



Hitachi Storage Systems USP V

17 May 2007

Marketing Manager

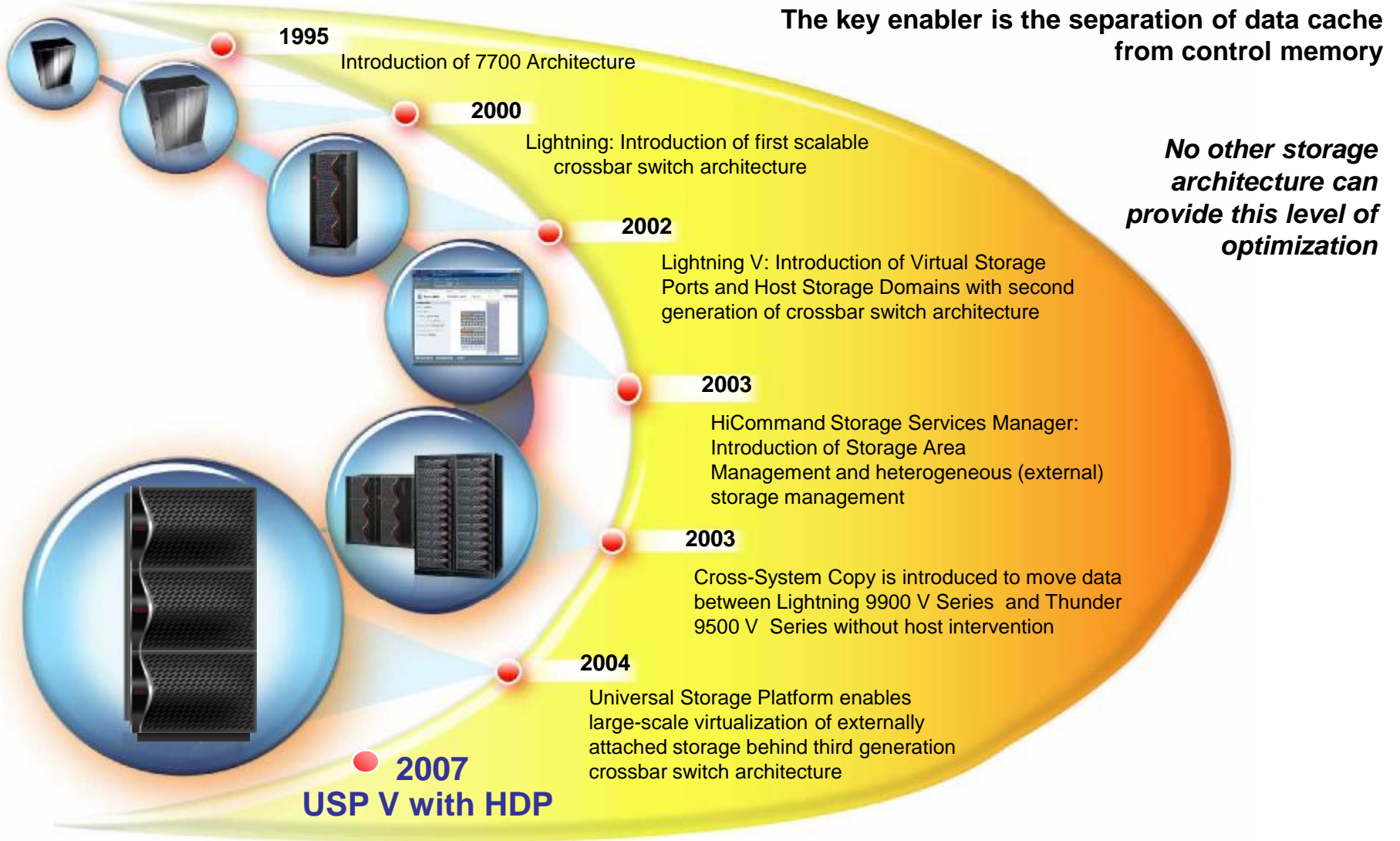
Javier Orejón

Theme for announcement on 14 May 2007

- **“Scalability, Performance and Virtualization Enhancement”**
 - Better, Faster and More Virtualization

