



Information On Demand

# IBM Tivoli Storage Productivity Center 4.1 (TPC)

## Technical Overview

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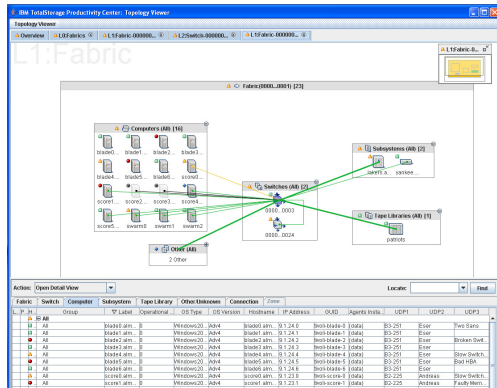
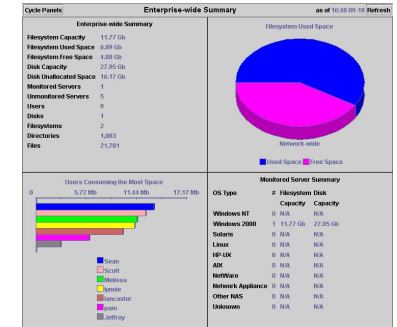


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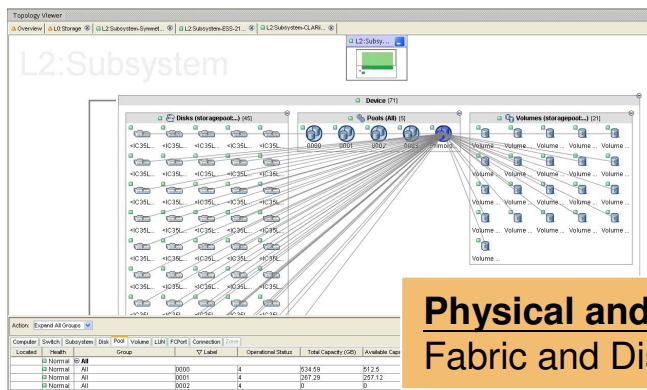
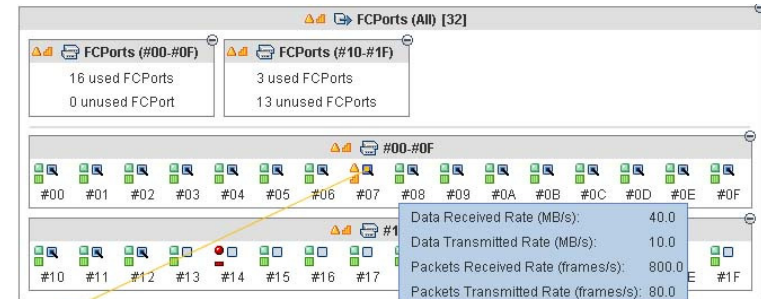


# IBM Tivoli Storage Productivity Center End to End Storage Management

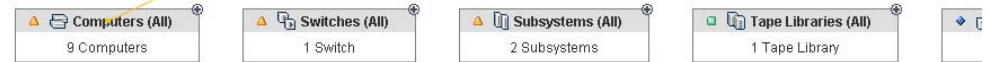


Automated identification of the storage resources in an infrastructure and analysis of how effectively those resources are being used.

**Centralized Management of multivendor SAN and Disk Systems**



**Physical and Logical views of Fabric and Disk**



Automated control through policies that are customizable with actions that can include centralized alerting, distributed responsibility and fully automated response.

# Tivoli Storage Productivity Center 4.1 Packaging



- TPC for Fabric is no longer separately orderable
- Features and Functions specific to TPC for Fabric are now available only through a TPC Standard Edition license
- TPC for Replication is always installed with any version of TPC 4.1 (With the exception of TPC-R zOS)
- TPC for Replication can be launched from TPC GUI
- Use of TPC for Replication still requires a separate license

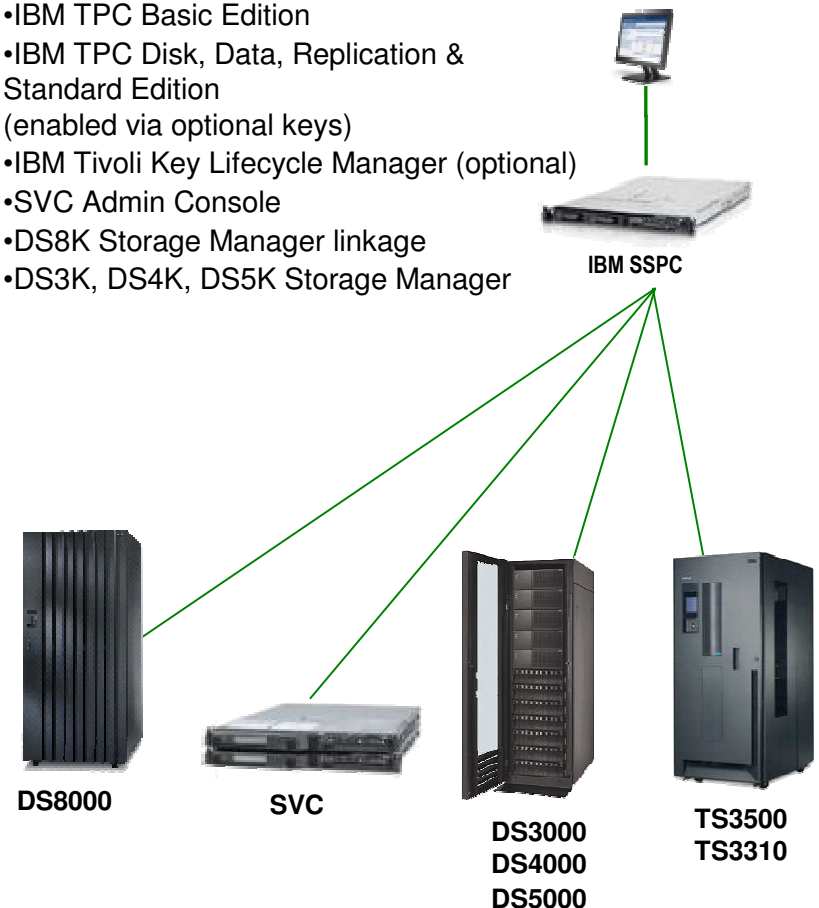
# System Storage Productivity Center 1.4 (SSPC)

- **Storage appliance** for simplified configuration & management
- **Centralized server** reduces the need to install, manage & administer multiple servers
- **Usability enhancements** to decrease deployment time and simplify management operations:
  - New hardware model with improved performance capabilities
    - Quad-Core E5530 2.4GHz, 8 GB RAM, 2 x 146GB Disks
  - Windows 2008 platform improves security and performance
  - Server Recovery CD to enables customer to rebuild server to factory default
  - New security interface allows administrator to reset all system passwords
  - New publications provide concise instructions for deployment and operations

- **Administrator points browser at SSPC for enterprise storage view of multiple devices**

**Pre-loaded Software:**

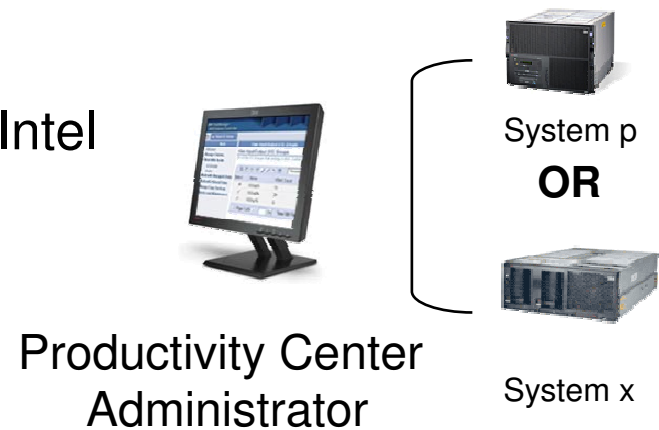
- IBM TPC Basic Edition
- IBM TPC Disk, Data, Replication & Standard Edition (enabled via optional keys)
- IBM Tivoli Key Lifecycle Manager (optional)
- SVC Admin Console
- DS8K Storage Manager linkage
- DS3K, DS4K, DS5K Storage Manager





## IBM Tivoli Storage Productivity Center Server Platforms

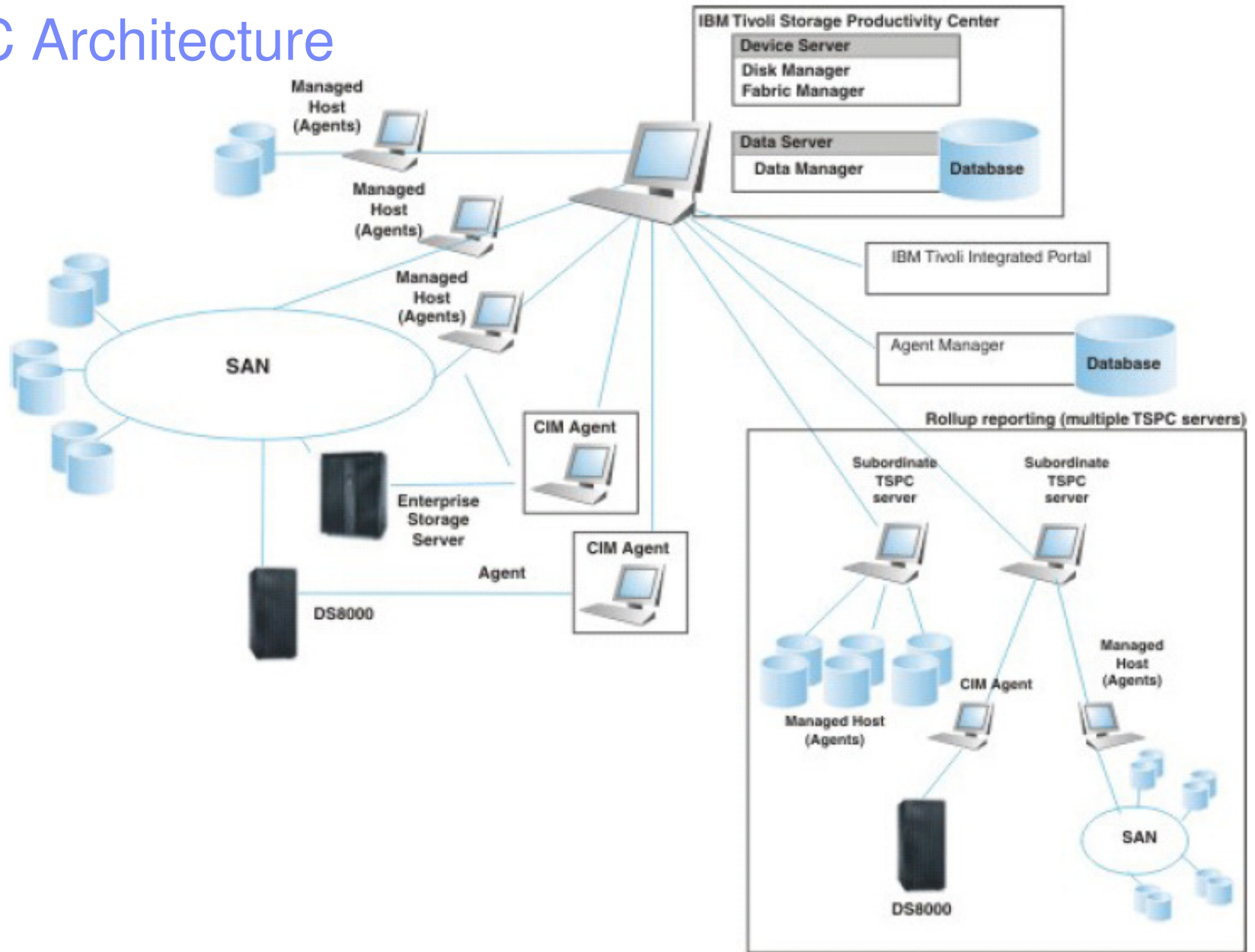
- AIX 5.3, 6.1
- RedHat Enterprise Linux Advanced Server 4, 5 on Intel
- Windows 2003 SE or EE, Windows 2008 on Intel







# TPC Architecture



# Storage Administration Portal

The screenshot shows the 'Integrated Solutions Console' in Microsoft Internet Explorer. The left-hand 'TIP Navigation' tree is highlighted with a blue box, and a blue callout box points to it with the text 'TPC Integrated into TIP Navigation Tree'. A red 'Start Product Console' button is highlighted with a blue callout box and the text 'Start Button to Launch TPC GUI'. A yellow arrow points from this button to the 'IBM TotalStorage Productivity Center' GUI window below. The GUI window displays a 'TPC-wide Summary' table, a 'Filesystem Used Space' pie chart, and a 'Monitored Server Summary' table.

