



# Maslow's Hierarchy of Needs for Storage Management



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# What Lies Ahead



- Storage Management Impact
- End User Sentiments
- Hierarchy of Needs for Storage Management
- HP product examples within this framework



# Storage Management impact

- Storage capacity dramatically expanding
- Data criticality growing
- IT technical headcount flat
- Storage management tools seen as the solution
- But - a plethora of management tools abound
- No holistic instruction for integrating tools
- Users needs assistance assessing priorities

# Top Ten Customer Pain Points

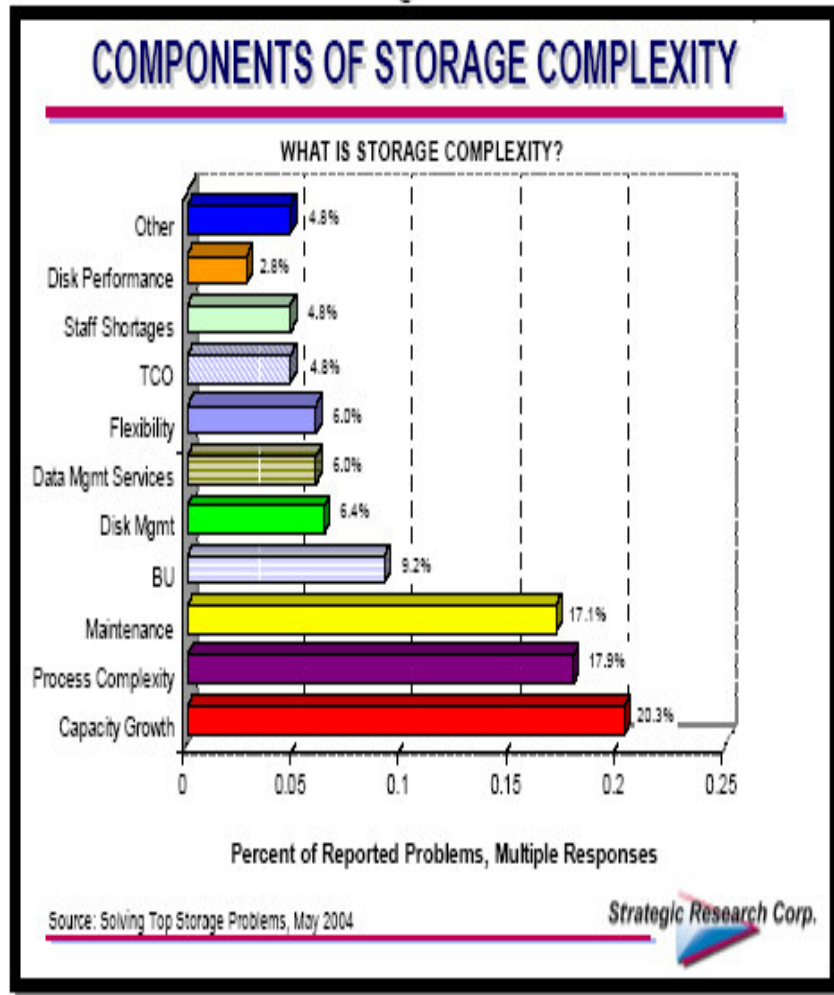
1. Cost (price and total cost of ownership (TCO))
2. The challenge of managing growth and meeting capacity needs
3. The inability to manage storage assets and infrastructure
4. The lack of integrated and/or interoperable solutions
5. Increasing complexity of storage infrastructure
6. Poor service, support, and ill-informed or poorly educated marketing channels
7. Lack of desired functions and features
8. Finding the right solutions and justifying expenditures
9. Undelivered promises
10. Lack of robust automation for provisioning

- *SNIA End User Council (EUC), 2004*

# Assessing End User Sentiments

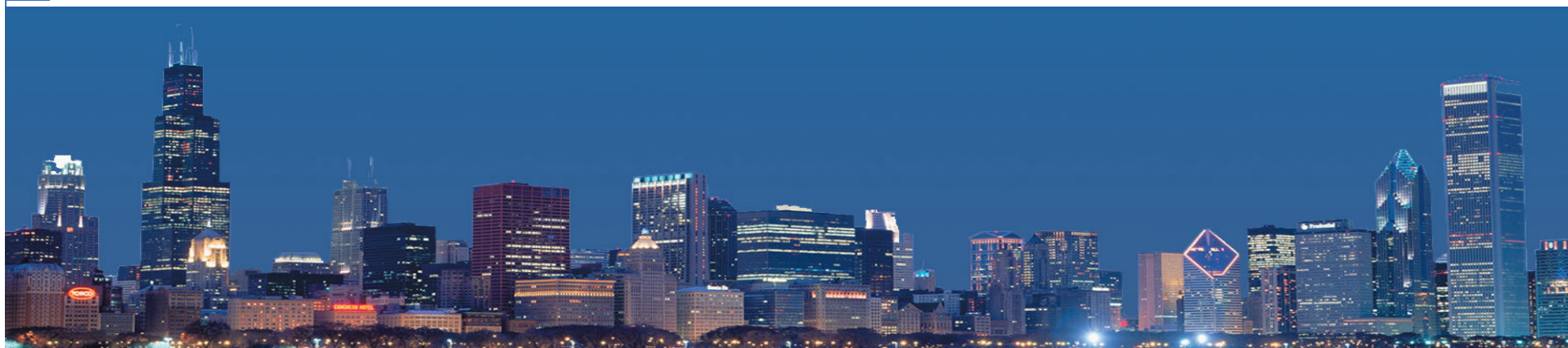


- Frustration is obvious
- Complaints not revealing of a central cause
- So where to start?
- Marketplace needs a framework to guide the intelligent use of storage management



“If the only tool I have is a hammer, I tend to treat everything like a nail.”

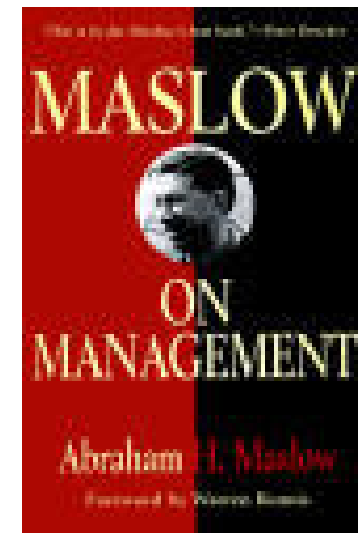
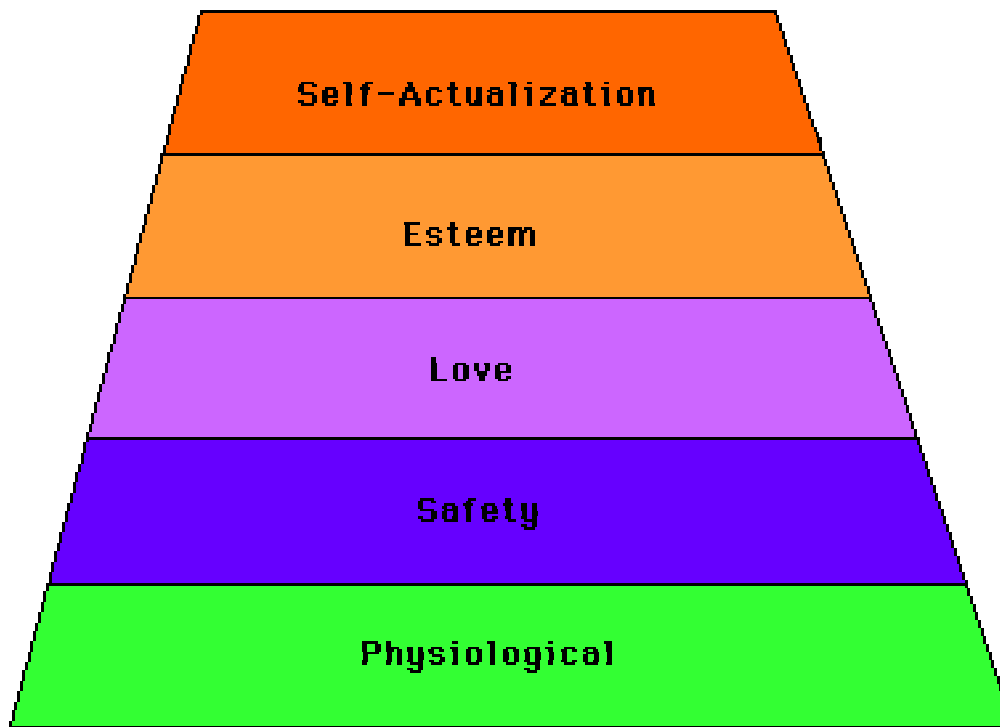
Abraham Maslow



