



IBM Tivoli Storage Infrastructure Management Solutions

## **IBM z/OS storage management overview**

*Louis Hanna – lhanna@us.ibm.com*

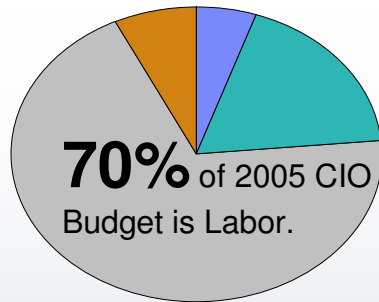
9/3/2008

© 2008 IBM Corporation

## Agenda

- **Storage challenges**
- **Traditional IBM System z Storage Infrastructure**
- **OMEGAMON XE for Storage on z/OS:**
  - TEP interface
  - Storage capabilities
  - Integration for full Tivoli power
- **Key Tivoli zStorage solutions**
- **IBM's System z Storage Management Future Directions**

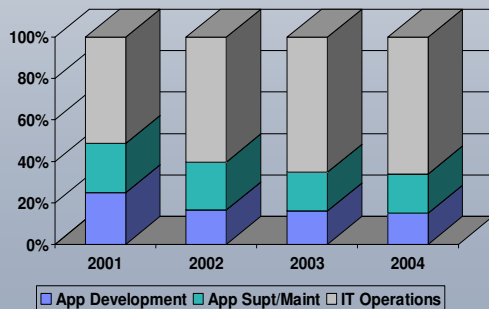
# Storage Management Challenges



- Hardware
- Services
- Labor
- Software

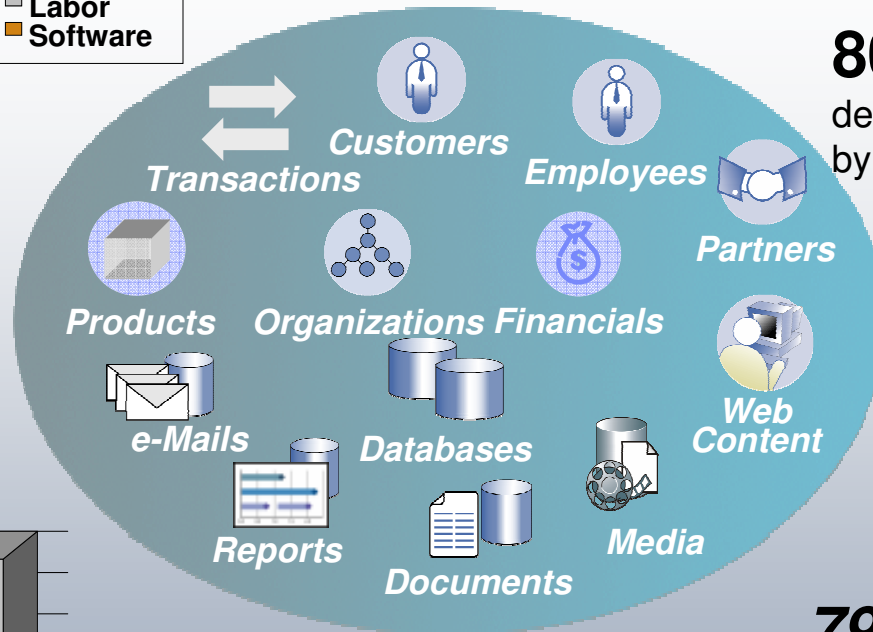
Source: Tivoli Commissioned IDC Study 1Q05

*Operations labor cost is largest and faster growing part of CIO budgets today*

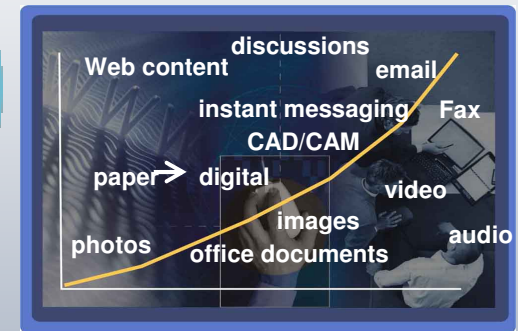


Source: Gartner Group, IT Spending & Staffing surveys

**37%** CGR Disk Storage Growth '96-'07



**80%** of IT problems are not detected by IT staff until reported by end users



**60%+** of CEOs: Need to do a better job capturing and understanding information rapidly in order to make swift business decisions

**79%** of companies: have 2 + repositories... (25%: have 15 +) used to store data from a large variety of information sources

Sources: IBM & Industry Studies, Customer Interviews

## Common issues in z/OS Storage Management

- Space – What's available at the Group, Volume and Dataset levels?
- Performance – Where are the slowdowns?
- Storage resources – Cache, Shared DASD, I/O subsystem, tape devices, etc.
- Applications – Are throughput problems related to DASD?
- Which logical volumes share physical disk media? – Challenges with hardware issues
- DFSMSHsm – Did the maintenance cycle run well last night, Which user is generating recalls, what do I do about my HSM errors, why are there so many of them?
- Auditing and correcting DFSMSHsm is time, labor and system resource intensive
- ICF Catalog – Are the catalogs and other VSAM files backed up for forward recovery, are they clean up, and do they utilize cache effectively?
- Allocations – These secondary allocation abends are killing my monthly batch cycle
- Tape – System A is always waiting on tape drives, what can we do?
  
- Resource constraints – Need to automate routine storage tasks to increase productivity

# Traditional IBM System z Storage Infrastructure: DFSMSxxx offerings - System z Storage Capability

Provides storage, data, program, and device management functions and DFSMS Copy Services capabilities

An optional feature providing backup, recovery, migration, space management functions as well as disaster recovery

An optional feature providing data movement, copy, backup, and space management functions

An optional feature providing management functions for removable media such as tape cartridges and 3420 reels

Provides, via the System Data Mover component, a comprehensive disaster recovery solution for the z/OS environment

**IBM Data Facility Product (DFSMSdfp)**

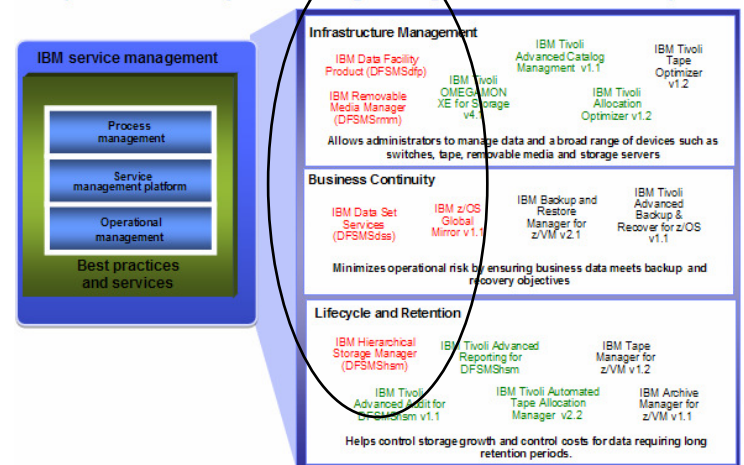
**IBM Hierarchical Storage Manager (DFSMSHsm)**

**IBM Data Set Services (DFSMSDss)**

**IBM Removable Media Manager (DFSMSrmm)**

**IBM z/OS Global Mirror**

Comprehensive IBM System z Storage Management Architecture Components



## Traditionally IBM thought of as a provider of zStorage Infrastructure

- **IBM Hardware**

- Traditional DASD storage devices, e.g. DS8000, DS6000, etc.
- Offline storage devices, e.g. tape drives, VTS, etc.

- **Software for allocation, backup & recovery of data**

- DFSMSdftp: Creation and allocation of datasets
- DFSMSHsm: Provides backup and recovery of datasets
- DFSMSdss: Provides backup and recovery of logical volumes
- DFSMSrmm: Provides offline storage library capability

- **But what about managing these basic capabilities in the zStorage environment?**



IBM Tivoli Storage Infrastructure Management Solutions

# IBM Tivoli OMEGAMON XE for Storage

9/3/2008

© 2008 IBM Corporation

## OMEGAMON XE for Storage's User Interface (TEP)

- **Browser based access to data**
- **Capability of creating alerts using logic as opposed to just threshold setting**
- **Ability to see alerts and associated information about the problem from the same interface**
- **Reflex automation capabilities (take action)**
- **Provide information about a situation through the Expert Advise feature**
- **Integrate your OMEGAMON alerts with other systems information from OMEGAMON monitors using DE**
- **Dynamic Workspace Linking**
- **Built-in TN3270 interface**
- **Built-in Browser interface**
- **Real-time, near term and long term history**



# Tivoli OMEGAMON XE Interface

Alerts



WLM Service Class Resources - DDWPH1XEX:17854 - SYSADMIN

File Edit View Help

Physical Business

**CPU Percentage**

Where CPU percentage greater than 0

**I/Os Per Second**

**Average Storage Use in Bytes**

**WLM Service Class Resources**

| Service Class | Period | Goal Type | Goal Percentile | Goal Importance | Goal Value | Duration | Average Response Time | Percent CPU | I/O Rate | Average Storage | Workload | Resource Group | Servi Des    |
|---------------|--------|-----------|-----------------|-----------------|------------|----------|-----------------------|-------------|----------|-----------------|----------|----------------|--------------|
| BATCH         | 1      | Velocity  | 0               | Medium          | 10         | 700      | 0                     | 0.0         | 0.1      | 21569           | BATCH    |                | Batch Job:   |
| BATCH         | 2      | Velocity  | 0               | Low             | 10         | 0        | 9856                  | 22.4        | 2.9      | 8297            | BATCH    |                | Batch Job:   |
| BATHI         | 1      | Velocity  | 0               | Medium          | 20         | 0        | 0                     | 0.0         | 0.0      | 0               | BATCH    |                | Batch Job:   |
| BATPROD       | 1      | Velocity  | 0               | High            | 20         | 0        | 0                     | 0.0         | 0.0      | 0               | BATCH    |                | Batch Job:   |
| BATSOAKR      | 1      | Velocity  | 0               | Medium          | 10         | 51200    | 0                     | 0.0         | 0.0      | 0               | BATCH    |                | Batch Soa    |
| BATSOAKR      | 2      | Velocity  | 0               | Low             | 5          | 0        | 0                     | 0.0         | 0.0      | 0               | BATCH    |                | Batch Soa    |
| CICS          | 1      | PctRe...  | 0               | High            | 1000       | 0        | 0                     | 0.0         | 0.0      | 0               | CICS     |                | CICS trans   |
| CICSCENT      | 1      | PctRe...  | 0               | High            | 2000       | 0        | 0                     | 0.0         | 0.0      | 0               | CICS     |                | CICS CEM     |
| CICSRaid      | 1      | PctRe...  | 0               | High            | 1000       | 0        | 0                     | 0.0         | 0.0      | 0               | CICS     |                | CICS CEM     |
| CICSTEST      | 1      | PctRe...  | 0               | High            | 1000       | 0        | 2046058               | 0.0         | 0.0      | 0               | CICS     |                | cics test re |
| CICSVSAM      | 1      | PctRe...  | 0               | High            | 1000       | 0        | 0                     | 0.0         | 0.0      | 0               | CICS     |                | CICS CEM     |

For System SYSG

Ready Server connected. 0

# OMEGAMON XE for Storage Alert

The screenshot shows the OMEGAMON XE for Storage interface. On the left is a tree view with categories like Applications, Address Space, Connections, Gateways and Dev, FTP, and OSA. Below this are various monitoring panels, including 'Current Byte Rate >= 1024' and 'Current Datagram Rate > 0' bar charts. A 'CRITICAL' alert dialog box is open in the foreground, displaying a list of alerts:

| Alert Name                       | Source               | Time              |
|----------------------------------|----------------------|-------------------|
| KS3_Vol_Disabled_VTOC_Critical   | VCCTH@L:SYSL:STORAGE | 03/30/05 16:11:28 |
| KS3_Vol_Free_Space_Pct_Critical  | VCCTH@L:SYSL:STORAGE | 03/30/05 16:11:25 |
| KS3_Vol_Fragment_Index_Critical  | VCCTH@L:SYSL:STORAGE | 03/30/05 16:11:25 |
| KS3_Vol_Perf_Resp_Time_Critical  | VCCTH@L:SYSL:STORAGE | 03/30/05 16:11:28 |
| KS3_Vol_Cache_Writ_HitP_Critical | VCCTH@L:SYSL:STORAGE | 03/30/05 16:11:27 |
| KS3_Cachecu_Read_HitP_Critical   | VCCTH@L:SYSL:STORAGE | 03/30/05 16:11:29 |
| KS3_Cachecu_Write_HitP_Critical  | VCCTH@L:SYSL:STORAGE | 03/30/05 16:11:27 |
| <b>WARNING</b>                   |                      |                   |
| KS3_Vol_Free_Space_Pct_Warning   | VCCTH@L:SYSL:STORAGE | 03/30/05 16:11:27 |
| KS3_Vol_Fragment_Index_Warning   | VCCTH@L:SYSL:STORAGE | 03/30/05 16:11:27 |

# Events, details, get Expert advice and Take Action

**Initial Situation Values**

| 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                 | 6                    |
| Disabled          | UN022B  | 022B           | 0           | 2707                     | 2276                 | 84.0               | 67                  | 16                   |
| Disabled          | SADMP2  | 0243           | 0           | 2707                     | 1488                 | 54.9               | 0                   | 14                   |

**Current Situation Values**

| 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                 | 6                    |
| Disabled          | UN022B  | 022B           | 0           | 2707                     | 2276                 | 84.0               | 67                  | 16                   |
| Disabled          | SADMP2  | 0243           | 0           | 2707                     | 1488                 | 54.9               | 0                   | 14                   |

**Take Action**

Action Name:   
 Command:   
 Arguments...

