs</u> | <u>Top 2</u> | <u>Top 5</u> |
| Total data sets: | 1,582,956 | Total data sets: | 957,671 | 1,354,516 |
| Avg data sets/catalog: | 79,148 | % of total data sets: | 60% | 85% |
| Number of aliases: | 7,526 | Total aliases: | 344 | 1,309 |



Avoid Catalog Issues

- ❖ Powerful, safe, reliable, and easy ICF catalog and VSAM backup and *fast* forward recovery
- ❖ Protects a catalog's complex structural integrity, alerts for potential errors, and reduces recovery time
- ❖ Reduces application down-time by permitting catalog maintenance while open (e.g. Split, Merge, Reorg, etc.)
- ❖ Alerts let you know of potential problems *before* they cause outages
- ❖ “What-if” simulation to preview effects of actions
- ❖ Easy-to-use interface improves staff productivity



The Value of the z Storage Solution

Application Performance

Device Management

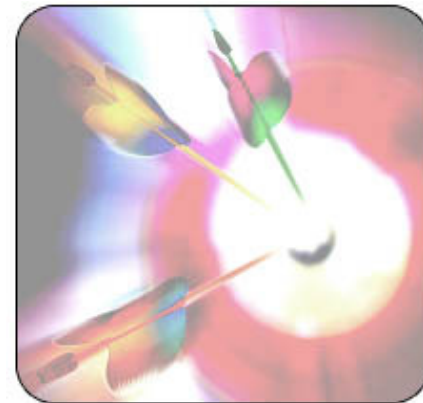
CPU & Storage Cost

Storage-Related Outages

Data Integrity

Storage Admin People Cost

- ❖ Identify what needs backup
- ❖ Do all the backups (once)
- ❖ Verify all the backups are there
- ❖ Quickly & accurately recover from either local outage or Disaster