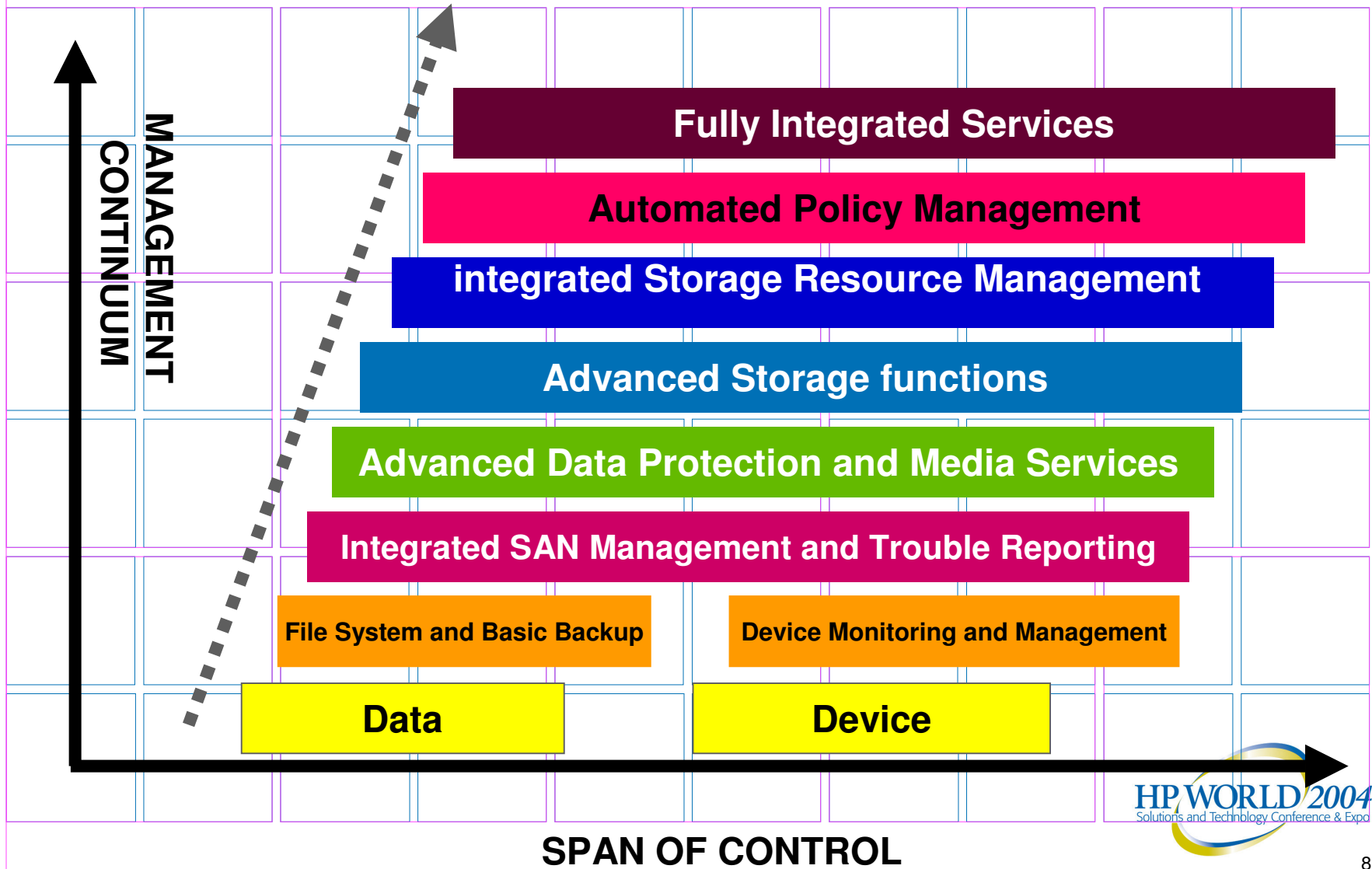


# Abraham Maslow, 1908-1970

- establishing the theory of a hierarchy of needs
- human beings are motivated by unsatisfied needs
- certain lower needs need to be satisfied before higher needs can be satisfied



# Storage Management Needs Hierarchy



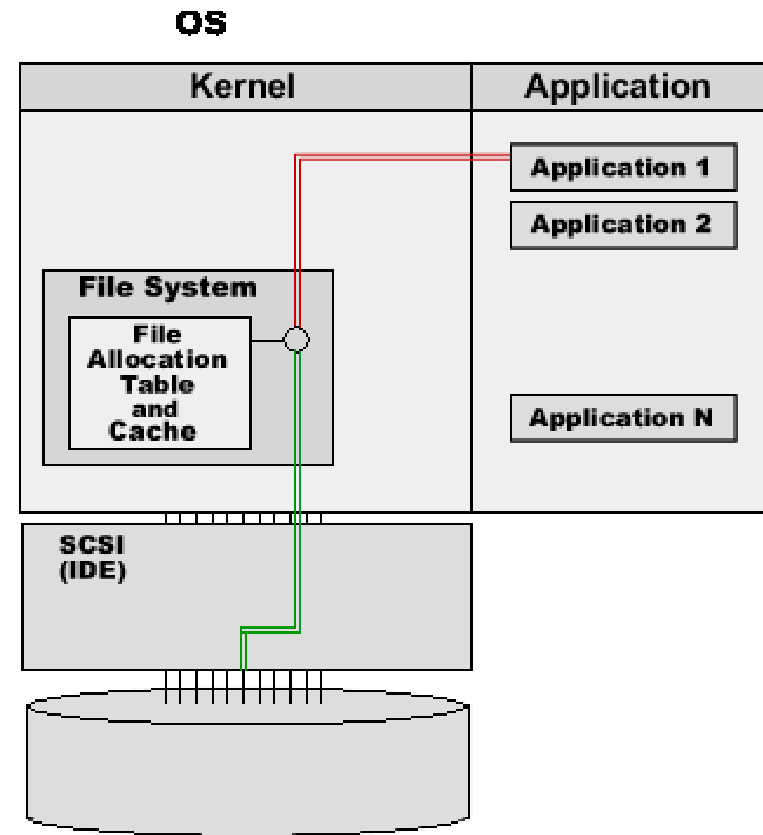


# File System Management

DATA – the primary entry point for most storage management tools

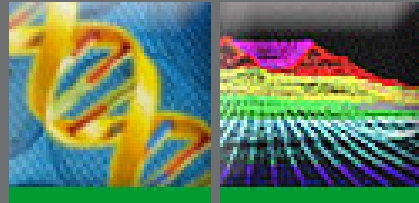
File Systems:

- Common Internet File System (CIFS)
- Network File System (NFS)
- Online Journal File System (JFS)



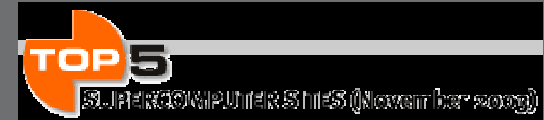
Single OS File Systems

# HP StorageWorks scalable file share



## Pacific Northwest National Labs (PNNL)

National supercomputing laboratory addressing environmental, energy, health and national security issues



### Business needs



- Faster answers from complex long-running simulations
- Higher scalability from faster interprocessor communication and balanced I/O
- High capacity and high bandwidth sharable file systems

### HP solution



- One of the “Top 5” fastest supercomputers (11+ TFLOPS, 1800+ Itanium 2 processors)
- High throughput from 2.5 GB/s of scalable-shared bandwidth to 53TB Lustre server
- HP design, installation, integration, and support

### Customer benefits

#### Simplicity

- Centralized, easy to use, manage, and expand

#### Agility

- Faster more accurate analysis in research to understand impacts to US environment
- Leverage existing IT investments

#### Value

- Cost-effective scalability leading to faster times to solution and better science

# Basic Backup

*Business continuity planning – one of the most important components of running a successful business today.*

Without it, companies risk incurring staggering costs from downtime and data loss.

Data is the foundation of any business – it means:

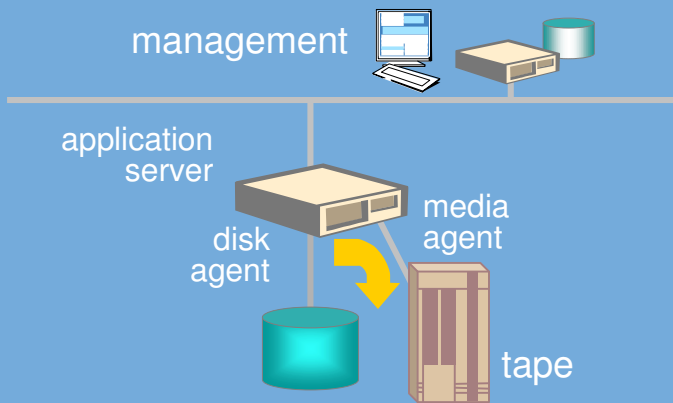
- customers
- communications
- cash flow

Yet despite the risks of human error, internal sabotage, and disasters:

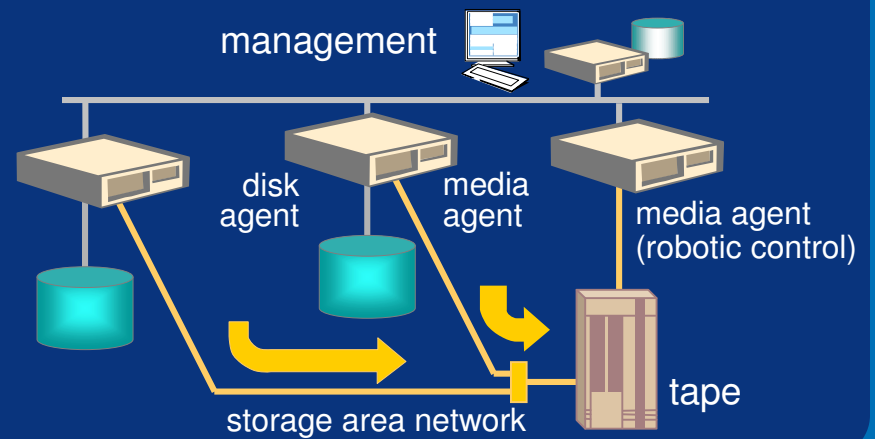
- Less than 25% of Global 2000 firms have adequate business continuity plans, policies and technologies in place.
- Only 50% have fully tested disaster recovery plans