Item	Value
Filesystem Capacity	136.61 GB
Filesystem Used Space	30.25 GB
Filesystem Free Space	106.36 GB
Computer Fibre Attached Disk Space	N/A
Computer Non-Fibre Attached Disk Space	136.61 GB
Storage Subsystem Physical Disk Space	501.67 TB
LUN Capacity	155.12 TB
Usable LUN Capacity	152.48 TB
FlashCopy Target Capacity	2.83 TB
Monitored Servers	1
Unmonitored Servers	58
Storage Subsystems	14
Users	5
Disks	2,719
LUNs	26,638
Filesystems	1
Directories	7,573
Files	175,250

OS Type	Number	Filesystem Capacity	Disk Capacity
Windows NT	0	N/A	N/A
Windows	1	136.61 GB	136.61 GB
MSCS Cluster Resource Group	0	N/A	N/A
Solaris	0	N/A	N/A
Linux	0	N/A	N/A
HP-UX	0	N/A	N/A
AIX	0	N/A	N/A
HACMP Cluster Resource Group	0	N/A	N/A
NetWare	0	N/A	N/A
Network Appliance	0	N/A	N/A
Other NAS	0	N/A	N/A
IBM SAN File System	0	N/A	N/A
VMware ESX	0	N/A	N/A
Unknown	0	N/A	N/A

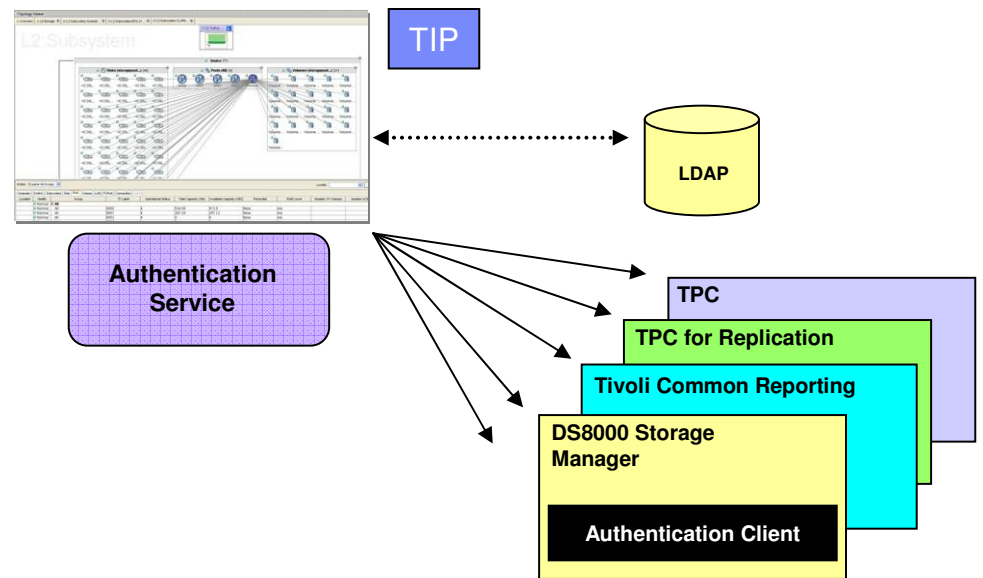
## Storage Administration Portal

- **Tivoli Integration Portal (TIP)** integration enables single management dashboard for many Tivoli products
- **Common security** enables role-based authorization across products
- **Common reporting** interface provides ability to generate custom reports merging data from multiple products



# Single Sign-On & Launch-in-Context

- **Basic (OS) and enterprise level (LDAP) authentication** for element managers and other applications that plug in to TPC and System Storage Productivity Center (SSPC)
- **Enables single sign-on** for element managers and other applications that plug in to TPC and SSPC **Credentials** are automatically passed between applications via LTPA tokens and validated by ESS Server
- **Enables launch-in-context** to and from other applications







# Custom Reporting – Executive Level Reports

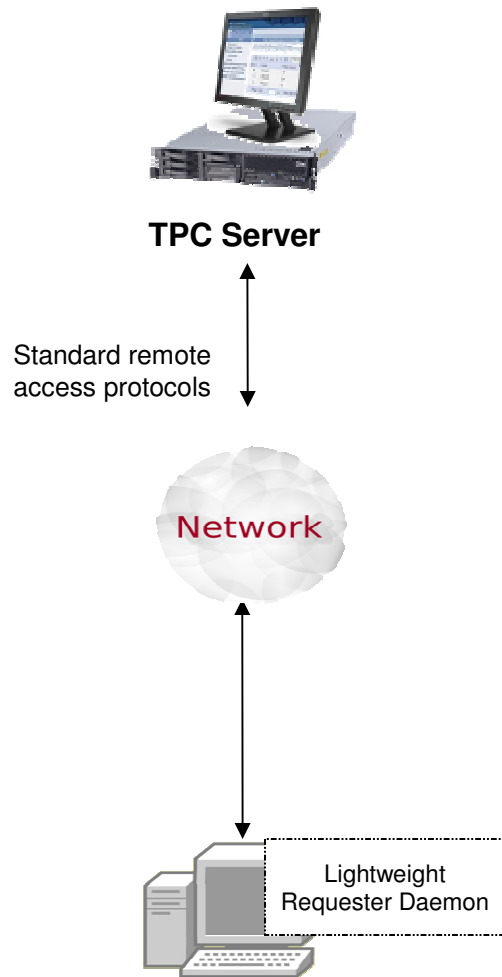
- **Enhanced reporting capabilities**  
providing unlimited combinations and views of capacity, performance, and asset reports derived from TPC data
- **Downloadable Best Practices Reports**  
can be plugged in, including cross-product reports using data joins
- **IBM, Business Partners, and Customers**  
can create and share reports

The image displays several screenshots of the IBM reporting software interface. On the left is the 'Integrated Solutions Console' showing a navigation tree with categories like 'Security', 'Users and Groups', and 'Reports'. The main area shows 'Trunk Reports' with a table listing report titles and descriptions. On the right, there are three overlapping report views: a 'Device Count' pie chart, a 'Report Status' table, and a 'Report History' table with a bar chart showing report execution over time.

Title	Description	Format
2007 Q2 Expenses	total of associated word usage	
2007 Q4 Expenses	total of associated word usage	
2007 Q1 Expenses	total of associated word usage	
2007 Q3 Expenses	total of associated word usage	

Status	Report	Start	End
Completed	2007-01-15 08:43:00	2007-01-13 08:43:00	View
Completed	2007-03-09 13:10:00	2007-03-09 13:10:00	View
Running	2007-03-22 17:00:00		Report/Cancel

# Lightweight Storage Resource Agents – Set it, Forget it



- **Collect asset and capacity data**  
from supported servers without manually installing an agent on the target server
- **Lightweight native code**  
remotely pushed to servers for data collection and quiesced at completion
- **Improved performance and memory footprint**  
of local process, consuming less than 10 MB of memory when in use
- **Simplifies server data collection**  
and reduces administrator burden of managing and monitoring agents. Agents are automatically updated from the TPC server when a new version is available



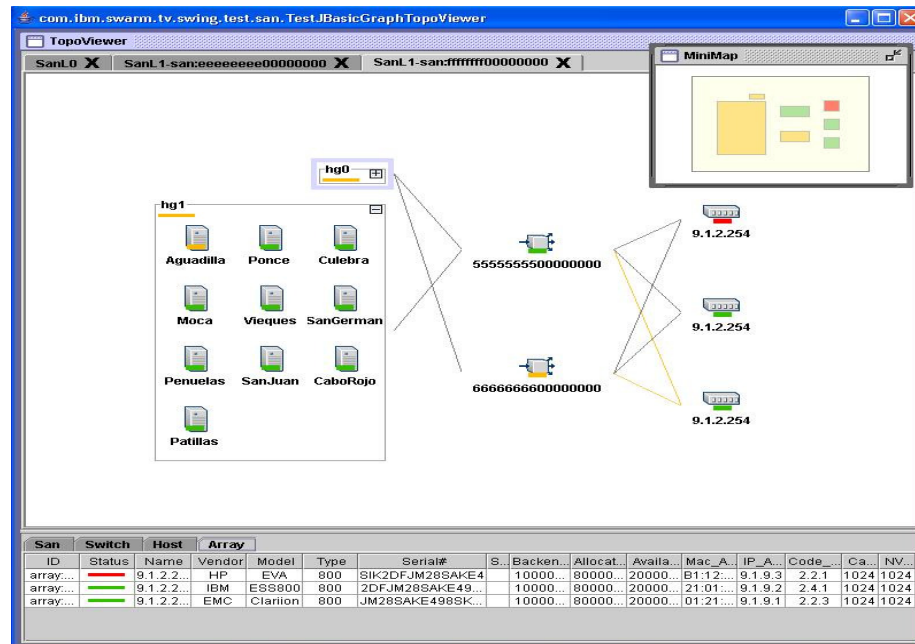
## IBM Tivoli Storage Productivity Center Master Console

- **Single Management Server**
- **Single Database**
- **Single Management Interface**
- **Single Point of Control**
- **Master Console**
  - Robust SAN and Storage topology viewer
  - Role based administration
- **Leading edge Topology Viewer**
  - Allows for layered drill down capabilities without complexity
  - Relationships between hosts, fabric components and storage systems



# TPC Topology Viewer

- **Role based Administration**
- **Multiple topology views with drill up/down**
  - Server
  - SAN Fabric
  - Storage Subsystem
- **Synchronized Graphical and Tabular views**
- **Minimap for overall context**
- **Progressive Information Disclosure on demand reduces complexity**
- **Semantic zooming (drill down and expand in place)**
  - Allows navigation while maintaining task, situational and spatial orientation
  - Reveals, hides or aggregates details rather than simply scaling objects
  - Provides effective scaling
- **Health, Zoning and Performance Overlays**



## Designed for 5 scenario sets:

1. **Planning** (anticipate problem areas, trends )
2. **Configuration** (allocation, zoning, masking)
3. **Monitoring** (visualization, assess health at a glance, logs)
4. **Reporting** (capacity, utilization, performance)
5. **Problem determination** (aggregated status, drill down, impacted resources identified)



# TPC Topology Viewer

**Pinning to keep selected entities in the view regardless of zoom level**

**Minimap to provide environmental context and navigate the primary view**

**Context menus to support global, group, and/or entity-level view function**

**Institutes progressive information disclosure and semantic zooming to focus on an entity without losing environmental context**

**Search function to locate entities. Synchronized with graphical view**

**Overlays allow user to turn on/off aggregated status (e.g., health, performance) and membership (e.g., zone, zone set) information**