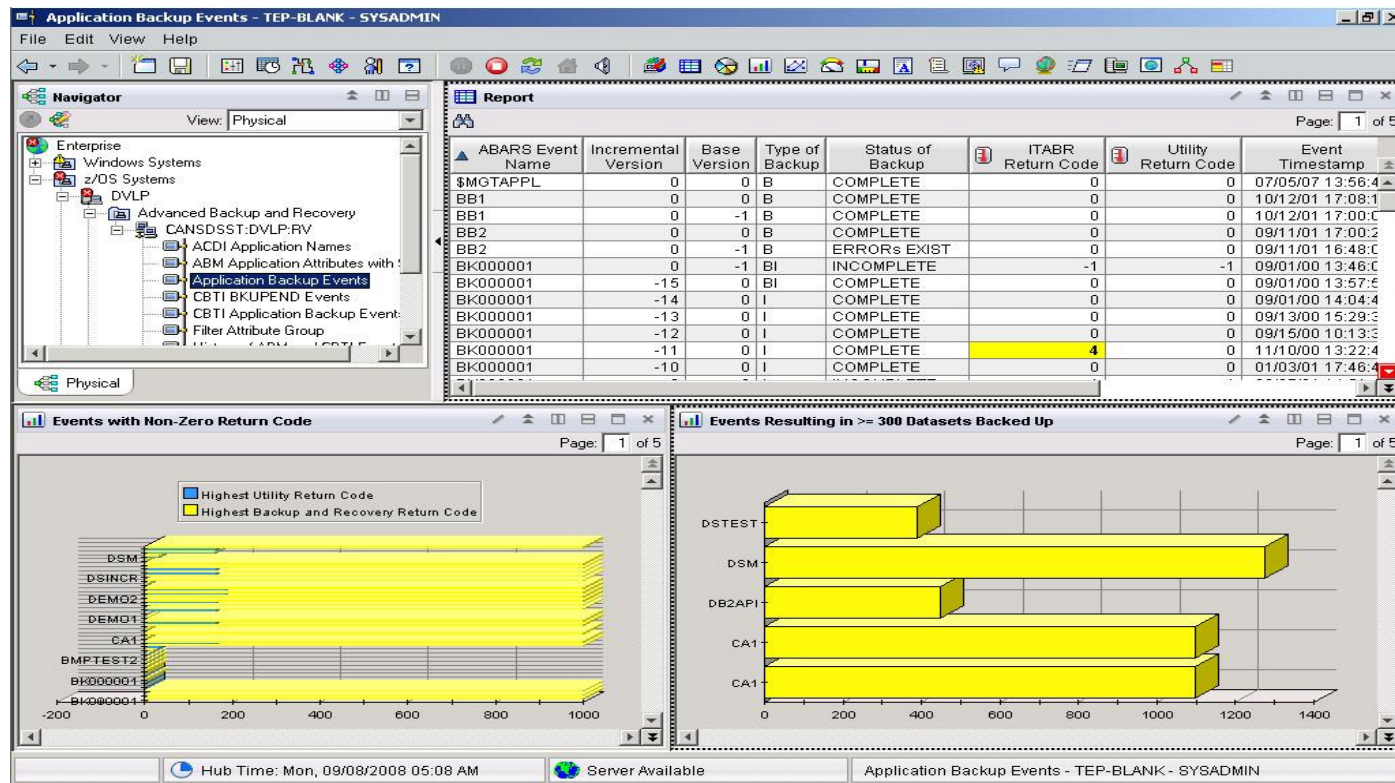


Disaster Recovery Management

- ❖ The ability to recover a failed operating environment often involves huge amounts of data manipulation
- ❖ Currency is a key factor in managing DR cost and validity
 - Time for backup as well as recovery is a 'cost' factor
- ❖ Mirrored environments can still benefit from tools to help manage the DR environment

Disaster Recovery Management

- ❖ Effective DR depends on several factors
 - Identify what needs to be preserved
 - Backup/Copy what needs to be preserved
 - Validate data capture and eliminate redundancy



The Value of the z Storage Solution

Application Performance

Device Management

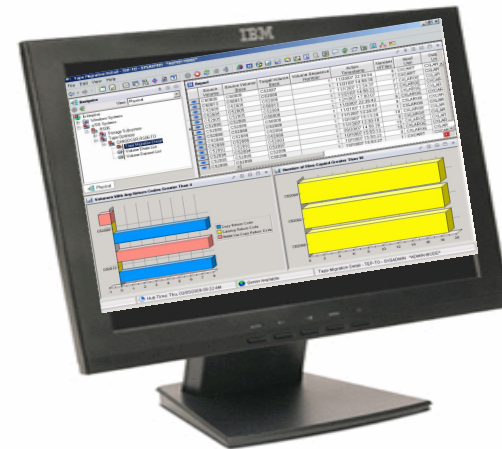
CPU & Storage Cost

Storage-Related Outages

Data Integrity

Storage Admin Productivity

- ❖ Productive and efficient leveraging to tools and information
- ❖ zStorage management is not a silo, it's a part of everything



IBM Tivoli Enterprise Portal Interface - Productivity

Navigator
 - Integrate and leverage other TEP enabled products

Selectable Chart Options - Versatility

Personalized Views - Customizable for different views

Intelligent Linking - Link to associated workspaces and actions for problem determination and resolution

The screenshot displays the 'WebSphere Processes' interface. On the left is a tree view (Navigator) showing a hierarchy from 'ENTERPRISE' down to 'Processes'. The main area contains two charts: 'UNIX Run Time' (a 3D bar chart) and 'CPU Times' (a grouped bar chart comparing User and System CPU Time). Below the charts is a table titled 'OS/390 UNIX Processes for WebSphere' with columns for MVS Status, Process Status, Execution State, Process ID, Parent Process ID, Leader Session ID, Process Group, and Foreground Process.