# Backup

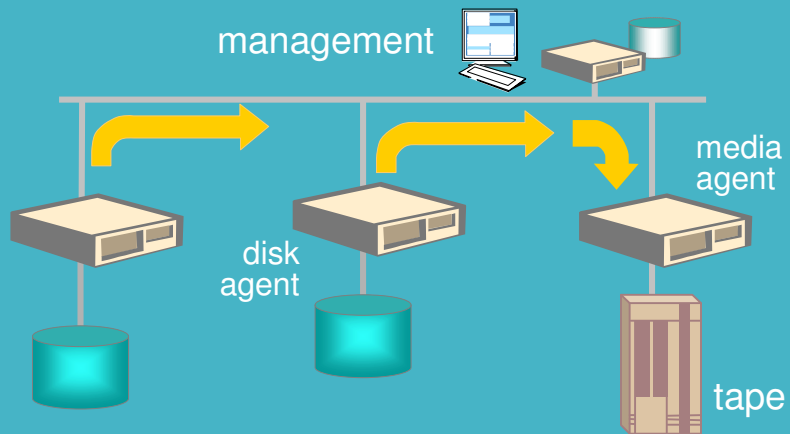
## local protection



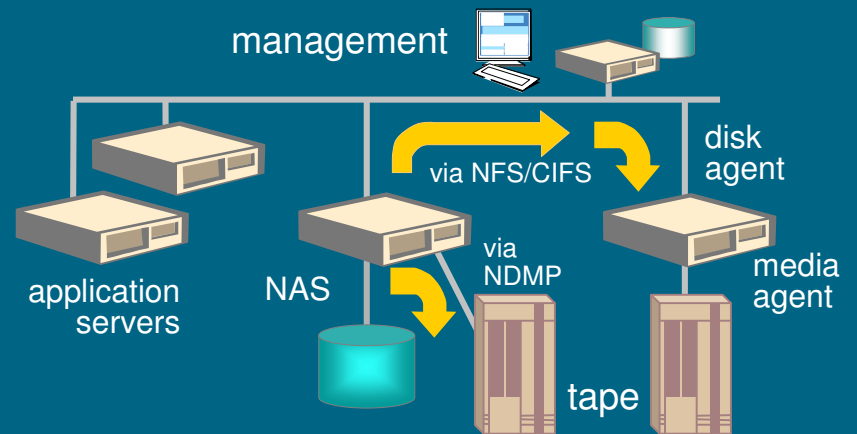
## SAN (LAN-free) protection



## network-based protection



## NAS (NDMP) protection

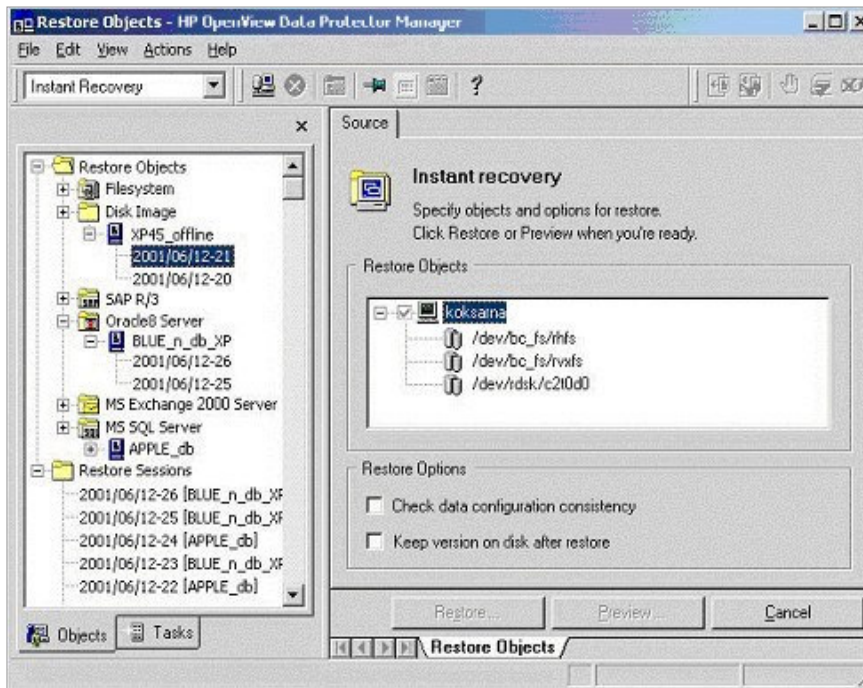


# Basic Backup

(HP portfolio example) HP OpenView Storage Data Protector 5.5



software that manages backup and recovery from disk or tape



## Ideal Use

- A single automated data protection solution for heterogeneous environments of companies of any size
- Eliminate backup window with online backup, open file backup, zero downtime backup, Microsoft Volume Shadow Copy Service (VSS)
- Recover terabytes of data in minutes with instant recovery
- Full range of bare metal recovery options
- Centralized, multi-site management
- Media management
- Track and manage of media outside the library with Data Protector Media Operations



# Device Monitoring and Management

DEVICE – the other entry point for storage management tools, effectively providing:

## Device Monitoring

- Fault Detection and Isolation

## Device Management

- Basic Device Configuration

At this level, each device is managed as a single entity.

Generally practical only with relatively small amounts of data and small numbers of devices.

# Device Monitoring and Management



(HP portfolio examples)

## HP OpenView Storage Operations Manager

- Centrally configures, monitors and manages HP StorageWorks Enterprise Virtual Arrays across distributed SANs

### Ideal Use

- Configure EVA disk groups, vdisks, and host presentation
- Manage array configuration, asset inventory, and problem identification from anywhere
- Visually monitor network storage topology, zones, and health status
- Consolidate all EVA/SAN-based events to a single console

The screenshot displays the HP OpenView Storage Operations Manager interface. The main window shows a tree view of the storage network topology, including SANs, hosts, disk groups, and hardware. A detailed view of the 'HSV Storage System Network Properties' is shown on the right, listing total storage space (473.96 GB) and storage space used (0.00 GB). The bottom of the interface features a 'Storage Events' table with columns for Ack., Severity, Occurred, Source, Category, Event Type, and Message.

Ack...	Severity	Occurred	Source	Category	Event Type	Message
	Warning	July 28, 2002 5:48:22 AM PDT	711b2.r...	Device	POLLED_EVENT	FC Link is DOWN. Local
	Warning	July 28, 2002 5:29:55 AM PDT	711b2.r...	Device	POLLED_EVENT	DLX firmware image rec
	Warning	July 28, 2002 2:56:23 AM PDT	711b1.r...	Device	POLLED_EVENT	DLX firmware image rec



# Device Monitoring and Management



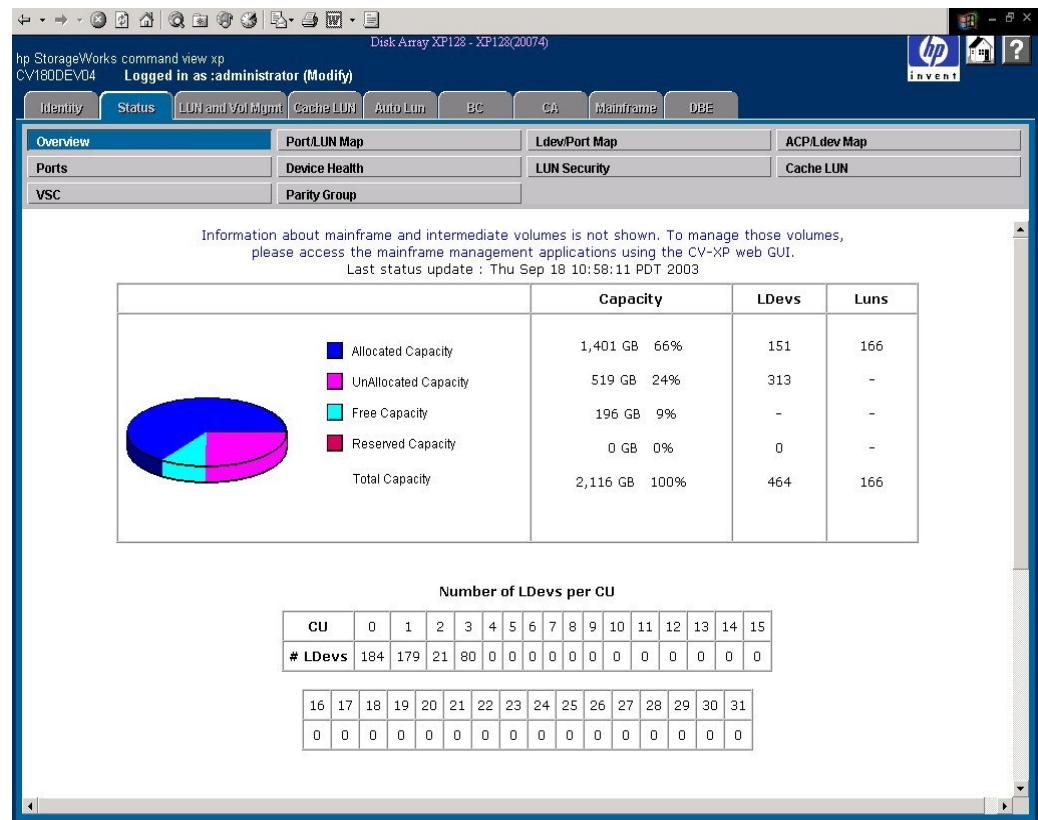
(HP portfolio examples)

## HP StorageWorks CommandView XP

- Web-based device management for XP disk arrays

### Ideal Use

- Globally manage XP disk arrays via the web
- Launch all XP applications from a single management console
- Integrate XP arrays with Enterprise Management applications





# Integrated SAN Management and Trouble Reporting

- This level deals with movement to an integrated approach
- Networked storage can be managed as a system
- Provides system view of basic operations and trouble reporting for both devices and data.
- Using topological views for fault detection and configuration management
- Basic security management possible (e.g. zoning and LUN masking)
- User span-of-control extended for greater efficiency