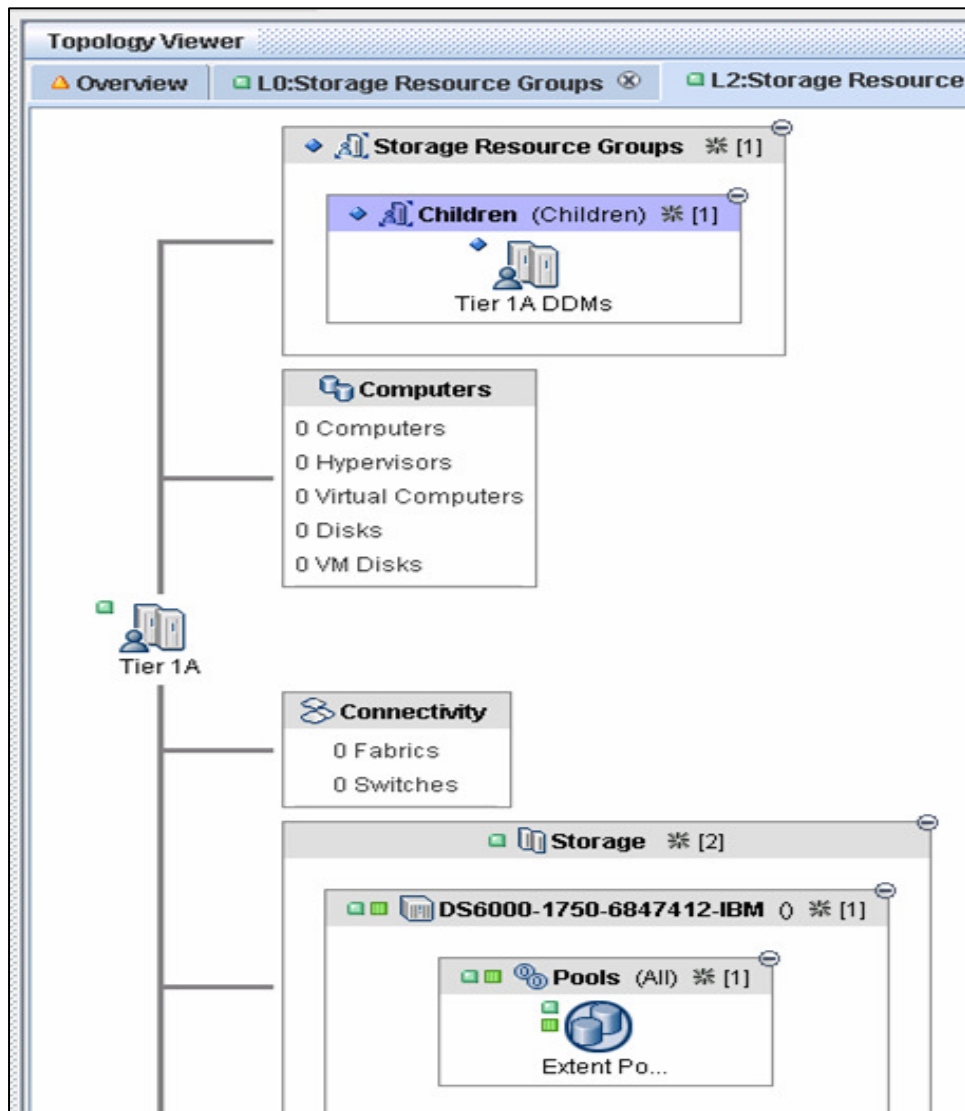
**Synchronized graphical and tabular views. Allows user to manipulate view by enlarging/reducing a view or closing one of the views**

Fabric	Switch	Computer	Subsystem	Tape Library	Other Unknown	Connection	Zone								
Group	Label	Operatio...	WWN	Domain	IP Adres...	Vendor	Model	Serial#	Version	Descript...	Parent...	Element...	UDP1	UDP2	UDP3
All	All	000000...	000000...	9.4.3.22	Brocade	2106	56345	1.2					B3-251		
All	All	000000...	000000...	9.4.3.25	Brocade	2106	56666	1.2					B3-251		





## Storage Resource Groups – Select Your IT Favorites



- **Group storage resources by application, line of business, or any other user-defined way**
- **Map storage resources to organizational structure** by creating hierarchies of SRGs
- **Monitor SRG health, performance & alerts** to ensure application availability
- **Debug application connectivity & performance issues** easily by looking at SRG view in topology viewer



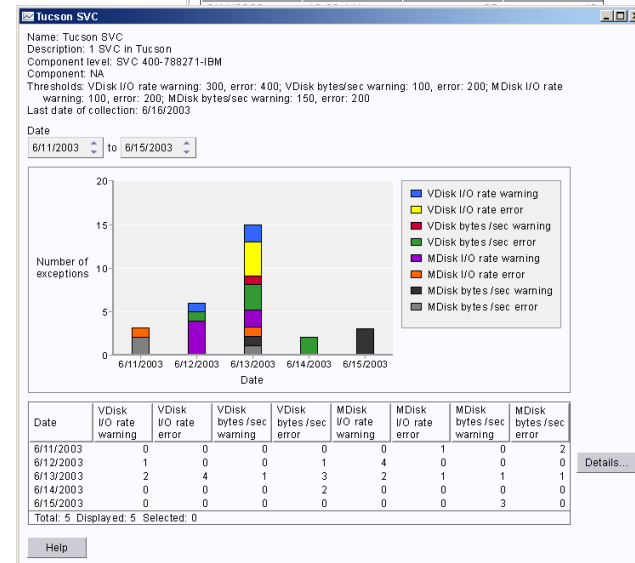
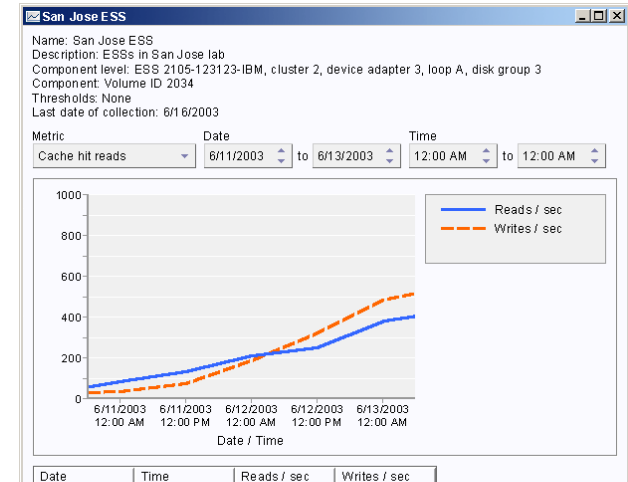
# IBM Tivoli Storage Productivity Center for Disk

## Key Capabilities

- **Configure multiple storage devices from a single console to improve productivity**
- **Monitor and track performance of storage devices to optimize the SAN performance**
- **Volume Planner recommends changes within your SAN storage based on existing performance workload**

## Performance Management

- Collects, stores, alert on performance metrics
- Monitors and helps to tune storage





# Creating Volumes with Productivity Center

- **Storage Configuration**
  - Assign Host Ports
  - Assign Volumes to Subsystem Ports
  - Create/Assign Fabric Zone
  - Define RAID Level
  - Create/Delete Volumes
  - Label Volumes

The screenshot shows the 'Volumes' section of the IBM Storage Productivity Center interface. At the top, there are buttons for 'Create', 'Assign Host Ports', and 'Delete'. Below these, a red message states: 'A volume job is in progress. To view the job status, click Monitoring --> Jobs.' The 'Volume view:' section has two filter options: 'Filter by extent pool' (selected) with a dropdown menu showing '2107.1301901-vs0' and a 'Go' button, and 'Filter by host port' with an empty dropdown and a 'Go' button. Below the filters, a table titled 'Volumes (2107.1301901):' displays a list of storage volumes. The volume 'FSVT\_1000' is highlighted in blue.

Volume	Subsystem	Subsystem Name	LCU	Type	Size	Unit
Camera_1809	DS8000-2107-1301901-IBM	2107.1301901	24	FB	5 GB	
Camera_180A	DS8000-2107-1301901-IBM	2107.1301901	24	FB	5 GB	
Camera_180B	DS8000-2107-1301901-IBM	2107.1301901	24	FB	5 GB	
Cuda_3606	DS8000-2107-1301901-IBM	2107.1301901	54	FB	5 GB	
Cuda_3607	DS8000-2107-1301901-IBM	2107.1301901	54	FB	5 GB	
Cuda_3608	DS8000-2107-1301901-IBM	2107.1301901	54	FB	5 GB	
FSVT_1000	DS8000-2107-1301901-IBM	2107.1301901	16	FB	5 GB	
FSVT_1001	DS8000-2107-1301901-IBM	2107.1301901	16	FB	5 GB	
FSVT_1002	DS8000-2107-1301901-IBM	2107.1301901	16	FB	5 GB	
FSVT_1003	DS8000-2107-1301901-IBM	2107.1301901	16	FB	5 GB	
FSVT_1004	DS8000-2107-1301901-IBM	2107.1301901	16	FB	5 GB	
FSVT_1005	DS8000-2107-1301901-IBM	2107.1301901	16	FB	5 GB	
FSVT_1006	DS8000-2107-1301901-IBM	2107.1301901	16	FB	5 GB	
FSVT_1007	DS8000-2107-1301901-IBM	2107.1301901	16	FB	5 GB	

Productivity Center Administrators can directly allocate storage, zone the fabric switches and assign the host ports



# Performance Management Process

- **Collect Performance Data**

- long running job that collects performance data from the selected subsystems

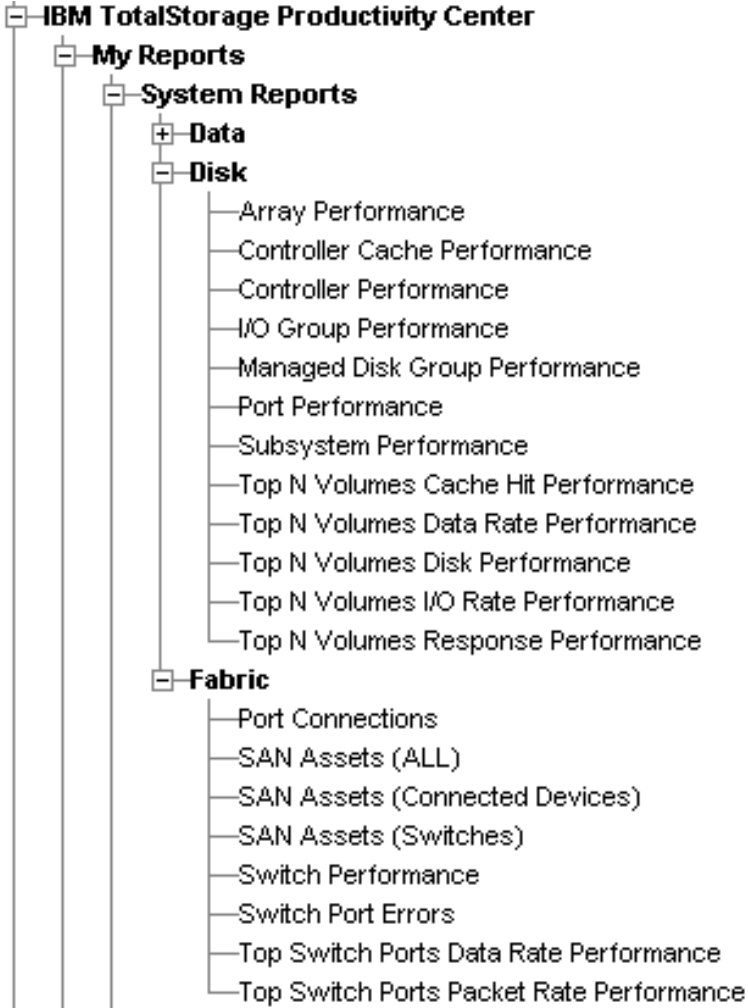
- **Create Performance Reports**

- User controls which volumes are included in the report
  - from multiple subsystems if desired
- The report mechanism is inherently multi-component
- Drill-up/drill-down mechanism
  - e.g. from disk array to disk volume in array
- Display multiple metrics per component
- View different chart presentations -- history charts or current data charts

- **Create Alerts for Threshold Violations**



# System Defined Performance Reports

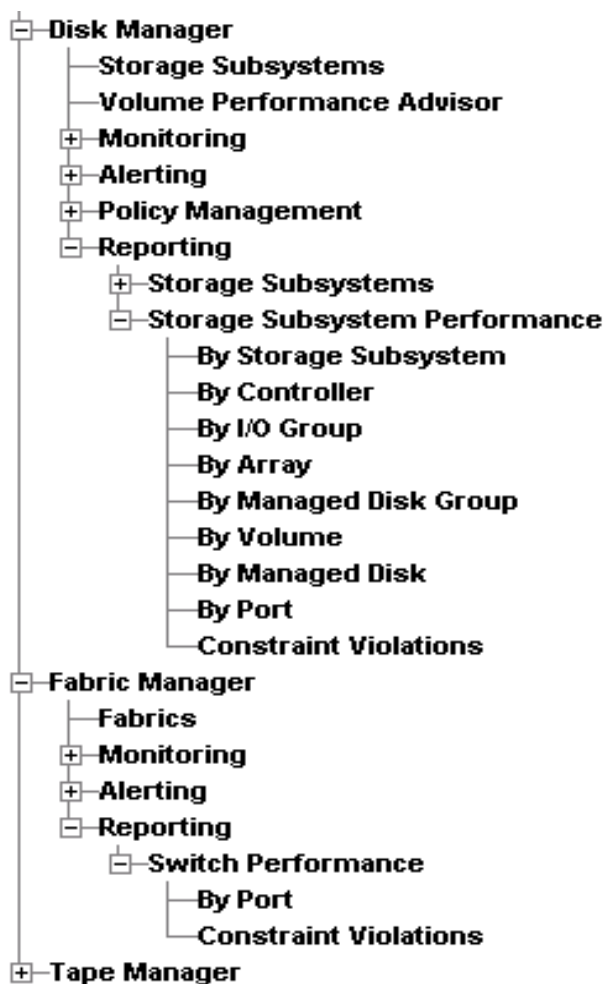


- **Storage Subsystem Performance**
- **Storage Subsystem Controller Performance**
- **Storage Subsystem Controller Cache Performance**
- **I/O Group Performance**
- **Array Performance**
- **Managed Disk Group Performance**
- **Port Performance**
- **Top 25 Volumes I/O Rate**
- **Top 25 Volumes Data Rate**
- **Top 25 Volumes Cache Hit**
- **Top 25 Volumes Response Time**
- **Top 25 Volumes Disk**
- **SAN Switch Report**
- **Switch Port Error Report**
- **Top 25 Switch Ports Ops Rate Report**
- **Top 25 Switch Ports Data Rate Report**