| MVS Status | Process Status | Execution State | Process ID | Parent Process ID | Leader Session ID | Process Group | Foreground Pro |
|-------------|---------------------------------------|----------------------------|------------|-------------------|-------------------|---------------|----------------|
| Normal | Multiple_Tasks_In_Process_+ Pthrea... | Running_not_in_kernel_wait | 50462821 | 1 | 50462821 | 50462821 | |
| Normal | Multiple_Tasks_In_Process_+ Pthrea... | Running_not_in_kernel_wait | 33685615 | 1 | 33685615 | 33685615 | |
| Normal | Multiple_Tasks_In_Process_+ Pthrea... | Running_not_in_kernel_wait | 50462832 | 1 | 50462832 | 50462832 | |
| Normal | Multiple_Tasks_In_Process_+ Pthrea... | Running_not_in_kernel_wait | 33685672 | 1 | 33685672 | 33685672 | |
| Swapped_Out | Multiple_Tasks_In_Process_+ Pthrea... | Running_not_in_kernel_wait | 16908492 | 1 | 16908492 | 16908492 | |
| Swapped_Out | Multiple_Tasks_In_Process_+ Pthrea... | Running_not_in_kernel_wait | 33685727 | 1 | 33685727 | 33685727 | |
| Normal | Multiple_Tasks_In_Process_+ Pthrea... | Running_not_in_kernel_wait | 16908519 | 1 | 16908519 | 16908519 | |
| Normal | Multiple_Tasks_In_Process_+ Pthrea... | Running_not_in_kernel_wait | 50462998 | 1 | 50462998 | 50462998 | |

View Zoom

Persistent customized workspaces

Splitter controls

Events, details, get Expert advice and Take Action

The screenshot displays the IBM Storage Management Console interface. The left pane shows a tree view of storage components, with 'KS3_Vol_Disabled_V...' selected. The main area is divided into three sections:

- Initial Situation Values:** A table showing the status of VTOC indices. All three are marked as 'Disabled'.
- Current Situation Values:** A table showing the current status of VTOC indices. All three are marked as 'Disabled'.
- Take Action:** A section with input fields for 'Name' and 'Command', and a 'Run' button.
- Expert Advice:** A text box providing guidance: 'A VTOC index has been disabled. This can degrade performance on the volume. Enable the VTOC index.' Below this is an 'Expert Advice' button.

The status bar at the bottom shows 'Ready', 'Hub Time: Wed, 03/30/2005 04:20 PM', 'Server Available.', and the event name 'KS3_Vol_Disabled_VTOC_Critical - orion2000 - BLAWS'.

| VTOC Index Status | Volume | Device Address | Device Type | Total Capacity Megabytes | Free Space Megabytes | Percent Free Space | Fragmentation Index | Largest Fr Extent Mi |
|-------------------|---------|----------------|-------------|--------------------------|----------------------|--------------------|---------------------|----------------------|
| Disabled | DUMP... | 0223 | 0 | 2707 | 1767 | 65.2 | 157 | € |
| Disabled | UN022B | 022B | 0 | 2707 | 2276 | 84.0 | 67 | 1€ |
| Disabled | SADMP2 | 0243 | 0 | 2707 | 1488 | 54.9 | 0 | 14 |



