



# Storage Architectures for Server Blade Environments



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# Topics

- Storage requirements driven by server blades
- Migrating from traditional to blade environments
- Storage infrastructure
- Virtualization and provisioning
- Deployment

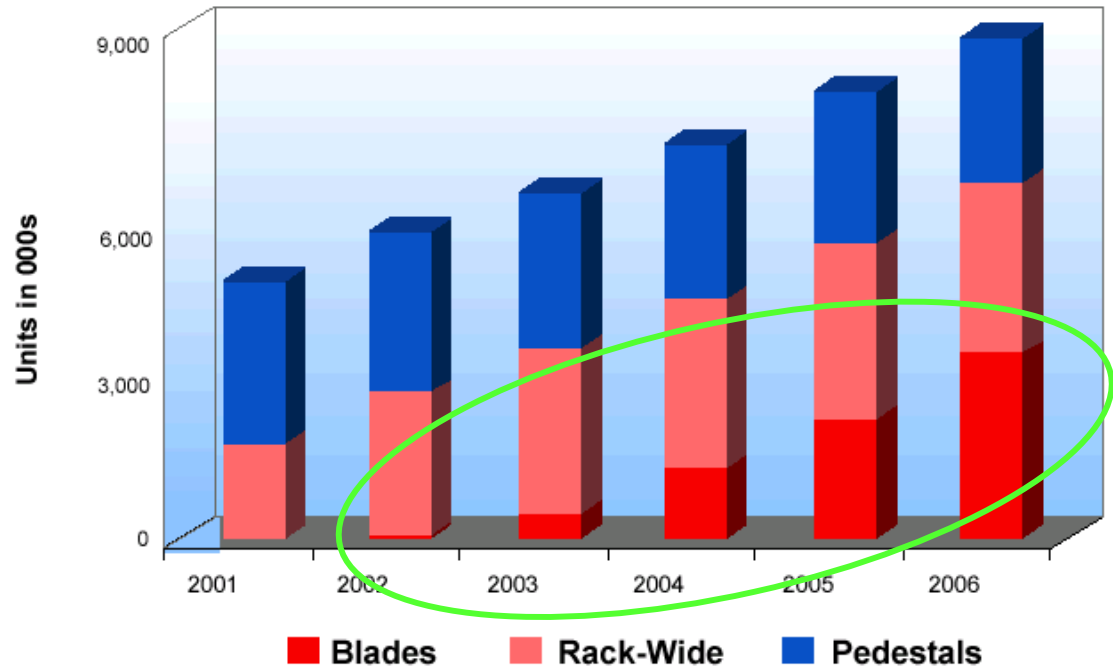
# Blade server adoption will drive new storage deployments



Blades will account for 25% of all Server Shipments by 2007

(IMEX Research)

Standard High-Volume Servers  
WW Market Forecast 2001-2006



Source: IMEX Research ©2003

The blade computing market is one of the few bright spots in today's information technology business. Industry analyst IDC remains bullish about the blade market, reaffirming its forecast for server blades to generate \$3.7 billion in revenue by 2006.

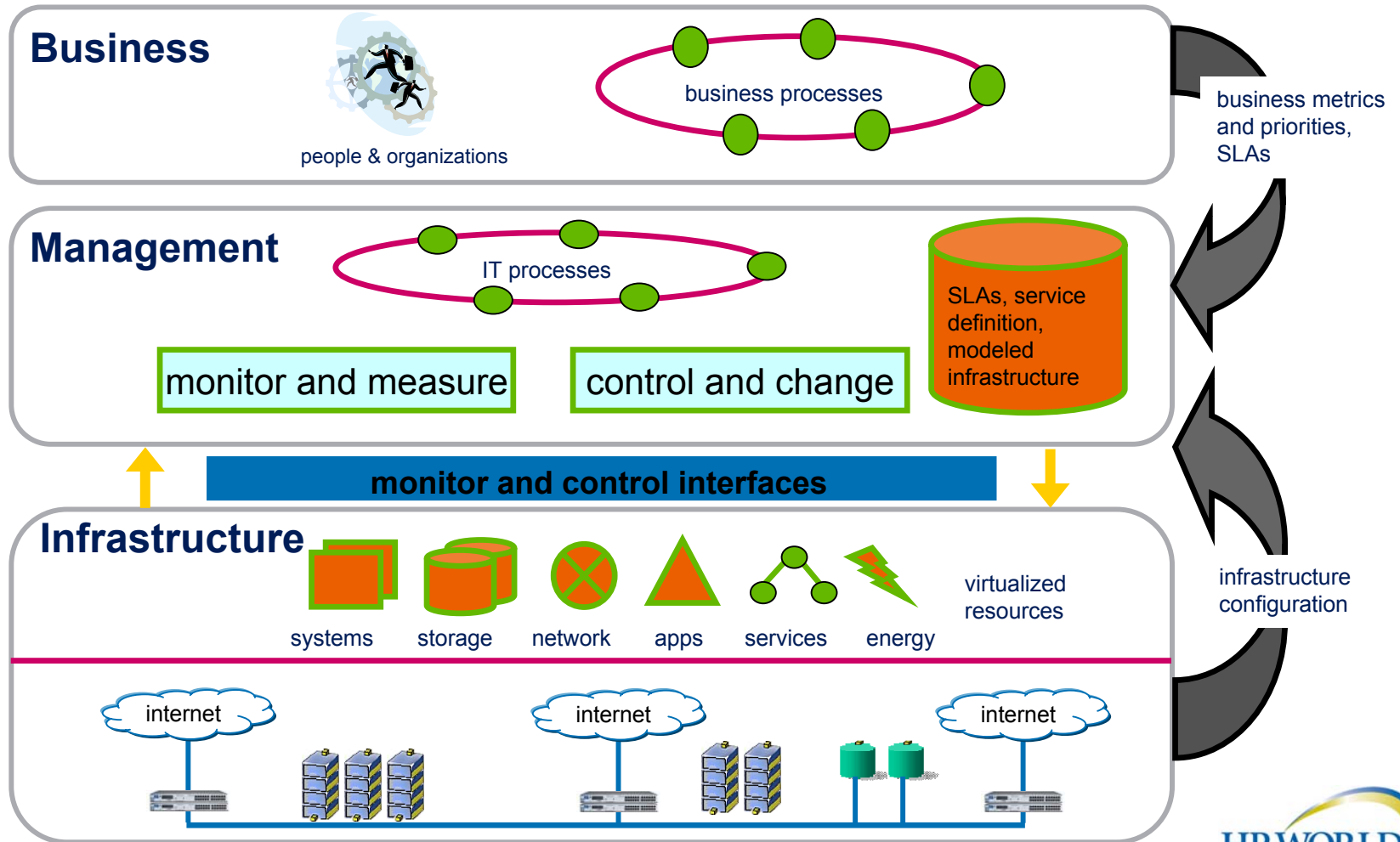


# The coming shifts for IT infrastructures

- All processes and content will be transformed from physical and static to digital, mobile and virtual.
- The demand for simplicity, manageability and adaptability will change how customers work and organize, buy and use technology.
- There is going to be a shift...
  - From hardware focus
  - To ecosystem focus
- The emerging focus:
  - Managing the environment **holistically** and **provisioning** it to the business environment



# Satisfying the shifts



# Key storage requirements

- Requirements stem from blades moving toward little embedded storage of their own
  - Use embedded capacity for swap space, data caching, and other temporary purposes
    - Not OS boot image
    - Not local data storage
- Most compelling benefit of blades come when connected to networked storage
  - Have a ‘personality’ move from one blade to another
  - Failover options
  - Dynamic provisioning

# Special considerations

- HBAs go away
  - GBICs, RNICs and other networking connectivity is a daughter card
  - How to replace the “lost” functionality?
- Blade server racks will include networking
  - Ethernet switches
  - Fibre channel switches
  - FC and Ethernet connectivity through the backplane