# User Defined Reports



- Each user-defined report has all possible metrics available
- Report customization includes: selecting components, columns/metrics to include, what order to show, etc.
- Scheduled report run
- Generate reports in HTML or other format output files



# By Array Report (11 arrays on 1 Storage Subsystem)

IBM TotalStorage Productivity Center: mdm-c53-win -- Storage Subsystem Performance: By Array

File View Connection Preferences Window Help

Navigation Tree

- Administrative Services
  - IBM TotalStorage Productivity Center
    - My Reports
      - System Reports
      - iscuser's Reports
      - Batch Reports
    - Topology
      - Computers
      - Fabrics
      - Storage
      - Other
    - Monitoring
      - Probes
    - Alerting
      - Alert Log
    - Data Manager
      - Data Manager for Databases
      - Data Manager for Chargeback
    - Disk Manager
      - Storage Subsystems
        - Volume Performance Advisor
        - Monitoring
        - Alerting
        - Policy Management
        - Reporting
          - Storage Subsystems
            - Storage Subsystem Performance
              - By Storage Subsystem
              - By Controller
              - By I/O Group
              - By Array
              - By Managed Disk Group
              - By Volume
              - By Managed Disk
              - By Port
              - Constraint Violations
      - Fabric Manager
      - Tape Manager

Selection Arrays

Storage Subsystem Performance: By Array

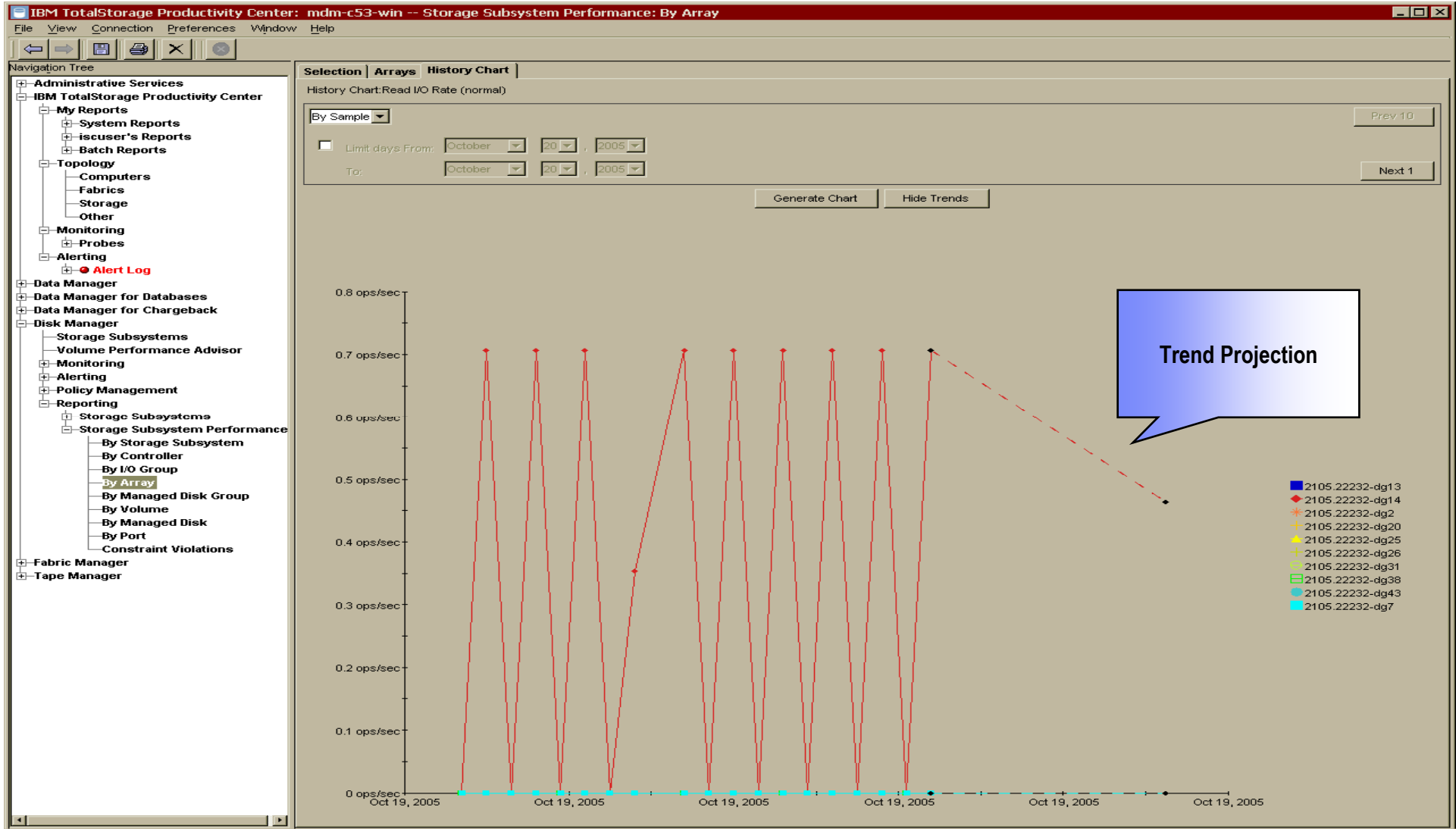
Number of Rows: 11

	Subsystem ID	Array ID	Time	Interval	Read I/O Rate (normal)	Read I/O Rate (sequential)	Read I/O Rate (overall)	Write I/O Rate (normal)
ESS-2105-22232-IBM	2105.22232-dg2	Oct 19, 2005 5:50:00 PM	300	0 ops/sec	0 ops/sec	0 ops/sec	0 ops/sec	
ESS-2105-22232-IBM	2105.22232-dg13	Oct 19, 2005 5:50:00 PM	300	0 ops/sec	0 ops/sec	0 ops/sec	0 ops/sec	
ESS-2105-22232-IBM	2105.22232-dg20	Oct 19, 2005 5:50:00 PM	300	0 ops/sec	0 ops/sec	0 ops/sec	0 ops/sec	
ESS-2105-22232-IBM	2105.22232-dg25	Oct 19, 2005 5:50:00 PM	300	0 ops/sec	0 ops/sec	0 ops/sec	0 ops/sec	
ESS-2105-22232-IBM	2105.22232-dg43	Oct 19, 2005 5:50:00 PM	300	0 ops/sec	0 ops/sec	0 ops/sec	0 ops/sec	
ESS-2105-22232-IBM	2105.22232-dg31	Oct 19, 2005 5:50:00 PM	300	0 ops/sec	0 ops/sec	0 ops/sec	0 ops/sec	
ESS-2105-22232-IBM	2105.22232-dg7	Oct 19, 2005 5:50:00 PM	300	0 ops/sec	0 ops/sec	0 ops/sec	0 ops/sec	
ESS-2105-22232-IBM	2105.22232-dg38	Oct 19, 2005 5:50:00 PM	300	0 ops/sec	0 ops/sec	0 ops/sec	0 ops/sec	
ESS-2105-22232-IBM	2105.22232-dg26	Oct 19, 2005 5:50:00 PM	300	0 ops/sec	0 ops/sec	0 ops/sec	0 ops/sec	
ESS-2105-22232-IBM	2105.22232-dg8	Oct 19, 2005 5:50:00 PM	300	0 ops/sec	0.023 ops/sec	0.023 ops/sec	0 ops/sec	
ESS-2105-22232-IBM	2105.22232-dg14	Oct 19, 2005 5:50:00 PM	300	0.017 ops/sec	0.707 ops/sec	0.723 ops/sec	0.003 ops/sec	

This report could easily have included arrays from different subsystems, too



# History chart: it shows a single metric (Read I/O Rate, Normal) over time, for multiple components





# Storage Configuration Planner – Volume Planner

## **Volume Planner enhances support for Volume Performance Advisor to include the DS8000 and DS6000**

- The new Volume Planning Wizard is added to the TPC typology viewer
- Volume Planner recommends changes within your SAN storage based on existing performance workload
- The Volume Planner is designed to:
  - Provide Volume Performance Advisor functions for ESS 800, DS6000 and DS8000
  - Provide planning guidance for heterogeneous controllers and RAID levels
  - Provide a GUI interface for updating above functions

**Volume Planner** Specify how the storage will be allocated and its performance characteristics

Total Capacity:  GB

Divide capacity between  and  volumes

Divide capacity among volumes of size  GB to  GB

Performance Profile:  ▾

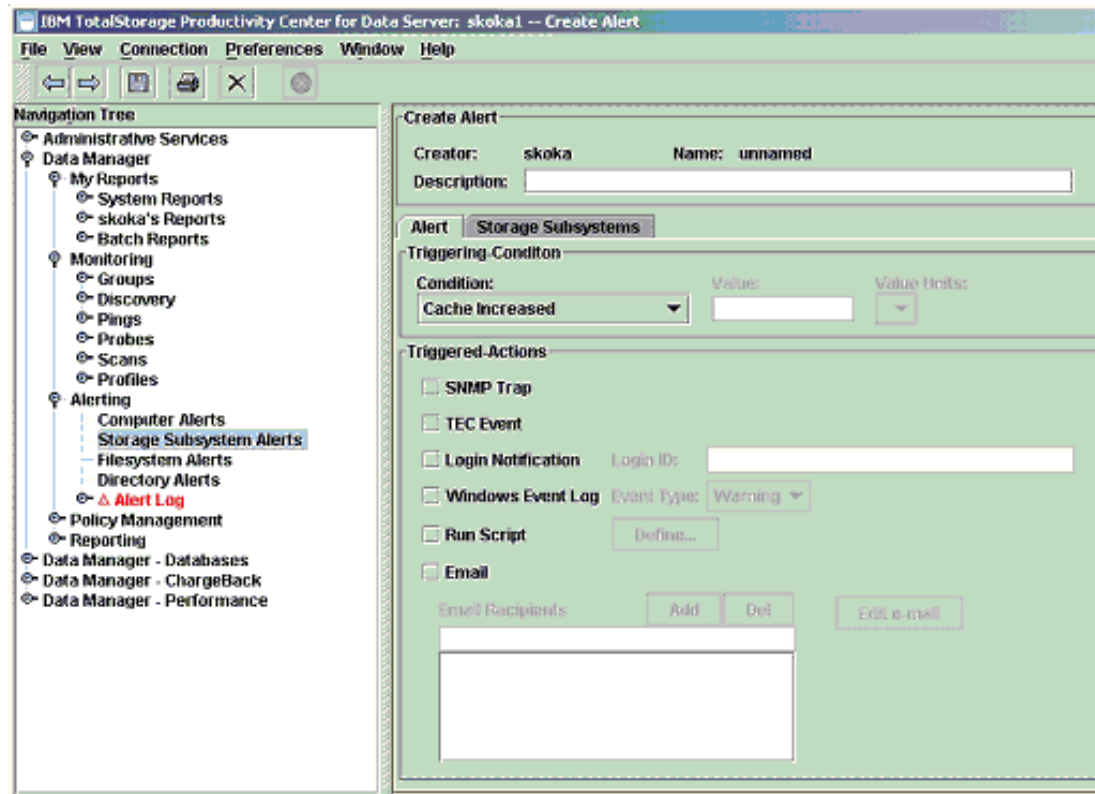
RAID Level:  ▾

Volume Name Prefix:

Use existing unassigned volumes (if available)