# SAN Management (HP strategy example)

## Unified Storage / Server Management – a Better Approach



- **Simplicity**
  - Breaks down artificial boundaries between servers and storage
    - Common tools – learn once
    - Eliminates duplicate tasks – do once
    - Systems level view – view once
- **Agility**
  - Open and extensible
    - Built on industry standards
    - Foundation that HP and partners can continually build upon
- **Value**
  - Enables demonstrable improvements in IT operational efficiency while your existing infrastructure evolves
    - Embraces heterogeneity and legacy environments
    - Basic management built-in
    - Expanded capabilities at an affordable price

# SAN Management

Unified Storage / Server Management – What you can do with HP that you could not do before



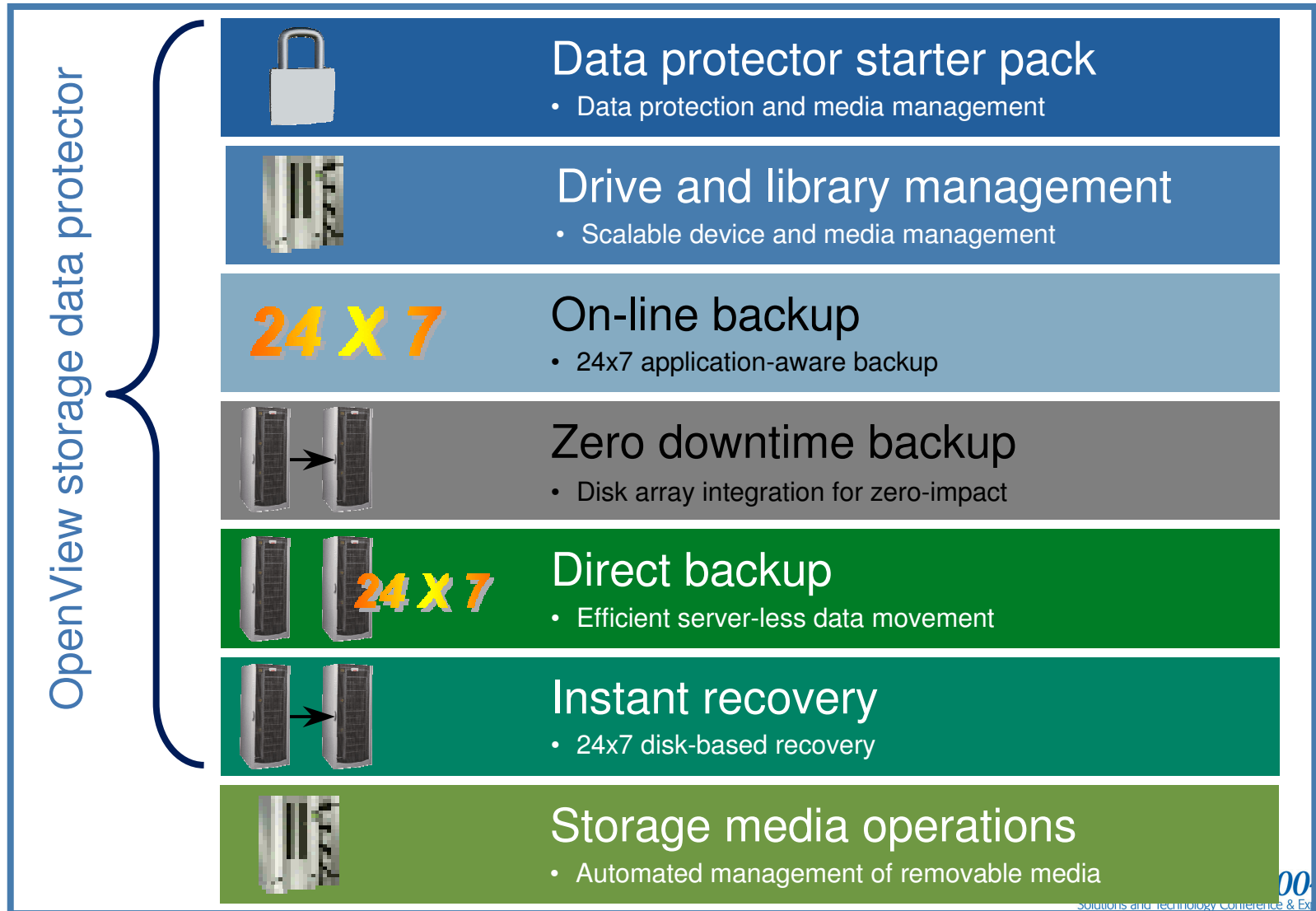
- Unified Server/Storage Management
  - Systems level view enables management of servers and storage together
    - Change management (config mgmt, asset mgmt)
    - Performance management (look at system in total)
    - Common fault and element management
    - Event correlation between servers and storage
- Simplified Deployment (CIMOM/SMI-S)
  - Non-disruptive to existing environments
  - No deployment of host agent required
- Consistent Storage Management
  - Consistent end-user experience across supported arrays



# Advanced Data Protection and Media Services

- This level fits best once system level management has been implemented.
- Key to success of any reliable data protection scheme
  - understanding business needs
  - having a strategy that addresses critical requirements
  - strategy keeps current with changing business needs
- At this level, recovery ability assurance is vital
- Business value of instant recovery
  - reduced cost of downtime
  - increased application service levels
  - operational efficiencies and cost savings
  - consolidation of servers, applications

# Advanced Data Protection and Media Services (HP portfolio examples)



# OpenView Storage Media Operations



Automated management of removable storage media

Increases data availability and maximizes the effectiveness of media operations

- software for tracking 2K, 10K or unlimited tape cartridges outside of the library
- sits on top of Data Protector for automatic media labeling and download of media info into its dB for tracking throughout media lifecycle
- directs daily media handling processes via operator task lists
- supports firewalls in an IT environment