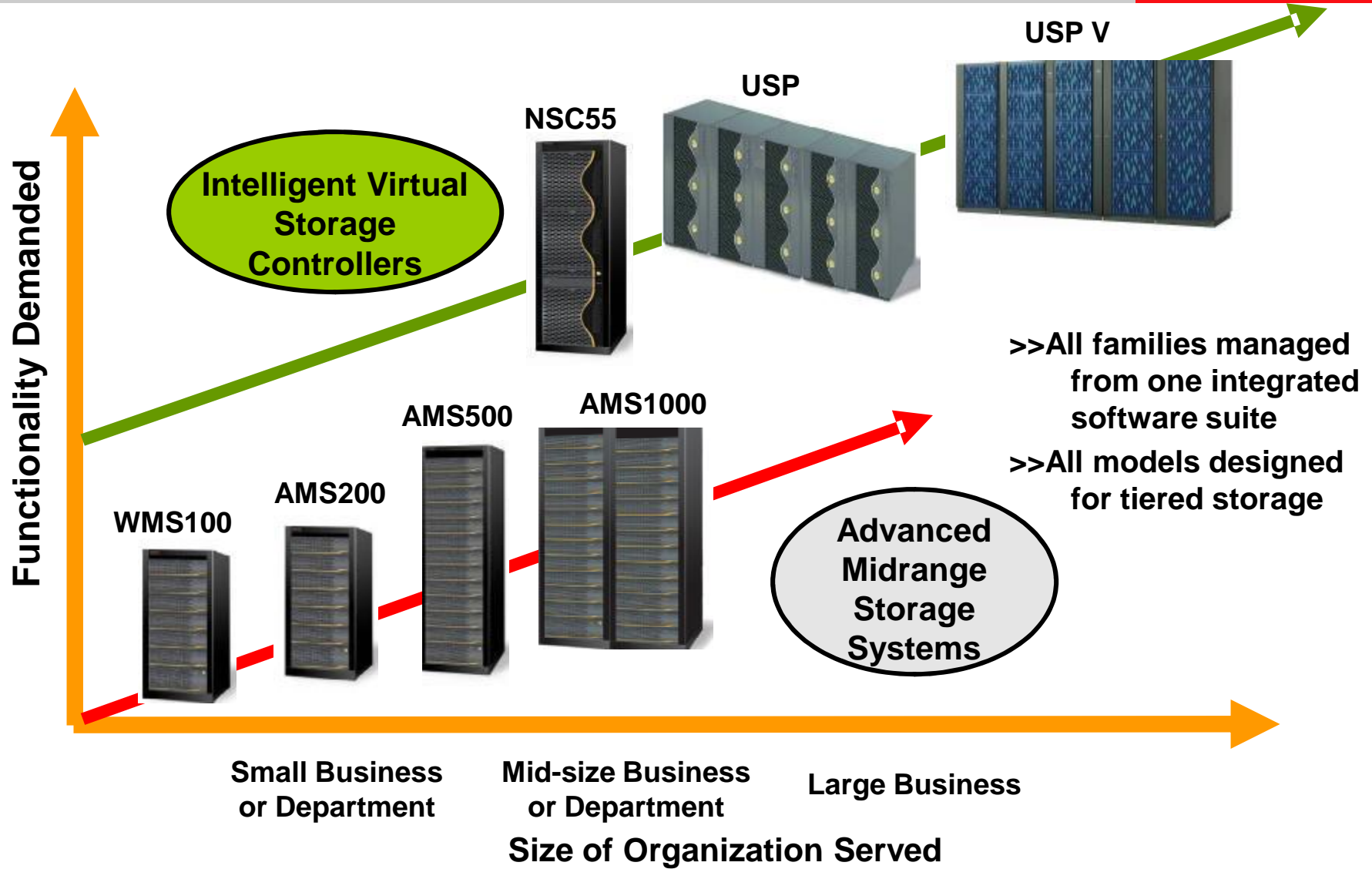
The Evolution of Hitachi Storage Virtualization

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Hitachi Storage Product Portfolio

- Common Software, Common Management



Capacity and Connectivity To Accommodate Massive Multi-Protocol Consolidation

- Capacity
 - 332 TBs of Internal Storage
 - 247 PBs of externally attached, virtualized storage
- Connectivity
 - 224 Fibre Channel Ports
 - 112 ESCON Ports
 - 112 FICON Ports
 - Hitachi High Performance NAS option
 - iSCSI planned
- Scalability
 - 2x the number of replication pairs per system
 - Up to 4x the number of logical devices (LDEVs) per system
- Configuration Flexibility
 - Optional features are more granular – you install only what you need
 - Improved availability and serviceability