# Threshold Violations Alerts

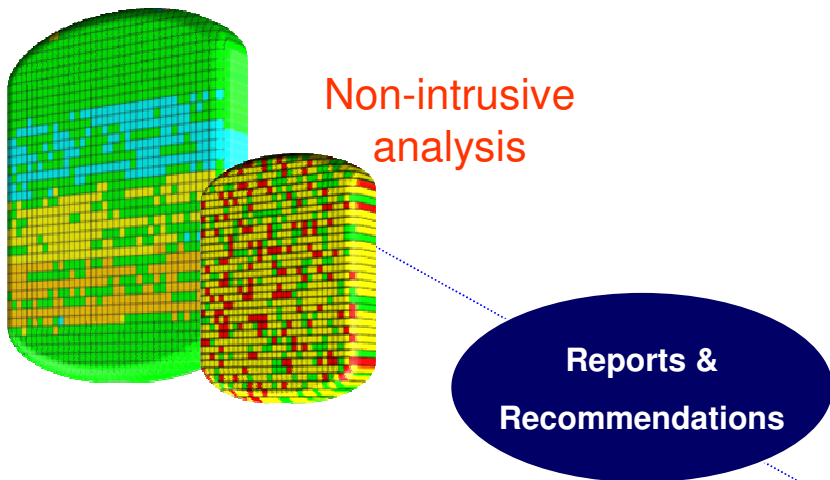
- Threshold violations logged in TPC database
  - Kept in alert log
    - Drill-down to details of individual exceptions
  - User defined alerts
  - Automatic actions on alerts
    - send SNMP traps, email message, running scripts on the server, etc



■ Storage events can be sent to an enterprise system management console, emailed to the administrators, and/or a script can be driven



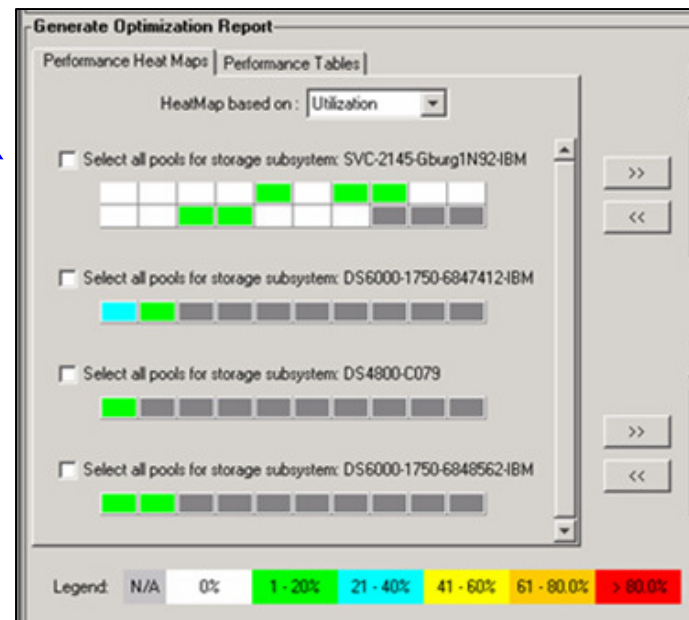
# Disk Performance Optimization



- **Out-of-band storage optimization** engine that lays out a process for optimal storage allocation, migration, and consolidation
- **Automatically identifies hot spots** on the disk controller and **provides recommendations** to improve disk efficiency

- **Can reduce service-level times** of resource-constrained applications by an average of 48% up to 90%
- **Integrates directly with DS8000, DS6000, DS5000, DS4000, & SVC** to enable migration of storage pools to optimize data throughput.

Output



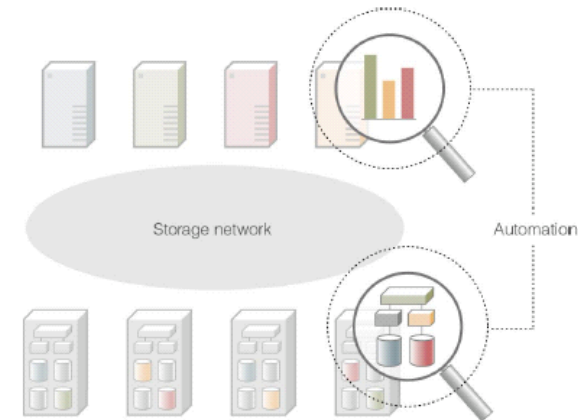
# Tivoli Storage Productivity Center for Data



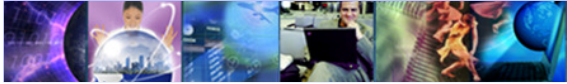
**Automated identification** of the storage resources in an infrastructure and **analysis** of how effectively those resources are being used, on file and database system.

**File-system and file-level evaluation** uncovers categories of files that, if deleted or archived, can potentially represent **significant reductions in the amount of data** that must be stored, backed up and managed.

**Automated control** through policies that are customizable with actions that can include centralized alerting, distributed responsibility and fully automated response. This includes deletion of unnecessary data.

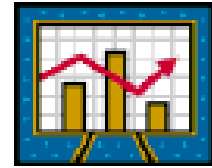


**Predict future growth and future at-risk conditions** with historical information.



## Today's Challenge – Finding Answers Quickly

- **WHAT** is your current utilization?
- **WHY** is storage growing?
- **HOW** will growth be accurately forecasted?
- **HOW MUCH** worthless data is being stored?
- **WHICH** systems will be migrated to new technology?
- **HOW** can storage inventories be kept up-to-date?
- **HOW MUCH** downtime is storage-related?
- **HOW** will storage policies be audited or enforced?





# Tivoli Storage Productivity Center for Data - Components

## Tivoli Storage Productivity for Data

systems

SAN, NAS & DAS

The diagram shows two storage architectures. On the left, 'Traditional NAS, SAN' shows a central server connected to multiple storage units (NAS, SAN, ISCSI SAN). On the right, 'RI Fork installation' shows a central server connected to multiple storage units (Sun UE 1030, Sun UE 4000, SG Orig 2800, Dell NT, Fabric Data, and various server models like Teradata 4710, Remanite 160, Sunwatec 3200, and Teradata 1610).

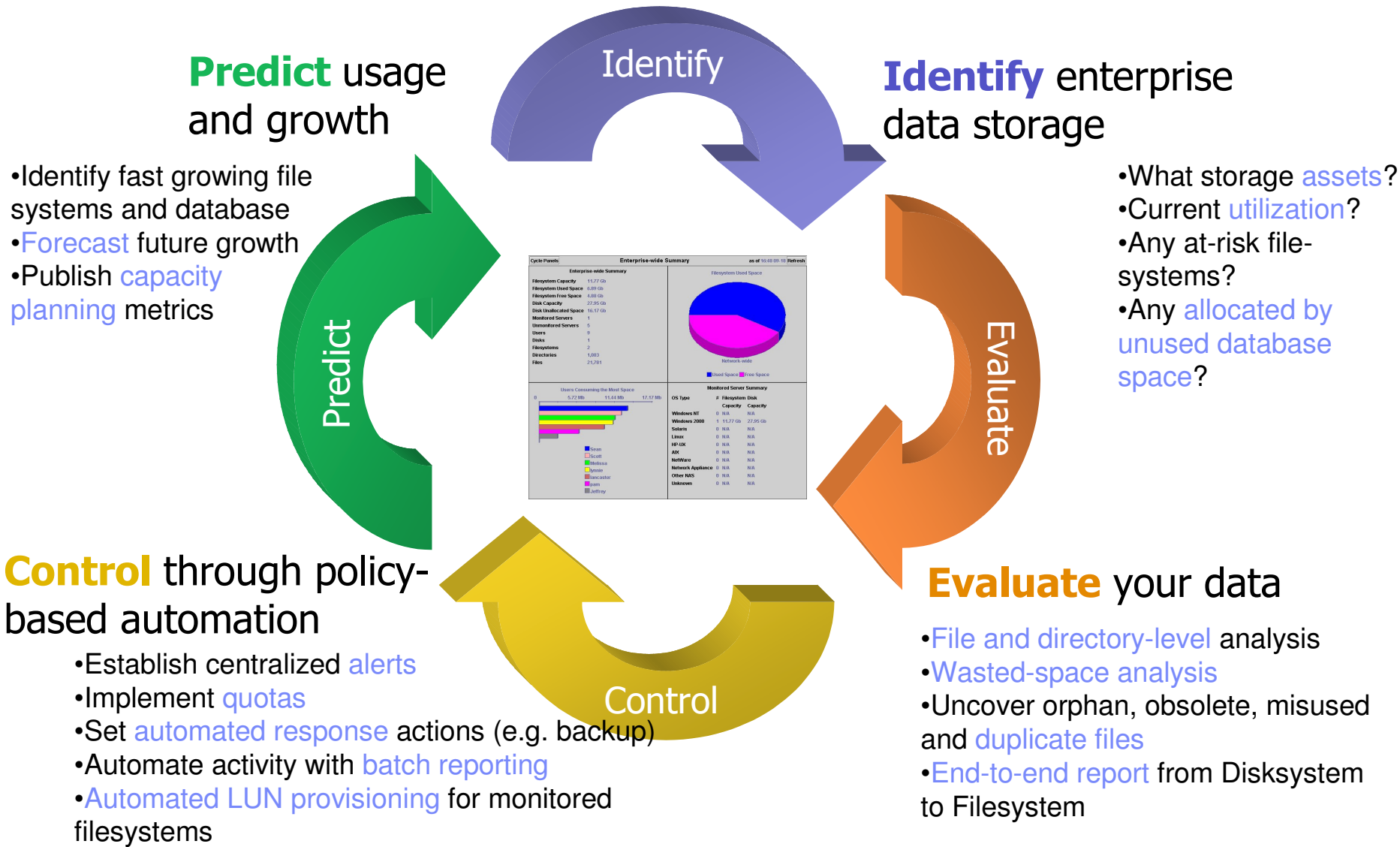
## TPC for Data Database

Application, Database

## TPC for Data Chargeback

Chargeback

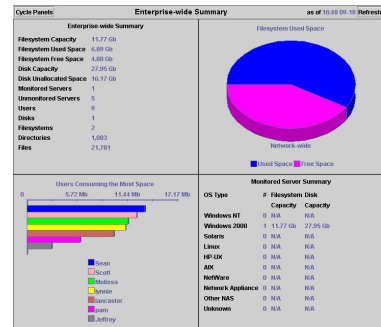
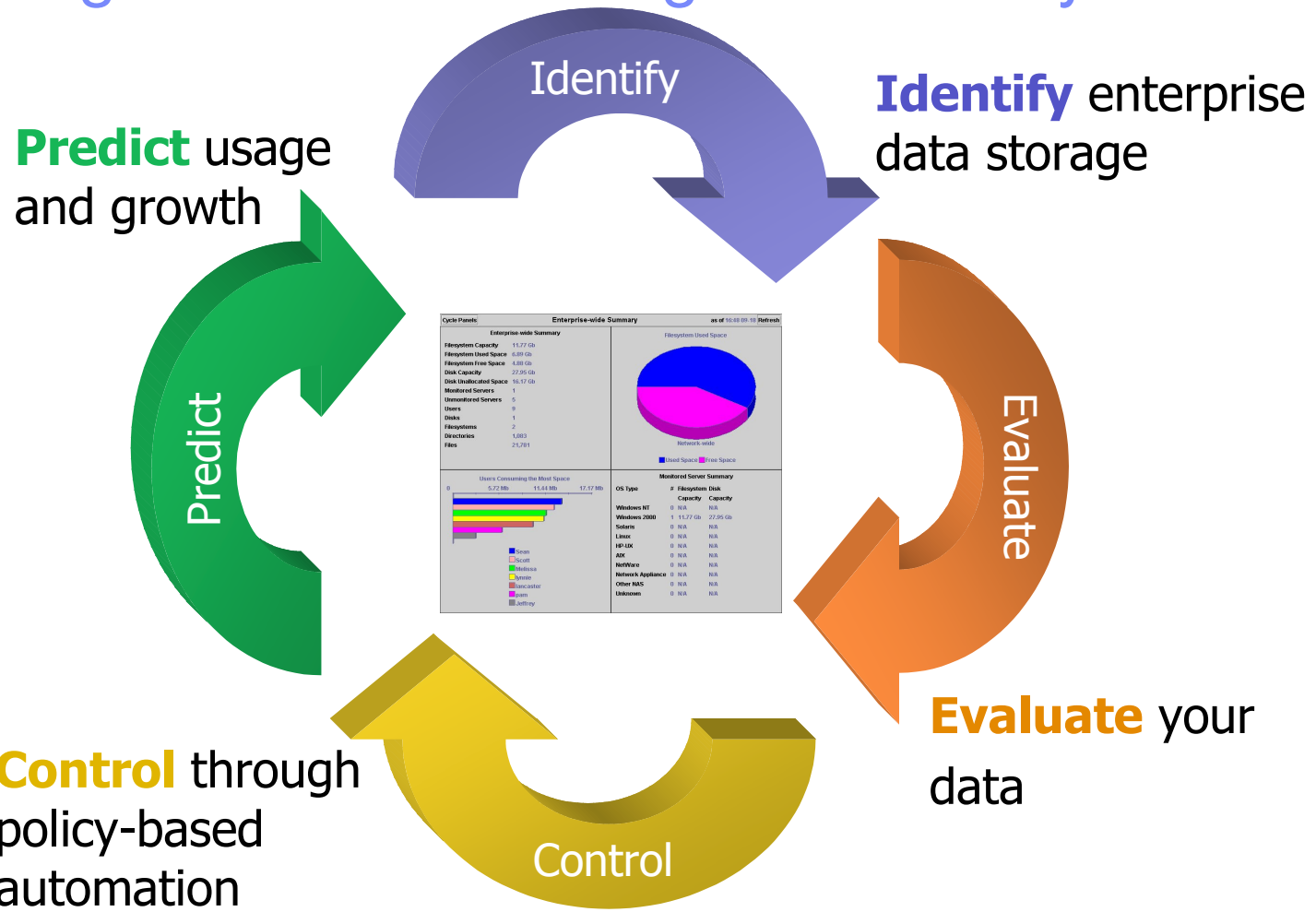
# TPC for Data - Storage Resource Management Lifecycle







