XP1024 Heterogeneous Clustering Solutions

Edwin Alabastro

System / Software Engineer
Hewlett-Packard Company

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Agenda

- Introduction
- Part 1: The StorageWorks Disk Array XP1024
- Part 2: Storage Area Network (SAN) Essentials
- Part 3: SAN Heterogeneous Essentials
- Part 4: Clustering Essentials
- Part 5: Heterogeneous Clustering Solutions
- Part 6: Question and Answer Session

Introduction

- Industry work experience

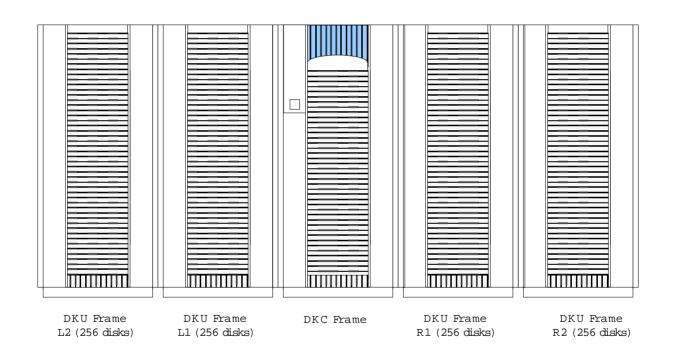- Reasons for presentation

- Audience expectations

Part 1: The storageworks disk array xp1024

- XP1024 Array

- Specifications

- Features

- CHIP (Client Host Interface Processor) Cards

XP1024 array

DKU Frame
L2 (256 disks)

DKU Frame
L1 (256 disks)

DKC Frame

DKU Frame
R1 (256 disks)

DKU Frame
R2 (256 disks)

Specifications

Maximum number of disk drives	1,024
Maximum capacity	129 TB
Maximum cache memory	64 GB
Maximum shared memory	3 GB
Maximum host connectivity ports	64
Maximum number of Array Control Processor (ACP) pairs	4 (8 total)
Host interface cards	64 Fibre Channel cards or 32 ESCON cards or 32 FICON cards
ESCON data transfer rate	17 MB/s
FICON data transfer rate	2 GB/s
Fibre Channel data transfer rate	2 GB/s
Sustained maximum sequential data transfer rate	2 GB/s
Peak cache maximum sequential data transfer rate	3.2 GB/s
Maximum random IO per sec	500 K
Supported disk drives	36 Gb 15K rpm, 73 Gb 10K rpm
RAID Level	RAID 5 / RAID 1
Cache memory battery backup time	48 hours
Shared memory battery backup time	7 days
Supported operating systems	HP-UX, Solaris, AIX, Linux, Win NT/2000, Tru64, etc.

Features

- Fully redundant components, no single point of failure

- Large cache and shared memory
    - 64 GB mirrored cache memory (minimum 4 Gb)
    - Dynamically duplexed cache with battery backup
    - 3 GB shared memory

- Crossbar switch architecture
    - Fast, efficient with point-to-point connections

Features continued

- Disk Capacity and Support
  - From 144 GB to 129 TB capacity
  - 1024 drives supported
  - Disk drives are dual ported native FC-AL
  - 64 FC-AL loops (2 GB/s)
  - Denser disk drive packaging - 256 disk drive packaging per DKU
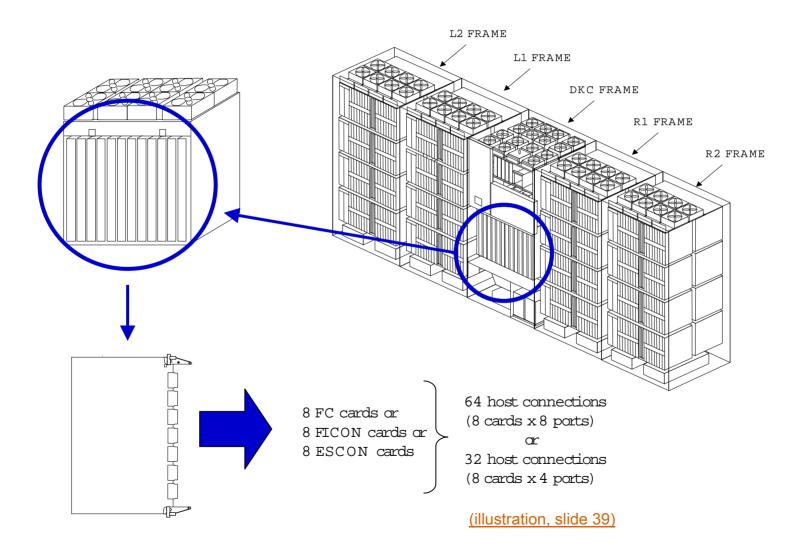 - Denser data center packaging – 1024 disk drives in a four DKU package