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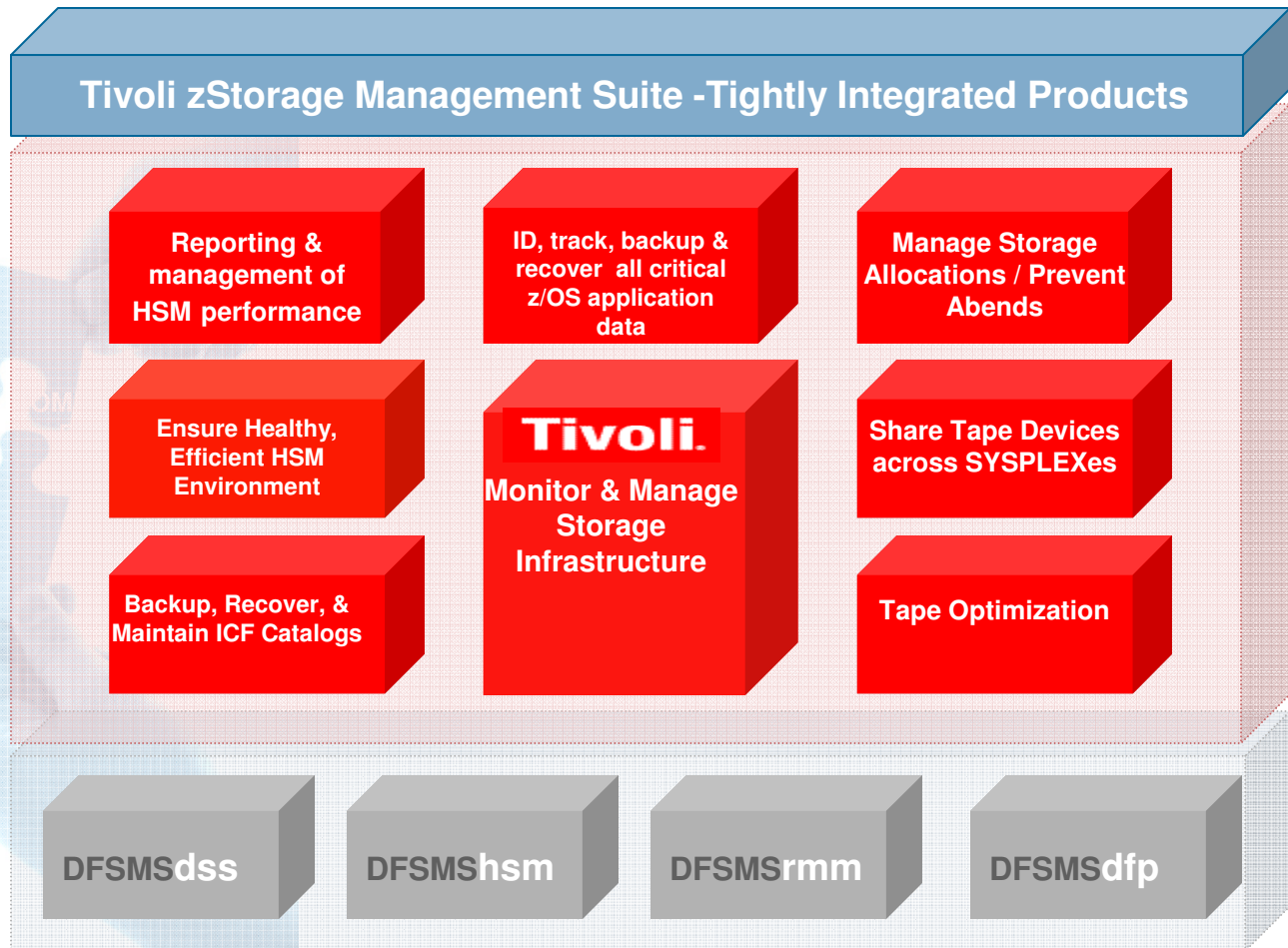
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IBM Tivoli System z Storage Management