# Storage Resource Management Lifecycle

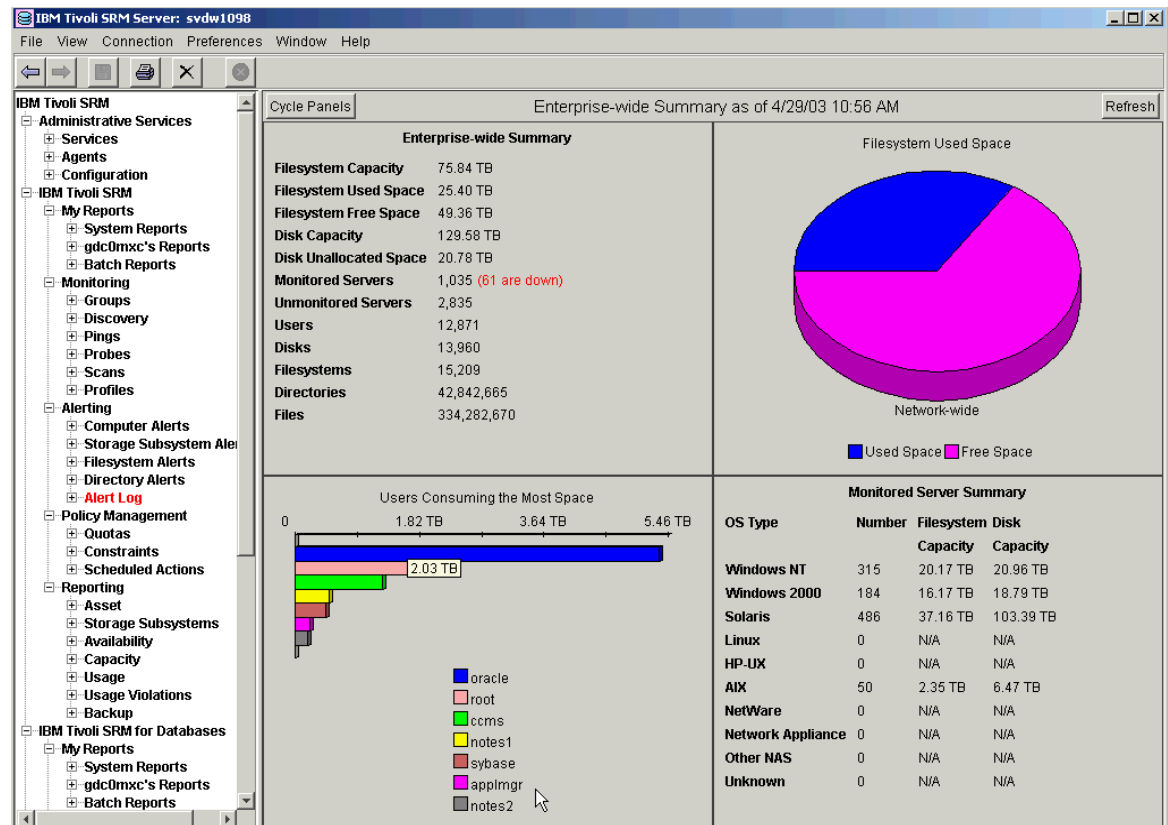




# TPC Data Management Data Life Cycle

## ■ Identify

- What are your storage assets?
- Do your allocations match expectations?
- What is your current utilization?
- Do you have at-risk file-systems?
- Do you have allocated, but unused database space?





# TPC Data Management Data Life Cycle

## ■ Evaluate

- Find out what storage consumers are doing
- Conduct file and directory-level analysis
- Perform a wasted-space analysis
- Uncover orphan, obsolete, misused and duplicate files
- End-to-end report from Disksystem to Filesystem
- Backup calculation

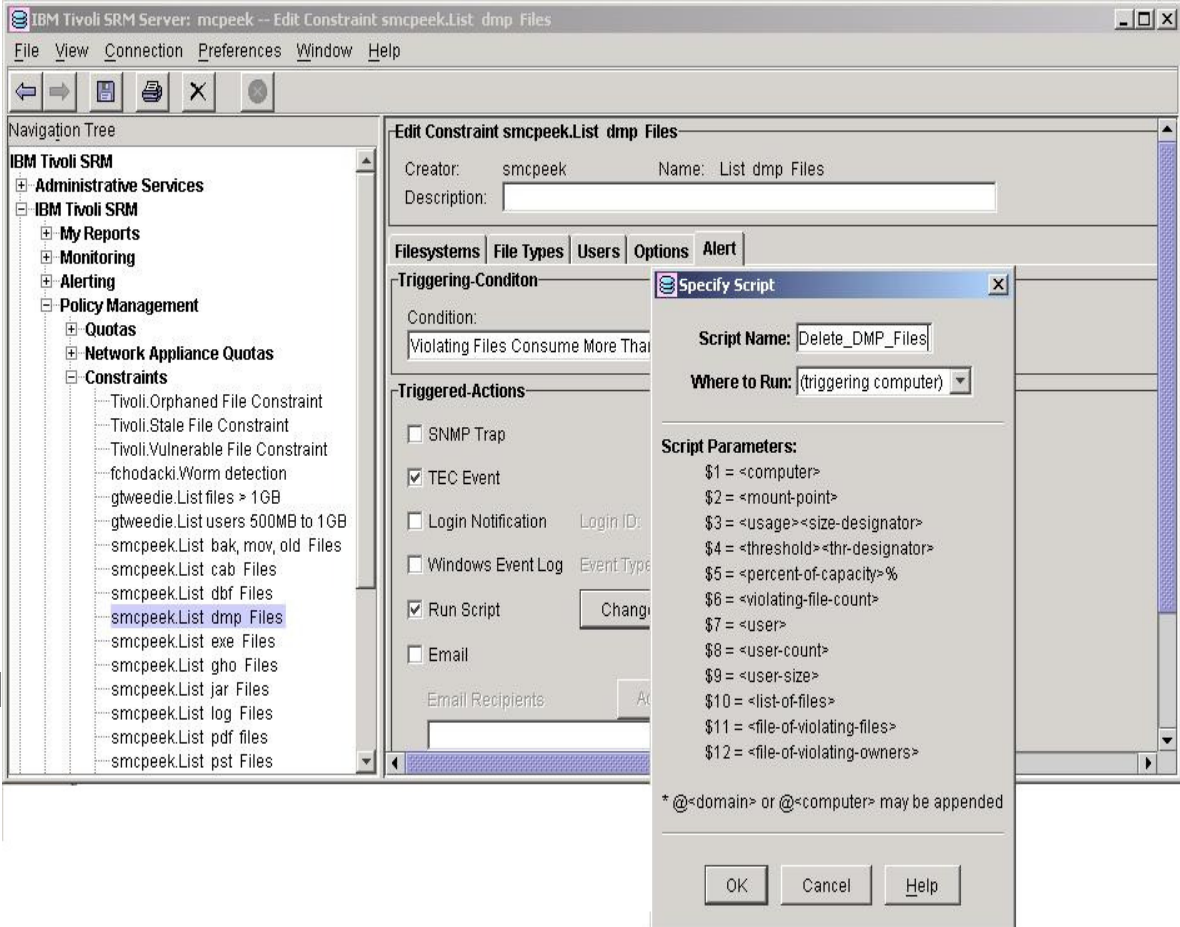
Access Time	Computer	Filesystem	Path	Physical Size
Jun 12, 2002 8:25:17 AM	w2s-prod1	F:/	Program Files/Exchsrvr/MDBDATA/pub1.stm	380.01 Mb
Jun 12, 2002 8:25:17 AM	w2s-prod1	F:/	Program Files/Exchsrvr/MDBDATA/pub1.edb	371.07 Mb
Jun 16, 2002 2:09:44 PM	w2s-web2	E:/	dvd_out/flaskOut1.avi	341.33 Mb
Jun 16, 2002 2:10:59 PM	w2s-web2	E:/	dvd_out/flaskOut2.avi	335.95 Mb
Jun 10, 2002 2:56:16 AM	w2s-wsm	C:/	pagefile.sys	256.00 Mb
Jun 14, 2002 11:12:53 AM	w2s-web2	E:/	Program Files/Microsoft SQL Server/MSSQL/Data/...	121.00 Mb
Jun 12, 2002 8:25:18 AM	w2s-prod1	E:/	Program Files/Exchsrvr/Storage Group 2/Mailbox SL...	42.01 Mb
Apr 29, 2002 12:01:20 PM	hp11-64b.trellissoft.com	/DBMS	sybase/ASE-12_5/bin/diagserver	28.66 Mb
Jun 14, 2002 11:06:16 AM	w2s-web2	E:/	Program Files/Microsoft SQL Server/MSSQL/Data/...	20.00 Mb
Jun 14, 2002 11:01:31 AM	w2s-web2	E:/	Program Files/Microsoft SQL Server/MSSQL/Data/...	13.94 Mb
Jun 14, 2002 10:58:55 AM	w2s-web2	E:/	Program Files/Microsoft SQL Server/MSSQL/Data/...	10.75 Mb
Jun 11, 2002 1:58:01 PM	w2s-bb	G:/	test1\0000kfile001.bt	10.21 Mb
Jun 11, 2002 1:58:01 PM	w2s-bb	G:/	test1\0000kfile007.bt	10.21 Mb
May 21, 2002 9:33:41 AM	nts-dev1	E:/	MSSQL7/Data/master.mdf	9.89 Mb
Jun 12, 2002 8:25:18 AM	w2s-prod1	E:/	Program Files/Exchsrvr/Storage Group 2/Mailbox SL...	9.01 Mb
May 21, 2002 9:33:45 AM	nts-dev1	E:/	MSSQL7/Data/TEMPDB.MDF	8.00 Mb
Jun 14, 2002 11:01:45 AM	w2s-web2	E:/	Program Files/Microsoft SQL Server/MSSQL/Data/...	8.00 Mb
May 21, 2002 9:33:37 AM	nts-dev1	E:/	MSSQL7/Data/msdbdata.mdf	7.50 Mb
May 18, 2002 12:07:23 AM	na-f720.trellissoft.com	/vol2	music/10CC - I'm Not In Love.Mp3	6.89 Mb
Apr 29, 2002 12:01:06 PM	hp11-64b.trellissoft.com	/DBMS	sybase/ASE-12_5/bin/diagbs	6.87 Mb
Jun 11, 2002 1:58:01 PM	w2s-bb	G:/	test1\0000kfile060.bt	6.25 Mb
Jun 11, 2002 1:58:01 PM	w2s-bb	G:/	test1\0000kfile270.bt	6.25 Mb
Jun 11, 2002 1:58:01 PM	w2s-bb	G:/	test1\0000kfile030.bt	6.25 Mb
Jun 11, 2002 1:58:01 PM	w2s-bb	G:/	test1\0000kfile361.bt	6.25 Mb
Jun 11, 2002 1:58:01 PM	w2s-bb	G:/	test1\0000kfile360.bt	6.25 Mb
Jun 11, 2002 1:58:01 PM	w2s-bb	G:/	test1\0000kfile090.bt	6.25 Mb
Jun 11, 2002 1:58:01 PM	w2s-bb	G:/	test1\0000kfile180.bt	6.25 Mb