# Blade server system overview



Blade systems unify servers, storage, & networking to increase utilization and agility

Blades are optimized to minimize installation time and downtime

Blades are the best-managed industry standard servers

Built-in fabrics make blades an ideal modular building block for virtualization

Ultra-dense blades improve data center utilization

Shared power infrastructure reduces power consumption

Blades plug into a backplane no cabling or cable management

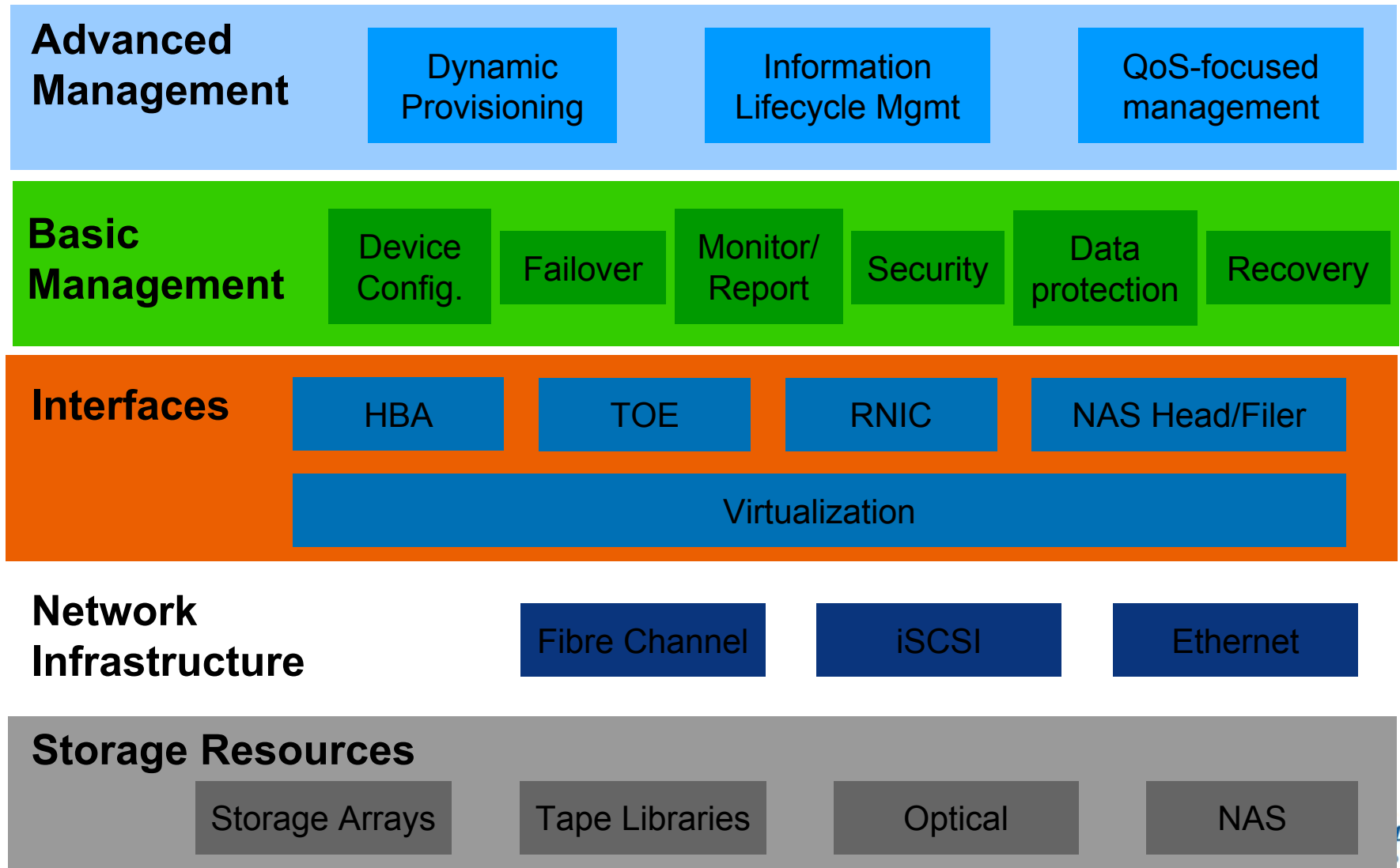
Built in power and network redundancy simplifies high availability

Standardized server, storage, networking simplify management

Integrated lights-out management provides secure access and control from anywhere