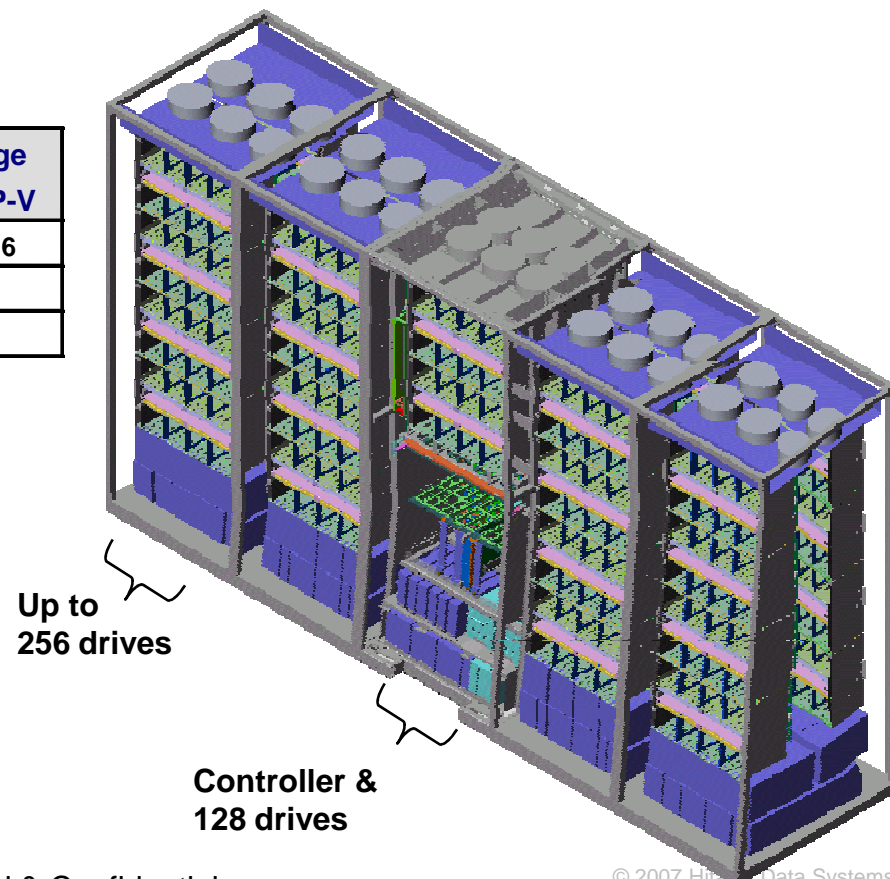


Hitachi Universal Storage Platform V Form Factor and Packaging

- Base controller frame and 1 to 4 optional disk array frames
- Controller boards are reduced to half previous size
- Improved Configurability and Serviceability

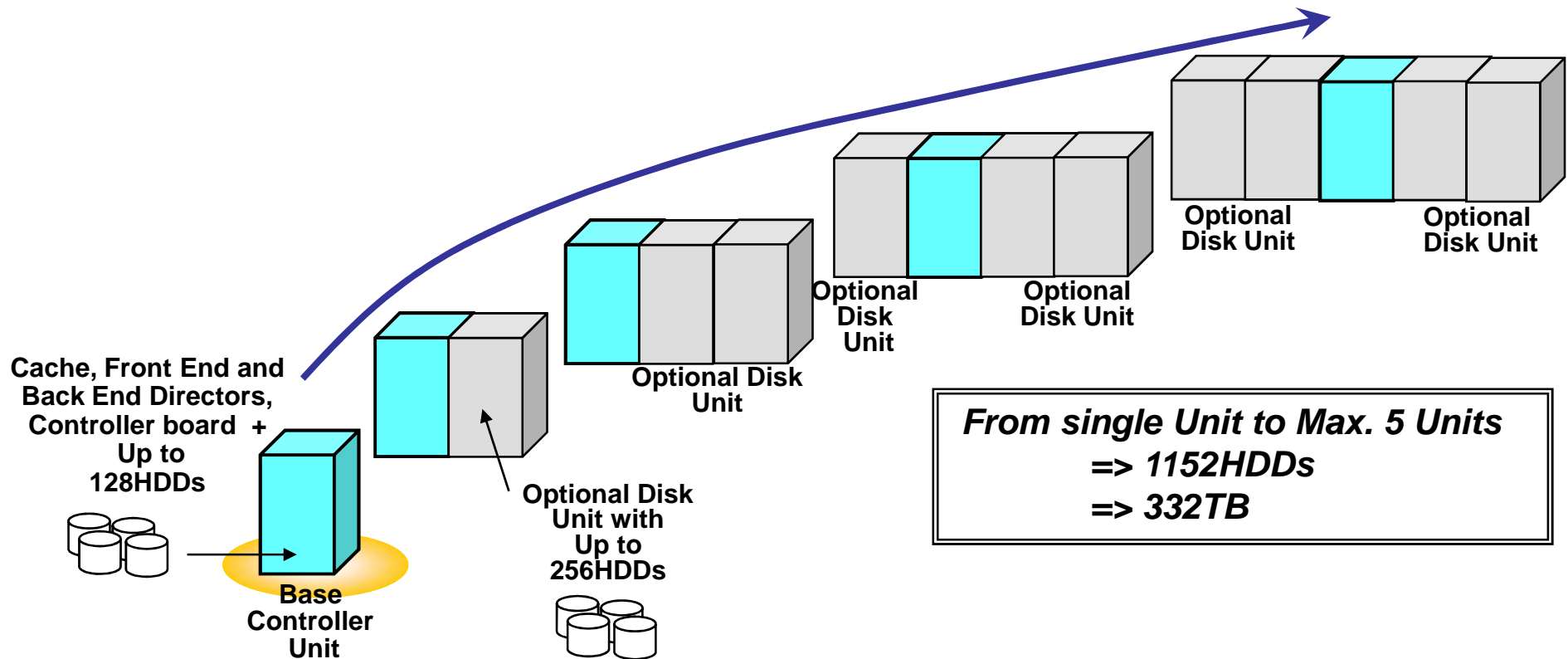
CHA Type	FED Packages		Ports / Package	
	USP	USP-V	USP	USP-V
Open Fibre	4	8	16,32	8,16
ESCON	4	8	16	8
FICON	4	8	8,16	8