A VTOC index has been disabled. This can degrade performance on the volume. Enable the VTOC index.

Ready Hub Time: Wed, 03/30/2005 04:20 PM Server Available. KS3\_Vol\_Disabled\_VTOC\_Critical - orion2000 - BLAWS

## IBM Tivoli OMEGAMON XE for Storage

- **A mainframe STORAGE monitor, real-time and historical**
- **XE user interface, comes with the CUA UI component**
- **A wide breadth of mainframe storage information:**
  - Space (storage groups or user groups ... define your own)
  - Performance (storage groups or user groups ... define your own)
  - Tape / VTS
  - CACHE
  - Channels (FICON)
  - Control Units
  - DFSMSshm (View your HSM queues, control Datasets, etc. )
  - DFSMSshm/DFSMSdss online toolkit
  - SMS constructs
  - DS8000 support
  - Ability to see all logical volumes on a physical disk
  - Powerful applications view
  - Powerful dataset view and action capability
  - Integration capabilities from TEP interface (Launch to TPC in v4.1.0)

# Volume Performance

SMS Storage Group Volume Performance - tehrl:16097 - SYSADMIN

File Edit View Help

Physical

- ENTERPRISE
  - OS/390 Systems
    - SP22
      - Storage Subsystem
        - SYSG
          - Storage Subsystem
            - Application Summary Report
            - Channel Path Report
            - Cache CU Performance Report
            - Cache CU Status Report
            - Logical Control Unit Report
            - Tape Group Report
            - Virtual Tape Subsystems Report
            - SMS Storage Groups Performance Report

Physical

### Volume Response Time > 25

Storage Group: SGPRIM

### Volume Performance Report

| Volume | Device Address | Busy Percent | I/O Per Second | IOSQ Delay | Pend Time | Connect Time | Disconnect Time | Response Time | MSR Connect Time Percent | I/O Count | Device MPL | DCBs Open | Reserved Percent | Current PAV Exposures | PAV Expos Change |
|--------|----------------|--------------|----------------|------------|-----------|--------------|-----------------|---------------|--------------------------|-----------|------------|-----------|------------------|-----------------------|------------------|
| PRI100 | 080B           | 0.0          | 0.0            | 0.0        | 0.2       | 1.6          | 0.4             | 2.3           | 69.6                     | 40        | 0          | 12        | 0.0              | n/a                   | n/a              |
| PRI101 | 080C           | 0.0          | 0.2            | 0.0        | 0.2       | 1.7          | 0.0             | 2.0           | 85.0                     | 155       | 0          | 19        | 0.0              | n/a                   | n/a              |
| PRI102 | 080D           | 0.0          | 0.0            | 0.0        | 0.1       | 1.8          | 0.0             | 1.9           | 94.7                     | 15        | 0          | 9         | 0.0              | n/a                   | n/a              |
| PRI103 | 080E           | 0.0          | 0.0            | 0.0        | 0.2       | 1.8          | 0.0             | 2.1           | 85.7                     | 41        | 0          | 13        | 0.0              | n/a                   | n/a              |
| PRI104 | 080F           | 0.1          | 1.1            | 0.0        | 0.2       | 1.1          | 0.0             | 1.5           | 73.3                     | 618       | 2          | 15        | 0.0              | n/a                   | n/a              |
| PRI105 | 0810           | 0.0          | 0.0            | 0.0        | 0.3       | 1.7          | 0.0             | 2.1           | 81.0                     | 37        | 0          | 12        | 0.0              | n/a                   | n/a              |
| PRI106 | 0811           | 0.8          | 7.0            | 0.0        | 0.9       | 1.2          | 0.0             | 2.2           | 54.5                     | 3665      | 15         | 25        | 0.0              | n/a                   | n/a              |
| PRI107 | 0812           | 0.0          | 0.4            | 0.0        | 0.1       | 1.7          | 0.1             | 2.0           | 85.0                     | 248       | 1          | 13        | 0.0              | n/a                   | n/a              |
| PRI108 | 0813           | 0.0          | 0.0            | 0.0        | 0.2       | 1.3          | 0.0             | 1.5           | 86.7                     | 38        | 0          | 7         | 0.0              | n/a                   | n/a              |
| PRI109 | 0814           | 0.0          | 0.0            | 0.0        | 0.1       | 5.5          | 0.4             | 6.1           | 90.2                     | 36        | 0          | 4         | 0.0              | n/a                   | n/a              |
| PRI110 | 0815           | 0.8          | 2.2            | 0.0        | 0.2       | 1.7          | 2.1             | 4.1           | 41.5                     | 1167      | 9          | 9         | 0.0              | n/a                   | n/a              |
| PRI111 | 0816           | 0.0          | 0.1            | 0.0        | 1.0       | 1.6          | 0.0             | 2.7           | 59.3                     | 56        | 0          | 35        | 0.0              | n/a                   | n/a              |
| PRI112 | 0817           | 0.0          | 0.0            | 0.0        | 0.1       | 1.2          | 0.5             | 2.0           | 60.0                     | 46        | 0          | 5         | 0.0              | n/a                   | n/a              |

Storage Group: SGPRIM

Ready Server Available. SMS Storage Group Volume Performance - tehrl:16097 - SYSADMIN

# Down to Dataset level information

Dataset Performance Detail - tehrle:16097 - SYSADMIN

File Edit View Help

Physical

ENTERPRISE  
 OS/390 Systems  
 SP22  
 Storage Subsystem  
 SYSG  
 Storage Subsystem  
 Application Summary Report  
 Channel Path Report  
 Cache CU Performance Report  
 Cache CU Status Report  
 Logical Control Unit Report  
 Tape Group Report  
 Virtual Tape Subsystems Report  
 SMS Storage Groups Performance

Physical

### Component Percent of Dataset MSR for All Jobs

DSN: SYS1.VTOC.VPRI123 Volume: PRI123

### Dataset Performance Detail Report

| Jobname | ASID | IOSQ Time | Pend Time | Disconnect Time | Connect Time | Device Active Only Time | Response Time | I/O Per Second | Eligible Cache Percent | Cache Hit Percent | Cache Read Hit Percent | Cache Write Hit Percent | Read V Percent |
|---------|------|-----------|-----------|-----------------|--------------|-------------------------|---------------|----------------|------------------------|-------------------|------------------------|-------------------------|----------------|
| HTAIR3  | 373  | 0.0       | 0.2       | 0.0             | 1.2          | 0.0                     | 1.4           | 0.0            | 100.0                  | 100.0             | 100.0                  | 100.0                   | 1              |
| S2CN5G@ | 222  | 36.1      | 0.2       | 0.0             | 129.1        | 0.0                     | 165.4         | 0.0            | 100.0                  | 100.0             | 100.0                  | n/a                     | 1              |
| S2D85G@ | 224  | 0.0       | 0.3       | 0.0             | 0.8          | 0.0                     | 1.0           | 0.0            | 100.0                  | 100.0             | 100.0                  | n/a                     | 1              |
| S3CMS12 | 261  | 0.0       | 0.1       | 0.0             | 0.8          | 0.0                     | 0.9           | 0.0            | 100.0                  | 100.0             | 100.0                  | n/a                     | 1              |
| S3SUB12 | 260  | 61.0      | 0.2       | 0.0             | 138.6        | 0.0                     | 199.8         | 0.0            | 100.0                  | 100.0             | 100.0                  | n/a                     | 1              |
| S9GBOG1 | 720  | 0.0       | 0.2       | 0.0             | 0.8          | 0.0                     | 1.0           | 0.0            | 100.0                  | 100.0             | 100.0                  | n/a                     | 1              |

DSN: SYS1.VTOC.VPRI123 Volume: PRI123

Ready Server Available. Dataset Performance Detail - tehrle:16097 - SYSADMIN

# Space Problem? Volume Getting Full

Physical

- DSN Group Interval Workspa
- Application Summary Report
- Channel Path Report
- Cache CU Performance Rep
- Cache CU Status Report
- Logical Control Unit Report
- Tape Group Report
- Virtual Tape Subsystems Re
- SMS Storage Groups Perform
- SMS Storage Groups Space**
- User DASD Groups Perform
- User DASD Groups Space R
- HSM Status Report
- SMS Configuration Report

### Volumes with Free Space % < 10

Volume: DB2006

Storage Group: SGDB2

### Volumes with Fragmentation Index > 650

Volume: DB2006

Storage Group: SGDB2

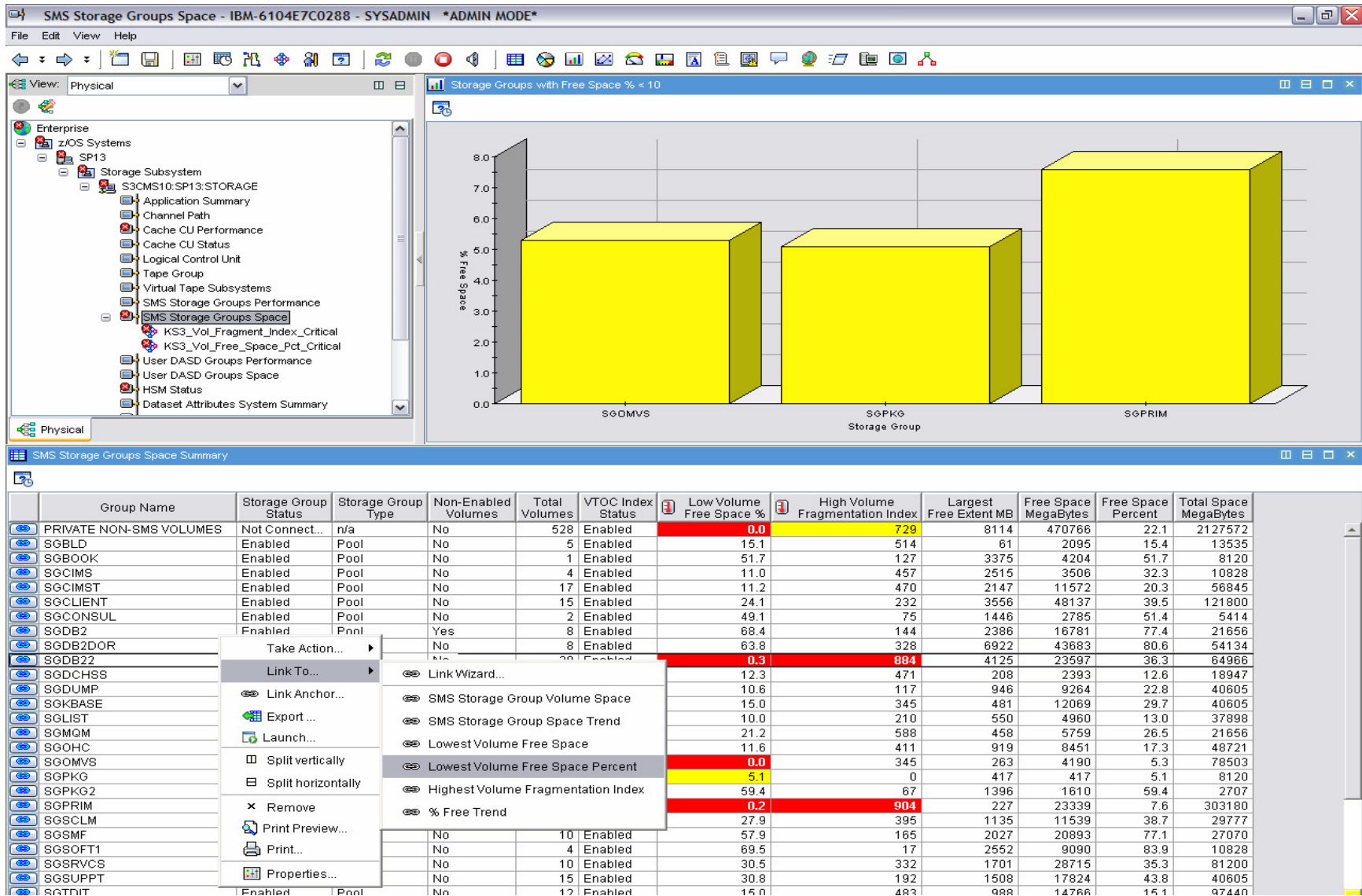
### Volume Space Report

| Volume | Device Address | Device Type | Total Capacity Megabytes | Free Space Megabytes | Percent Free Space | Fragmentation Index | Largest Free Extent MB | VTOC Index Status | SMS Conversion Status | SMS Status |
|--------|----------------|-------------|--------------------------|----------------------|--------------------|---------------------|------------------------|-------------------|-----------------------|------------|
| DB2005 | 0221           | 3390        | 2707                     | 319                  | 11.7               | 201                 | 115                    | Enabled           | Converted             | Enabled    |
| DB2004 | 0276           | 3390        | 2707                     | 276                  | 10.1               | 333                 | 78                     | Enabled           | Converted             | Enabled    |
| DB2006 | 2106           | 3390        | 2707                     | 128                  | 4.7                | 172                 | 85                     | Enabled           | Converted             | Enabled    |
| DB2009 | 240A           | 3390        | 2707                     | 315                  | 11.6               | 506                 | 29                     | Enabled           | Converted             | Enabled    |
| DB2008 | 251F           | 3390        | 2707                     | 470                  | 17.3               | 411                 | 134                    | Enabled           | Converted             | Enabled    |