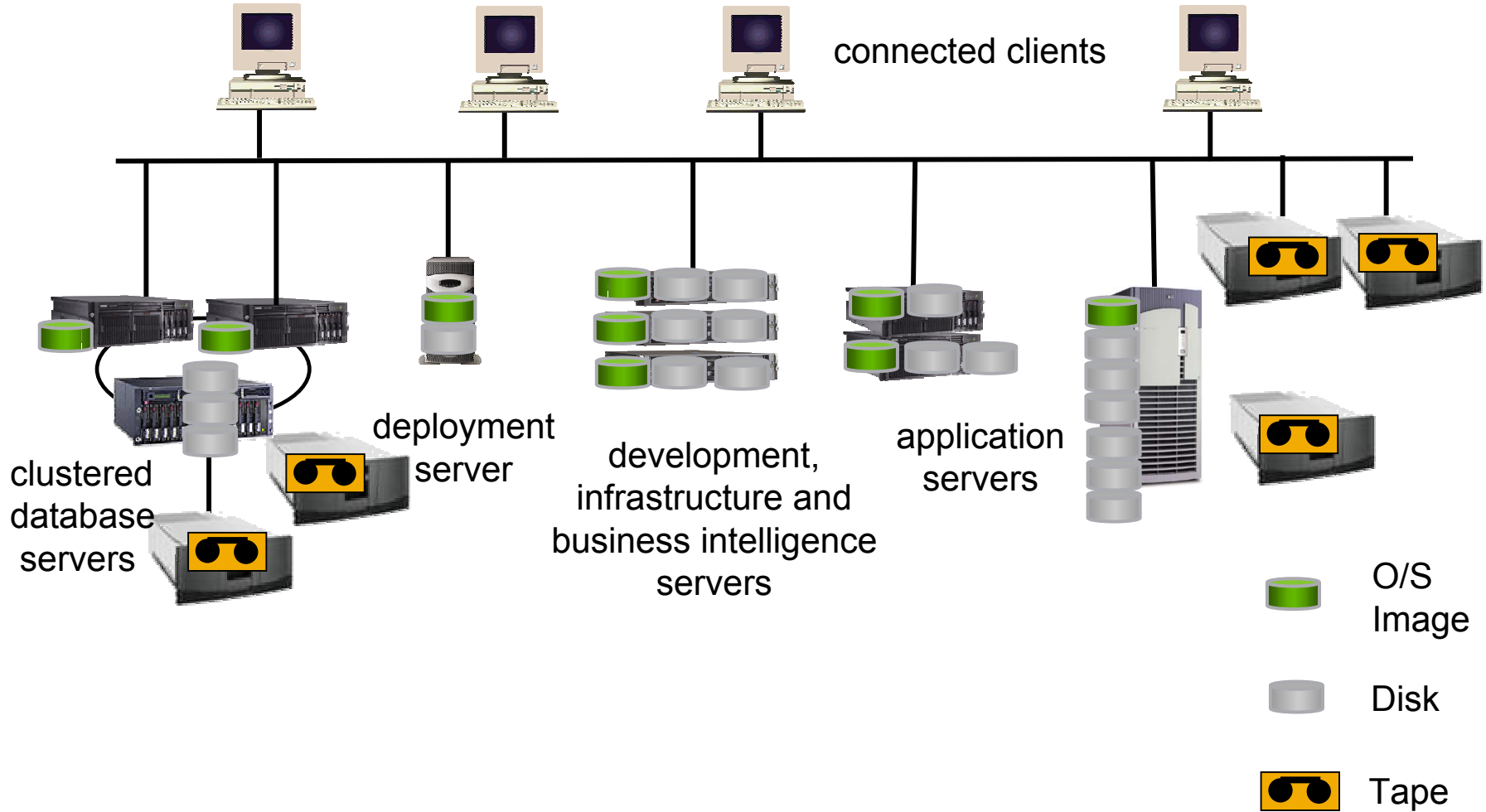


# Developing an overall storage architecture



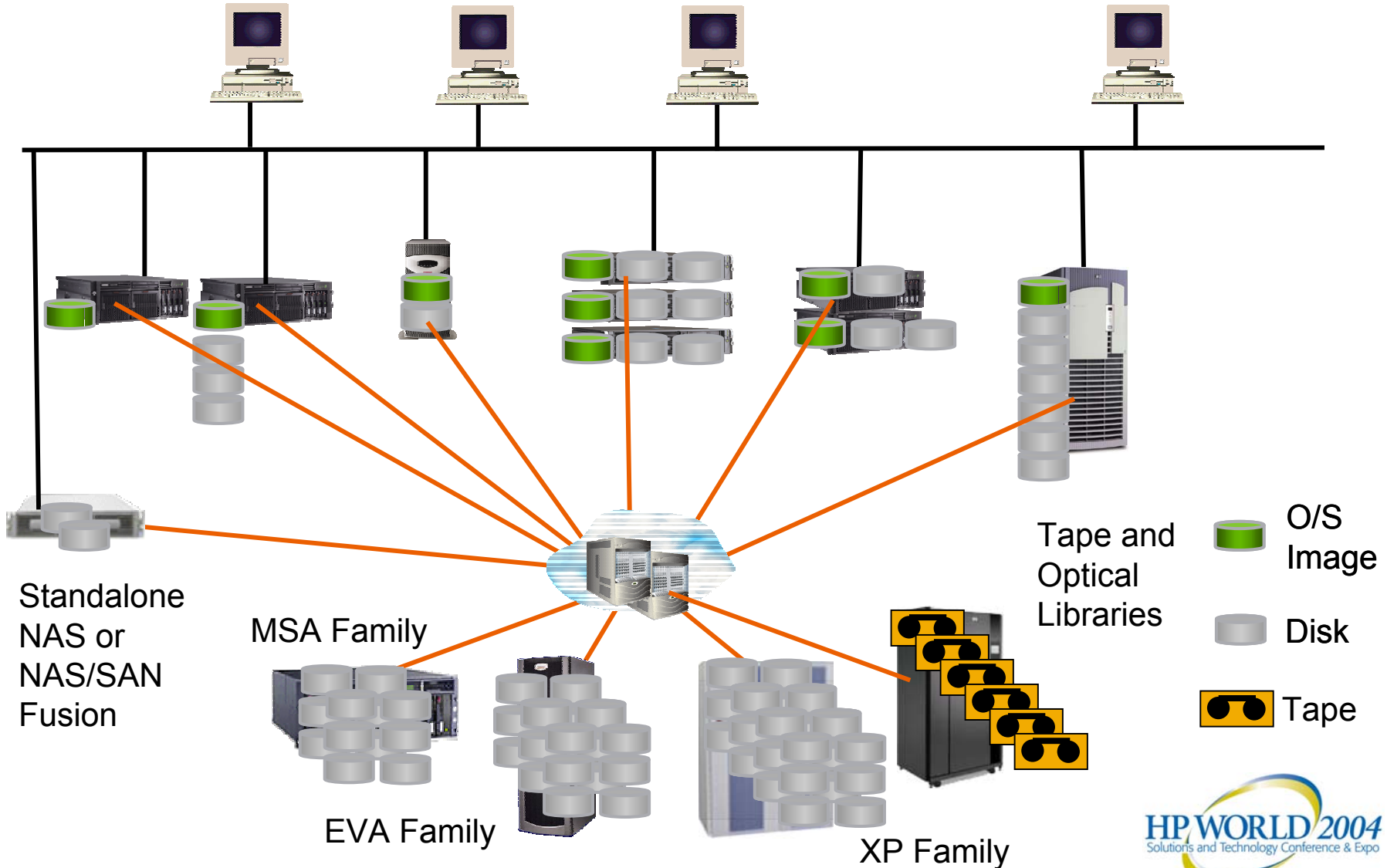
# The evolving environment

## Today's growing environment



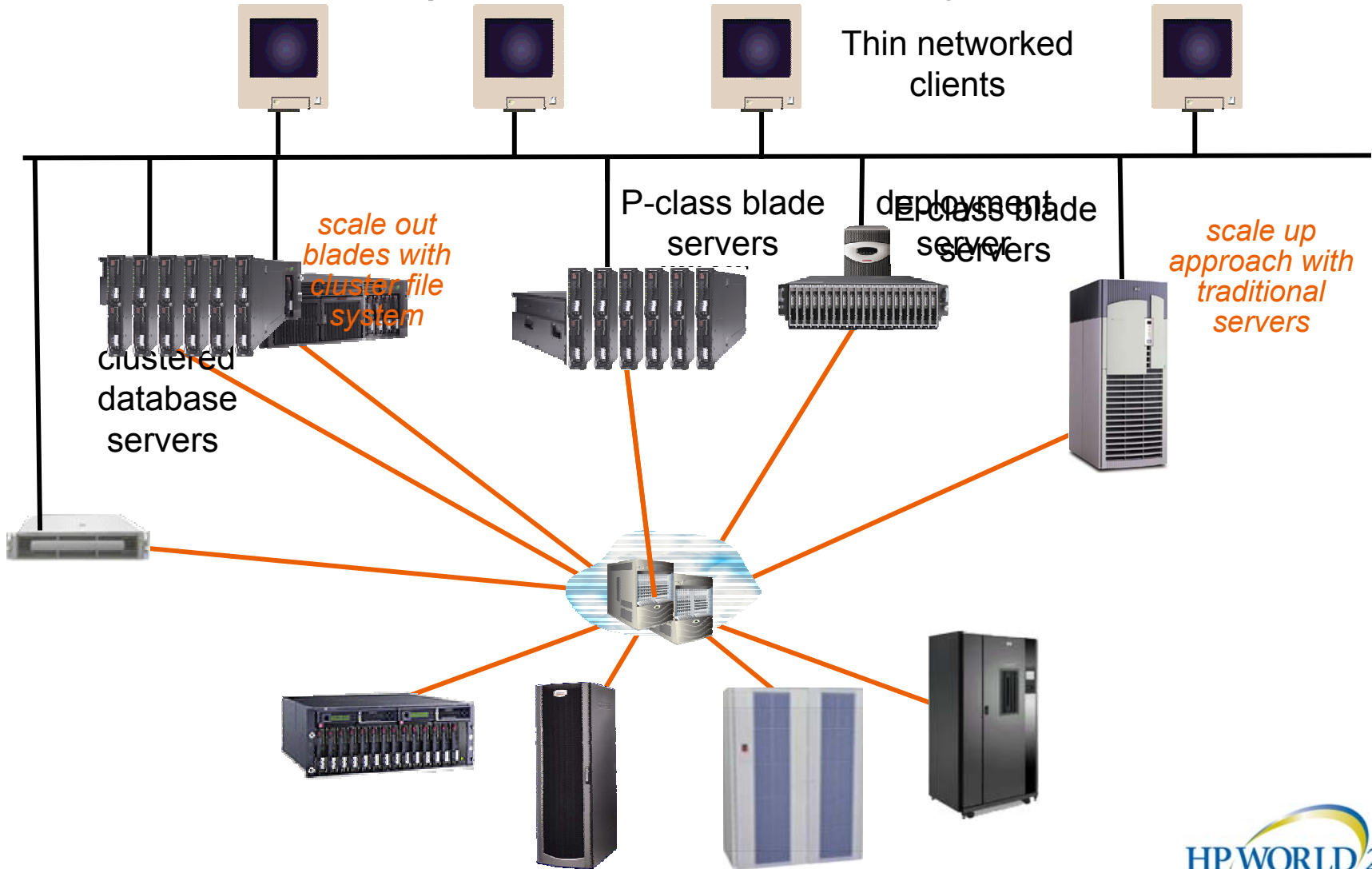
# The evolving environment

## Step 1 (or 2): consolidate storage



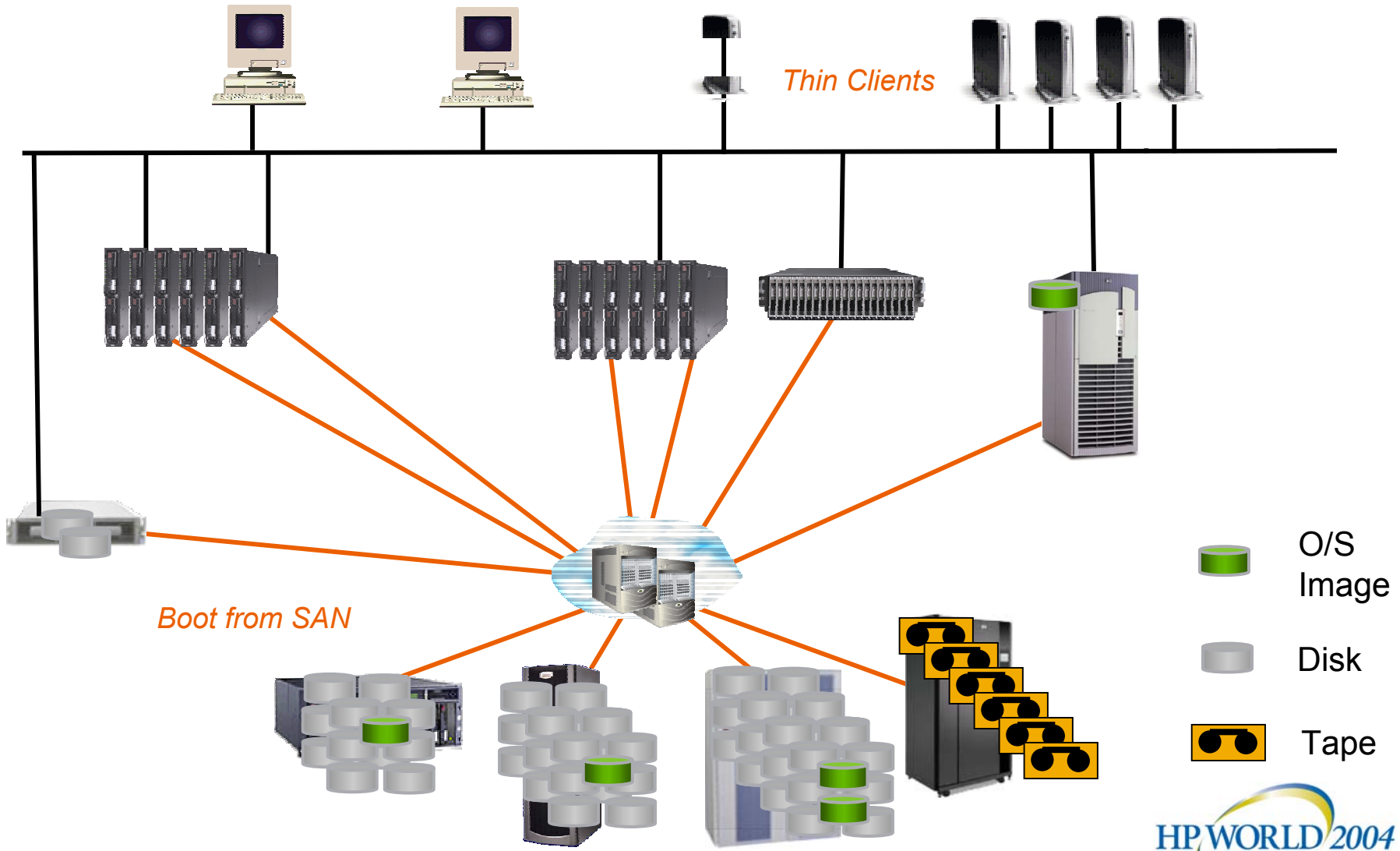