Features continued

- **New RAID Support**
  - RAID 1 (4D + 4D)
  - RAID 5 (7D + 1P)

Client host interface processor cards

L2 FRAME

L1 FRAME

DKC FRAME

R1 FRAME

R2 FRAME

8 FC cards or
8 FICON cards or
8 ESCON cards

64 host connections
(8 cards x 8 ports)
or
32 host connections
(8 cards x 4 ports)

(illustration, slide 39)

Part 2: Storage area network essentials

- Must be robust and reliable

- Must be able to support different types of operating systems (OS), i.e., heterogeneous hosts

- Must be secure

- Must guarantee data protection

- Must be scaleable

Robustness and reliability

- Use H/W and S/W components from vendors that formed partnerships or worked together to qualify the products

- The SAN infrastructure must be able to withstand localized server H/W or S/W anomalies (illustration, slide 39)

- Pay close attention to ASCII standards that are vendor unique because it might cause inter-operability issues, e.g., inter-switch communication problem

- Must be able to reliably backup the data from different operating system

- Continuous data availability - 7x24x365

Heterogeneous environment

- Supports different operating systems:
    - AIX
    - HP-UX
    - Solaris
    - Tru64
    - Windows NT / 2000
    - etc.
- Supports different protocols:
    - Fibre Channel
    - ESCON
    - FICON

Security and data protection

- Must be able to secure data within the SAN (using World Wide Name LUN security)

- Must be able to ensure different hosts do not have access to Logical Units (LUN) belonging to other operating system on the same SAN topology

- Must be able to backup and restore the data reliably

Scalability

Initial SAN topology design should take into account future growth in:

- Number of servers
- Number of switches
- Number extenders/converters
- Number of storage devices
- Change in protocols and topologies: from ESCON to FICON, direct-connect to fabric-switch-connect
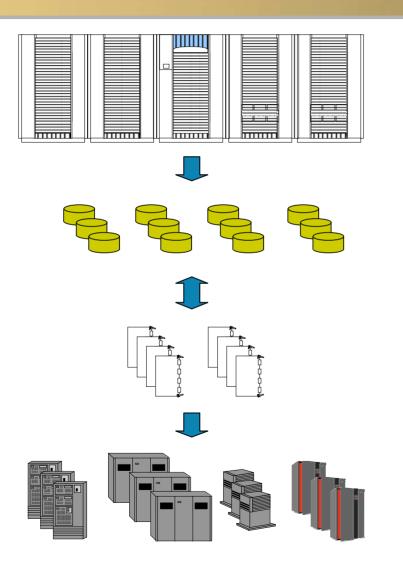
Part 3: SAN heterogeneous essentials

- Storage array connectivity supporting different OS connectivity

- Enough host port connectivity

- Sufficient storage devices

- Correct fabric controller for the environment

- SAN Topology

SAN heterogeneous essentials

Multiple OS Support

XP array supports different OS via Host Mode setting

Storage Scalability

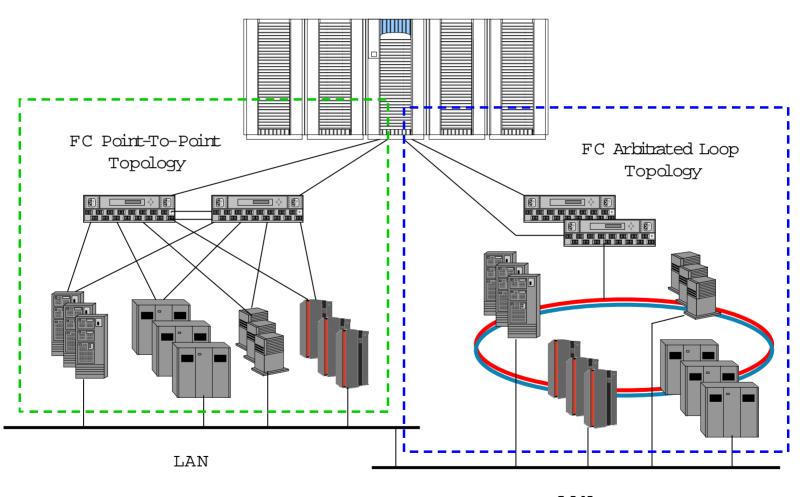XP array can scale up to 129 TB

Multiple Host Interface

XP CHIP cards support 32 or 64 host connections

Heterogeneous Connections

Hosts with different OS. LUNs are secured using WWN of the host bus adapter (HBA)