# TPC Data Management Data Life Cycle

## Control

- Establish centralized alerts
- Implement quotas
- Granular Constraints
- Set automated response actions (e.g. TSM)
- Automate activity with batch reporting
- Automated LUN provisioning for monitored filesystems

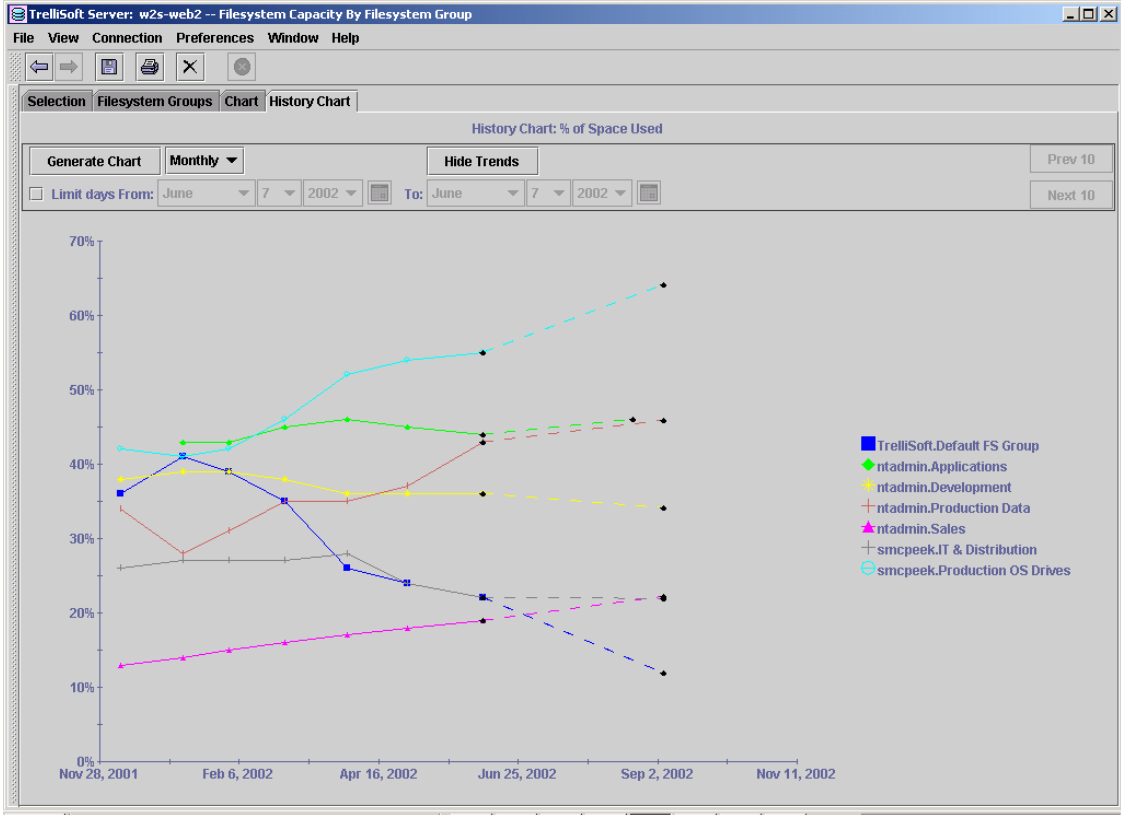




# TPC Data Management Data Life Cycle

## ■ Predict

- Identify the fastest growing users, file systems and database tables
- Forecast future growth and at-risk situations
- Publish capacity planning metrics





# For Databases

- **Prevent database downtime**
  - Predict tablespace failure due to space allocation problems.
- **Reduce unnecessary space usage**
  - Find allocated, but unused space
- **Perform capacity planning**
  - Trend storage growth of specific objects
- **Plan network migration or SAN implementation**
  - Identify the fastest-growing databases







# For Chargeback

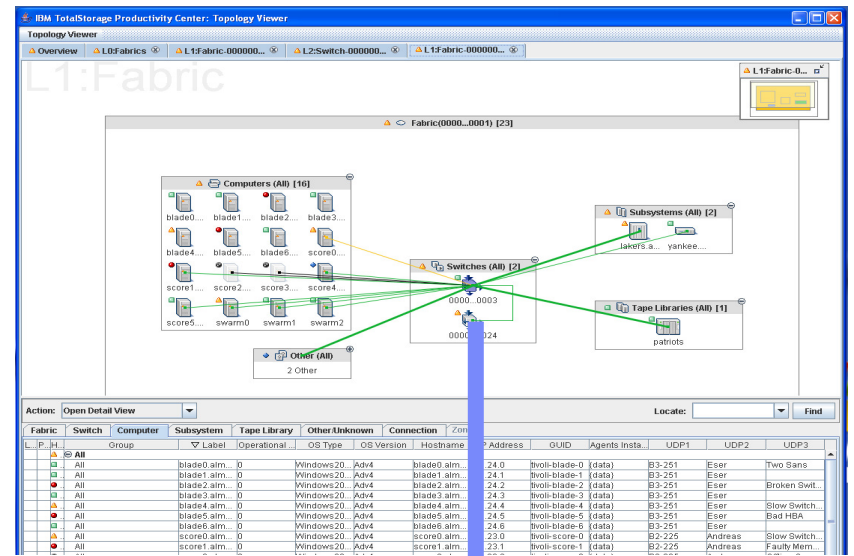
- **Generate Invoices**
  - Users, Departments, Database Instances/Users
  - Automatic total roll up
  
- **Invoice Flexibility**
  - File Systems
  - Databases
  - User Usage
  - Computer Capacity
  - Tablespace Capacity
  
- **Special format for import into CIMS**



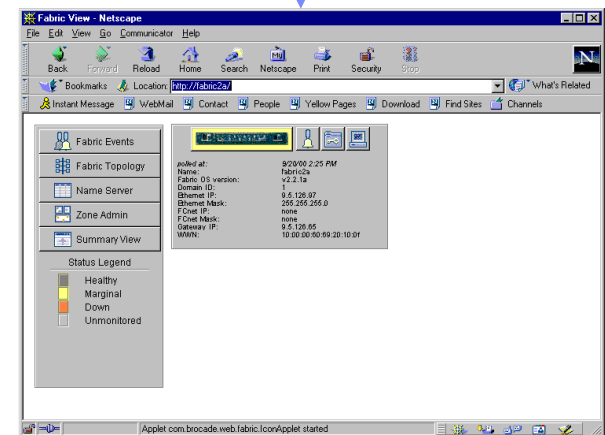


# IBM Tivoli Storage Productivity Center Standard Edition – Fabric Component

- Centralized control for SAN configuration
- Automated management
  - Multi-vendor switch zone provisioning
  - SAN, NAS, iSCSI
  - Multi-vendor HBA support
- Visualization of the topology
- Real-time status & performance monitoring
  - Connection and Resource status
  - Switch Performance
- Reporting capabilities
  - SAN Fabric Asset and Performance
- Automated status and problem alerts
  - Integration with Tivoli management
  - Integrated with 3<sup>rd</sup> party via SNMP



Launch Element Manager



View Connection Preferences Window Help

TopoViewer

L0:San L1:San-fabric... L1:San-fabric...

Administration Tree

- Administration Tree
  - My Resources
    - Storage
      - Storage Groups
      - Backup
      - Topologies
        - File
        - Computer
        - Storage
      - Monitoring
        - Performance
      - Alerting
        - Alerts
      - Data Management
        - Monitoring
          - Groups
          - Performance
          - Storage
          - Performance
        - Alerting
          - Configuration
          - File
          - Diagnostic
        - Policy
          - Quality
          - Network
          - Configuration
          - Storage
          - Alerting
        - Repository
          - Groups
          - Alerting
          - Alerting
          - Configuration
          - Update
          - Update

Computers(OS:AIX)

Moca.b...

Computers(OS:HPUX)

1 Computer

Computers(OS:Linux)

2 Computers

Computers(OS:SOLARIS)

1 Computer

Computers(OS:WIN\_2000)

1 Computer

Computers(OS:WIN\_NT)

2 Computers

Switches(San:ffffff...)

My Vir...

My Vir...

My Vir...

My Vir...

My Vir...

SubSystems(SingleGroup)

My Sto...

My Sto...

Focus San Switch Computer SubSystem TapeLibrary Other Zone

Locate:  Go

	Group	ID(debug)	Name	Type	UDP1	UDP2	UDP3

start

100%

8:12 AM

Monday

View Connection Preferences Window Help

TopoViewer

L0:San L1:San-fabric... L1:San-fabric... L1:San-fabric... L2:Switch-switch...

L2:Switch-...

Fabric

Switch(2-3HAJ...)

00-0F	3	13	10-1F	7	9	20-2F	2	14	30-3F	5	11
00-0F	NA...	NA...	00-0F	NA...	NA...	00-0F	NA...	NA...	00-0F	NA...	NA...
10-1F	NA...	NA...	10-1F	NA...	NA...	10-1F	NA...	NA...	10-1F	NA...	NA...

Computers(OS:Unknown) 2 Computers

Switches(San:) 1 Switch

SubSystems(SingleGr) 2 SubSystems

Focus Switch Computer Switch SubSystem TapeLibrary Other FCPort Zone

Locate: [ ] Go

Group	ID(debug)	WWN	Port_ID_Str	Type

start 100% 8:18 A

Data Received Rate(Mb/s): 1

Data Transmitted Rate(Mb/s): 3

Packets Received Rate(frames/s): 13

Packets Transmitted Rate(frames/s): 6



# Fabric Zoning Configuration

The screenshot shows the IBM TotalStorage Productivity Center interface for fabric zoning configuration. The window title is "IBM TotalStorage Productivity Center: tpc-d9-int -- Fabrics: Fabrics". The interface is divided into a navigation tree on the left and a main configuration area on the right.

**Navigation Tree:**

- Administrative Services
  - IBM TotalStorage Productivity Center
    - My Reports
      - System Reports
        - Data
        - Disk
        - Fabric
          - Port Connections
          - SAN Assets (ALL)
          - SAN Assets (Connected Devices)
          - SAN Assets (Switches)
          - Switch Performance
          - Switch Port Errors
          - Top Switch Ports Data Rate Perfo
          - Top Switch Ports Packet Rate Per
      - administrator's Reports
      - Batch Reports
      - Topology
        - Computers
        - Fabrics
        - Storage
        - Other
      - Monitoring
        - Probes
        - Alerting
          - Alert Log
      - Data Manager
        - Data Manager for Databases
        - Data Manager for Chargeback
      - Disk Manager
        - Storage Subsystems
        - Volume Performance Advisor
      - Monitoring
        - Alerting
        - Policy Management
        - Reporting
      - Fabric Manager
        - Fabrics
        - Monitoring