# The evolving environment

## Step 2 (or 1): consolidate systems

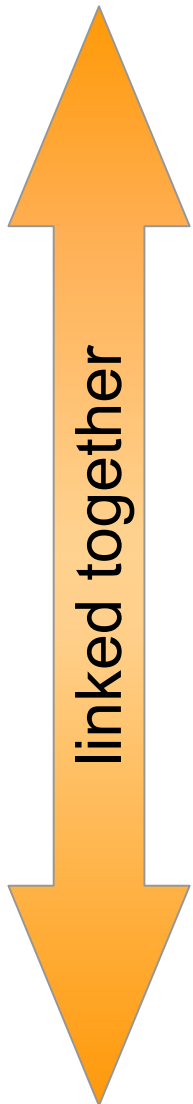


# The evolving environment

## Step 3: stateless computing



# HP delivers single pane of glass management



## Service Centric Management

- Example: Service Desk, Navigator

## Enterprise Operations Management

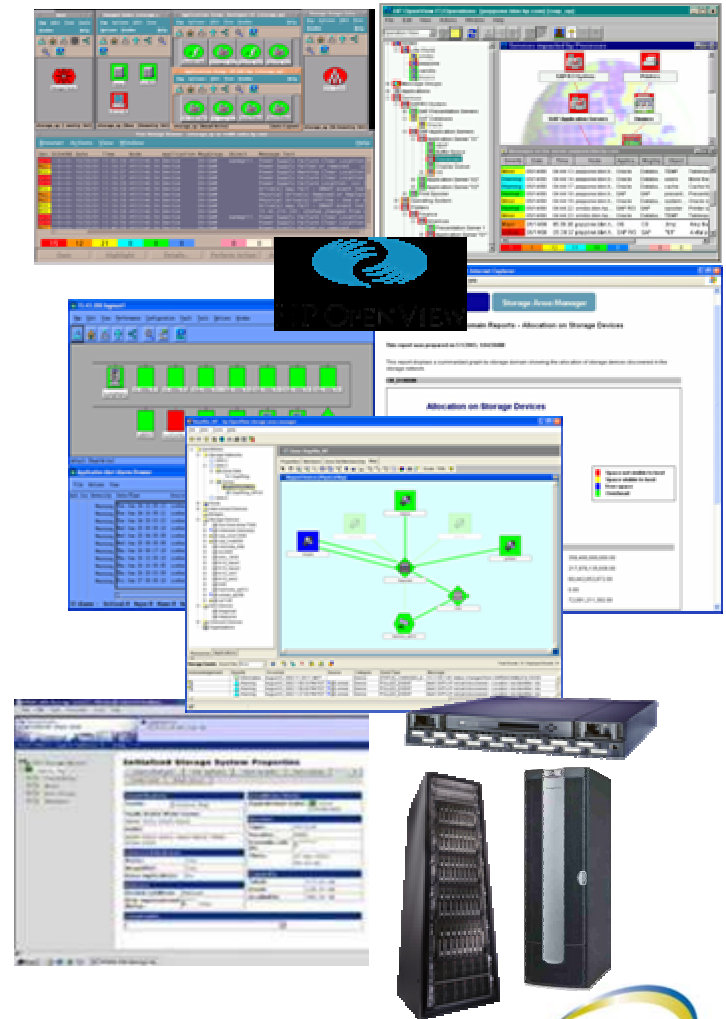
- HP OpenView examples: Reporter, Network Node Manager

