HP Networked Storage Overview With Respect to OpenVMS

Reinhard Neumann
Hewlett-Packard Company
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reinhard.neumann@hp.com

HP StorageWorks Product Portfolio
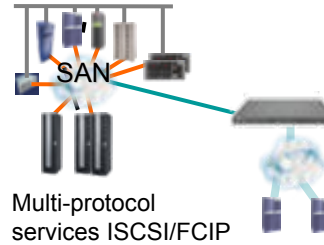
Infrastructure	HP Switches and Directors	Multi-protocol services ISCSI/FCIP	Embedded switches · Host Bus Adaptors

Storage servers (NAS) & storage arrays
- ProLiant Storage Servers
- StorageWorks Clustered Gateway
- StorageWorks All-in-One
- MSA Family
- EVA Family
- XP Family

Tape & disk-based data protection
- Media
- Standalone drives & autoloaders
- ProLiant Data Protection Storage Server
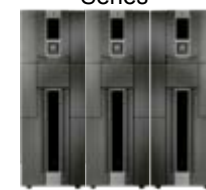- Virtual Library Systems
- MSL series
- EML E-Series
- ESL E-Series

Software

MANAGE
- Storage resource management
- StorageWorks device management

PROTECT
- Data protection & recovery
- Replication

OPTIMIZE
- Data archive
- Data migration

Services & Solutions

The B-Series SAN switch family

SAN Director 4/256
32-256 4Gb ports
FICON support

SAN Switch 4/64
(32-64 ports)

SAN Director 2/128
4Gb FC blade

SAN Switch 4/32
(16-32 ports)

Common Fabric OS 5.x
New release of Fabric Manager

SAN Switch 4/8 and SAN Switch 4/16
8 and 16 ports

HP MPR Blade
4Gb FC blade

Brocade 4Gb SAN Switch
for HP c-Class BladeSystem

Brocade 4Gb SAN Switch
for HP p-class BladeSystem

HP 400 MP-Router
(16 ports)