SAN topology

FC Point-To-Point
Topology

FC Arbitrated Loop
Topology

LAN

LAN

Part 4: Clustering essentials

- Why use clustering?

- What clustering technology to use?

- Leverage on existing technology infrastructure

Why use clustering?

- Provides high availability systems by eliminating a single point of failure

- Online maintenance of systems by moving packages / services from one node to another node

- Load balancing by distributing the I/Os between nodes

- Load sharing by re-routing the I/Os to another host bus adapter (HBA) during an HBA failure

- Failover functions by moving packages / services from one node to another node

- Peace of mind that your data is highly available

What clustering technology to use

- Active / active
    - Multiple independent, redundant nodes
    - Load is balanced between nodes
- Active / passive
    - Multiple independent, redundant nodes
    - Only one node is providing the service
    - The other node is the standby node
- Cascading
    - The resources move through an ordered list of nodes
    - When the primary node recovers and joins the cluster, the resources will move back to the primary node.

What clustering technology to use continued

- Rotating

  - The resource group moves to the next node in the list.

  - When the failed node joins the cluster, the resource group do not move back.

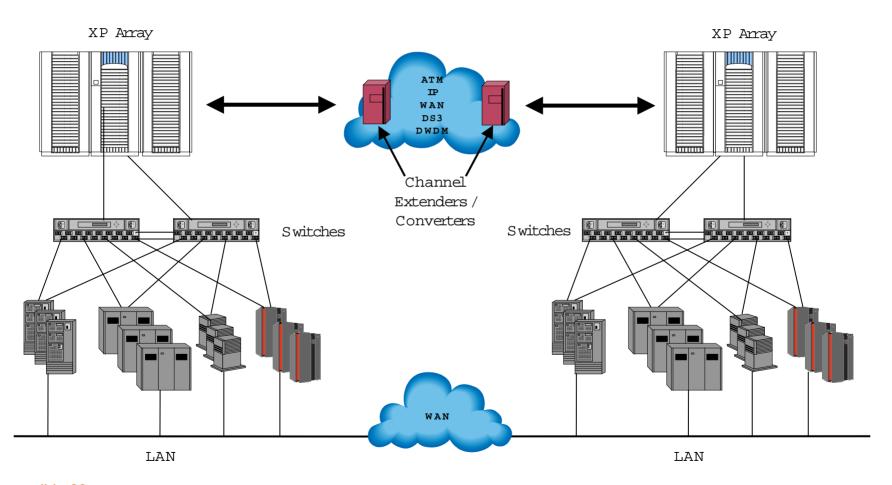# Leverage on existing technology infrastructure

- Decide what core business applications are going to be highly available
  - Databases
  - Enterprise Resource Planning applications
- Decide on the cluster software that is suited for your infrastructure
  - The brand / type of critical servers usually determines the cluster software
  - Distance between the cluster nodes might be a factor
  - Type of extenders between the nodes might be a factor