**Storage Group: SGDB2**

Ready
Hub Time: Thu, 03/24/2005 01:51 PM
Server Available.
SMS Storage Group Volume Space - localhost - SYSADMIN

# Problem Identification





# Problem Resolution

Lowest Volume Group Free Space Percent - IBM-6104E7C0288 - SYSADMIN \*ADMIN MODE\*

View: Physical

Enterprise  
z/OS Systems  
SP13  
Storage Subsystem  
S3CMS10:SP13:STORAGE  
Application Summary  
Channel Path  
Cache CU Performance  
Cache CU Status  
Logical Control Unit  
Tape Group  
Virtual Tape Subsystems  
SMS Storage Groups Performance  
SMS Storage Groups Space  
KS3\_Vol\_Fragment\_Index\_Critical  
KS3\_Vol\_Free\_Space\_Pct\_Critical  
User DASD Groups Performance  
User DASD Groups Space  
HSM Status  
Dataset Attributes System Summary

Storage Group: SGDB22

Storage Group: SGDB22

Volume Free Space Percent Report

| Volume | Device Address | Percent Free Space | Total Capacity Megabytes | Free Space Megabytes | Fragmentation Index | Largest Free Extent MB | VTOC Index Status | Device Type | SMS Conversion Status | SMS Status |
|--------|----------------|--------------------|--------------------------|----------------------|---------------------|------------------------|-------------------|-------------|-----------------------|------------|
| DB2S16 | 632D           | 0.3                | 2707                     | 9                    |                     |                        | led               | 3390        | Converted             | Enabled    |
| DB2S17 | 632B           | 11.3               | 2707                     | 307                  |                     |                        | led               | 3390        | Converted             | Enabled    |
| DB2S04 | 5ACF           | 22.6               | 2707                     | 613                  |                     |                        | led               | 3390        | Converted             | Enabled    |
| DB2S02 | 5ACD           | 23.1               | 2707                     | 628                  |                     |                        | led               | 3390        | Converted             | Enabled    |
| DB2S0A | 5AD5           | 24.4               | 2707                     | 661                  |                     |                        | led               | 3390        | Converted             | Enabled    |
| DB2S14 | 5BD4           | 25.8               | 2707                     | 700                  |                     |                        | led               | 3390        | Converted             | Enabled    |
| DB2S05 | 5AD0           | 26.1               | 2707                     | 707                  |                     |                        | led               | 3390        | Converted             | Enabled    |
| DB2S08 | 5AD3           | 30.4               | 2707                     | 825                  |                     |                        | led               | 3390        | Converted             | Enabled    |
| DB2S01 | 5ACC           | 30.7               | 2707                     | 832                  |                     |                        | led               | 3390        | Converted             | Enabled    |
| DB2S03 | 5ACE           | 32.4               | 2707                     | 879                  |                     |                        | led               | 3390        | Converted             | Enabled    |
| DB2S09 | 5AD4           | 32.8               | 2707                     | 889                  |                     |                        | led               | 3390        | Converted             | Enabled    |
| DB2S07 | 5AD2           | 35.5               | 2707                     | 961                  |                     |                        | led               | 3390        | Converted             | Enabled    |
| DB2S13 | 5B8D           | 36.3               | 2707                     | 983                  |                     |                        | led               | 3390        | Converted             | Enabled    |
| DB2S11 | 5AC9           | 37.7               | 2707                     | 1023                 |                     |                        | led               | 3390        | Converted             | Enabled    |
| DB2S12 | 5ACB           | 44.6               | 2707                     | 1210                 |                     |                        | led               | 3390        | Converted             | Enabled    |

Take Action...  
Link To...  
Launch...  
Link Anchor...  
Export...  
Volume Actions...  
Split vertically  
Split horizontally  
Remove  
Print Preview...  
Print...  
Properties...

Backup  
Convert  
Migrate  
Release Space

# Problem Resolution

The screenshot displays the IBM Tivoli Storage Administration console. A 'Volume Space Release' dialog box is open, showing options for releasing space on volumes. The background shows a 'Volume Free Space Percent Report' table and two bar charts. The table lists volumes and their free space percentages, while the charts show the distribution of free space across different storage groups.

| Volume | Device Address | Percent Free Space | Total Capacity Megabytes | Free Space Megabytes |
|--------|----------------|--------------------|--------------------------|----------------------|
| DB2S16 | 632D           | 0.3                | 2707                     | 9                    |
| DB2S17 | 632B           | 11.3               | 2707                     | 307                  |
| DB2S04 | 5ACF           | 22.6               | 2707                     | 613                  |
| DB2S02 | 5ACD           | 23.1               | 2707                     | 628                  |
| DB2S0A | 5AD5           | 24.4               | 2707                     | 661                  |
| DB2S14 | 5BD4           | 25.8               | 2707                     | 700                  |
| DB2S05 | 5AD0           | 26.1               | 2707                     | 707                  |
| DB2S08 | 5AD3           | 30.4               | 2707                     | 825                  |
| DB2S01 | 5ACC           | 30.7               | 2707                     | 832                  |
| DB2S03 | 5ACE           | 32.4               | 2707                     | 879                  |
| DB2S09 | 5AD4           | 32.8               | 2707                     | 889                  |
| DB2S07 | 5AD2           | 35.5               | 2707                     | 961                  |
| DB2S13 | 5B8D           | 36.3               | 2707                     | 983                  |
| DB2S11 | 5AC9           | 37.7               | 2707                     | 1023                 |
| DB2S12 | 5ACB           | 44.6               | 2707                     | 1210                 |

# Shared DASD? Look for cross system information

Cross System Group Summary - tehrle:16097 - SYSADMIN

File Edit View Help

Physical

- Storage Subsystem
  - Application Summary Report
  - Channel Path Report
  - Cache CU Performance Report
  - Cache CU Status Report
  - Logical Control Unit Report
  - Tape Group Report
  - Virtual Tape Subsystems Report
  - SMS Storage Groups Performance**
  - SMS Storage Groups Space Report
  - User DASD Groups Performance
  - User DASD Groups Space Report
  - HSM Status Report
  - SMS Configuration Report

Physical

### Device Contention Index

Storage Group: SGPRIM

### Cross System Performance Report

| Volume | Device Model | Control Unit Model | True % Busy | Cumulative I/O Rate | Device Contention Index | High MSR Value | High MSR System | High Disconnect Time Value | High Disconnect Time System |
|--------|--------------|--------------------|-------------|---------------------|-------------------------|----------------|-----------------|----------------------------|-----------------------------|
| PRI100 | 3390-3       | 3990-3             | 0.0         | 0.0                 | 0.0                     | 1.5            | SP22            | 0.0                        |                             |
| PRI101 | 3390-3       | 3990-3             | 0.0         | 0.0                 | 49.0                    | 2.8            | SP22            | 0.0                        |                             |
| PRI102 | 3390-3       | 3990-3             | 0.0         | 0.0                 | 5.8                     | 1.7            | SP22            | 0.0                        |                             |
| PRI103 | 3390-3       | 3990-3             | 0.0         | 0.0                 | 6.4                     | 1.6            | SP22            | 0.0                        |                             |
| PRI104 | 3390-3       | 3990-3             | 6.7         | 26.7                | 6.8                     | 2.9            | SYSG            | 0.1                        | SYSG                        |
| PRI105 | 3390-3       | 3990-3             | 0.0         | 0.0                 | 40.7                    | 2.7            | SP22            | 0.0                        |                             |
| PRI106 | 3390-3       | 3990-3             | 0.0         | 0.0                 | 5.8                     | 1.7            | SP22            | 0.0                        |                             |
| PRI107 | 3390-3       | 3990-3             | 0.0         | 0.0                 | 4.7                     | 1.6            | SP22            | 0.0                        |                             |
| PRI108 | 3390-3       | 3990-3             | 0.0         | 0.0                 | 6.2                     | 1.6            | SP22            | 0.0                        |                             |
| PRI109 | 3390-3       | 3990-3             | 1.7         | 15.7                | 10.0                    | 1.6            | SP22            | 0.0                        |                             |
| PRI110 | 3390-3       | 3990-3             | 0.0         | 0.0                 | 7.1                     | 1.6            | SP22            | 0.0                        |                             |
| PRI111 | 3390-3       | 3990-3             | 0.0         | 1.0                 | 12.1                    | 2.0            | SYSG            | 0.0                        |                             |
| PRI112 | 3390-3       | 3990-3             | 0.0         | 0.0                 | 2.5                     | 6.1            | SYSG            | 0.0                        |                             |

Storage Group: SGPRIM

Ready Server Available. Cross System Group Summary - tehrle:16097 - SYSADMIN

# TotalStorage Extent Pools

The screenshot displays the IBM Tivoli Storage Infrastructure Management Solutions interface. A context menu is open over the 'TotalStorage Configuration' table, with the 'Link To' option selected. The 'Link To' submenu is visible, showing options: 'TotalStorage Ranks', 'TotalStorage Extent Pool Volumes', and 'TotalStorage Extent Pool Trend'. The 'TotalStorage Configuration' table shows the following data:

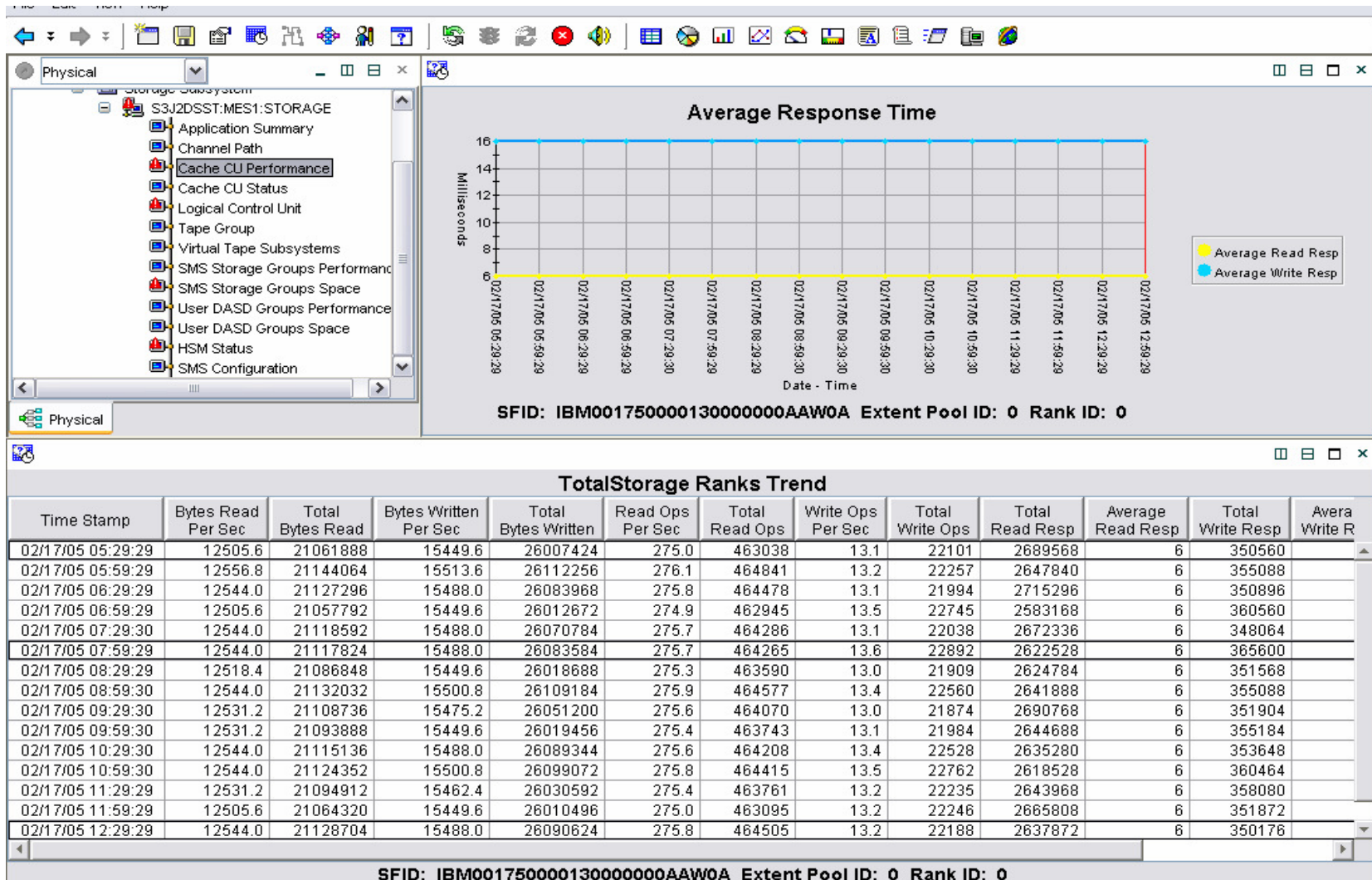
| Total Cache | Available Cache | Configured NVS | Pinned NVS | Logical Volumes | Logical Subsystems | Total Extent Pools | Total Ranks | Total Arrays |
|-------------|-----------------|----------------|------------|-----------------|--------------------|--------------------|-------------|--------------|
| 3648.0      | 981.1           | 128.0          | 0.0        | 2               | 1                  | 2                  | 2           | 2            |