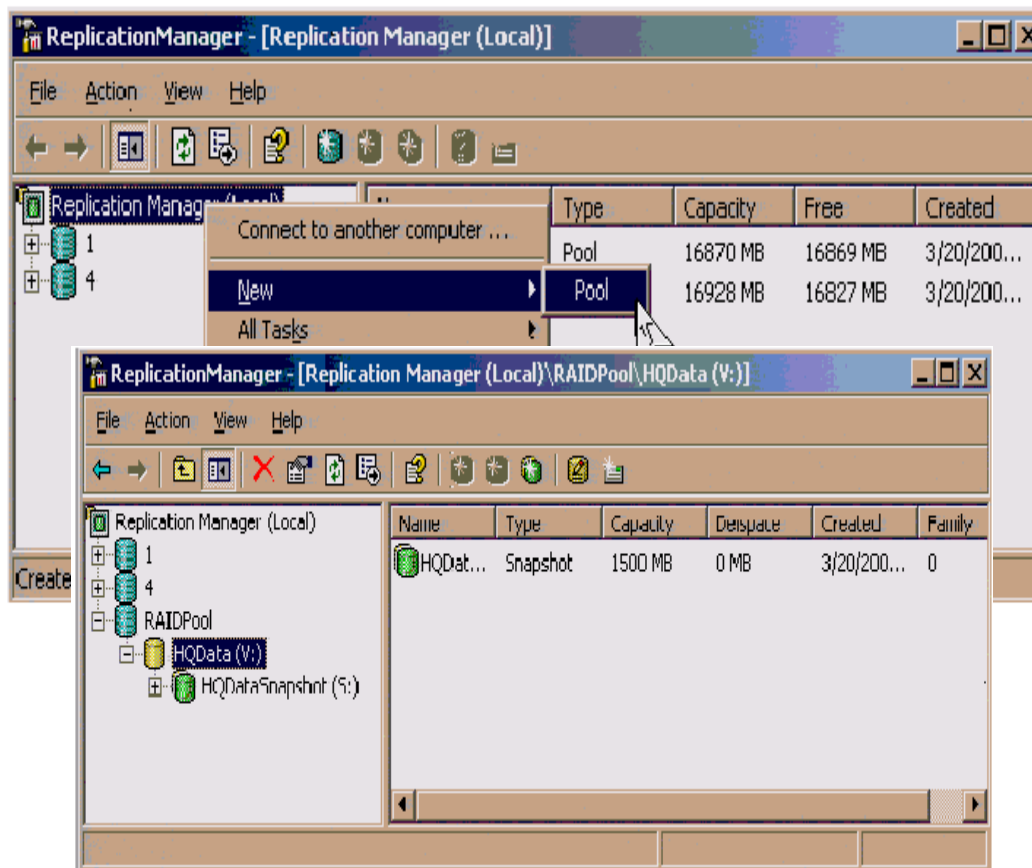
# Advanced Storage Functions

- Moving to the next level, also involves a deeper understanding of business needs.
- Then, if required by business need, advantage taken of:
  - data replication
  - mirroring
  - remote capabilities
  - distributed data storage / applications hosting
  - business continuity schemes

# HP OpenView Storage Virtual Replicator



A Windows host-based storage replication product that pools and replicates local storage resources



## Ideal use

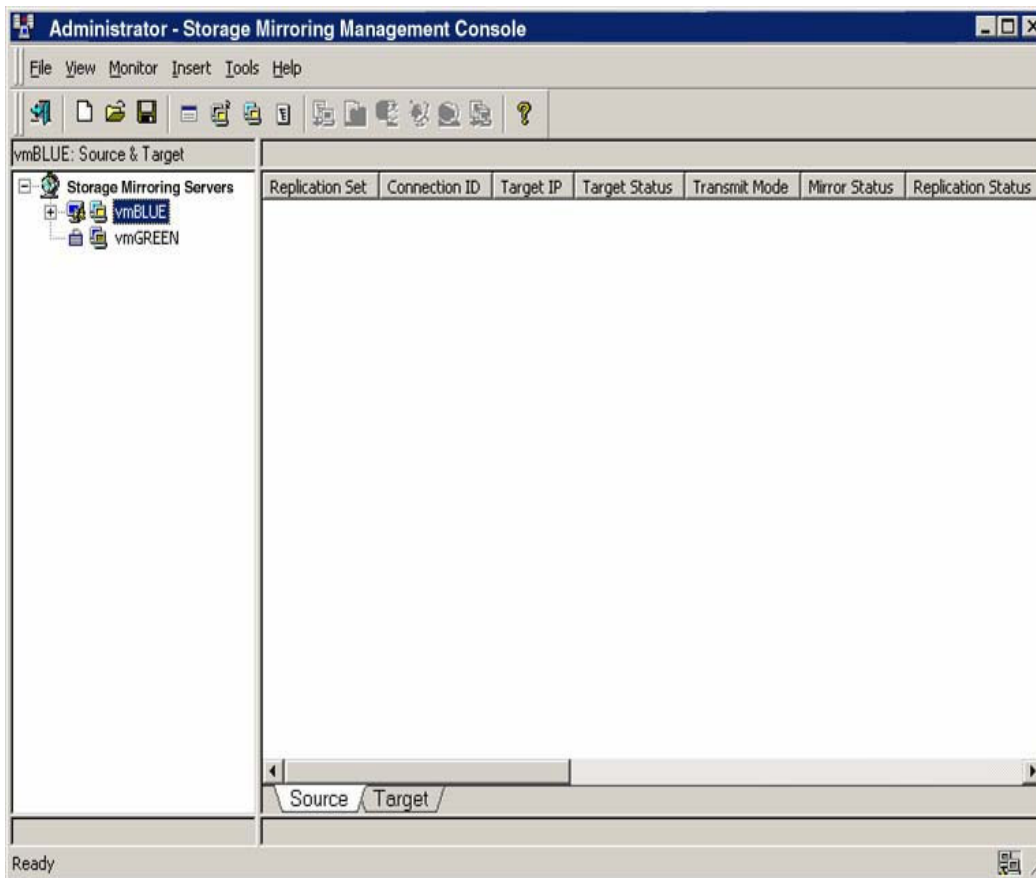
- Small departmental SANs with Windows servers
- Consolidation of Windows based resources into virtual disks
- Snapshots of virtual disks
- Un-disrupted backups of production volumes
- Online volume growth - HP OpenView Storage Volume Growth



# HP OpenView Storage Mirroring



Windows host based application performing asynchronous remote replication over an IP LAN/WAN.



## Ideal use

- Replication of critical data from many servers to single server
- Local or long distance disaster tolerance over IP LAN/WAN
- Replication and backup of remote branch office servers
- When array based replication is not practical or not present
- When IT staff is minimal or not present at remote branch offices
- Automated failover and failback

# HP StorageWorks Continuous Access XP & Continuous Access XP Extension



Remote data mirroring between XP disk arrays

## Ideal Use

- Enhanced business continuity across remote storage sites
- Disaster recovery

hp StorageWorks command view xp  
CV170DEV01 Logged in as administrator (Modify)

Identity Status LUN Management Volume Management Cache LUN Auto Lun BC CA DBE

Disk Array Status

Pair Operation RCU Operation Asynchronous Operation Usage Monitor History Operations

Continuous Access Selected LUs : 0

Operation : Show pair(s) Display Filter

Subsystem	Port	Group	LUN	Status	Sub	S/N	SSID	Port	Group	LUN
CU#00	CL1-C	00	00(00:40)	SMP						
CU#01	CL1-C	00	01(00:41)	SMP						
CU#02	CL1-C	00	02(00:42)	SMP						
CL1-C	CL1-C	00	03(00:43)	SMP						
CL1-D	CL1-D	00	00(02:00)	PAIR		20580	0005	CL1-D	00	00(01:00)
CL1-D	CL1-D	00	01(02:01)	PAIR		20580	0005	CL1-D	00	01(01:01)
CL1-D	CL1-D	00	02(02:02)	PAIR		20580	0005	CL1-D	00	02(01:02)
CL1-D	CL1-D	00	03(02:03)	PAIR		20580	0005	CL1-D	00	03(01:03)
CL1-D	CL1-D	00	04(02:13)	PAIR		20580	0005	CL1-D	00	04(01:13)
CL1-D	CL1-D	00	05(02:14)	PAIR		20580	0005	CL1-D	00	05(01:14)
CL1-D	CL1-D	00	06(02:15)	PAIR		20580	0005	CL1-D	00	06(01:15)
CL1-D	CL1-D	00	07(02:16)	PAIR		20580	0005	CL1-D	00	07(01:16)
CL1-D	CL1-D	00	08(02:30)	PAIR		20580	0005	CL1-D	00	08(01:26)
CL1-D	CL1-D	00	09(02:31)	PAIR		20580	0005	CL1-D	00	09(01:27)
CL1-D	CL1-D	00	0A(02:32)	PAIR		20580	0005	CL1-D	00	0A(01:28)
CL1-D	CL1-D	00	0B(02:33)	PAIR		20580	0005	CL1-D	00	0B(01:29)
CL1-D	CL1-D	00	0C(02:35)	PAIR		20580	0005	CL1-D	00	0C(01:39)
CL1-D	CL1-D	00	0D(02:36)	PAIR		20580	0005	CL1-D	00	0D(01:3A)
CL1-D	CL1-D	00	0E(02:37)	PAIR		20580	0005	CL1-D	00	0E(01:3B)
CL1-D	CL1-D	00	0F(02:38)	PAIR		20580	0005	CL1-D	00	0F(01:3C)
CL1-D	CL1-D	00	20(01:00)	SMP						
CL1-D	CL1-D	00	21(01:01)	SMP						