Illustration, slide 24

Next slide

Leverage on existing technology infrastructure

XP Array

ATM
IP
WAN
DS3
DWDM

Channel
Extenders /
Converters

Switches

XP Array
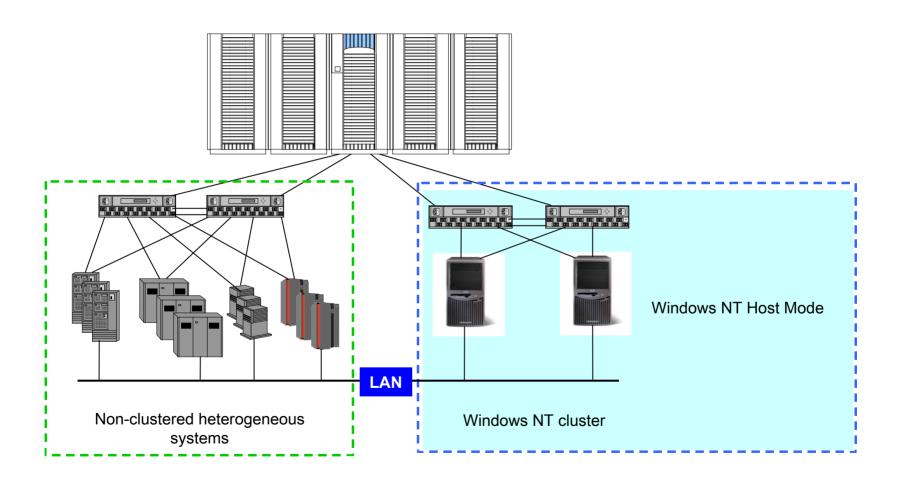
Switches

WAN

LAN

LAN

slide 23

Part 5: Heterogeneous clustering solutions

- Windows NT Enterprise Edition

- Windows 2000 Advanced Server

- HACMP

- MC/ServiceGuard

- SunCluster

- TruCluster

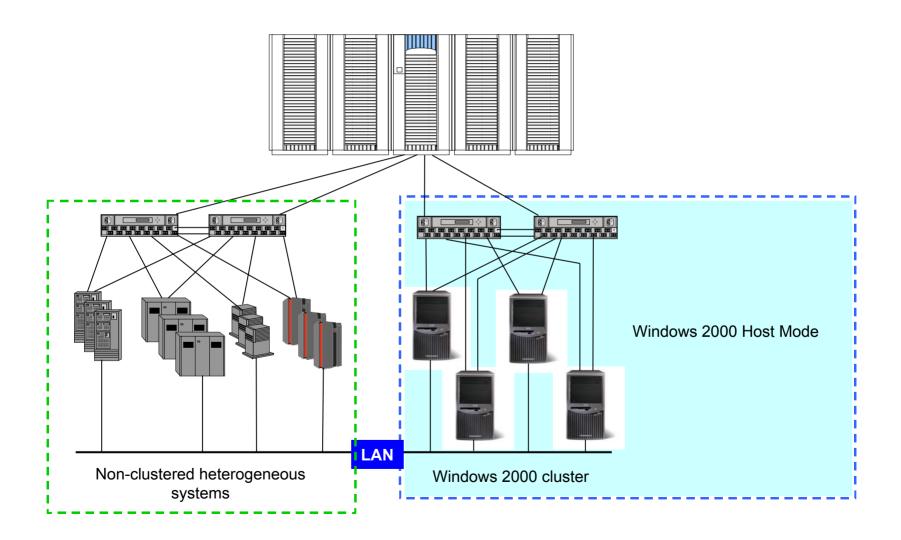- Multi-vendor cluster combinations
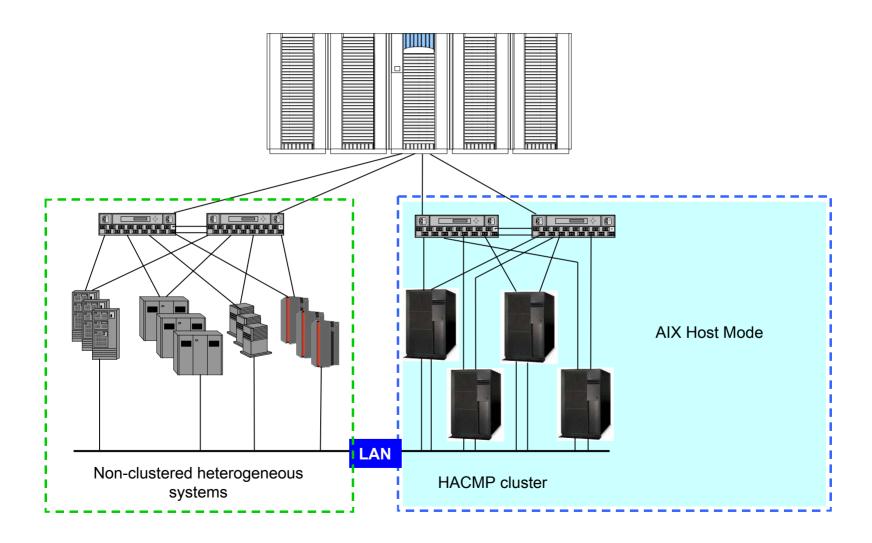
Windows NT Enterprise Edition