Below the configuration table, there are two charts: 'Average Read Response Time' and 'Average Write Response Time'. Both charts show a single bar for Extent Pool ID 6 (0) with a value of 6. The Storage Facility ID for both is IBM0017500013000000AAW0A.

At the bottom, the 'TotalStorage Extent Pools' table is displayed:

| Extent Pool ID | Pool Type | Real Pool Capacity | Virtual Pool Capacity | Real Extents | Virtual Extents | Allocated Extents | Pool Utilization | Real Extents Converted | Virt Extents Converted | Dyn Reloc Src Extents | Dyn Reloc Tgt Extents | Avg Read Resp Time | Max Resp |
|----------------|-----------|--------------------|-----------------------|--------------|-----------------|-------------------|------------------|------------------------|------------------------|-----------------------|-----------------------|--------------------|----------|
| 0              | CKD       | 762                | 0                     | 866          | 0               | 851               | 98.3             | 0                      | 0                      | 0                     | 0                     | 6                  |          |
| 1              | CKD       | 762                | 0                     | 866          | 0               | 851               | 98.3             | 0                      | 0                      | 0                     | 0                     | n/a                |          |

# Historical Trending



## When using Tivoli OMEGAMON XE for Storage

- **Alerts provide enhanced capability in problem determination, reducing mean-time to resolution**
- **Just some of the alerts you can create to monitor (situations):**
  - Storage Group and volume space conditions
  - Response times for critical volumes
  - Response times for datasets of critical applications
  - Disabled Volume VTOC indexes
  - DFSMSHsm Queues
  - Long tape mounts
  - Many more
- **Build custom work spaces, specifically addressing problems and the environment**
- **Utilize take action to reduce problem resolution time**
- **Integration of your alerts for faster recognition of critical applications experiencing slow downs or problems**
- **Leverage integration and interoperability**

# OMEGAMON XE for Storage on z/OS v4.1.0

## *Highlights at a Glance*

- **New HyperPAV support**
- **New storage toolkit for DFSMSHsm and DFSMSdss for storage administration functions in the TEP interface provide capability to quickly create commands or schedule actions to maintain and administer DASD storage.**
- **New dataset attribute database allows versatile and granular reporting capabilities at the dataset level that you can administer via the new storage toolkit function.**
- **Dynamic Workspace Linking (DWL) to OM XE on z/OS (integration!)**
- **New problem solving workspaces adding to your problem determination capabilities – Intelligent situation analysis**
- **Top 10 reports**
- **Integration:**
  - **DWL to other OMEGAMON XE**
  - **Tivoli Storage Management offerings:**
    - Navigation to/from IBM Tivoli Advanced Catalog Management for z/OS
    - Navigation to/from IBM Tivoli Advanced Audit for DFSMSHsm
    - Navigation to/from IBM Tivoli Advanced Reporter for DFSMSHsm
  - ***Launch of TotalStorage Productivity Center (TPC)***
- **Storage Toolkit now able to cancel active HSM requests**
- **Navigation from Cross System Volume workspace to Dataset Summary on another z/OS image**

## HyperPAV Support

- **New LCU Metrics**
  - Maximum number of I/Os queued
  - Percent of I/Os that couldn't start because no alias was available
- **New Volume Metric**
  - Average number of aliases utilized
- **New Control Unit Metrics**
  - The number of I/Os that couldn't start because a HyperPAV alias wasn't available
  - The percent of I/Os that couldn't start because a HyperPAV alias wasn't available
  - The number of HyperPAV I/O requests
  - The maximum number of HyperPAV aliases in use at one time for the control unit
  - The maximum number of HyperPAV aliases in use at one time by a single base volume
  - The maximum number of I/O requests queued



# Toolkit - Create a Volume Request

*Select a request and choose options*

The screenshot displays the 'SMS Storage Group Volume Performance' interface. A 'Volume Space Release' dialog box is open, allowing configuration of release parameters. The background shows a 'Volume Performance Report' table for storage group 'SGPRIM'.

**Volume Space Release Dialog Box:**

- Options | General | Schedule
- This action uses a DFSS service
- Minimum secondary allocation for release:  Tracks
- Minimum unused space prior to release:  Tracks
- Wait for volume between retries:  Seconds
- Try to obtain volume access:  Times
- Exclude datasets qualified by:
  - Dataset Name or Pattern
- Buttons: OK, Cancel, Test, Help

**Volume Performance Report Table:**

| Volume | Device Address | Busy Percent | I/O Per Second | ...                                    |
|--------|----------------|--------------|----------------|--|
| PRI192 | 5A92           | 0.0          | 0.2            |  |
| PRI177 | 5AA9           | 0.4          | 2.2            |  |
| PRI181 | 5AB6           | 0.2          | 2.2            |  |
| PRI182 | 5AB7           | 0.5          | 4.0            |  |
| PRI186 | 5B0C           | 1.0          | 3.6            |  |
| PRI187 | 5B0D           | 1.6          | 8.6            |  |
| PRI188 | 5B0E           | 0.0          | 0.2            |  |
| PRI189 | 5B0F           | 0.0          | 0.2            |  |
| PRI190 | 5B10           | 3.0          | 7.6            |  |
| PRI191 | 5B11           | 0.1          | 0.2            | 0.0 2.0 8.0 0.0 10.0 80.0 1 2 5 0.0    |
| PRI171 | 5B12           | 0.4          | 2.2            | 0.0 1.5 2.0 0.0 3.6 55.6 11 8 11 0.0   |
| PRI172 | 5B13           | 5.8          | 29.8           | 0.0 1.5 1.9 0.0 3.4 55.9 149 101 8 0.0 |
| PRI173 | 5B14           | 5.1          | 24.6           | 0.0 1.0 2.0 0.0 3.1 64.5 123 76 24 0.0 |
| PRI174 | 5B15           | 0.0          | 0.2            | 0.0 2.0 3.0 0.0 5.0 60.0 1 1 12 0.0    |
| PRI175 | 5B16           | 1.0          | 6.0            | 0.0 1.0 1.6 0.0 2.7 59.3 30 16 10 0.0  |

Storage Group: SGPRIM

Hub Time: Tue, 05/23/2006 05:19 PM Server Available SMS Storage Group Volume Performance - TEHRlich - SYSADMIN \*ADMIN MODE\*

# Dataset Attribute DB: Build Custom Lists of Data Sets e.g Uncataloged DS Summary

Uncataloged Dataset Summary - TEHRLICH - SYSADMIN \*ADMIN MODE\*

File Edit View Help

View: Physical

- Cache CU Performance
- Cache CU Status
- Logical Control Unit
- Tape Group
- Virtual Tape Subsystems
- SMS Storage Groups Performance
- SMS Storage Groups Space
- User DASD Groups Performance
- User DASD Groups Space
- HSM Status
- Dataset Attributes System Summary
- Dataset Group Summary
- SMS Configuration
- Storage Toolkit

Uncataloged Dataset Total

Uncataloged Dataset Allocation Total

Uncataloged Dataset Summary Report

| Volser | Total Datasets | Allocated Tracks | Used Tracks | Unused Tracks |
|--------|----------------|------------------|-------------|---------------|
| ABRBKP | 224            | 1854             | 1854        | 0             |
| ADMIN1 | 1              | 9                | 0           | 9             |
| BLD001 | 9              | 3614             | 2266        | 1348          |
| BLD002 | 14             | 5390             | 3069        | 2321          |
| BLD003 | 5              | 2310             | 732         | 1578          |
| CAN001 | 3              | 1225             | 1225        | 0             |
| CIDEV8 | 1              | 1903             | 1903        | 0             |
| CLNT01 | 70             | 94274            | 93902       | 372           |
| CLNT02 | 30             | 74375            | 74201       | 174           |
| CLNT03 | 45             | 93658            | 93357       | 301           |
| CLNT04 | 52             | 100591           | 100278      | 313           |
| CLNT05 | 5              | 103770           | 103765      | 5             |
| CLNT06 | 63             | 102539           | 102162      | 377           |
| CLNT07 | 58             | 103300           | 102634      | 666           |
| CLNT08 | 48             | 78845            | 78571       | 274           |

Uncataloged Dataset Allocation by Volume

Hub Time: Thu, 05/25/2006 03:07 PM Server Available

Uncataloged Dataset Summary - TEHRLICH - SYSADMIN \*ADMIN MODE\*

# Dataset Attribute DB and leveraging of Storage Toolkit

**Dataset Space Summary - TEHRLICH - SYSADMIN \*ADMIN MODE\***

View: Physical

**Top Datasets by Allocated Space**

| Dataset Name             | Volser | Allocated Tracks | Used Tracks | Unused Tracks | Extents      | DSORG               |
|--------------------------|--------|------------------|-------------|---------------|--------------|---------------------|
| PKGS.REL.SYSMOD          | PKG002 | 115500           | 115500      | 0             | 28           | PDSE                |
| HSM.BCDSA.DATA           | HSMBCD | 80205            | 69210       | 10995         | 1            | VSAM                |
| CLIENT.BEAR.BSWA.MONITOR | CLNT05 | 60000            | 60000       | 0             | 4            | Physical_Sequential |
| SYS1.HASPACE             | SPL13B | 50040            | 50040       | 0             | 1            | PS_Unmovable        |
| SYS1.HASPACE             | SPL13C | 50040            | 50040       | 0             | 1            | PS_Unmovable        |
| SYS1.HASPACE             | SPL13E | 50040            | 50040       | 0             | 1            | PS_Unmovable        |
| SYS1.HASPACE             | SPL331 | 50040            | 50040       | 0             | 1            | PS_Unmovable        |
| SYS1.HASPACE             | SPOOL2 | 50040            | 50040       | 0             | 1            | PS_Unmovable        |
| SYS1.HASPACE             | SPOOL3 | 50040            | 50040       | 0             | 1            | PS_Unmovable        |
| SYS1.HASPACE             | SPL112 | 50040            | 50040       | 0             | 1            | PS_Unmovable        |
| SPL13A                   | 50040  | 50040            | 0           | 1             | PS_Unmovable |                     |
| SPOOL1                   | 50040  | 50040            | 0           | 1             | PS_Unmovable |                     |
| PAGL02                   | PAGL02 | 50025            | 50025       | 0             | 1            | VSAM                |
| PAGA02                   | 50025  | 50025            | 0           | 1             | VSAM         |                     |

**Top Datasets by Extents**

| Dataset Name        | Volser | Extents |     |
|---------------------|--------|---------|-----|
| DB2C81.DSNDDBD      | A001   | DB2S10  | 123 |
| OMVS.DOKAM.USER.DIR | OMV005 | 123     |     |
| OMVS.RGATS.USER.DIR | OMV011 | 123     |     |

**Top Datasets by CA Splits**

| Dataset Name   | Volser | CA Splits | CI Splits | As        |
|----------------|--------|-----------|-----------|-----------|
| HSM.BCDSA.DATA | HSMBCD | 1868      | 69722     | HSM.BCDSA |
| HSM.OCDS.DATA  | HSMOCD | 1656      | 1869      | HSM.OCDS  |
| HSM.MCDS.DATA  | HSMMC1 | 1156      | 46595     | HSM.MCDS  |