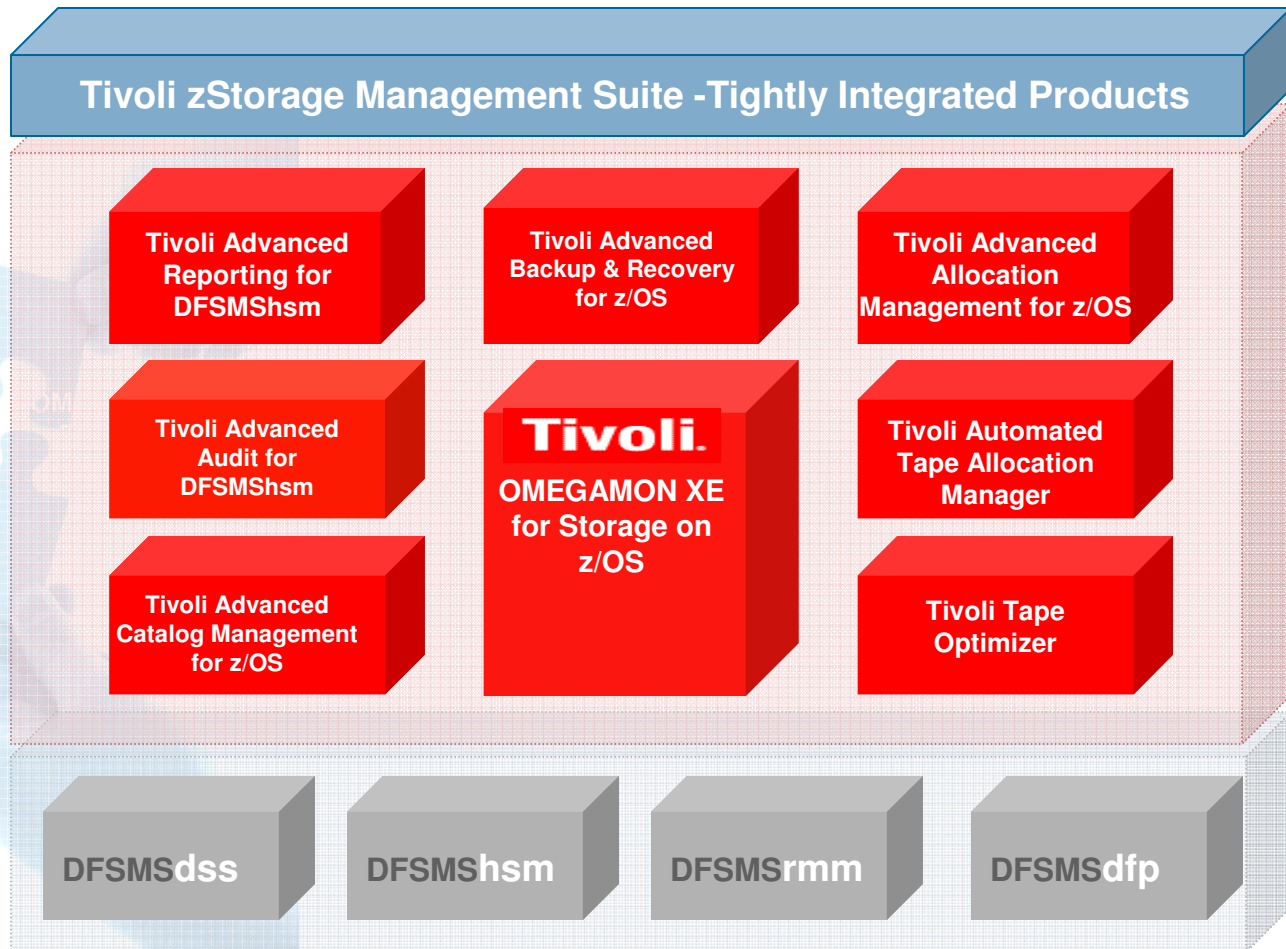


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IBM Tivoli System z Storage Solution

Tivoli zStorage Management Suite - Tightly Integrated Products

Tivoli Advanced Reporting for DFSMSHs

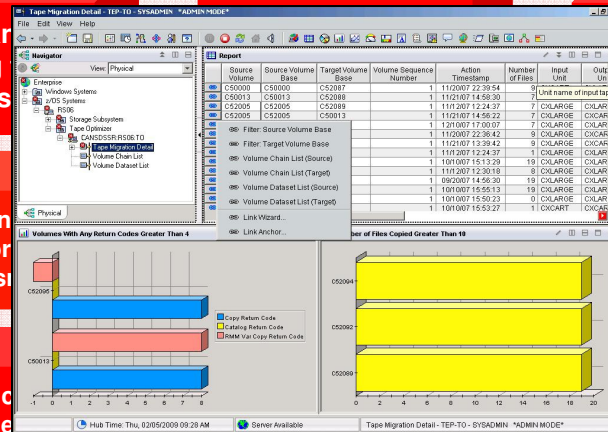
Tivoli Advanced Audit for DFSMSHs

Tivoli Advanced Catalog Management for z/OS

Tivoli Advanced Allocation Management for z/OS

Tivoli Automated Tape Allocation Manager

Tivoli Tape Optimizer



DFSMSdss

DFSMSHsm

DFSMSrmm

DFSMSdfp

Enterprise Storage Integration:

- Customers are beginning to ask “What can you do in cross-platform storage management?”
- Today using OMEGAMON Dashboard Edition (DE) we can create views of storage information that span both System z and Distributed storage encompassing:

- OMEGAMON XE for Storage
- Advanced Catalog Management
- Tivoli Storage Manager (TSM)
- Tivoli Productivity Center (TPC)
- Advanced Backup & Recovery for z/OS
- Advanced Audit for DFSMSHsm
- and more....

The screenshot displays three main panels from the OMEGAMON XE for Storage interface:

- HSM Function Summary:** A table showing the status of various HSM functions.

| Function | Function Status | Dataset | Volume | Active Requests | Waiting Requests | Funct |
|-----------|-----------------|---------|--------|-----------------|------------------|---------|
| Migration | Not Held | 0 | 0 | 0 | 0 | 0 Migra |
| Recall | Not Held | 0 | 0 | 0 | 0 | 0 Recla |
| Backup | Not Held | 0 | 0 | 0 | 0 | 0 Backu |
| Recovery | Not Held | 0 | 0 | 0 | 0 | 0 Reco |
| Dump | Not Held | 0 | 0 | 0 | 0 | 0 Dumy |
| Delete | Not Held | 0 | 0 | 0 | 0 | 0 Delet |
- TSM Schedule:** A table showing the execution status of TSM schedules.

| Timestamp | Server Name | Schedule Name | Node Name | Node Type | Schedule Start | Actual Start | Schedule Status | Schedule Result |
|-----------------|-------------|---------------|-----------|-----------|-----------------|-----------------|-----------------|-----------------|
| 080209 19:52:46 | SO-TSM18 | DAILY_INCR | BKCL1243 | CLIENT | 080209 17:00:00 | | Pending | |
| 080209 19:52:46 | SO-TSM18 | DAILY_INCR | BKCL1240 | CLIENT | 080209 17:00:00 | | Pending | |
| 080209 19:52:46 | SO-TSM18 | DAILY_INCR | BKCL1241 | CLIENT | 080209 17:00:00 | | Pending | |
| 080209 19:52:46 | SO-TSM18 | DAILY_INCR | SO-TSM18 | CLIENT | 080109 17:00:00 | 080109 17:41:08 | Success | 4 The operatio |
| 080209 19:52:46 | SO-TSM18 | DAILY_INCR | SO-TSM18 | CLIENT | 080209 17:00:00 | 080209 18:05:41 | Success | 4 The operatio |
| 080209 19:52:46 | SO-TSM18 | DAILY_INCR | SO-TSM18 | CLIENT | 072709 17:00:00 | 072709 17:58:04 | Success | 4 The operatio |
| 080209 19:52:46 | SO-TSM18 | DAILY_INCR | SO-TSM18 | CLIENT | 072809 17:00:00 | 072809 17:11:07 | Success | 4 The operatio |
| 080209 19:52:46 | SO-TSM18 | DAILY_INCR | SO-TSM18 | CLIENT | 072809 17:00:00 | 072809 17:57:49 | Success | 4 The operatio |
| 080209 19:52:46 | SO-TSM18 | DAILY_INCR | SO-TSM18 | CLIENT | 073009 17:00:00 | 073009 17:26:25 | Success | 4 The operatio |
| 080209 19:52:46 | SO-TSM18 | WEEKLY_INCR | SO-TSM18 | CLIENT | 073109 16:55:49 | 073109 16:57:00 | Success | 4 The operatio |
| 080209 19:52:46 | SO-TSM18 | DAILY_INCR | SO-TSM18 | CLIENT | 073109 17:00:00 | 073109 17:40:35 | Success | 4 The operatio |
| 080209 19:52:46 | SO-TSM18 | DAILY_INCR | SO-TSM18 | CLIENT | 072609 17:00:00 | | Missed | |
| 080209 19:52:46 | SO-TSM18 | DAILY_INCR | SO-TSM18 | CLIENT | 072609 17:00:00 | | Missed | |
- TPC Device Server Services:** A table showing the status of various TPC services.