LAN

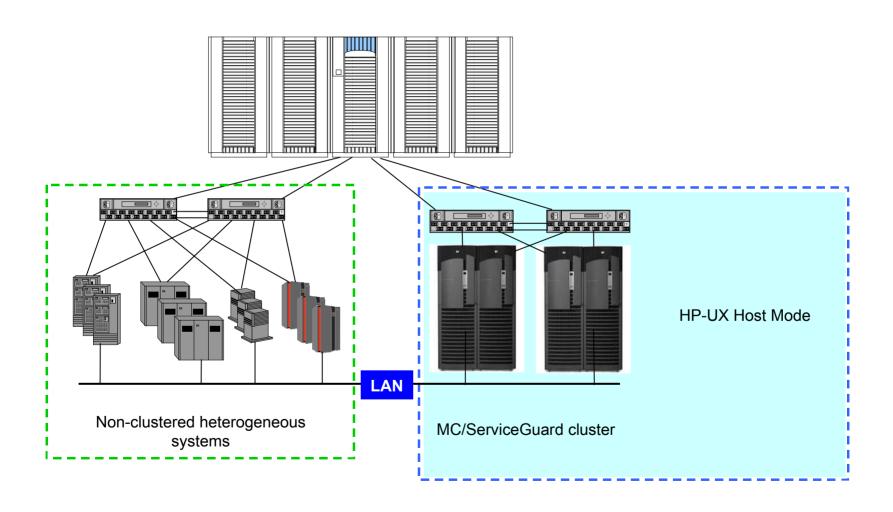Non-clustered heterogeneous systems

Windows NT Host Mode

Windows NT cluster

Windows 2000 Advanced Server

Non-clustered heterogeneous systems

LAN

Windows 2000 Host Mode

Windows 2000 cluster

High Availability Clustering Multiprocessor (HACMP)

AIX Host Mode

LAN

Non-clustered heterogeneous systems
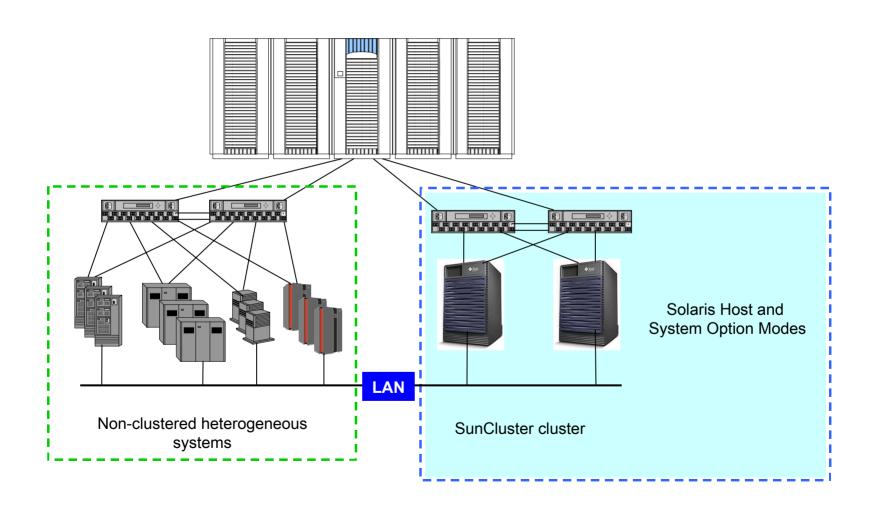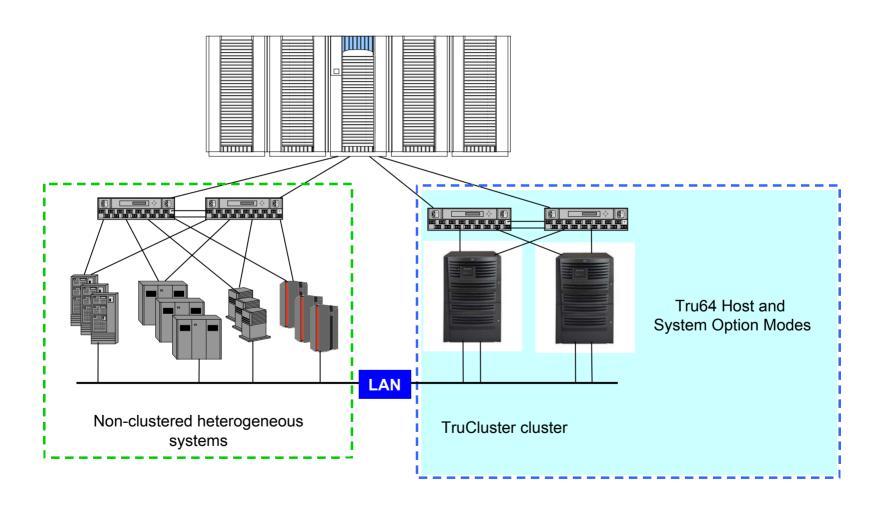
HACMP cluster