**Top Datasets by Unused Space**

| Dataset Name           | Volser | Unused Tracks | Allocated Tracks | Used Tracks | E |
|------------------------|--------|---------------|------------------|-------------|---|
| DCPC.PRODTAPE.CQ       | TSO004 | -55011        | 51               | 55062       |   |
| PAGE.SYSG.LOCAL06.DATA | PAGG06 | 50025         | 50025            | 0           |   |
| PAGE.SYSG.LOCAL02.DATA | PAGG02 | 50025         | 50025            | 0           |   |
| PAGE.SYSG.LOCAL04.DATA | PAGG04 | 50025         | 50025            | 0           |   |
| PAGE.SYSG.LOCAL03.DATA | PAGG03 | 50025         | 50025            | 0           |   |
| PAGE.SYSG.LOCAL05.DATA | PAGG05 | 50025         | 50025            | 0           |   |

**Top Datasets by CI Splits**

| Dataset Name                     | Volser | CI Splits | CA Splits |            |
|----------------------------------|--------|-----------|-----------|------------|
| HSM.BCDSA.DATA                   | HSMBCD | 69722     | 1868      | HSM.BCDS   |
| HSM.MCDS.DATA                    | HSMMC1 | 46595     | 1156      | HSM.MCDS   |
| TDSV.VC.CSI.DATA                 | ST0011 | 33282     | 172       | TDSV.VC.CI |
| ALOR13.DDIR.D                    | PRI174 | 29276     | 261       | ALOR13.DD  |
| TDSV.VD.CSI.DATA                 | ST0003 | 23429     | 100       | TDSV.VD.CI |
| VKUMA.0G340.@SYSAVK.RKOGCKP.DATA | PRI174 | 22923     | 109       | VKUMA.0G   |

Hub Time: Thu, 05/25/2006 02:59 PM Server Available Dataset Space Summary - TEHRLICH - SYSADMIN \*ADMIN MODE\*

# Dynamic Workspace Linking in zStorage Management

The screenshot displays several overlapping windows from the Tivoli Storage Manager interface:

- Basic Catalog Structure Summary:** A table listing catalog entries with columns for Name, Volume Serial, SMS Managed, Catalog On Shared DASD, Open, Shared Catalog, and Last Catalog Backup.
- Catalog Dataset Attributes:** A table listing dataset attributes with columns for Name, Volume Serial, Creation Date, and Last Ref Date.
- Catalog Volume Summary:** A table listing volume details with columns for Node, Volume Serial, Allocated Capacity, Fragmentation Index, Free Extent Count, Largest Free Extent, and Timestamp.
- Volume Capacity:** A bar chart showing allocated and free space.
- Volume File Rate:** A line graph showing file activity over time.
- Device Space Details:** A table listing device space information with columns for System ID, MVS Status, SMS Status, Device Address, Device Type, RAID Model, and LCU Number.
- Volume Space Details Report:** A summary table for a specific volume (BLD001) showing capacity, free space, and fragmentation metrics.
- Volume Space Details Report (Detailed):** A table showing detailed volume space metrics.

Callouts and arrows highlight key features:

- Basic Catalog Structure Workspace:** Points to the top window.
- Link to Other Catalog Workspaces:** Points to a link in the Basic Catalog Structure Summary window.
- Link to OMEGAMON XE for Storage Workspace:** Points to a link in the Catalog Dataset Attributes window.

## Next Steps 4.2.0 OMEGAMON XE for Storage on z/OS

- Major extensions to the Storage Toolkit
- Support for DFSMSrmm
- Support for TS7700 (IBM vts)
- DASD Volume Users
- Dynamic Workspace Linking to:
  - **IBM Tivoli Advanced DFSMShsm Reporter (AHR)**
  - **IBM Tivoli Advanced DFSMShsm Audit (AHA)**
  - **IBM Tivoli Advanced Catalog Management (ACM)**
  - **IBM Tivoli Allocation Optimizer (AO)**
- Additional DFSMShsm function and attributes
- Currency and Exploitation of new z/OS features
- Reports for the Tivoli Common Reporting initiative
- Message standardization

## Next Steps 4.2.0 OMEGAMON XE for Storage on z/OS

### Storage Toolkit Extensions

- GUI dialogs for IDCAMS requests
- GUI dialogs for DFSMSrmm requests
- Modify GUI created requests
- Submit user JCL (with variable substitution)
- Create JCL via GUI interface
- Rerun requests with new resources or previous execution
- Security validation based on ID used to sign on to TEP

**Cross product link scenario (XE Storage -> ACM)  
Number of Extents Exceeded Scenario**

Welcome SYSADMIN

Log out

**Tivoli** Enterprise Portal



File Edit View Help



View: Physical Initial Situation Values

| Managed System | SMFID | TimeStamp         | Dataset Group Name | Dataset Name  | Request Type | Si |
|----------------|-------|-------------------|--------------------|---------------|--------------|----|
| 6:IP01:STORAGE | IPO1  | 06/04/07 19:19:49 | SYS1               | SYS1.DUMP00   |              |    |
| 6:IP01:STORAGE | IPO1  | 06/04/07 19:19:49 | SYS1               | SYS1.DUMP01   |              |    |
| 6:IP01:STORAGE | IPO1  | 06/04/07 19:19:49 | SYS1               | SYS1.DUMP02   |              |    |
| 6:IP01:STORAGE | IPO1  | 06/04/07 19:19:49 | XESTORAGE          | KS3410.SMPPTS |              |    |
| 6:IP01:STORAGE | IPO1  | 06/04/07 19:19:49 | HFS                | OMVS.TMP      |              |    |

The Storage Administrator links to the Event Workspace for the situation to view details for the situation including attributes associated with the object that caused the situation to be triggered.

| Managed System | SMFID | TimeStamp         | Dataset Group Name | Dataset Name  | Request Type | Si |
|----------------|-------|-------------------|--------------------|---------------|--------------|----|
| 6:IP01:STORAGE | IPO1  | 06/04/07 19:19:49 | XESTORAGE          | KS3410.SMPPTS |              |    |

**CRITICAL**

**KS3\_Dataset\_Group\_VSAM\_Extents** XESTORAG:IP01:STORAGE 06/04/07 15:28:07

Command View  
KFWMTM1021 Select workspace link button to view situation event results for: KS3\_Dataset\_Group\_VSAM\_Extents

**Take Action**

Action Name:

Command:

No advice is available for this situation.

Hub Time: Mon, 06/04/2007 03:30 P Server Available KS3\_Dataset\_Group\_VSAM\_Extents - omut3.tivlab.raleigh.ibm.com - SYSADMIN \*ADMIN MODE\*

Applet CMWApplet started Internet



Welcome SYSADMIN

Log out

**Tivoli** Enterprise Portal

File Edit View Help



View: Physical

- Cache CU Status
- Logical Control Unit
- Tape Group
- Virtual Tape Subsystems
- SMS Storage Groups Performance
- SMS Storage Groups Space
- User DASD Groups Performance
- User DASD Groups Space
- HSM Status
- Dataset Attributes System Summ
- Dataset Group Summary
- SMS Configuration
- Storage Toolkit

Initial Situation Values

| Extents | Managed Custom | SMFID | TimeStamp | Dataset Group Name | Dataset Name  | Reque Type |
|---------|----------------|-------|-----------|--------------------|---------------|------------|
| 10      |                |       |           |                    | SYS1.DUMP00   |            |
| 10      |                |       |           |                    | SYS1.DUMP01   |            |
| 10      |                |       |           |                    | SYS1.DUMP02   |            |
| 10      |                |       |           | XESTORAGE          | KS3410.SMPPTS |            |
| 10      |                |       |           |                    | OMVS.TMP      |            |

The Storage Administrator linked to the event workspace for that situation and notices that the number of extents is currently still a problem. He also determines that the data set with the excessive extents is a catalog.

Current Situation

| Extents | Dataset Group Name     | Dataset Name | Reque Type    |
|---------|------------------------|--------------|---------------|
| 16      | XESTORAGE:IP01:STORAGE | SYS1         | SYS1.DUMP00   |
| 16      | XESTORAGE:IP01:STORAGE | SYS1         | SYS1.DUMP01   |
| 16      | XESTORAGE:IP01:STORAGE | SYS1         | SYS1.DUMP02   |
| 12      | XESTORAGE:IP01:STORAGE | XESTORAGE    | KS3410.SMPPTS |
| 14      | XESTORAGE:IP01:STORAGE | USER         | OMVS.TMP      |

Command View

### Take Action

Action Name:

Command:

Arguments...

Expert Advice

No advice is available for this situation.

Hub Time: Mon, 06/04/2007 03:35 P Server Available KS3\_Dataset\_Group\_VSAM\_Extents - omut3.tivlab.raleigh.ibm.com - SYSADMIN \*ADMIN MODE\*

Applet CMWApplet started

9/3/2008

Internet © 2008 IBM Corporation

Welcome SYSADMIN

Log out

**Tivoli** Enterprise Portal

File Edit View Help



View: Physical

- Cache CU Status
- Logical Control Unit
- Tape Group
- Virtual Tape Subsystems
- SMS Storage Groups Performance
- SMS Storage Groups Space
- User DASD Groups Performance
- User DASD Groups Space
- HSM Status
- Dataset Attributes System Summ
- Dataset Group Summary
- SMS Configuration
- Storage Toolkit

The Storage Administrator links to the Advanced Catalog Management Catalog Details workspace (using the catalog name as a link attribute) to determine if reorganization would be beneficial.

Initial Situation Values

Extents

- ACM Catalog Details
- Link Wizard...
- Link Anchor...

| Extents               | Managed System | SMFID | TimeStamp         | Dataset Group Name | Dataset Name  | Reque Type |
|-----------------------|----------------|-------|-------------------|--------------------|---------------|------------|
| XESTORAG:IP01:STORAGE | IP01           | IP01  | 06/04/07 19:19:49 | SYS1               | SYS1.DUMP00   |            |
| XESTORAG:IP01:STORAGE | IP01           | IP01  | 06/04/07 19:19:49 | SYS1               | SYS1.DUMP01   |            |
| XESTORAG:IP01:STORAGE | IP01           | IP01  | 06/04/07 19:19:49 | SYS1               | SYS1.DUMP02   |            |
| XESTORAG:IP01:STORAGE | IP01           | IP01  | 06/04/07 19:19:49 | XESTORAGE          | KS3410.SMPPTS |            |
| XESTORAG:IP01:STORAGE | IP01           | IP01  | 06/04/07 19:19:49 | HFS                | OMVS.TMP      |            |

Current Situation Values

| Extents | Managed System        | SMFID | TimeStamp         | Dataset Group Name | Dataset Name  | Reque Type |
|---------|-----------------------|-------|-------------------|--------------------|---------------|------------|
| 16      | XESTORAG:IP01:STORAGE | IP01  | 06/04/07 19:34:51 | SYS1               | SYS1.DUMP00   |            |
| 16      | XESTORAG:IP01:STORAGE | IP01  | 06/04/07 19:34:51 | SYS1               | SYS1.DUMP01   |            |
| 16      | XESTORAG:IP01:STORAGE | IP01  | 06/04/07 19:34:51 | SYS1               | SYS1.DUMP02   |            |
| 12      | XESTORAG:IP01:STORAGE | IP01  | 06/04/07 19:34:51 | XESTORAGE          | KS3410.SMPPTS |            |
| 14      | XESTORAG:IP01:STORAGE | IP01  | 06/04/07 19:34:51 | HFS                | OMVS.TMP      |            |

Command View

### Take Action

Action

Name:

Command:

Arguments...

Navigation icons: back, forward, refresh, home, print

No advice is available for this situation.

Expert Advice

Hub Time: Mon, 06/04/2007 03:38 P Server Available KS3\_Dataset\_Group\_VSAM\_Extents - omut3.tivlab.raleigh.ibm.com - SYSADMIN \*ADMIN MODE\*

Applet CMWApplet started

Internet

Welcome SYSADMIN

Log out

Tivoli Enterprise Portal

File Edit View Help

The screenshot displays the Tivoli Enterprise Portal interface. On the left is a tree view of the storage infrastructure. The main area shows several panels: 'Extents for USERCAT.UCAT2' and 'Free Space for NONSMS' (a line graph), 'Catalog Dataset Details for USERCAT.UCAT2' (a table), and 'Cache Performance for USERCAT.UCAT2' (another table). A 'Destination Systems' window is also open, listing the IP address #192.168.55.72.RN.

| Catalog Name  | Volume Serial | Extents |
|---------------|---------------|---------|
| USERCAT.UCAT2 | NONSMS        |         |

| Catalog Name  | Volume Serial | Records | Searches | Hits | Deletes | Updates | Purges | % |
|---------------|---------------|---------|----------|------|---------|---------|--------|---|
| USERCAT.UCAT2 | NONSMS        |         |          |      |         |         |        |   |

Viewing the Advanced Catalog Management Catalog Details workspace, the Storage Administrator analyzes extent growth rate and notices that this catalog experienced rapid extent growth rate.