The C-series SAN switch family

	Small & Medium-Sized Business		Enterprise & Service Provider		

MDS 9000 Family Systems

MDS 9120 and 9140	MDS 9216 and 9216i	MDS 9506	MDS 9509	MDS 9513

MDS 9000 Modules

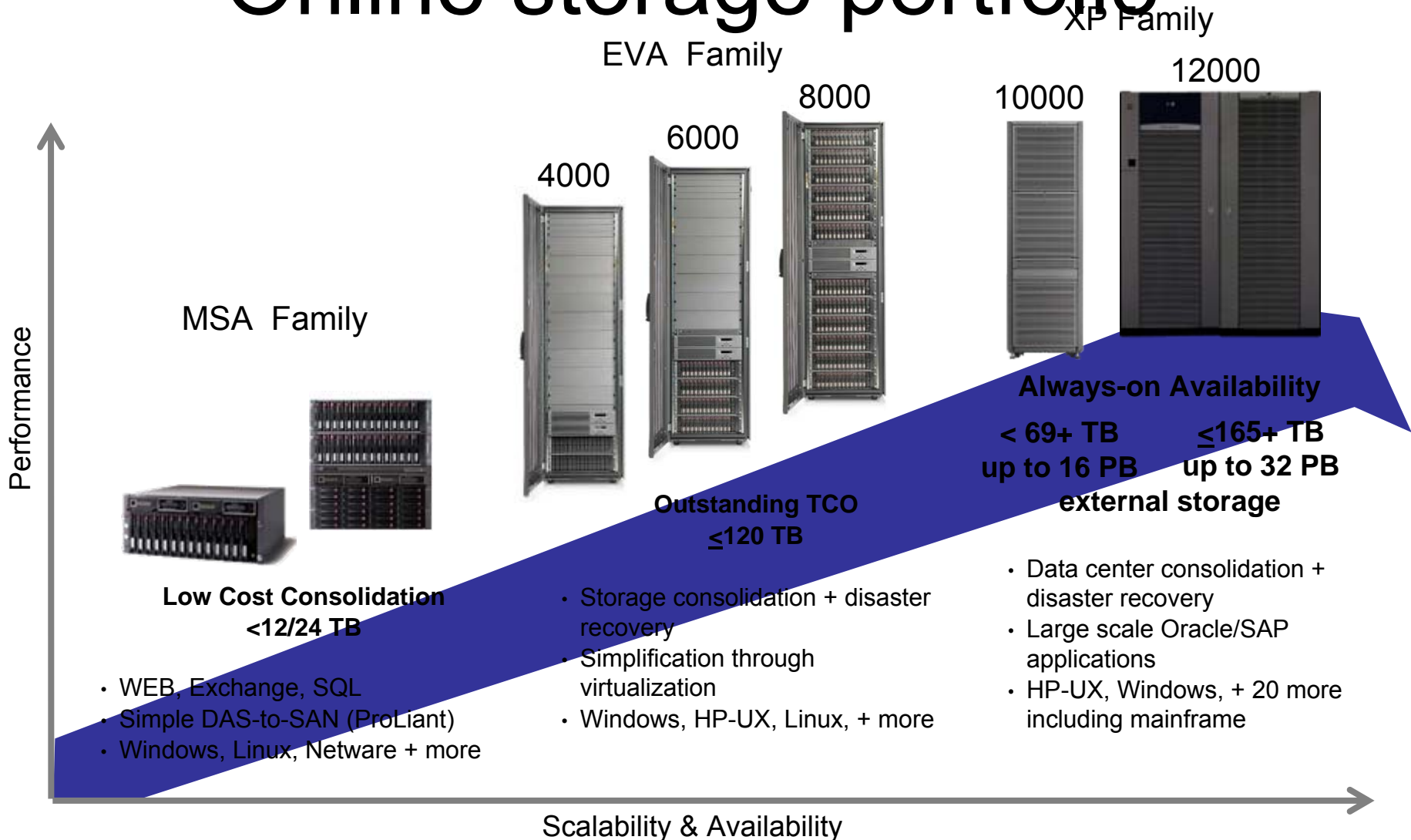| Supervisor 1 and 2	14-Port, 16-Port, 32-Port 1 & 2 Gb FC	12-Port, 24-Port, 48-Port 1, 2 & 4Gb FC	4-Port 10Gb FC	IP Storage Services – iSCSI and FCIP	SSM (Virtualization; Intelligent fabric Applications)

Mgmt. — Cisco Fabric Manager

OS — Cisco MDS 9000 Family SAN-OS

HP StorageWorks
Online storage portfolio

EVA Family

XP Family

12000

8000

10000

6000

4000

MSA Family

Always-on Availability

< 69+ TB
up to 16 PB

≤165+ TB
up to 32 PB
external storage

Outstanding TCO
≤120 TB

Performance

Low Cost Consolidation
<12/24 TB

· Data center consolidation + disaster recovery
· Large scale Oracle/SAP applications
· HP-UX, Windows, + 20 more including mainframe

· Storage consolidation + disaster recovery
· Simplification through virtualization
· Windows, HP-UX, Linux, + more

· WEB, Exchange, SQL
· Simple DAS-to-SAN (ProLiant)
· Windows, Linux, Netware + more

Scalability & Availability

MSA1500 cs Active/Active overview

- The Modular Smart Array (MSA) 1500 cs (controller shelf)

HP StorageWorks
Modular Smart Array 1500 cs

Features

- Redundant power supplies, fans and hot plug standard
- Hot plug controller and redundant controller optional, active/passive
- Microsoft, Linux and Novell Clustering*
  (*some clustering limitations)
- RAID 0, 1+0, 5 and ADG
- Warranty 3-1-1

Flexibility

- 16.8 TB with SCSI, up to 24 TB with SATA
- Mix and Match SATA and SCSI behind same controller
- DAS to SAN technology with SCSI