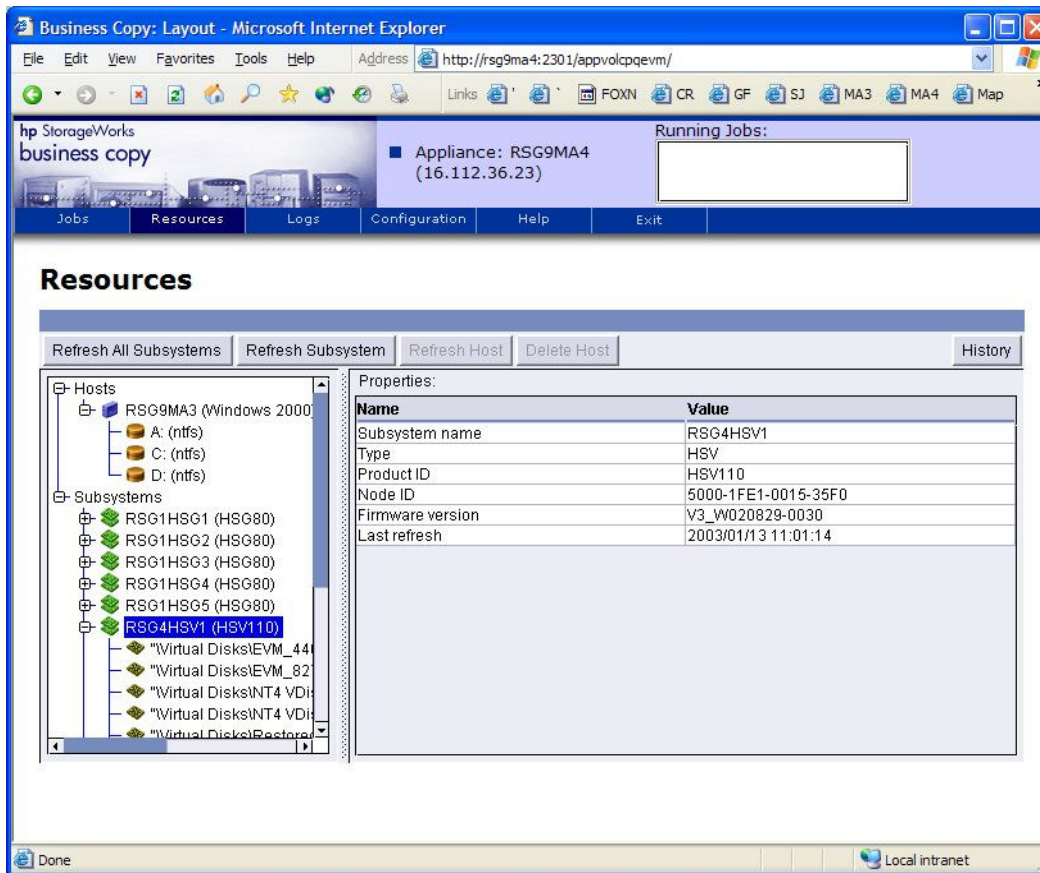
Previous Next Apply Cancel



# HP StorageWorks Business Copy EVA



Delivers point-in-time copy capability for the EVA 3000/5000. Keeps your Enterprise up and running while making the most of your data



## Ideal Use

- Keep applications on line while backing up data
- Test applications against real data before deploying
- Restore a volume after a corruption
- Data mine to improve business processes or customer marketing

# Integrated Storage Resource Management (iSRM)

Includes functions such as

- capacity and performance reporting and analysis
- capacity/ performance management automation,
- storage provisioning
- storage management product integration
- application integration.\*

\* InfoStor, September 2003

# Integrated Storage Resource Management



HP OpenView building blocks

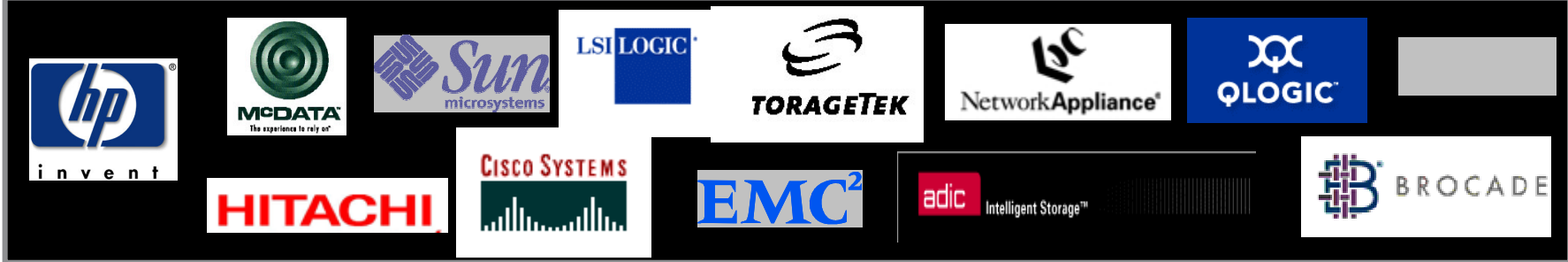


Centralized management and storage services



SMI-S and API's

HP and heterogeneous storage





“HP OpenView Storage Area Manager software is a powerful tool that gives us a detailed view of all our local and SAN network elements—including capacity, utilization, and disk drive status.”

Kevin Donnellan  
Director of Enterprise Infrastructure Services,  
Screen Actors Guild



# Automated Policy Management

- Allows management software to interpret conditions using guidelines that customers establish
- Drive automated change/adjust operations of storage networking environment
- Levels of sophistication can vary from simple event analysis to root cause analysis
- Level of automation can vary as well
- Allows for management of policies vs SLAs

# Automated Policy Management

(HP portfolio examples)



HP StorageWorks  
reference information storage system



Major wall street financial services customer

## Business needs



- Compliance with SEC regulation (17a-4) for e-mail retention.
- Find one e-mail in a Billion
- Need a more automated process for retrieving files (currently very manually intensive).