## Storage Area Management

- Example: HP OpenView SAM

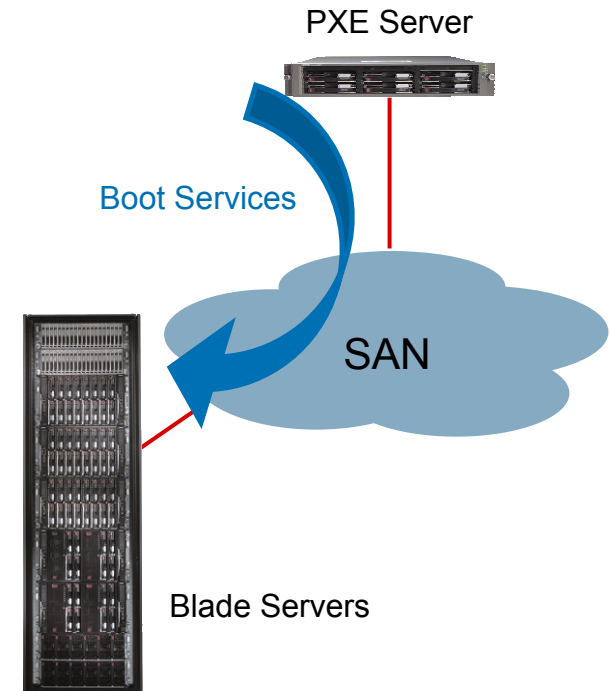
## Element Management

- Common interface, HP StorageWorks Command View, Systems Insight Manager



# Providing storage to servers

- Today: boot locally
  - Configure storage
  - Manually present LUN to blade server
  - Write any images needed by the server to its LUNs
  - Start the application
- Boot from SAN
  - Configure storage
  - Present LUN to blade server
  - Boot blade to PXE server
  - Enable BIOS on server's network interface to see array
  - Write any OS, images needed by the server to its LUNs
  - Add drivers to OS to see the storage network



Requires manual interaction with three management interfaces

Server  
Storage  
Network

# As blade connectivity to SANs increases...

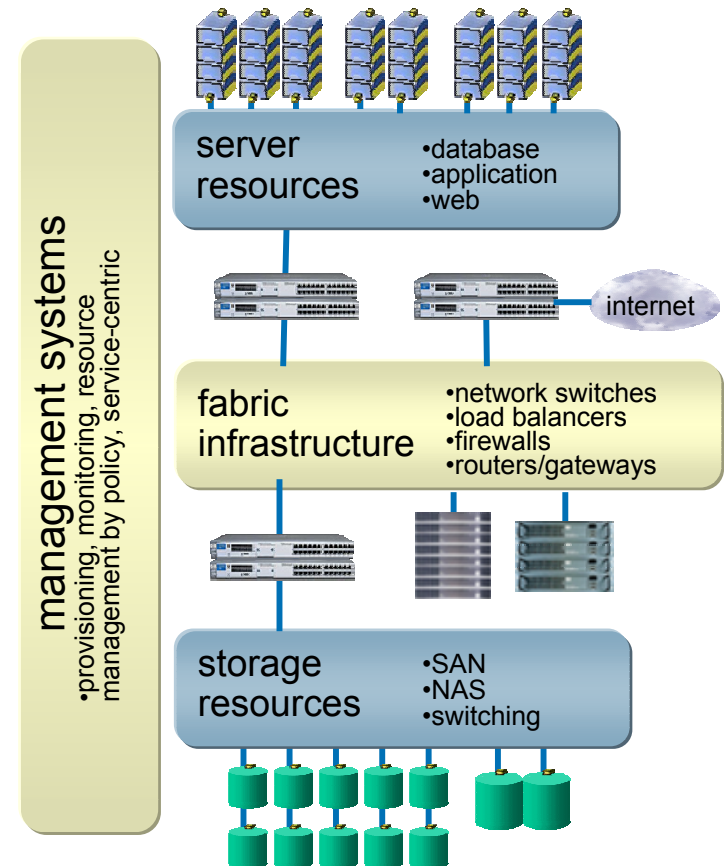


- Extending the 'reach' of networked storage is important
  - More cost/connectivity options
    - Ethernet SAN (iSCSI, RDMA, etc.)
  - Lower cost storage systems
    - Incorporate SATA, SAS devices
- The number and types of servers supported concurrently per controller port becomes increasingly important
  - Especially as PC blades are added to the mix




# Fabrics within future data centers

- Data Center Fabrics
- Fabrics connecting heterogeneous “islands” of compute & storage resources
- “Ethernet everywhere” scaling across the datacenter with RDMA/TCP (iSER) efficiency
- Routers & bridges translate between heterogeneous infrastructure islands
- Enabling Utility Computing
- Static n-tier architecture (DISA) enhanced by dynamic resource pools
- Resource access managed by UDC, ProLiant Essentials and HP OpenView
- Functions virtualized over the fabric



# Data center network infrastructure evolution

**storage**



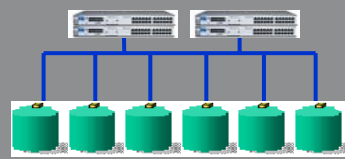
## Today

- SAN  
1, 2, Gigabit Fibre Channel
- NAS (storage over IP)

## Tomorrow


- SAN  
1, 2, 4, 8/10 Gb FC
- iSCSI (storage over IP)

**storage fabric**



storage elements

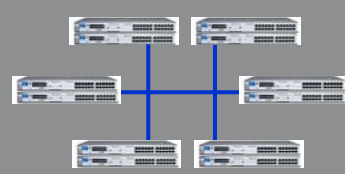
**networking**



- 1 Gigabit Ethernet
- KVM over IP (Lights-out management)


- 10 Gigabit Ethernet
- IP acceleration (TCP/IP and IPsec)
- IP Fabrics (RDMA/TCP)

**data center fabric**



fabric switches


**clustering**



- Proprietary Solutions (ServerNet, Myrinet, etc.)

- InfiniBand Fabrics

**compute fabric**



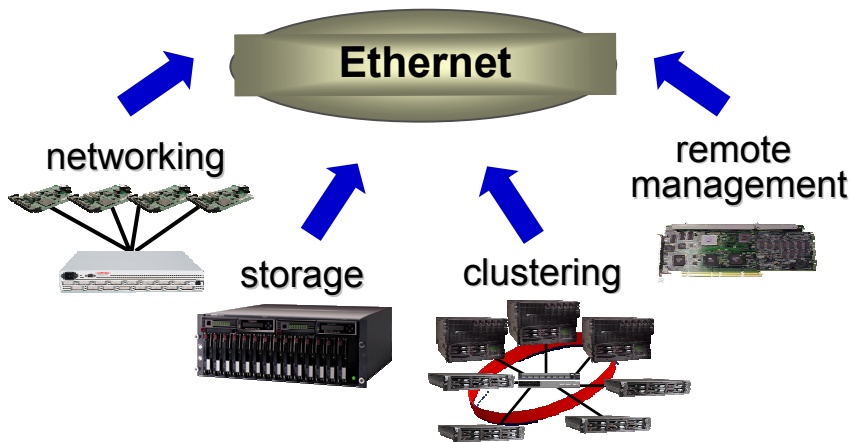
compute elements

# Fabric directions

Enhance IP infrastructure capabilities to increase solution performance and enable platform extension while leveraging Ethernet pervasiveness

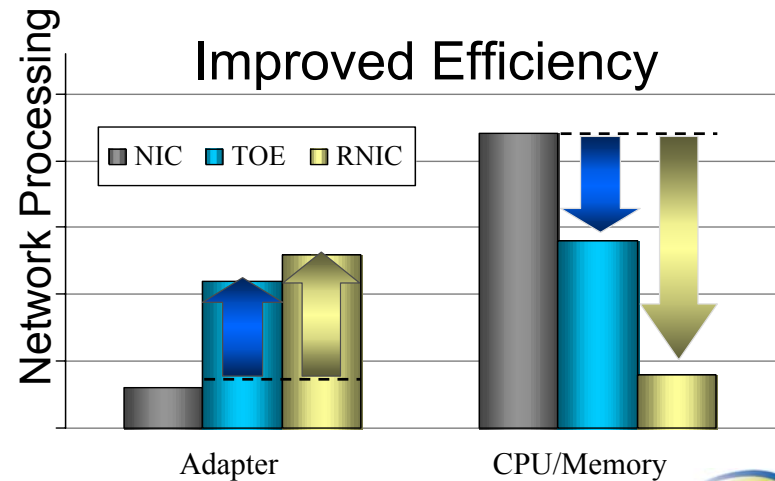
## Simplify infrastructure

- Consolidate ports
- Converge functions
- Centralize management



## Just better networking

- Lower CPU utilization
- Free memory bandwidth
- Increased overall solution performance