The Storage Administrator notices that the number of extents increased at the same time that the number of aliases increased. The Storage Administrator further notices that activity in both aliases and extents has settled down since their latest increase. Separate investigation confirms that the growth was due to a single change (the merging of two catalogs). The Storage Administrator determines that reorganization would be beneficial, but that the catalog needs to be allocated with additional space. The Storage Administrator confirms there is space on the volume for the increase in size of the BCS.

Welcome SYSADMIN

Log out

Tivoli Enterprise Portal

File Edit View Help



View: Physical

- Enterprise
  - Windows Systems
  - z/OS Systems
    - DVLP
      - Catalog Management
        - #192.168.55.72:RN
          - Alias Space
          - Catalog Dataset Attributes
          - Catalog Summary
          - Catalog Volume Summary
          - Cache Performance
          - Last Catalog Backup
  - DFSMSHsm Audit
  - Storage Subsystem
    - CANSDSST:DVLP:STORAG
      - Application Summary
      - Channel Path
      - Cache CU Performance
      - Cache CU Status
      - Logical Control Unit
      - Tape Group
      - Virtual Tape Subsystem
      - SMS Storage Groups Performance
      - SMS Storage Groups Status
      - User DASD Groups Performance
      - User DASD Groups Status
      - HSM Status

Extents for USERCAT.UCAT2

Free Space for NONSMS

USERCAT.UCAT2

Physical

| Catalog Name  | Volume Serial | Extents |
|---------------|---------------|---------|
| USERCAT.UCAT2 | NONSMS        |         |

Take Action

Action Name: Send WTO

Command: SEND 'Catalog: USERCAT.UCAT2 is in 119 extents, REORG recommended'

Destination Systems: #192.168.55.72:RN

Buttons: OK, Cancel, Help

Cache Performance for USERCAT.UCAT2

| Catalog Name  | Volume Serial | Records | Searches | Hits | Deletes | Updates | Purges | % |
|---------------|---------------|---------|----------|------|---------|---------|--------|---|
| USERCAT.UCAT2 | NONSMS        |         |          |      |         |         |        |   |

Alias Space Details for USERCAT.UCAT2

| Catalog Name  | Volume Serial | Alias Count | Average Length | Remaining Aliases | Total Alias Length | Timestamp         |
|---------------|---------------|-------------|----------------|-------------------|--------------------|-------------------|
| USERCAT.UCAT2 | NONSMS        | 122         | 6              | 3467              | 1065               | 08/06/07 09:10:13 |

The Storage Administrator issues a WTO via the Take Action facility that will drive automation to run a job to reorganize the user catalog while open and increase the allocated space. The Storage Administrator checks the outcome of the job from the MVS System Console to ensure it ran successfully.

Hub Time: Mon, 08/06/2007 12:14 PM

Server Available

Catalog Details - localhost - SYSADMIN

Welcome SYSADMIN

Log out

**Tivoli Enterprise Portal**

File Edit View Help



View: Physical

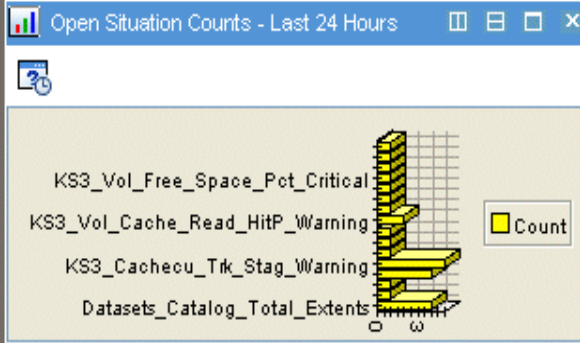
- Cache CU Status
- Logical Control Unit
- HSM Status
- Dataset Attributes System Sumr
- Dataset Group Summary
- SMS Configuration
- Storage Toolkit

The Storage Administrator navigates back to OMEGAMON XE for Storage and verifies that the problem has been resolved.

Situation Event Console

Total Events: 9 | Item Filter: Enterprise

| Severity | Status | Owner | Situation Name                   | Display Item | Source                |
|----------|--------|-------|----------------------------------|--------------|-----------------------|
|          | Open   |       | KS3_Cachecu_Cache_Stat_Critical  |              | XESTORAG:IP01:STORAGE |
|          | Open   |       | KS3_Cachecu_Trk_Dstg_Critical    |              | XESTORAG:IP01:STORAGE |
|          | Open   |       | KS3_Dataset_Group_Total_IO       |              | XESTORAG:IP01:STORAGE |
|          | Open   |       | KS3_HSM_Status_Inactive_Critical |              | XESTORAG:IP01:STORAGE |
|          | Open   |       | KS3_Vol_Disabled_VTOC_Critical   |              | XESTORAG:IP01:STORAGE |
|          | Open   |       | KS3_Vol_Fragment_Index_Critical  |              | XESTORAG:IP01:STORAGE |
| Warning  | Open   |       | KS3_Vol_Fragment_Index_Warning   |              | XESTORAG:IP01:STORAGE |
| Critical | Open   |       | KS3_Vol_Free_Space_Pct_Critical  |              | XESTORAG:IP01:STORAGE |
| Warning  | Open   |       | KS3_Vol_Free_Space_Pct_Warning   |              | XESTORAG:IP01:STORAGE |



My Acknowledged Events

| Severity | Status | Owner | Situation Name | Display Item | Source | Impact | Opened | Local Timestamp | Type |
|----------|--------|-------|----------------|--------------|--------|--------|--------|-----------------|------|
|          |        |       |                |              |        |        |        |                 |      |

Message Log

| Status | Name | Display Item | Origin Node | Global Timestamp | L |
|--------|------|--------------|-------------|------------------|---|
|        |      |              |             |                  |   |

Hub Time: Fri, 05/11/2007 02:58 PM | Server Available | Enterprise Status - omut3.tivlab.raleigh.ibm.com - SYSADMIN \*ADMIN MODE\*

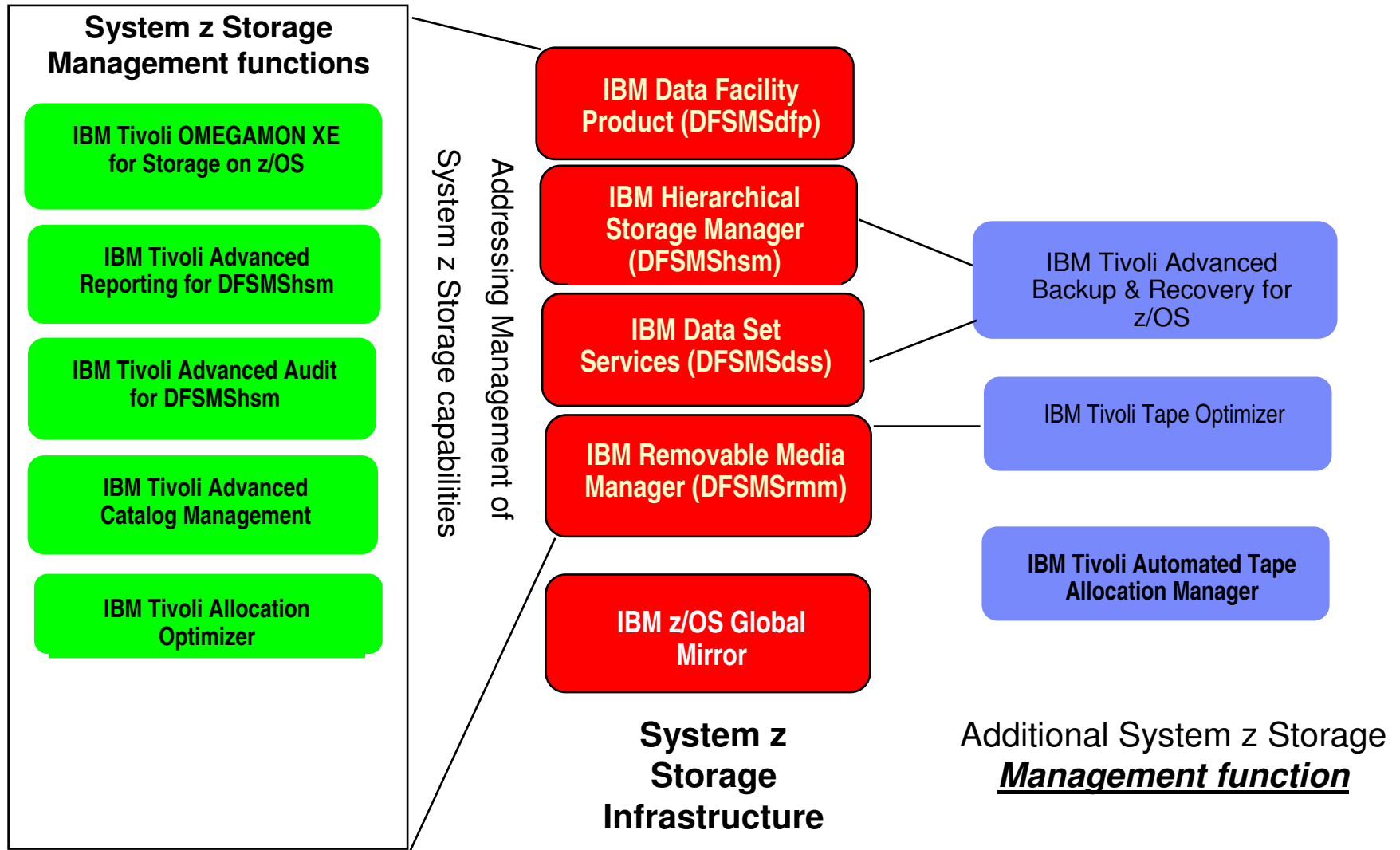
Applet CMWApplet started

Internet © 2008 IBM Corporation

## Addressing zStorage Management

- **In 2004 IBM/Tivoli acquired Candle and the OMEGAMONs**
- **2004 to 2007 IBM/Tivoli introduce new Storage Management solutions for System z**
  
- **From these actions a rich and full range additional capability in the zStorage management segment have been delivered and available today!**
  - Availability management
  - Performance management
  - zStorage administration capability
  - Management capability of vital zStorage Management subsystems
  - Critical catalog management capability
  - Extended capability in the offline storage area

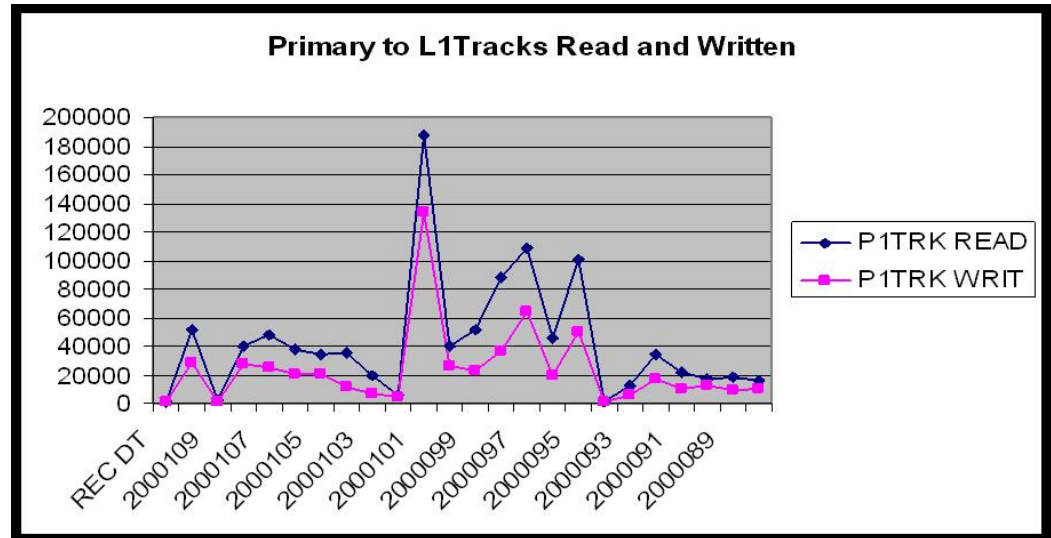
## System z Storage Management Solutions: Added Capability



# IBM Tivoli Advanced Reporting for DFSMSHsm

## ■ Provides Detailed HSM Reporting Capability

- Daily Health Reports
  - Provides reports for:
    - DFSMS Mounted Volumes
    - DFSMSHsm Managed Volumes
    - DFSMSHsm Space Management
    - DFSMSHsm Automatic Backup
    - DFSMSHsm Autodump Activities
  - Automatic Spreadsheet Charting
- Ad-hoc reporting
  - Fast and highly interactive
  - Easily find areas of concern
    - Drive the view to the area of concern
    - Look around, Act on what you see
- Perform “what-if” analysis
  - Migration thresholds
  - Recycle percent valid
- “Plans” Feature makes new reports simple to create and save
  - Provides filtering logic so you can drill down
- Automated command generation
  - Allows wrapping action commands around listed data sets
  - Go from “Now I know what to do” to “I’ve already done it”
  - Add your own customized commands to the command library