MC/ServiceGuard

LAN

Non-clustered heterogeneous
systems

MC/ServiceGuard cluster

HP-UX Host Mode

SunCluster

Non-clustered heterogeneous systems

SunCluster cluster

Solaris Host and System Option Modes

LAN

TruCluster

Tru64 Host and
System Option Modes

LAN

Non-clustered heterogeneous
systems

TruCluster cluster

Multi-vendor cluster solutions

MC/ServiceGuard and HACMP Clusters

HP-UX Host Mode

AIX Host Mode

LAN

MC/ServiceGuard cluster

HACMP cluster

Multi-vendor cluster solutions
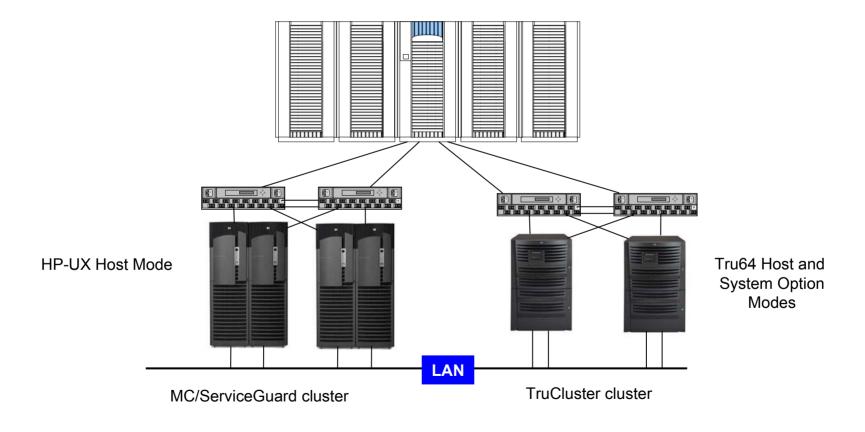
Windows NT and TruCluster Clusters

Windows NT Host Mode

Tru64 Host and System Option Modes

LAN

Windows NT cluster

TruCluster cluster

Multi-vendor cluster solutions
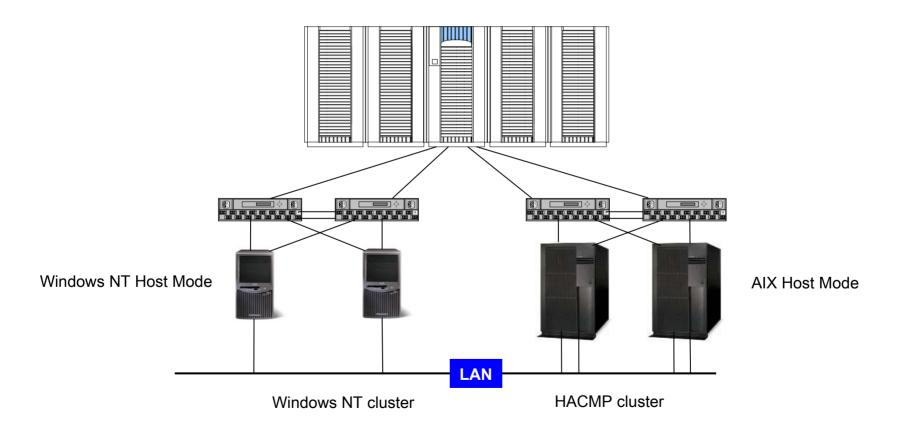
MC/ServiceGuard and Tru64 Clusters