# As more information assets are deployed

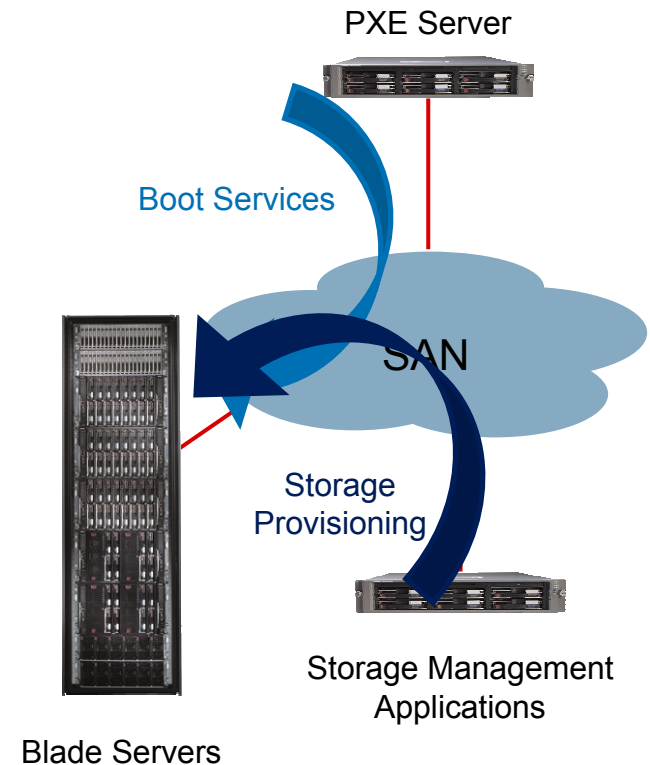


- Ensuring cost-effective usage of all physical assets is essential
  - Automatic, dynamic provisioning
    - Storage and servers
    - To application requirements (SLA, QoS) rather than IT requirements (generally, pure cost)



# Automatic provisioning of storage

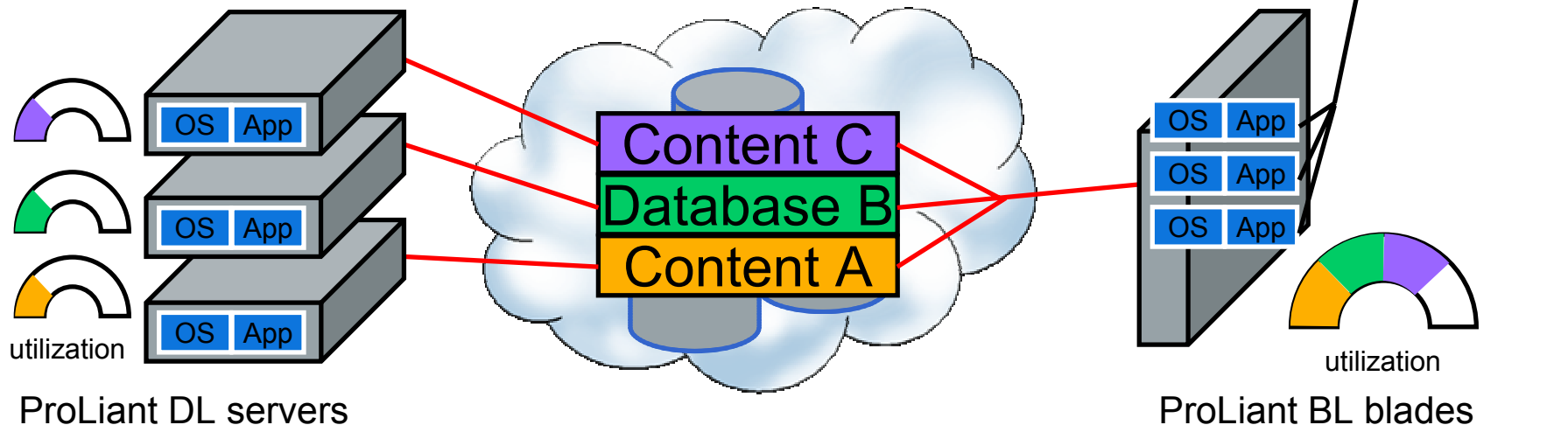
- The ultimate goal
  - Automatically configured storage
    - Driven by QoS and other attributes
  - Management Server recognizes application workload requirement
    - Management Server dynamically presents appropriate LUNs to blade
- Manual intervention is significantly reduced
  - Plug components in
  - Set provisioning policies
  - All done through a single management interface



# Virtualization: blades and storage 'scale in' approach



*Build on advantages of virtualized storage...*

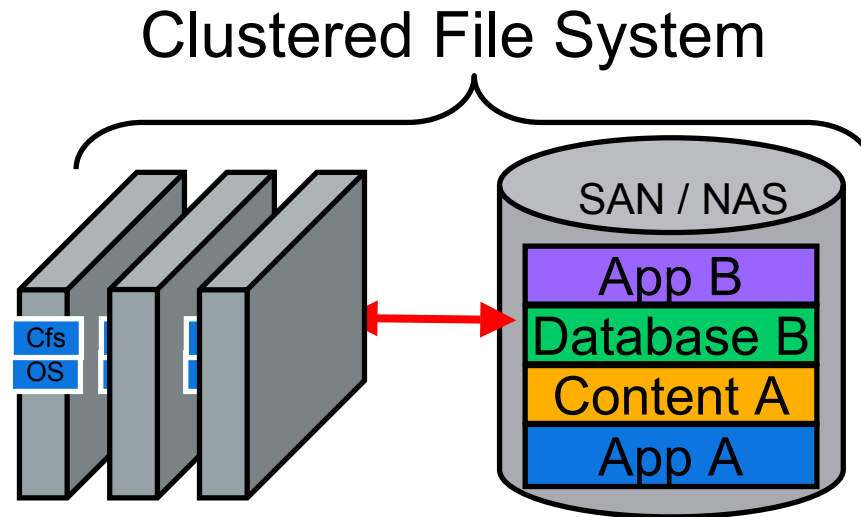


## Virtualized storage + virtualized blade resources

- Excess capacity on smallest scale out building block
- Server maintenance measured in physical instantiation
- Partition at the OS, reduce application contention
  - Leading choices: VMware, Microsoft Virtual Server
- Partition the Resource
  - Leading choice (Windows): HP ProLiant Essentials Resource Partition Manager
- Net effect: better utilization, efficiency, flexibility