## ■ Easy-to-Use ISPF User Interface



## IBM Tivoli Advanced Audit for DFSMSHsm

- Audits, repairs, and ensures integrity of the DFSMSHsm environment, including tape.
- Automates data collection and corrective actions
- Proactive notification and alerts to critical problems which can be expertly resolved before a system outage occurs
- Finds and can correct 100% of DFSMSHsm errors
- Prove integrity of DFSMSHsm environment
- Operates many times faster than native DFSMSHsm commands, without performance impact on DFSMSHsm
- Ease-of-Use and performance permits regular rather than periodic audits

### Error Summary Panel

#### AUDIT MCDS SUMMARY

<VRRR.xx>

Row 1 to 17 of 31

OPTION ==>

SCROLL==> CSR

ENTER F TO DISPLAY FIXES OR B TO BROWSE ERRORS

S NUMBER COUNT MESSAGE

11D1C 0081708 MCD ENTRY IS NOT CATALOGED

11D2C 0000570 MCD ENTRY IS CATALOGED ON DIFFERENT VOLUME

11V2C 0000010 MCO VSAM COMPONENT ON DIFFERENT VOLUME

1103W 0000790 MCD ENTRY IS MISSING THE MCA ENTRY

11V1C 0002320 MCO VSAM COMPONENT IS NOT CATALOGED

1104C 0000070 MCD LEVEL 1 ENTRY HAS NO VTOC ENTRY ON L1 VOLUME

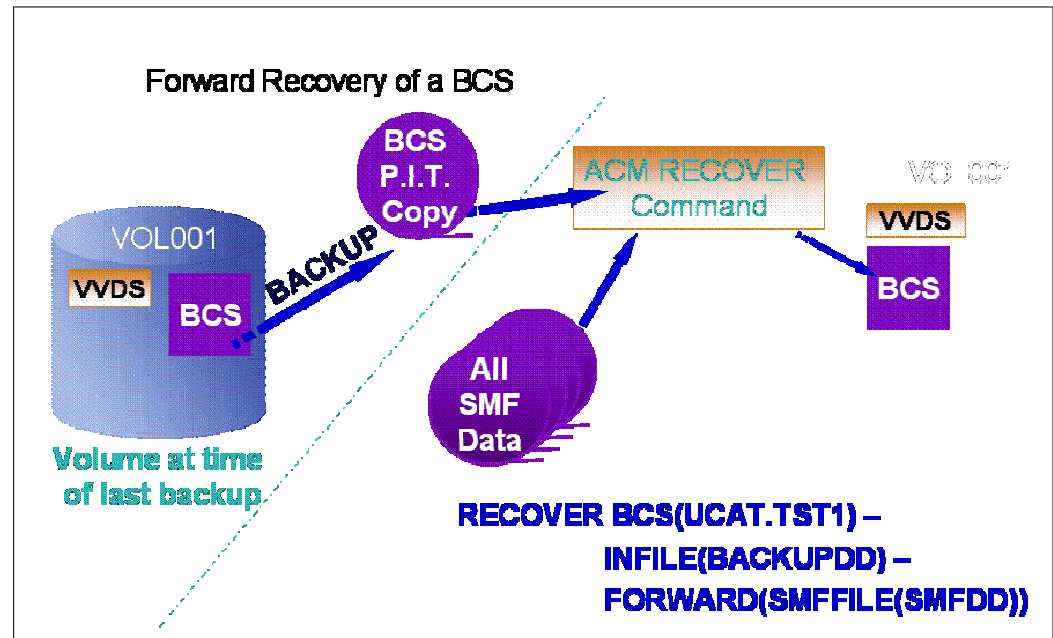
1105W 0000001 MCD VSAM BASE NAME IS MISSING IN MCO

1106C 0009109 MCD IS ON VOLUME WHICH HAS NO MCV ENTRY

1106V 0000017 SUMMARY OF VOLUMES HAVING NO MCV ENTRY

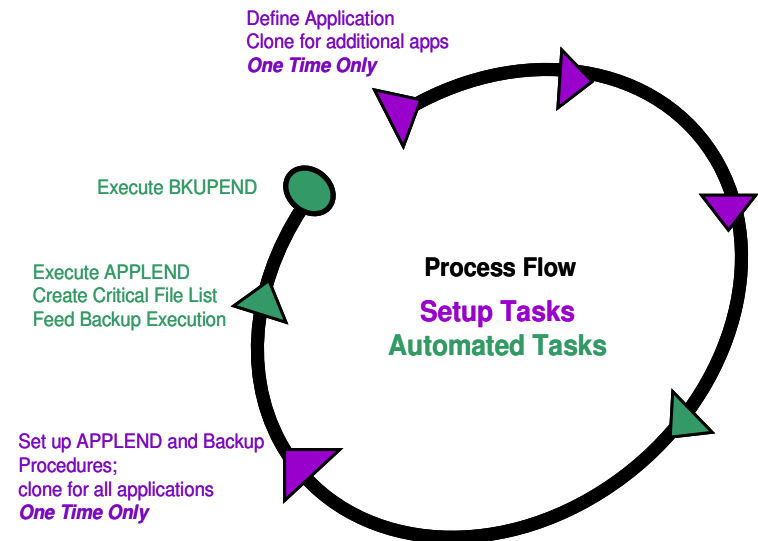
# IBM Tivoli Advanced Catalog Management for z/OS

- Provides 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 downtime by permitting catalog maintenance while open
- Allows "what-if" simulation to preview effects of actions
- Easy-to-use interface improves staff productivity



# IBM Tivoli Advanced Backup & Recovery for z/OS

- Single Toolset to automatically:
  - Identify critical application data
  - Track & Validate Backups
    - Where they are
    - Currency
    - Supporting removable or non-removable media types
  - Recover **Fast** from Disasters or Local Outages
    - Either at Local or DR site
    - From one central location
    - With one simple process
  - Eliminates guesswork and manual processes
    - Provides assurance that the data needed for the business to be resilient and compliant is protected and can be recovered from any type of outage, with documented evidence of the recoverability



# IBM Tivoli Allocation Optimizer for z/OS

## Allocation Optimizer:

- Enables users to avoid and recover from X37 type abends such as B37, D37, and E37 abends
- Handles all DASD data sets, both SMS and non SMS-managed (VSAM and non-VSAM). Used with SMS, ***all*** unsuccessful DASD allocations are eligible for recovery
- Maximizes use of the current volume before attempting to allocate additional volumes - dynamically adjusting catalog and control blocks only when an extent is needed
- Limits fragmentation of a data set on a single volume and across multiple volumes, preserving valuable catalog space and memory-based control block storage

```

Session A - rs25 mod3 - [32 x 80]
Tivoli Allocation Optimizer Recovery Statistics

Statistics recording started at 01/03/2005 16:16:03      Subsystem ID AOSH

Initial volume primary space allocation failures recovered..... 137
Subsequent volume primary space allocation failures recovered.... 0
Undefined secondary allocation space abends avoided (D37)..... 435
Unavailable secondary allocation space abends avoided (B37/E37)... 43
Unavailable secondary allocation space abends recovered (B37/E37). 77
Insufficient volumes defined abends recovered (B37/E37)..... 1691
Possible insufficient space abends avoided (B37/E37)..... 254
Space release option added to primary or secondary allocation.... 27
Insufficient PDS directory space for member save errors recovered. 0

*****
*
* Total number of abends and errors either avoided or recovered      2664  *
*
* Number of tracks recovered from adding space release                354   *
*
*****
  
```

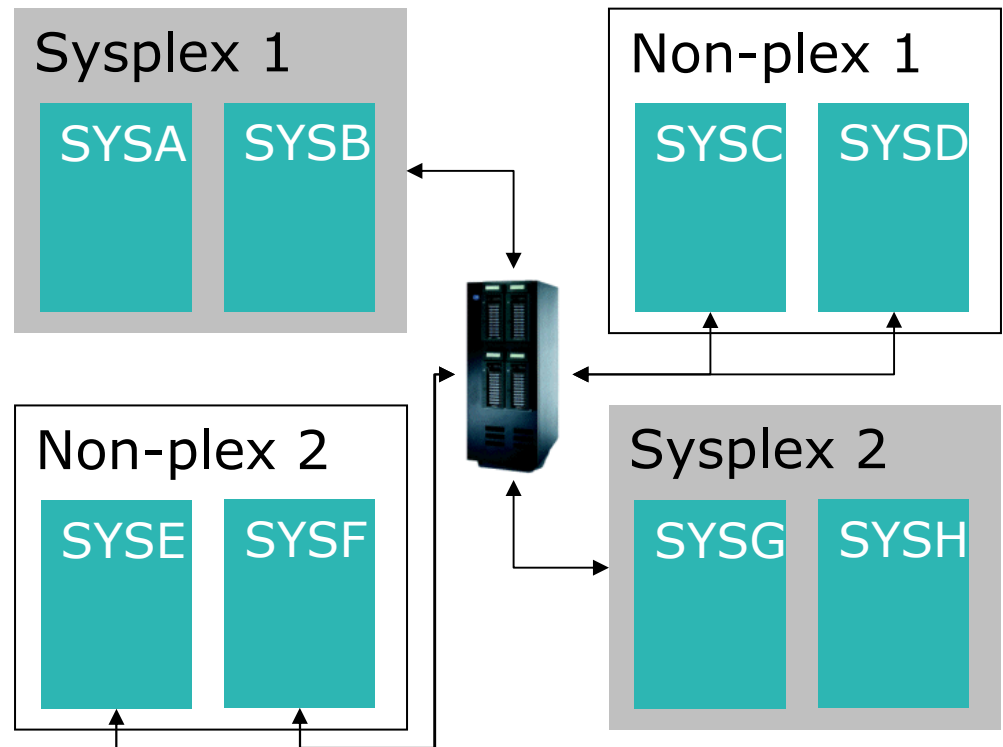
# IBM Tivoli Automated Tape Allocation Manager for z/OS

■ **Automated Tape Allocation Manager (ATAM):**

- ◆ Enables customers to share existing tape devices between multiple images: sysplex, nonplex, multiple standalone in any combination including legacy devices such as 3420

■ **Improves Operational Efficiency:**

- ◆ Maximize the use of existing tape devices
- ◆ Reduce operational overhead
- ◆ Minimize backlogs of job requests
- ◆ Improve the ROI on tape hardware investments
- ◆ Support hardware acquisition decisions
- ◆ Architecture: Since ATAM operates at the Hardware Level, it exploits the fact that an autoswitchable device can only be online and allocated to one system at a time
- ◆ Availability: Single Point of Control without the Single Point of Failure – ATAM does not need to coordinate device allocation information through a shared control file
- Responds automatically and directly to user/job resource requests
- Responds to requests at “machine speed” instead of “operator speed”
- Real-time and historical reporting – built-in



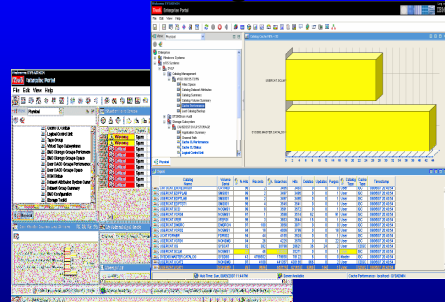
# IBM Tivoli Integrated System z Storage Management

## IBM's System z Storage Management Provides:

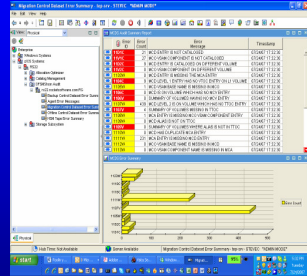
- Powerful Integration of related System z Storage information via the Tivoli Enterprise Portal (TEP)
- Robust Tools for monitoring and managing System z Storage
- Dynamic linking and capability to take action directly from the TEP
- Standardize System z Storage Toolset - Reduce dependency on zStorage Management 'gurus'
- Simpler maintenance & upgrade – all use standard IBM SMP/E packaging
- Reduce usage of System z Resources – reduce cost and energy usage