Simplicity

- Array Configuration Utility (ACU)
- Command Line Interface (CLI)
- Similar usage as the MSA1000

Performance

- 2 GB/sec Fibre Channel
- 256 MB Battery Backed Write Cache, 512 MB optional
- Up to 30,000 IOPs

MSA1500 cs product positioning

- *"Positioned in the SAN product line to be an easy to use, scalable, high-availability storage solution for ProLiant and x86 platform storage consolidation on heterogeneous SANs."*

- MSA1500 cs
  - A next-generation 2Gb Fibre Channel storage system.
  - Designed for the entry-level to mid-range Storage Area Network (SAN).
  - Positioned to reduce the complexity, expense, and investment risk of the customer's SAN deployment.
  - Modular in design, allowing customers to easily add storage capacity as needed.
  - Plays a key role in encouraging customers to more easily expand.

MSA 1500cs Active/Active features

– Supports simultaneous I/O processing on controllers, providing better performance and high availability

- I/O can be processed simultaneously by both controllers
- LUNs are owned by only one controller at any given time

– Supports explicit controller ownership, using both MSA Command Line Interface (CLI) and HP-UX PVLinks

– Supports implicit LUN failover to other controller for optimized I/O processing

– ACU CLI now available for HP-UX (active/active only)

Migrating active/passive to active/active

– Upgrade MSA1500cs to active/active

1. Go to MSA1500cs web site http://www.hp.com/go/msa1500cs

2. Go to Software, firmware & drivers page and obtain following

   – Active/active version Support Software CD ISO image (burn image to blank CD)
   – Active/active version controller firmware files or ISO image

3. Obtain following from Technical documents page

   • Migration instructions (Windows, Linux, and HP-UX only)
   • Firmware upgrade guide
   • Installation guide (Active/Active version, December 2005 or later)

4. Review migration instructions of operating system, complete prerequisites, and migrate existing MSA1500cs and servers to active/active

5. Install active/active components on servers

6. Install firmware using files from CD created in step 2

MSA1500 configuration maximums
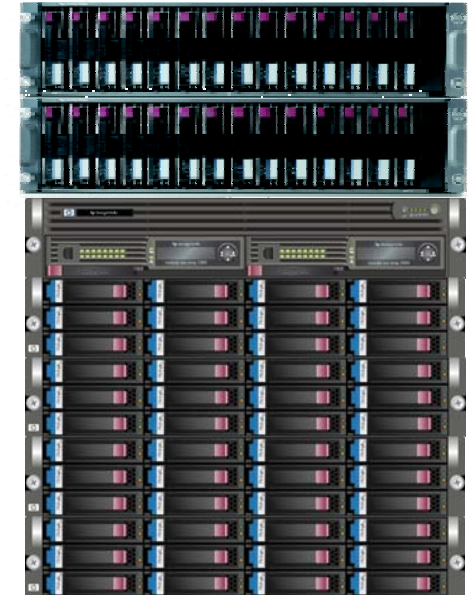
MSA1500 Version SATA +MSA20

MSA1500 Version SCSI +MSA30

MSA1500 version SATA and SCSI +MSA20 and MSA30

24 TB with 96 SATA hard drives

16 TB with 56 SCSI hard drives (300GB)

20.4 TB with 71 SCSI/SATA hard drives

MSA1000 configuration maximum

MSA1000

Max. 12 TB with 46
SCSI hard drives
(300GB)

OS support

- Current OS support
  - Windows 2000 Advanced Server
  - Windows 2000 Server
  - Windows 2003 Enterprise Edition
  - Windows 2003 Standard Edition
  - Red Hat Linux
  - SuSE Linux SLES 8
  - Novell NetWare
  - HP-UX
- Planned OS Support (almost there…)
  - OpenVMS
  - Tru64 UNIX