## HP solution



- RISS for email archiving
- 2 locations with replication ensuring disaster tolerant solution and to help address “offsite” copy requirements of SEC

## Customer benefits

### Simplicity

- Automated and easy to manage

### Agility

- Scale in capacity and performance while leveraging existing IT investments

### Value

- Additional ROI in just 2 searches, breakeven with just one



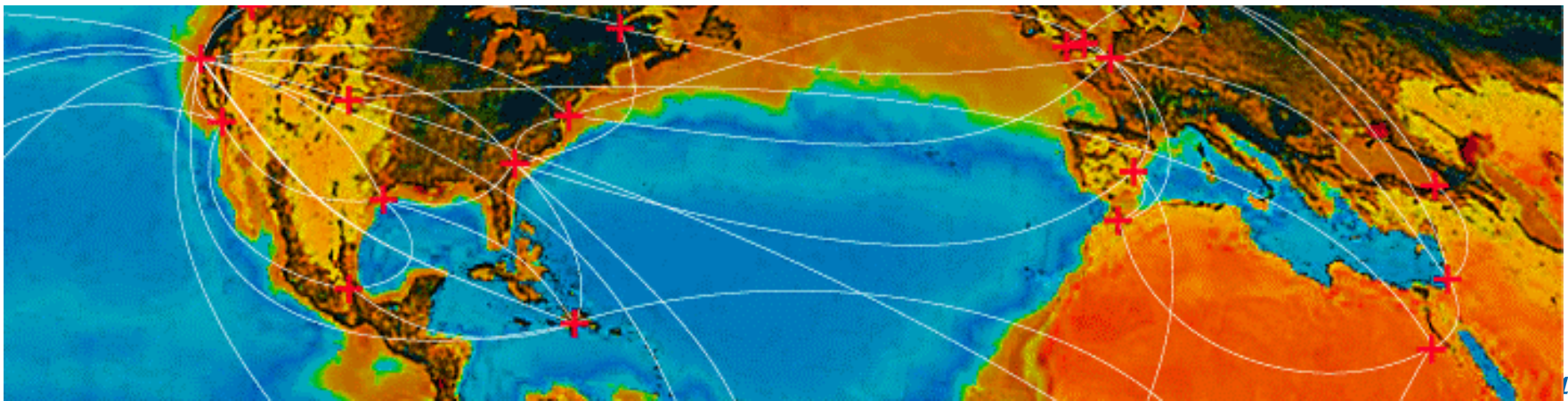
# Fully Integrated Services

- Top level of the management hierarchy of needs
- Point of full integration of business issues with IT infrastructure and data management
- Facilitated through iSRM and enterprise management integration
- Also involves a level of application and data-focused collaborative efforts across the IT organization

# Adaptive enterprise computing

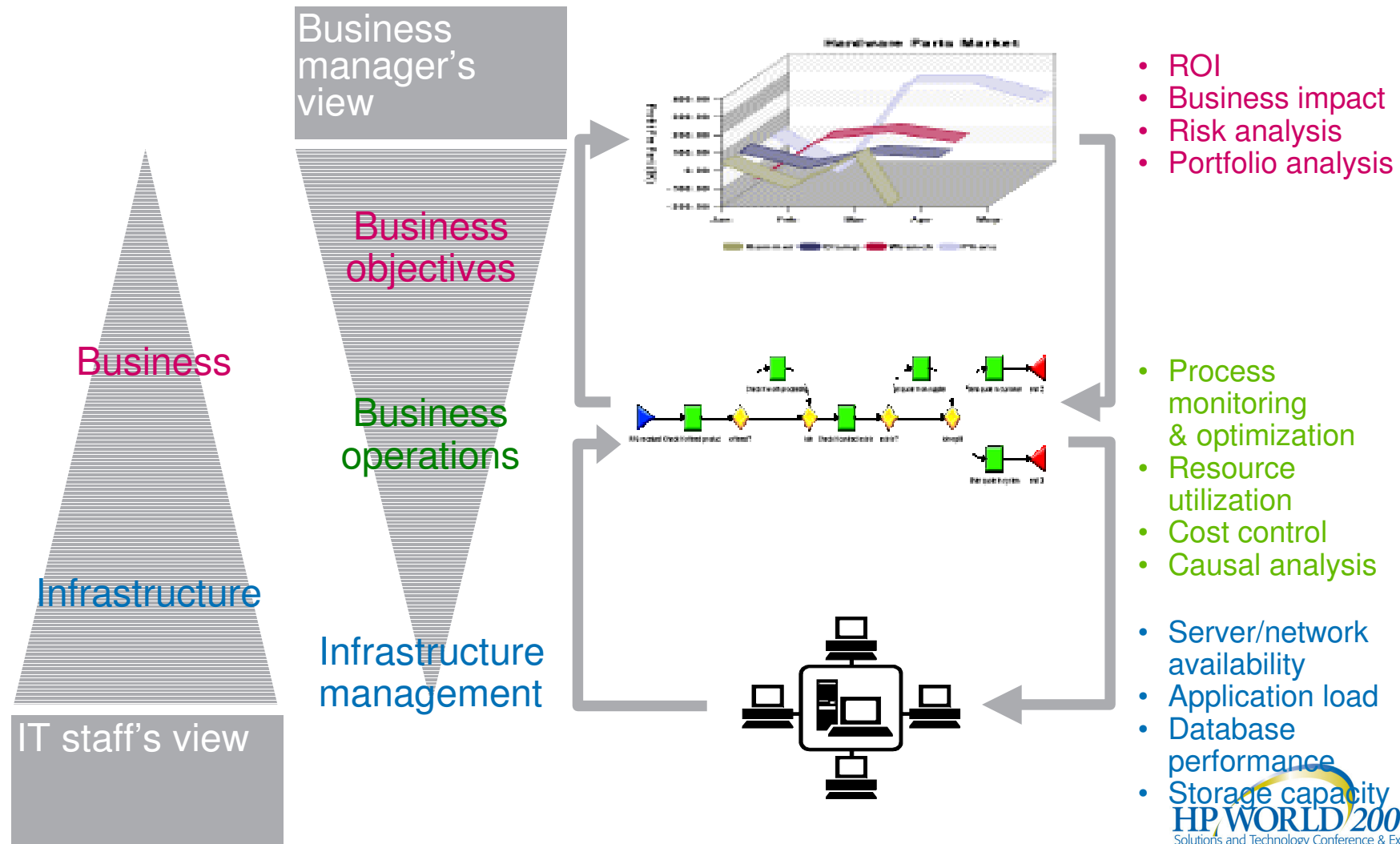


- Enable integrated business process and IT management
- Flexible, economical and trusted utility computing
- Dynamically allocate shared virtualized resources
- Wire once, rewire IT infrastructure programmatically in minutes
- Efficient energy control



# Fully Integrated Services

(HP strategy examples)



“Management software allows customers to run IT as a “services delivery” business. It allows CIOs to take cost out of their IT infrastructure and put those dollars into applications to enable the business.

Nora Denzel, HP







# Storage Management Progression Recap

## Fully Integrated Services

Device View

Device Monitor/Mgt

Data View

FS + Basic BU

Integrated SAN Management and Trouble Reporting

Advanced Data Protection and Media Services

Advanced Storage functions

integrated Storage Resource Management

Automated Policy Management

Fully Integrated Services



Ordered pace for  
Enterprise Management  
build out

“The ability to manage change is increasingly the difference between the companies that win and the companies that lose.”

Carly Fiorina







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