# Virtualization: blades and storage scale-out architecture



## Leveraging virtual storage and clustered file systems

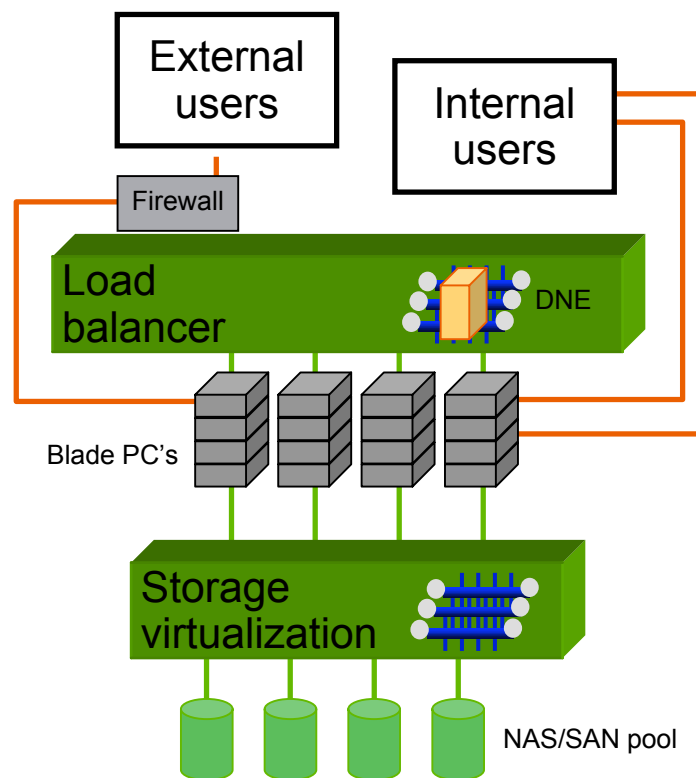
- Storage efficiencies: better storage utilization, more efficient admin usage
- Shared files (lock managed across nodes) with “clustered file systems”
  - Leading choices: PolyServe, Sestina (RedHat)
- Parallel database clusters – scale-out databases (Oracle 9i RAC and 10g)
- Scale a large application across blades for higher performance and availability.... at lower cost than large SMP UNIX servers

# Blades everywhere...

## Extending to the desktop



- Consolidated Client Infrastructure (CCI)
  - A total HP solution that enables enterprise customers to consolidate their desktop infrastructures
  - Provides a flexible, personalized environment
  - Supports static and dynamic blade allocation
    - Dynamic enables “less than one blade” per user and is disaster tolerant
    - Static allocates 1 blade/user; appropriate for users needing system level access





# HP's Consolidated Client Infrastructure

## Flexible personalized environment



### Today's PC

### CCI solution



Access, compute and storage all in one package



Access Tier

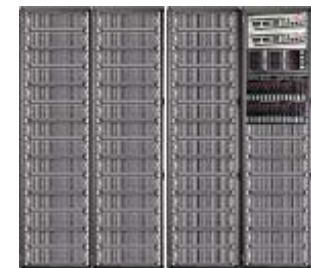
HP thin client  
TFT display



↕ 1:1 blade to thin client via RDP + standard Ethernet

Compute Tier

HP Blade PC bc1000  
Proliant e-class  
Enclosure / Switch  
Load Balancer



Resource Tier

SAN or NAS  
Shared printers  
App servers

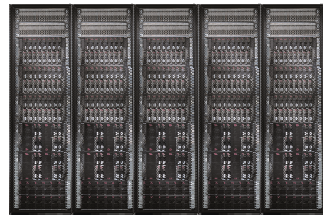


# StorageWorks Scalable File Share simplification with a clustered file system



## Storage Clients (CFS)

Workstations & Application Servers (trad. Servers, blade and PC servers)

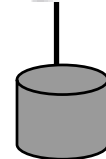


### Attributes

- Highly scalable (performance, capacity, # clients)
- Single system image
- Shared data access (includes lock management)

## Metadata Servers(MDS)

Serve File Metadata



Parallel Data Transfer  
File Locking

Metadata Access  
Concurrency

Storage Control  
(recovery, file  
status, file  
creation)

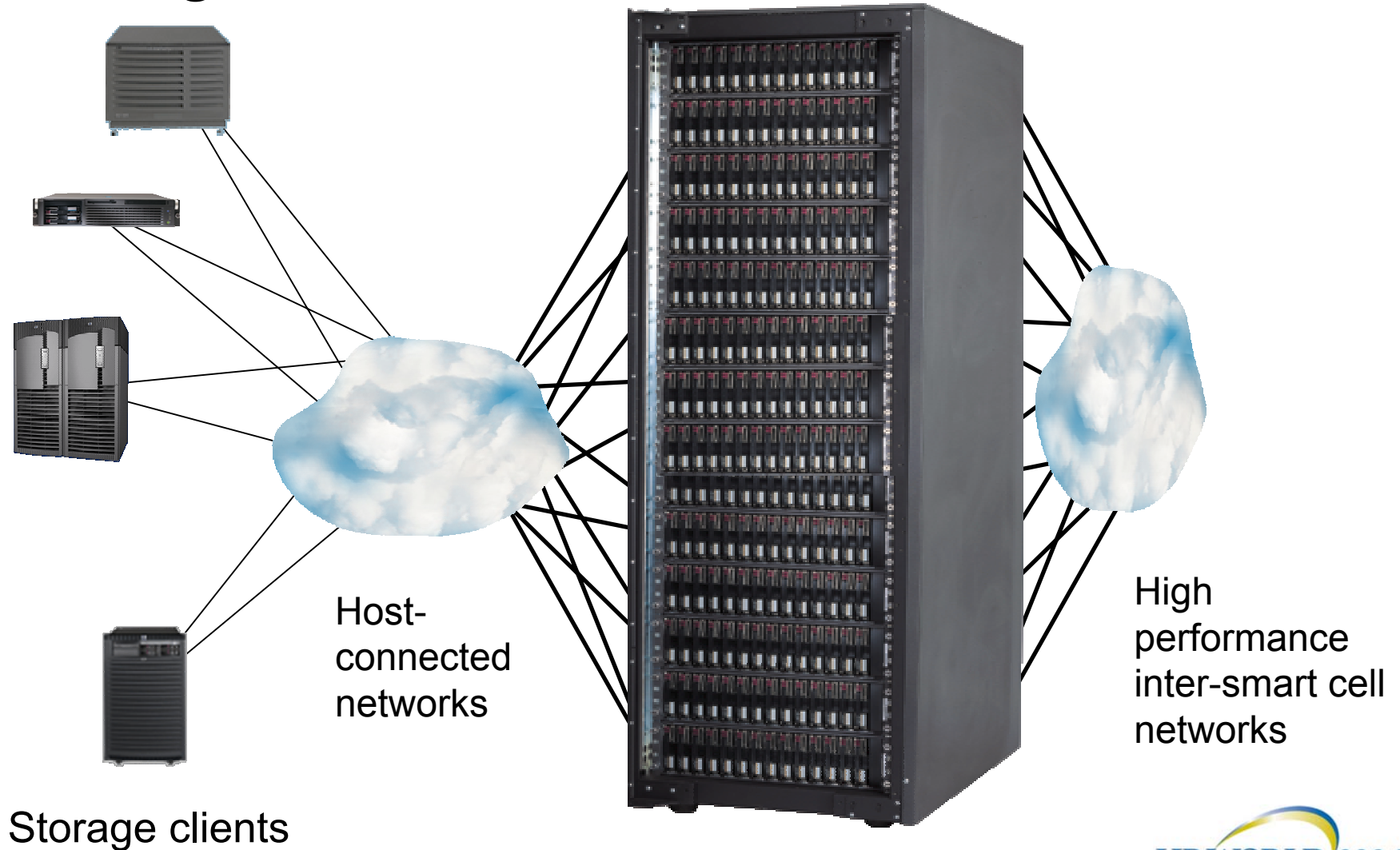
## Object Storage Targets (OST)

Serve File Data



# Storage architecture for the future

## StorageWorks Grid

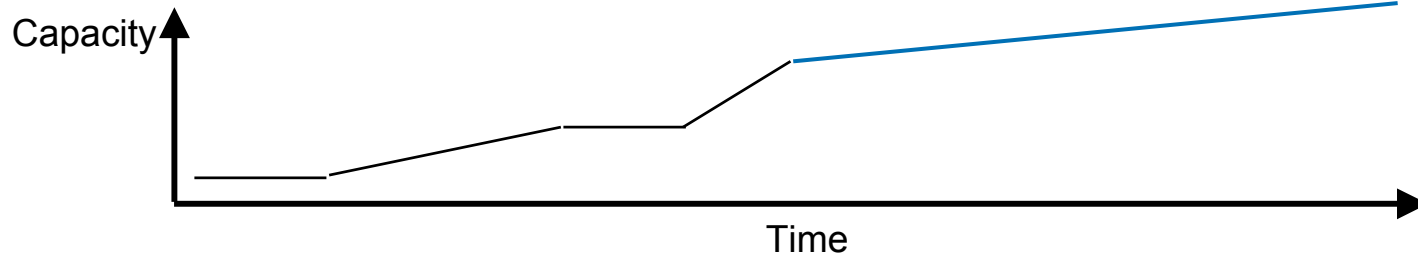


Storage clients

Host-connected networks

High performance inter-smart cell networks

# Planning for the future



Plan for the future, deal with today  
Acquire with both “today” and “tomorrow” perspectives  
Refine overall management as feasible