The EVA family

Leading in array virtualization and ease of use

- A revolutionary redesign of the proven EVA3000 and EVA5000 Storage Arrays
- Three family members for a broad range of prices, storage capacities and performance
- 4Gbps FC Controller
- iSCSI Connectivity Option
- Concurrent support of various FC and FATA Disks in the same Disk Enclosures
  - 72, 146, 300GB FC
  - 250, 400, 500GB FATA
- Virtual RAID Arrays: Vraid0, Vraid1, Vraid5
- Industry standard multi-path failover support
  - MPIO
  - Pvlink
  - DMP etc.
- Native HBAs Support (Sun, IBM, HP)
- Local and remote copy support
- Broad range of solutions and integrations available

EVA4000

EVA6000

EVA8000

The EVA family specifications

	EVA4000	EVA6000	EVA8000
Controller	HSV200		HSV210
Cache size	4GB		8GB
RAID Levels	VRAID0, VRAID1, VRAID5		
Supported OS	Windows 2000/2003, HP-UX, Linux, IBM AIX, **OpenVMS**, Tru64, SUN Solaris, VMWare, Netware		
Supported Drives	FC: 72, 146GB/15krpm, 146, 300GB/10krpm FATA: 250, 400, 500GB		
Host ports	4		8
Device ports	4		8
Mirror ports	4		
Backend loop switches	0	2	4
# of Drives	8 - 56	16 – 112	8 – 240
# of Enclosures	1 - 4	4 - 8	2 – 18
Max Capacity	28TB	56TB	120TB

EVA4000

EVA6000

EVA8000

The EVA4000 architecture

Management Server (Windows)

Fabric 1

Fabric 2

- 4Gbps Front-End

- 2 HSV Controllers

HSV200 controller 1

HSV200 controller 2

- 1 to 4 Disk enclosures
- 8 to 56 FC Disks
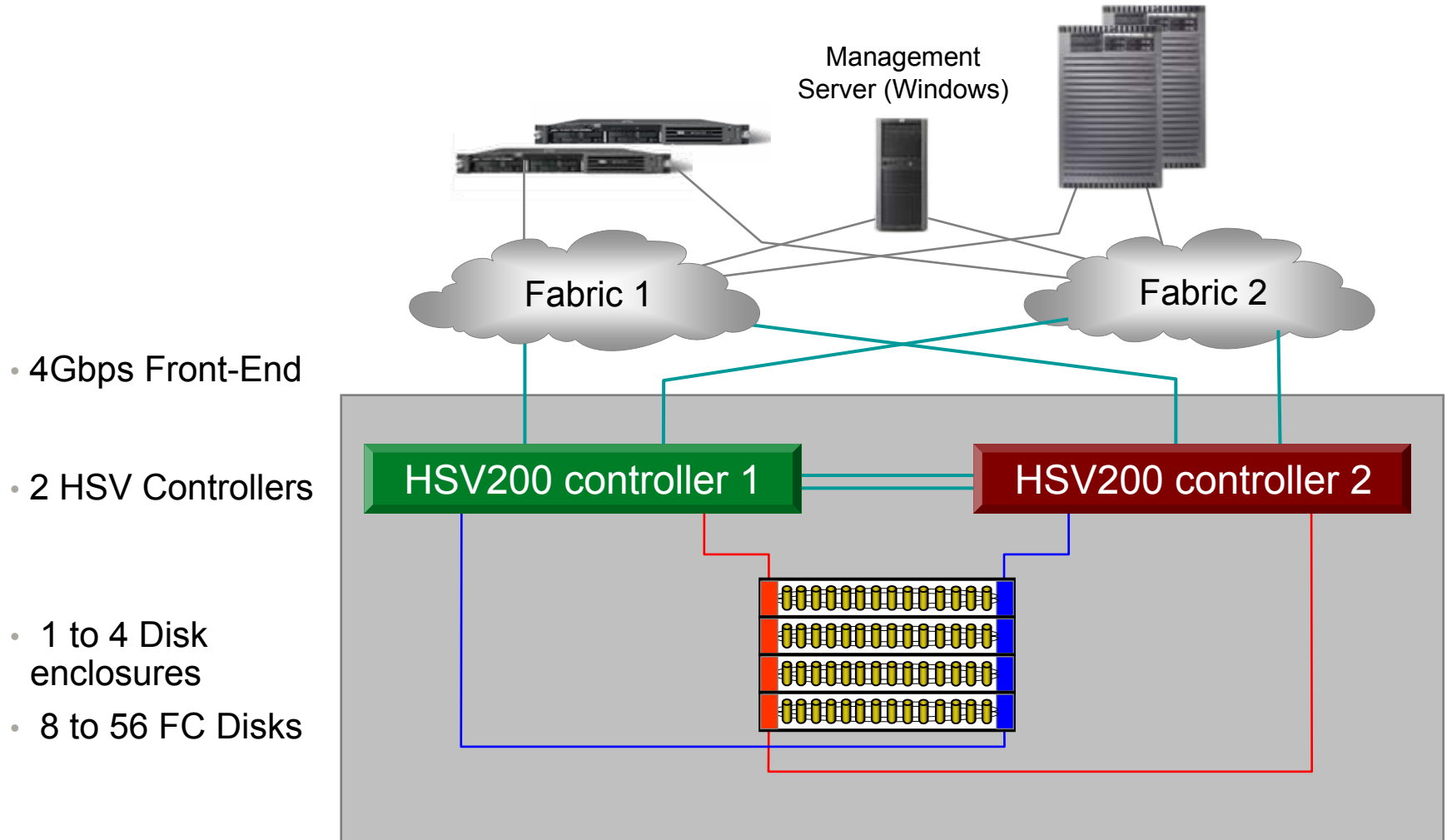
The EVA6000 architecture