HP-UX Host Mode

Tru64 Host and
System Option
Modes

LAN

MC/ServiceGuard cluster

TruCluster cluster

Multi-vendor cluster solutions
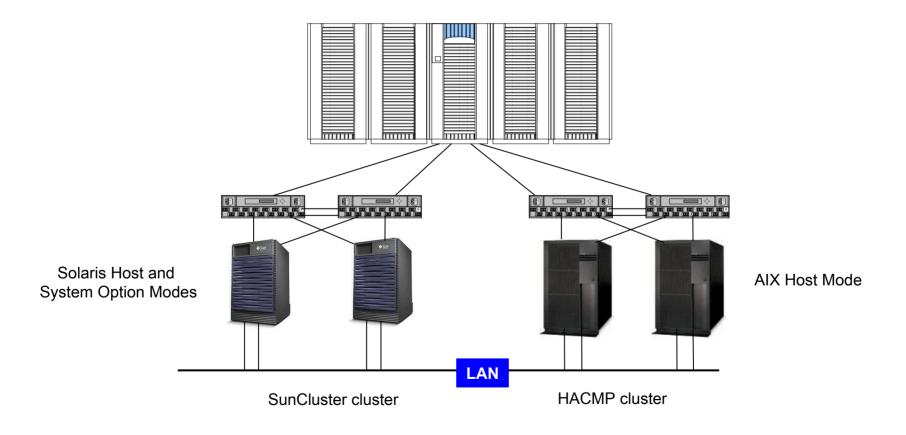
Windows NT and HACMP Clusters

Windows NT Host Mode

AIX Host Mode

LAN

Windows NT cluster

HACMP cluster

Multi-vendor cluster solutions

SunCluster and HACMP Clusters

Solaris Host and
System Option Modes

AIX Host Mode

LAN

SunCluster cluster

HACMP cluster

?