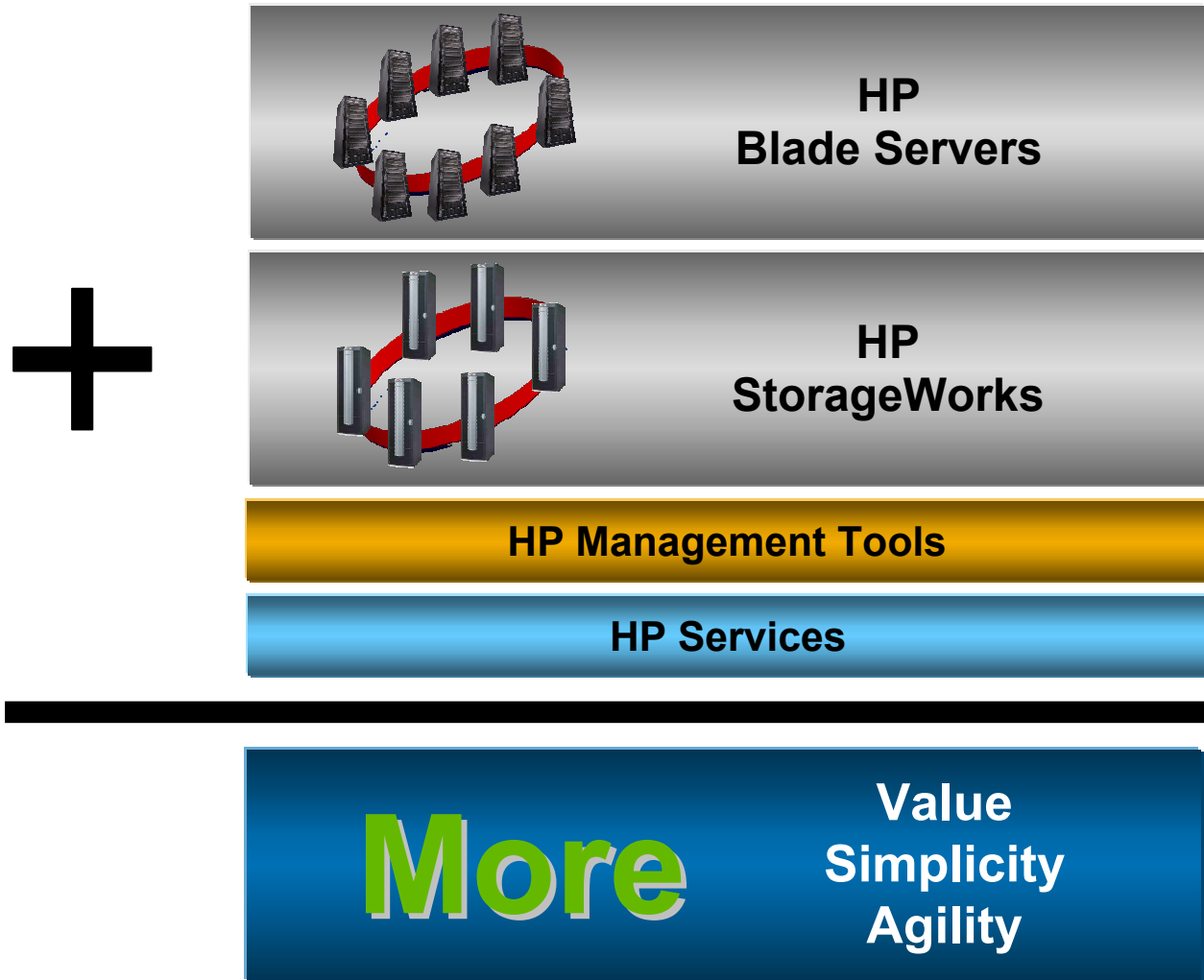
# HP Services for blades and storage

- Total IT services from a single provider
- IT consolidation services
- Architecture & design consulting services
- Storage infrastructure solutions
- Migration services
- Storage deployment services
- Mission-critical support services
- Support services
- Multi-vendor environment services
- Managed services



*Customers are looking for a knowledgeable, experienced service provider to help with their IT infrastructures*

# HP blades and network storage together deliver more for the Adaptive Enterprise



# Customer example: KT FreeTel Co. Ltd. (KTF)



## Customer challenge

- KTF – large Telco and Network Service Provider
- **Goals**
  - Telecom Billing Solution for IP data billing
  - Improve TCO of server infrastructure
  - Reduce cost of SUN infrastructure (installed base)

## HP solution

### Infrastructure

- 140 ProLiant BL blade server farm: 2p p-class blades servers running Linux
- HP StorageWorks EVA SAN (3TB of storage)

### Applications

- Applications developed by solution partners for blade server infrastructure
- IP billing and usage collection application.

## Customer results

- Lower cost of infrastructure – in comparison to Sun Microsystems
- Why HP?**
- Excellent account team partnership
  - HP products and Services

# Customer example: Large U.S. bank/financial service



## Migration from Solaris SMP to Linux Blade cluster

### Customer challenge

- Large NA Bank – a transaction reconciliation application
- **Goals**
  - Dramatically improve the price/performance of server platform
  - Ability to manage the blade cluster as one machine
  - Successfully migrate a Solaris application to Linux

### HP solution

#### Infrastructure

- ProLiant BL blade server farm: 2p p-class blades servers running Linux
- HP Blade management tools: RDP, Insight Manger
- StorageWorks EVA SAN

#### Applications

- Clustered file system from PolyServe
- F5 Networks Big-IP Blade Controller S/W for virtual IP load balancing of the cluster
- Custom application migrated from Solaris

### Customer results

- Application has improved performance by 25%
  - Platform costs reduced by 70%
- Why HP?**
- Good account team relationship
  - Demonstrated technical expertise in implementing HP ProLiant blades and SAN connectivity
  - Blade Management tools
  - Long term investment protection of blade system infrastructure



# HP blades and network storage together deliver more for the Adaptive Enterprise



## Simplicity

- Consistent hardware implementations across the data center
- Remove 1 to 1 relationship of hardware and image
  - Boot servers from SAN for quick and consistent O/S and app image
  - Server image or client “personality” can reside on any blade
  - Users can access their desktop personality from anywhere
- Centralized Back-up via SAN arrays and libraries

## Agility

- Quickly deploy and change data center
  - Quickly present applications with Blade/SAN environment
  - Quickly present application data to any blade (host)
  - Rapidly change server role to meet business requirements in real-time
- Architectural approach for growth
  - SAN storage enables online volume growth beyond local disk capacities
  - Virtual blade/storage enables utility-like computing

## Value

- Consolidation to increase utilization and reduce costs
- Network storage enables high availability for maximum uptime
  - Clustering
  - Remote Replication

# Summary

- Modular storage has been “bladed” for several years; for storage, it was needed to provide the sort of agility, extensibility, and flexibility demanded for complex server environments. Blades are really an extension of those environments.
- The best storage infrastructure for blade environments — for both PC blades and server blades — is networked storage.
  - Server blades: either FC- or Ethernet-based SAN
  - CCI: NAS, NAS/SAN fusion
- Server consolidation (to blades) and storage consolidation (to networked storage) go hand-in-hand.



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