**Main Configuration Area:**

**Fabrics | 100000051E34F6A8 Zoning | 100000051E34F6A8 Definition**

**Zone Configuration**

Update and Activate    Update only

**Zone Sets**

Add    Remove    Change    Duplicate    Deactivate    Activate

Zone	Active	Description
AAA	Active	
TestZoneSet	Inactive	

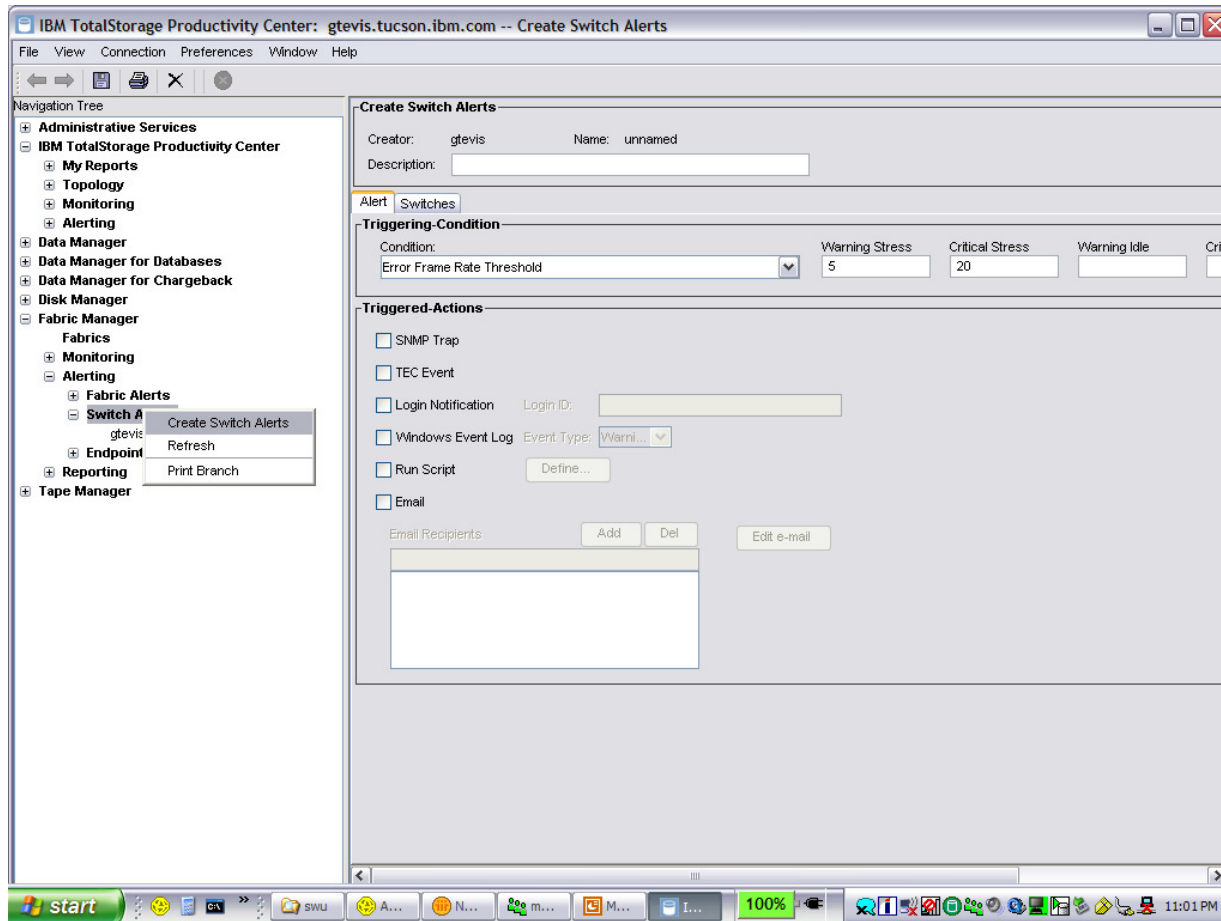
**Zones**

Add    Remove    Change    Duplicate

Zone	Description
c35_ess	
c57_ess	
c58_ess	
chandra_tpcd14int	
dwolfe_tpcd7int	
ess20870_plus_c224lin	
jimm_tpc_d15_int	
jimm_tpc_d13_int	
mdm2_tsnm_plus_redc2	
mfbC32ESS20870	

# SAN Predictive Fault Monitoring

- **Most SAN link failures due to deteriorating Fiber Optics**
  - Typically appear as intermittent frame errors long before hard failure



- **TPC provides Error Frame Rate Report that identifies suspect ports**
  - The average number of frames received in error, per second, for specified ports





**IBM TotalStorage Productivity Center: gtevis.tucson.ibm.com -- Create Switch Alerts**

File View Connection Preferences Window Help

Navigation Tree

- Administrative Services
- IBM TotalStorage Productivity Center
  - My Reports
    - System Reports
    - gtevis's Reports
    - Batch Reports
  - Topology
    - Computers
    - Fabrics
    - Storage
    - Other
  - Monitoring
    - Probes
    - Alerting
      - Alert Log
  - Data Manager
  - Data Manager for Databases
  - Data Manager for Chargeback
  - Disk Manager
  - Fabric Manager
    - Fabrics
      - Monitoring
        - Groups
        - Jobs
          - Switch Performance Monitors
            - gtevis.switch perf probe
        - Alerting
          - Fabric Alerts
            - Switch Alerts
          - Endpoint Device Alerts
        - Reporting
          - Switch Performance
      - Tape Manager

**Create Switch Alerts**

Creator: gtevis Name: unnamed  Dis

Description:

Alert Switches

**Triggering-Condition**

Condition: Total Port Packet Rate Thres... Warning Stress Critical Stress Warning Idle Critical Idle Packets per Second

Switch State Changes

Switch Property Changes

Switch Status Change Offline

Switch Status Change Online

Switch Version Change

Switch Port Change

Switch Blade change

Switch Blade change Offline

Switch Blade change Online

Total Port Data Rate Threshold

Link Failure Rate Threshold

Error Frame Rate Threshold

Total Port Packet Rate Threshold

Email recipients

Add Del Edit e-mail

**Switch & Port Threshold Reporting and Alerts**

**Top Violating Components To Show Most Active**

**Topology Console Displays Performance Violations**

start 100% 3:56 PM



## Fabric Reports

- **System SAN Fabric Performance Reports Created**
  - SAN Switch, Switch Port Errors, and Top N reports
  
- **System SAN Fabric Asset Reports**
  - SAN Assets reports and Port Connections reports
  - OS Type and version: Reporting -> Asset -> By Computer
  - HBA information: Reporting -> Asset -> By Computer->Controllers
  - “Paths”: Reporting -> Asset -> By Computer->Controllers->Disks
  - Firmware revisions for storage subsystems: Reporting -> Asset -> By Storage Subsystems



# Storage Configuration Planners – Path Planner

## **Path Planner for simplified management of host functions such as HBA and multi-pathing management**

- The new Path Planning Wizard is added to the TPC typology viewer
- Path Planner provides policy-based specification of paths between hosts and storage systems during storage provisioning
- The Path Planner is designed to:
  - Provide configuration guidance for your multipart drivers (initial scope is to configure IBM SDD)
  - Allow input of application requirements
  - Convert logical flows into physical flows
  - Provide the wizard functions off of the TPC Topology Console, as well as through a CLI

**Path Planner** Setup multipath options (if supported by the host drivers)

Multipath Option:

Specify number of paths:

Use fully redundant paths (requires 2 fabrics)



# Storage Configuration Planners – Zone Planner

## Zone Planner for simplified, wizard-based zone security management

- The new Zone Planning Wizard is added to the TPC typology viewer
- Zone Planner enforces policy-based zone security specifications between hosts and storage systems.
- The Zone Planner is designed to:
  - Determine which hosts can access storage
  - Determine which host ports can see what storage volumes
  - Provide auto-zoning functions
  - Provide zoning based on Best Practices
  - Perform LUN Masking/Mapping assignments automatically based on current customer usage
  - Provide GUI interface for updating the above functions

**Zone Planner** Automatically change the zoning to ensure hosts can see the new storage

Automatically create zone...

Specify maximum number zones:

Specify maximum zone members per zone:

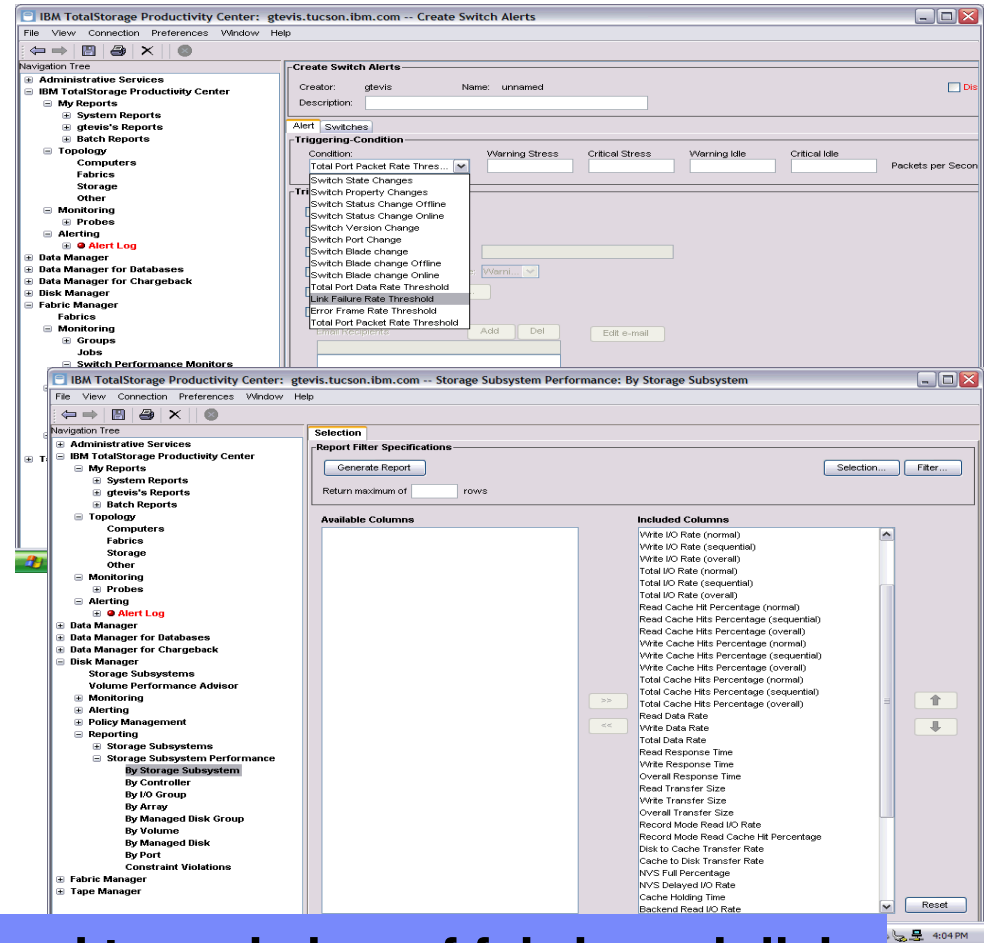
No two HBA with different vendors should be in the same zone

No two controllers with different types should be in the same zone

Use active zone set

# SAN Storage and Fabric Performance Analysis

- **TPC for Disk** monitors disk subsystem ports, subsystem arrays, disk volumes for throughput, I/O and cache rates, as well as for response times
- **TPC Standard Edition Fabric Component** monitors switches and ports for throughput rates and allows you to specify throughput threshold
- Thresholds can be set for these metrics and alerts are generated when thresholds are violated, indicating potential bottlenecks.
- TPC Topology console will show all performance violations and propagate the thresholds events through performance health monitor icons



▪ **Storage administrator can see end to end view of fabric and disk subsystem performance and assess business impact and drill into potential or actual problem areas**



# End-to-End view with Performance Status Information (Data Path Explorer)

- Quickly assess the performance state of your storage infrastructure
- End-to-end view of the entire storage path
- Reduces time to problem isolation and resolution

The screenshot shows the IBM TotalStorage Productivity Center Topology Viewer interface. The main window displays a topology diagram with several components:
 

- Computer:** ODCBETA159.wsclab.washington.ibm.com
- Fabric:** 26C2000DEC1900C1, containing switches (Brocade\_3534\_179, Brocade\_3534\_180) and a Cisco switch (Cisco-9216i-194).
- Storage device:** DS6000-1750-6847412-IBM
- Data path:** A green line connects the Computer to the Storage device through the Fabric.
- Performance:** A yellow box shows performance metrics for the path: Port Send I/O Rate: 0.0, Port Receive I/O Rate: 431.35, Port Send Data Rate: 0.0, Port Receive Data Rate: 26.9, Port Receive Response Time: 7.26, Port Send Response Time: 0.0.
- Volume:** Hollis159\_LUN1 (ID:1009)

At the bottom, a **Tabular Data Path details** table is shown:

Data Path	Data Path Segment	Alert	Zone	Group	Initiator Entity	Initiator Disk	Initiator FCPort	Target Entity	Target Volume	Target FCPort
All										
Data Path #0	ODCBETA159.wsclab...				Disk 11	210000E08B09942B		DS6000-1750-68474...	Hollis159_LUN1 (ID:1009)	R1-12-C1-T0





# Value of the IBM Tivoli Storage Productivity Center

- Simplify Storage Infrastructure Management for better availability
  - Predict storage network failures before they happen
  - Prevent out-of-space conditions on file and database systems
  - Meet storage service levels
- Automate planning, management and provisioning of storage
  - Report on storage network and disk subsystem performance
  - Basic provisioning to configure the storage fabric and disk
  - Categorize data by database, file system, directory and file-level analysis
  - Improve service levels for data protection by identifying files not backed up
- Optimize Storage Personnel Productivity and storage ROI
  - Create a single point of control, administration and security for the management of storage networks and disk systems
  - Automate reporting of information and metrics to help administrators make better, more timely decisions
  - Automate responses to policy violations



# Question & Answers