Management Server (Windows)

Fabric 1

Fabric 2

- 4Gbps Front-End
- 2 HSV Controllers

HSV200 controller 1

HSV200 controller 2

- 2 FC Loop Switches

FC loop switch

FC loop switch

- 4-8 Disk enclosures

- 16 to 112 FC Disks
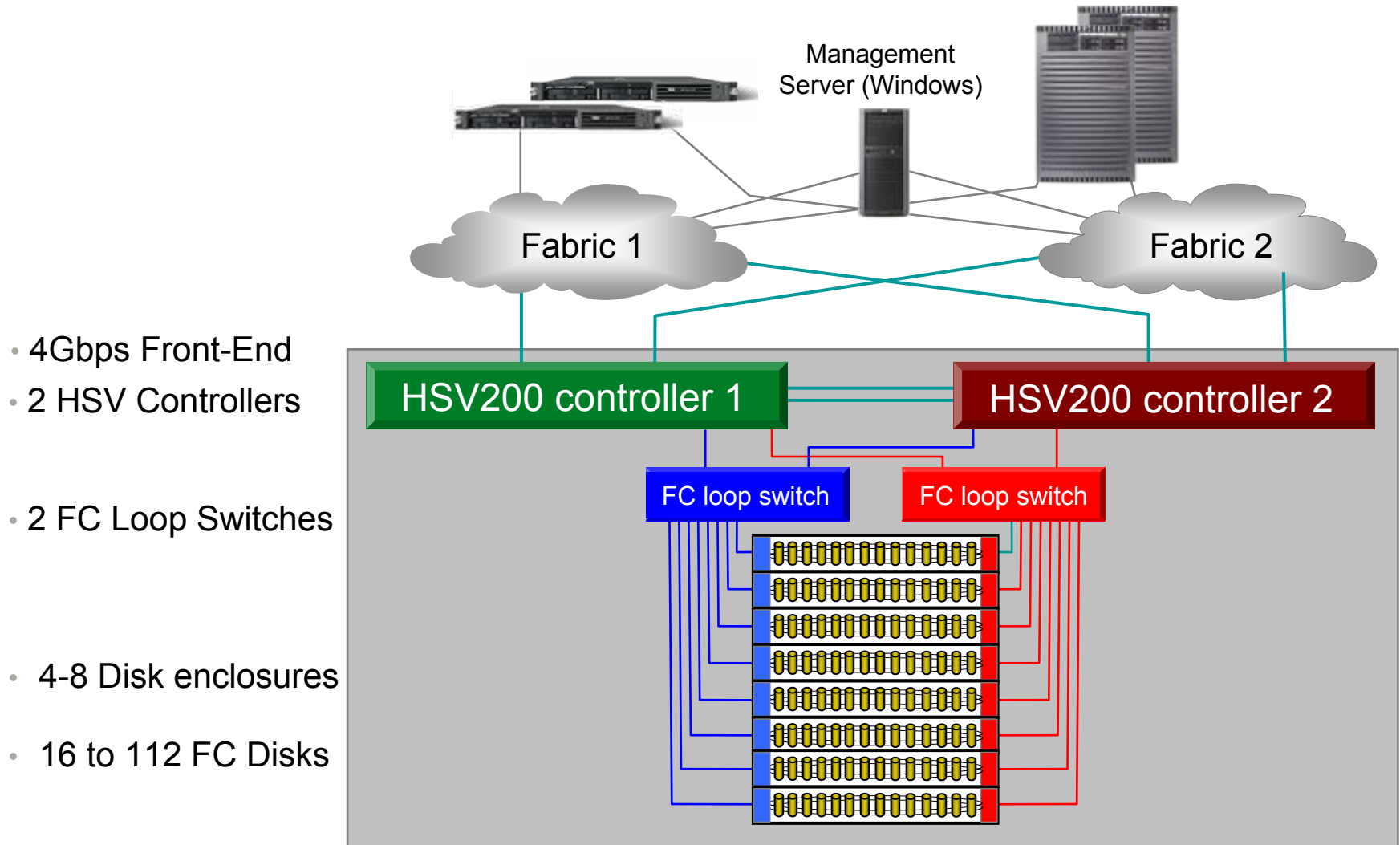
The EVA8000 architecture