### Tivoli Enterprise Portal

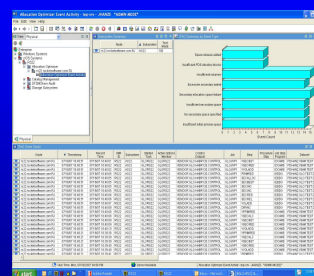
**Tivoli OMEGAMON XE for Storage**



**Tivoli Advanced Catalog Management**

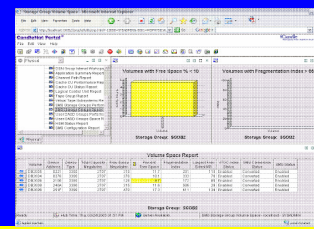


**Tivoli Advanced Audit for DFSMSHsm**

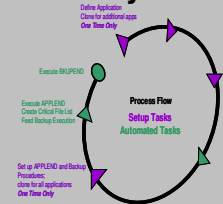


**Tivoli Allocation Optimizer**

**Tivoli Advanced Reporting for DFSMSHsm**



**Tivoli Advanced Backup & Recovery**

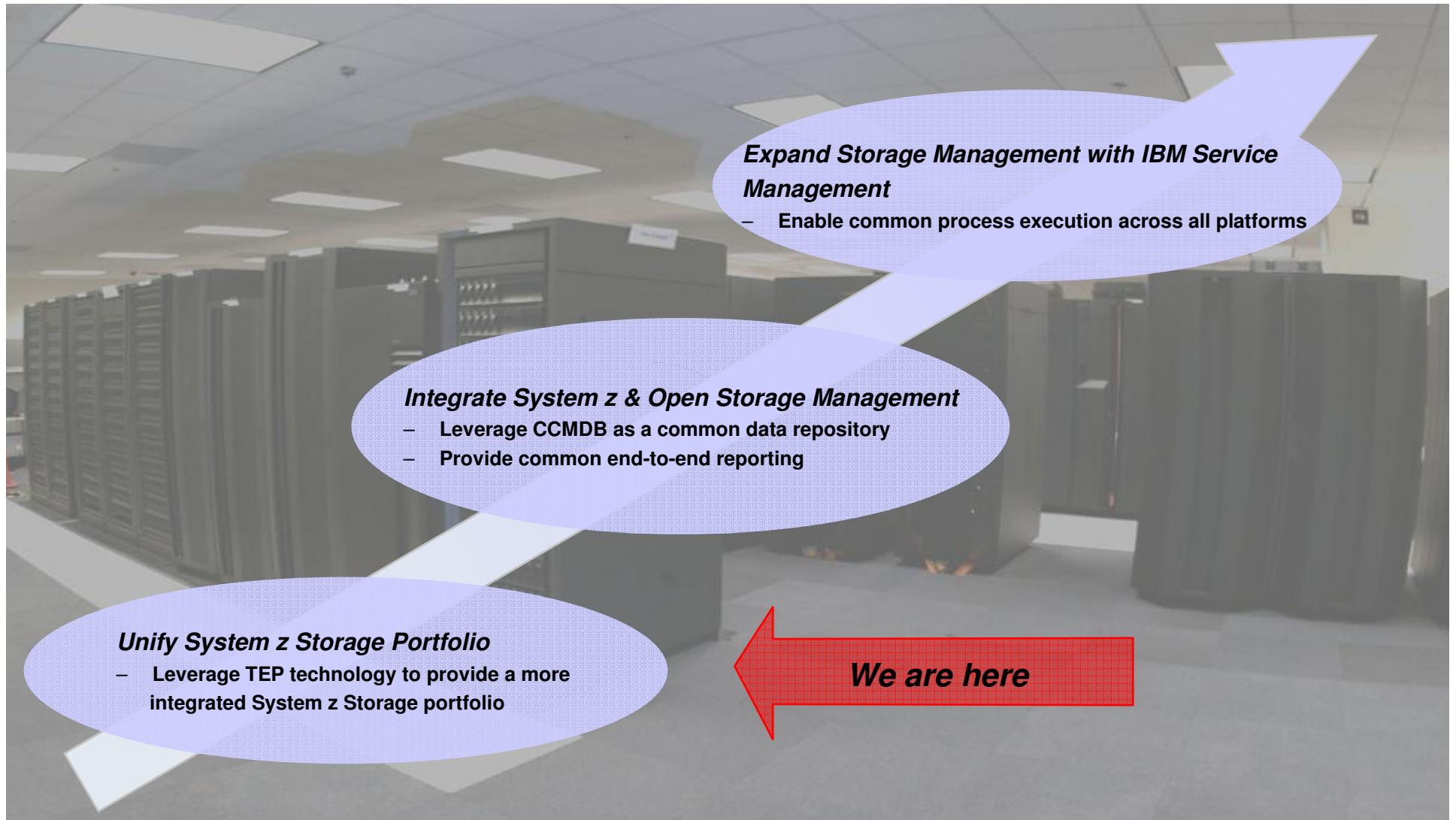


**V2.1 Available 10/26/2007**

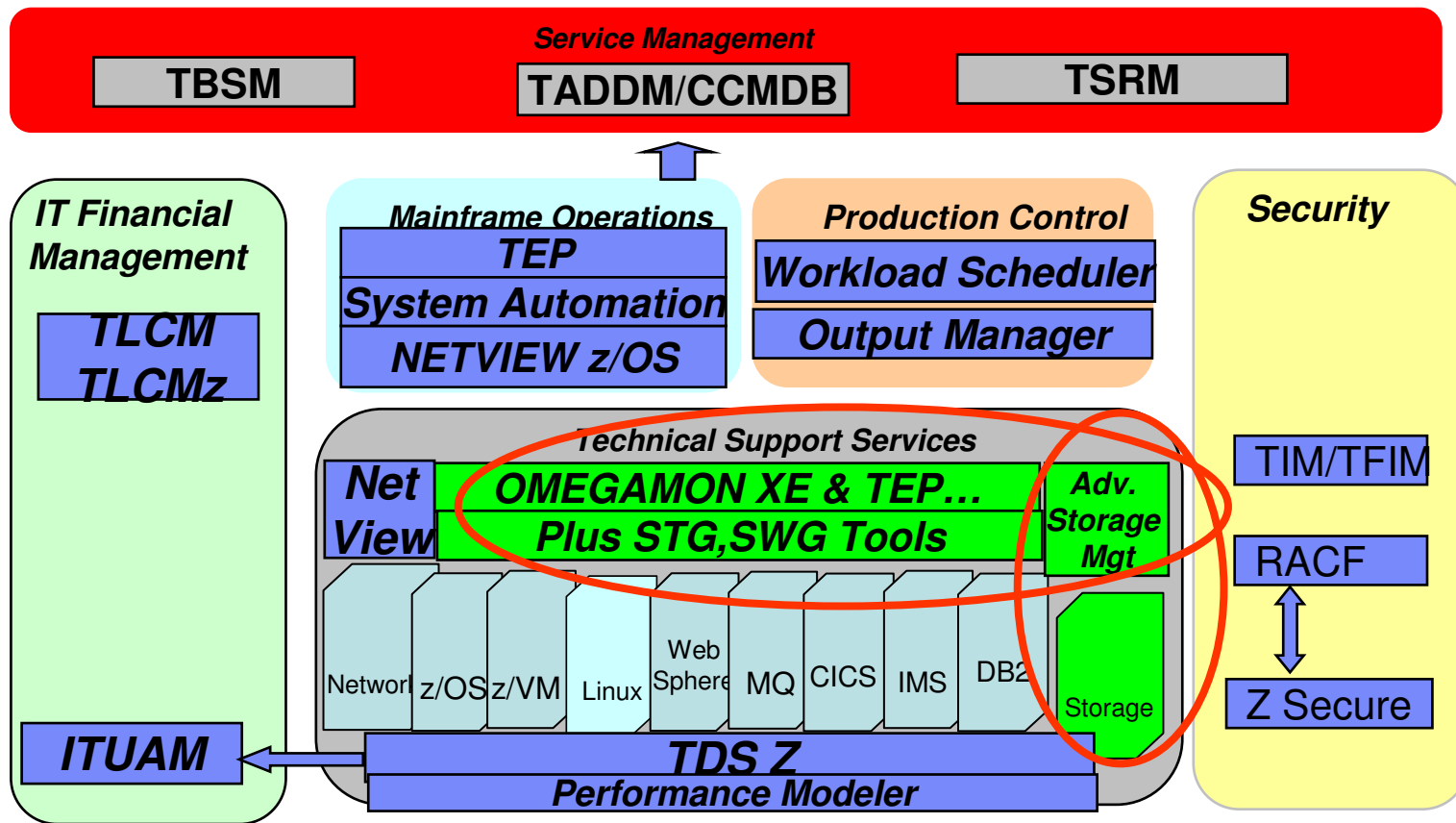
**V2.1 Available 1/25/2008**

**V1.1 Available Dec. 2007**

## IBM's System z Storage Management Future Directions



# z Storage Management Integrates with Service Management Center for System z



***zStorage Management portfolio feeds detailed event, workload, discovery and automation to the Service Management Center for System z and ISM***



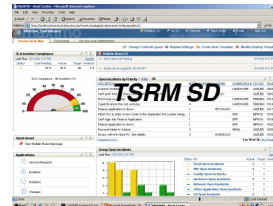
# Incident and Problem Management Demo Flow



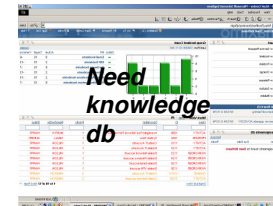
Jane, a Help Desk Operator has been assigned to a new work assignment - mainframe trouble tickets. A bit worried due to her lack of z skills, she decides to get a cup of coffee and cancel lunch plans.



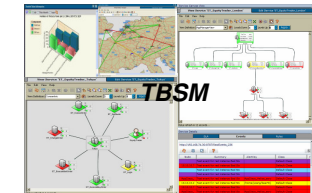
Actually, automation has started working this incident for Jane. Behind the scenes threshold violations in TEP IT Ops dashboard have been turned into events and trouble tickets in her service desk.



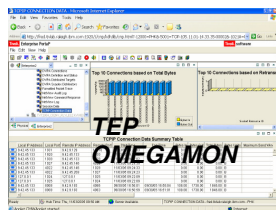
Jane's personalized start center includes incidents. A high priority incident alerts her that users are having difficulty connecting to a z/OS based application.



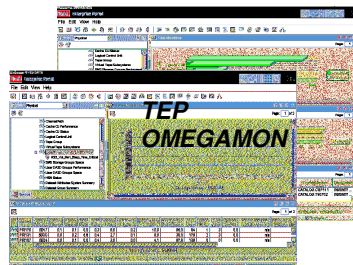
Jane searches the knowledge database in service desk. It advises her to go to business service dashboard to isolate the problem.



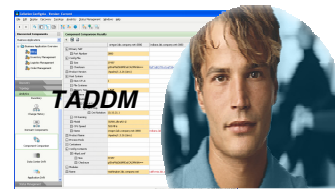
Jane launches in context from service desk to the appropriate business event view. Using the service desk knowledge database it instructs her to perform a drill down analysis with IT Ops Dashboard.



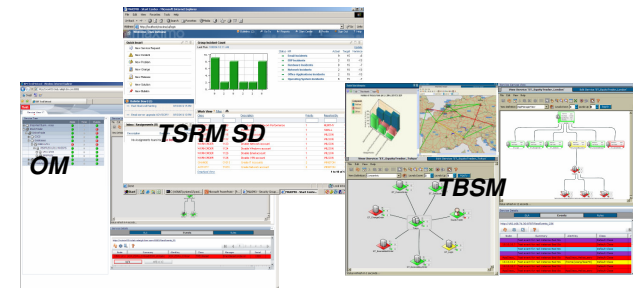
Jane first looks at network, storage and server z/OS resources associated with the application to further isolate the problem. Network availability and performance looks ok. Next storage is examined and reveals an out of space condition.



Jane launches into the TEP Storage performance workspace and identifies the linkage between the volume with the out of space condition and the physical disk.



Jane decides to contact storage Sys Prog for help to remediate. Tom views the workspaces to identify the data sets on the volume. IT views of discovered configuration and configuration drift is a studied.



Tom determines to remediate the problem he must migrate some datasets off the volume. Tom uses Storage Toolkit to issue and track commands. Jane updates incident to the resolve state.

Jane also notices the business view has returned to green status.

## System z Storage Management Solution working together and providing value

- zStorage Solutions:
  - IBM Tivoli OMEGAMON XE for Storage on z/OS
  - IBM Tivoli Advanced Reporting for DFSMSHsm
  - IBM Tivoli Advanced Audit for DFSMSHsm
  - IBM Tivoli Advanced Catalog Management
  - IBM Tivoli Allocation Optimizer
  
  - IBM Tivoli Automated Tape Allocation Manager
  - IBM Tivoli Tape Optimizer
  - IBM Tivoli Advanced Backup and Recovery Manager for z/OS
  
- What Value does this bring to you:
  - **Consolidated zStorage Management capability**
    - Total zStorage Management capability
    - Same look and feel
    - Integration for leveraging synergy
    - Highly customizable to precise site specifications
    - Reduced cost in training and ability to do more with less
    - Reduced time to problem identification and resolution
    - Future consolidated end-to-end solution (Enterprise breadth)
    - Important integration to Service Management Center for System z

**Questions ????**

**Thank You!**