Backup slides

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SAN topology

FC Point-To-Point Topology

FC Arbitrated Loop Topology

LAN

LAN

Failure scenario
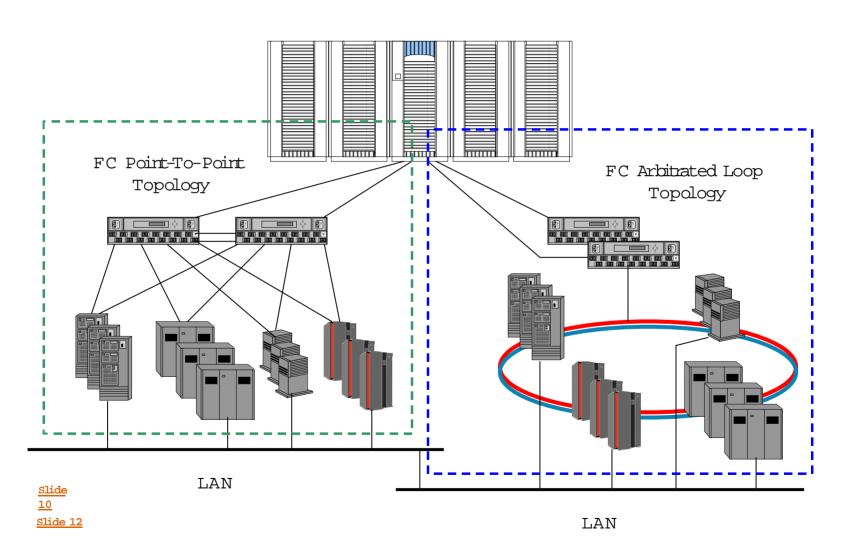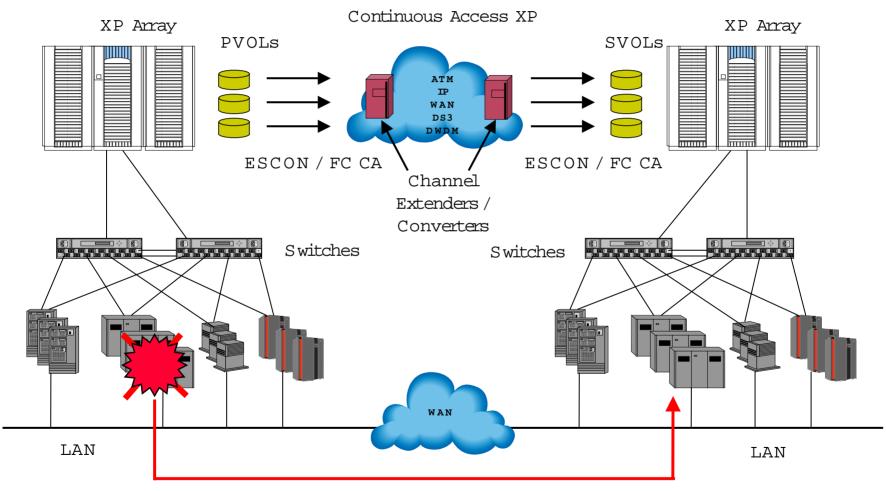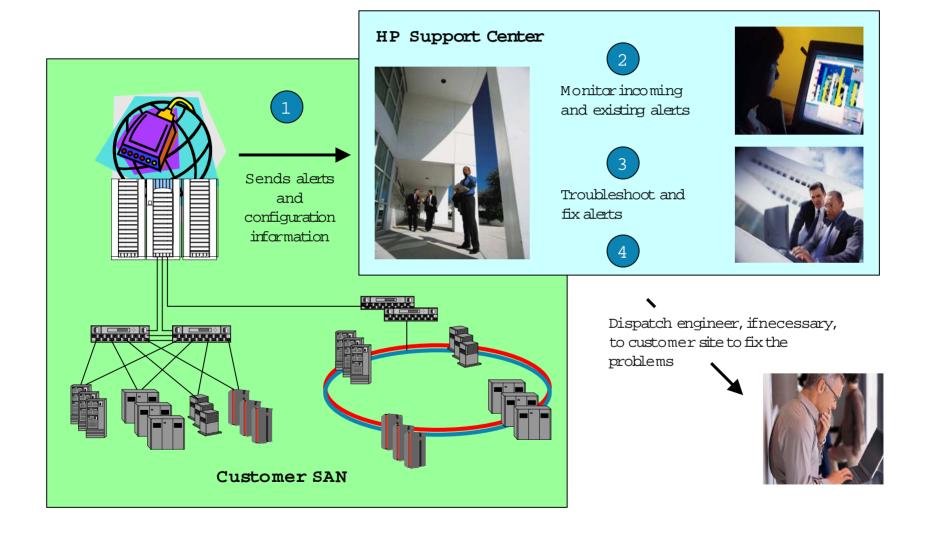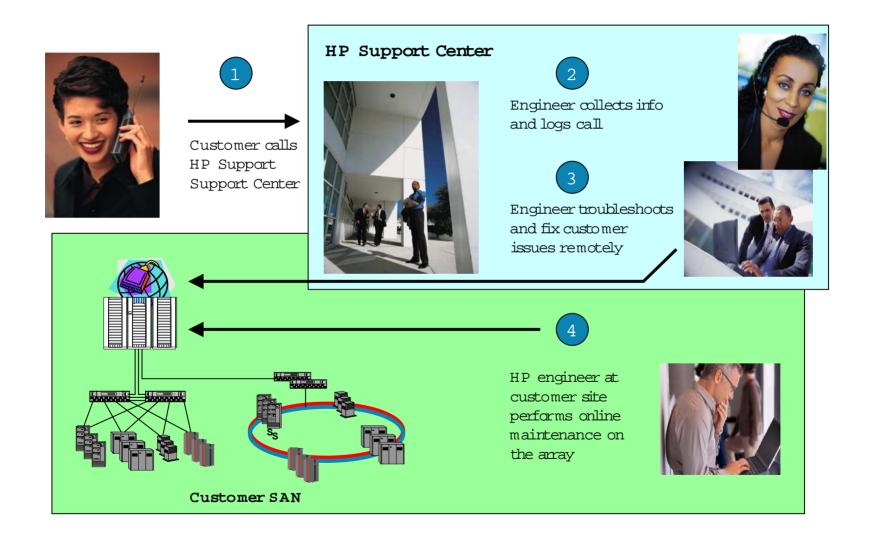
Automatically sends alerts to hp support centers

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HP Support Center

1
Sends alerts and configuration information

2
Monitor incoming and existing alerts

3
Troubleshoot and fix alerts

4
Dispatch engineer, if necessary, to customer site to fix the problems

Customer SAN

Online maintenance

HP Support Center

1

Customer calls
HP Support
Support Center

2

Engineer collects info
and logs call

3

Engineer troubleshoots
and fix customer
issues remotely

4

HP engineer at
customer site
performs online
maintenance on
the array

Customer SAN

Interex, Encompass and HP bring you a powerful new HP World.