- 4Gbps Front-End
- 2 HSV Controllers

- 4 FC Loop Switches

- 2-18 Disk enclosures
  12 in the first rack
  6 in the utility cabinet

- 8 to 240 FC Disks
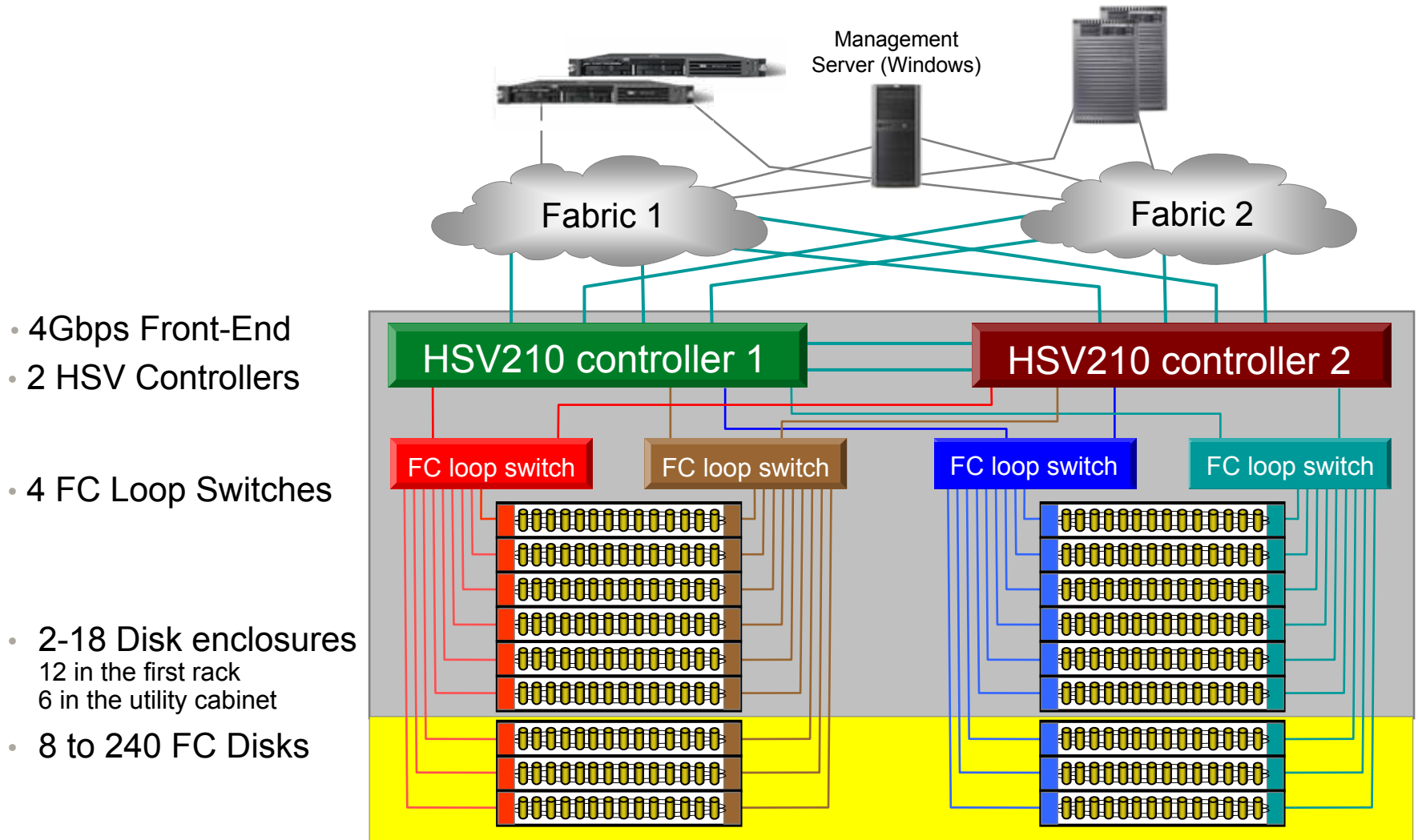
Multipathing and boot support

Operating System	EVA 3000/5000 with VCS 2.x and 3.x	Concurrent attachment [1]	EVA 4000/6000/8000 and EVA3000/5000 with VCS 4.x	Boot support
HP-UX	Secure Path v3.0F	Same server Same HBA	native pvlinks Secure Path v3.0F Veritas DMP	√
Windows	MPIO DSM Secure Path v4.0C SP2	Same server Same HBA	HP MPIO - AA DSM (full-feature) Veritas MPIO DSM Direct server attachment supported	√
Linux	Qlogic FO driver – basic Secure Path v3.0C SP2	Same server Same HBA	Qlogic FO driver Md driver planned; DMP support by Symantec	√
Tru64	Native	Same server Same HBA	Native	√
OVMS	Native	Same server Same HBA	Native	√
Solaris	Secure Path v3.0D SP1	Same server Different HBA	MPxIO/STM (New also non-SUN HBAs) [2] Veritas DMP	√
AIX	Secure Path v2.0D SP3 Antemeta Solution	Same server Different HBA	MPIO – PCM	√
Netware	Secure Path v3.0C SP2.1	Same server Same HBA	Native	√
VMware ESX	VM MPIO	Same server Same HBA	VM MPIO	√

XP Family Comparison

	XP256	XP512	XP1024	XP10000	XP12000
Max internal Disks	240	512	1024	240	1152
Max internal Capacity TB	9	93	149	72	332
Max Subsystem Capacity TB	9	93	149	16'000	32'000
Max FC Host Ports	16	32	64	48	224
Max Cache GB	16	32	128	32	256
Max Sequential Performance GB/s	0.17	0.84	2.1	1.3	9.9
Max Random Cache Performance IOPS	51'000	165'000	544'000	700'000	2'100'000
Max Random Disk Performance IOPS	10'900	31'000	66'000	16'000	120'000
Internal Bandwidth	0.7 GB/s	6.4 GB/s	15 GB/s	12.1 GB/s	83 GB/s