| Data Server | Timestamp | Service Name | Run Statu |
|--------------------------------|-----------------|---------------------------|-----------|
| sp-tsmapp01.rocketsoftware.com | 080209 18:58:34 | PlannerService | Running |
| sp-tsmapp01.rocketsoftware.com | 080209 18:58:34 | PerformanceManagerService | Running |
| sp-tsmapp01.rocketsoftware.com | 080209 18:58:34 | SAEServiceFactory | Running |
| sp-tsmapp01.rocketsoftware.com | 080209 18:58:34 | log | Running |
| sp-tsmapp01.rocketsoftware.com | 080209 18:58:34 | ConfigurationChecker | Running |
| sp-tsmapp01.rocketsoftware.com | 080209 18:58:34 | ControlService | Running |
| sp-tsmapp01.rocketsoftware.com | 080209 18:58:34 | FabricManagerService | Running |
| sp-tsmapp01.rocketsoftware.com | 080209 18:58:34 | DiskManagerService | Running |
| sp-tsmapp01.rocketsoftware.com | 080209 18:58:34 | SANHostMgr | Running |
| sp-tsmapp01.rocketsoftware.com | 080209 18:58:34 | DiskMonitorService | Running |
| sp-tsmapp01.rocketsoftware.com | 080209 18:58:34 | SNMPAgentManager | Running |
| sp-tsmapp01.rocketsoftware.com | 080209 18:58:34 | ElementManagerMgmtService | Running |
| sp-tsmapp01.rocketsoftware.com | 080209 18:58:34 | SingleSignOnService | Running |
| sp-tsmapp01.rocketsoftware.com | 080209 18:58:34 | ConfigService | Running |
| sp-tsmapp01.rocketsoftware.com | 080209 18:58:34 | DiscoverService | Running |
| sp-tsmapp01.rocketsoftware.com | 080209 18:58:34 | TapeManagerService | Running |
| sp-tsmapp01.rocketsoftware.com | 080209 18:58:34 | TopologyService | Running |
| sp-tsmapp01.rocketsoftware.com | 080209 18:58:34 | MessagingService | Running |
| sp-tsmapp01.rocketsoftware.com | 080209 18:58:34 | DataManagerService | Running |

A yellow callout box on the right side of the screenshot contains the text: "Sample View shows information extracted from OMEGAMON XE for Storage, TSM, Adv. Backup & Recovery, and TPC".

IBM Tivoli System z Storage Management

- ❖ IBM Tivoli Solution Addresses Key Storage Management Issues:
 - Application Performance
 - Efficient Device Management
 - CPU & Storage Cost
 - Storage-Related Outages
 - Data Integrity
 - Storage Administration Productivity
- ❖ Easy to use GUI interface shared with other System Management tools
 - Improves efficiency
 - Provides visibility into your storage environment
 - Gives you the control you need to manage
 - Automates repetitive or programmable actions
 - Fosters integrated management methodology (breaking down organizational silo's)
 - Reduces learning curve

धन्यवाद

Hindi/Hindi

多謝

Traditional Chinese

ขอขอบคุณ

Thai

Спасибо

Russian

Gracias

Spanish

Thank You

English

شكراً

Arabic

Obrigado

Brazilian Portuguese

Grazie

Italian

多谢

Simplified Chinese

Danke

German

Merci

French

நன்றி

Tamil/Tamil

ありがとうございました

Japanese

감사합니다

Korean