Supported Storage Systems OVMS

Table 63 HP OpenVMS supported storage systems

HP OpenVMS	MSA1000	MSA1500	MSA1500 AA	EVA3000 3x	EVA3000 4x	EVA5000 3x	EVA5000 4x	EVA4000 5x	EVA4000 6x	EVA6000 5x	EVA6000 6x	EVA8000 5x	EVA8000 6x	EMA12000	ESA12000	EMA16000	MA6000	MA8000	RA8000	VA7100	VA7110	VA7400	VA7410	XP48	XP128	XP256	XP512	XP1024	XP12000	XP10000
8.2-1 (i64) 8.2 (Alpha, i64)	•			•2	•	•2	•	•		•		•		•	•	•	•	•	•					•	•		•	•	•	•
7.3-2	•			•	•	•	•	•		•		•		•	•	•	•	•	•					•	•		•	•	•	•

[1] • = supported
[2] Only 8.2 is supported; 8.2-1 is not supported.

OVMS Configuration Rules

Table 64 HP OpenVMS SAN configuration rules

Storage systems[1]	OpenVMS SAN rules
All supported	• Zoning is required when OpenVMS is used in a heterogeneous SAN with other operating systems. • Supports OpenVMS Clusters. • Supports active/active and active/passive failover mode. A multipathing driver is embedded in the operating system. • Supports boot from SAN. For more information, see "EVA and EMA/ESA/MA/RA SAN boot support" on page 179 and "XP and VA SAN boot support" on page 190. • Supports multipathing high-availability configuration in multiple fabrics or in a single fabric with zoned paths.
EVA3000 EMA12000 EVA4000 ESA12000 EVA5000 EMA16000 EVA6000 MA6000 EVA8000 MA8000 RA8000	• For HP Continuous Access EVA configuration information, see "HP Continuous Access EVA SAN integration" on page 167. • For EMA/ESA/MA/RA DRM configuration information, see "DRM SAN integration rules" on page 177.
MSA1000	• Requires a dedicated MSA1000. • Supports standalone servers or clusters with a maximum of 8 nodes. • 7.3-2 requires DEC-AXPVMS-V732_Fibre_SCSI-V0700.

[1]Unlisted but supported storage systems have no additional SAN configuration restrictions. For the latest support information, contact an HP storage representative.

OVMS MPIO Coexistence

Table 65 HP OpenVMS multipathing coexistence support

Legend:[1] S = same server and HBA		MSA1000 single controller	EVA3000/ 5000 VCS 3x	EVA3000/ 5000 VCS 4x	EVA4000/ 6000/ 8000 XCS 5x	EMA/ ESA/ MA/ RA	XP
		Native multipathing driver					
MSA1000 single controller	Native multi-pathing driver	S	S	S	S	S	S
EVA3000/ 5000 VCS 3x		S	S	S	S	S	S
EVA3000/ 5000 VCS 4x		S	S	S	S	S	S
EVA4000/ 6000/ 8000 XCS 5x		S	S	S	S	S	S
EMA/ ESA/ MA/RA		S	S	S	S	S	S
XP		S	S	S	S	S	S

[1]EMA/ESA/MA/RA using HSG80 platform kit 8.7

Host-based volume shadowing

- HP OpenVMS servers with host-based volume shadowing are supported in a heterogeneous SAN.

- Support includes configurations that use host-based volume shadowing over Fibre Channel links with long-distance transceivers or WDM.

- Host-based volume shadowing is supported on the same link with the following applications:
  - • DRM
  - • HP Continuous Access EVA
  - • HP Continuous Access XP

Thanks for listening!