	Back-end Loops		Max Disks	
	USP	USP-V	USP	USP-V
1 BED	16	8	384	192
2 BED	32	16	640	384
3 BED	48	24	896	512
4 BED	64	32	1152	640
5 BED	-	40	-	768
6 BED	-	48	-	896
7 BED	-	56	-	1024
8 BED	-	64	-	1152



Seamless Scalability with Single Model

- Common components from base unit to maximum configuration.
- Non-Disruptive upgrade from base to maximum



- Hitachi Dynamic Provisioning (HDP)
 - 1st Enterprise Scale Implementation
 - Increase Storage Utilisation, typically from 40% to 80% in OS
- Scalability
 - 247 PBs external Storage
 - 224 FC connections / 112 FICON / 112 ESCON
 - 64K Volumes (MF & OS)
- Performance
 - 40% more IOPs (3.5 Million)
 - Virtualised Port Performance, 500% increase
 - Internal Bandwidth 106 GB/sec, 30% increase

Feature Comparison – Hitachi Universal Storage Platform versus Hitachi Universal Storage Platform V

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	USP	USP V
Technology / Virtualization	3 rd Generation Cross-Bar Switch Embedded Virtualization	4th Generation Cross-Bar Switch Embedded Virtualization
Maximum IOPS	2,500k	3,500k
External Storage Bandwidth IOPS	2,000	12,000
Maximum supported Internal Capacity	332TB's	332TB's
Maximum supported Total Capacity	32PB's	247 PB's
Internal Bandwidth	81GB/second	106GB/second
Maximum cache	256GB	256GB today, 512GB planned
Back-end loops	64 x 2Gb/second	64 x 4Gb/second
Front End Fibre Channel Ports	192 x 4Gb/second	224 x 4Gb/second
Maximum Internal Disks	1152 x 2Gb/second	1152 x 4Gb/second
Maximum LDEV's	64k (MF) 16k (OS)	64k MF & OS today (128k in 4Q 2007)
External Storage Connection	FC	FC, FICON in 4Q 2007
Maximum ESCON PORTS	96	112
Maximum FICON PORTS	96	112
Size Single LDEV	2TB	2TB (planned increase)
NAS and iSCSI support	High Performance NAS platform, iSCSI and NAS Blades	High Performance NAS platform, iSCSI planned

USP V versus USP Business Continuity Scalability and Performance Improvements

	USP	USP V
TrueCopy Sync PAIRS	16k	32k
TrueCopy Async PAIRS	16k	32k
TrueCopy Async CTG's	128	128
TrueCopy Async PAIRS per CTG	4096	4096
Universal Replicator PAIRS	16k	32k
Universal Replicator CTG's	256	256
Universal Replicator PAIRS per CTG	4096	4096
ShadowImage PAIRS	8k	16k
ShadowImage CTG's	128	128
ShadowImage PAIRS per CTG	4096	8192

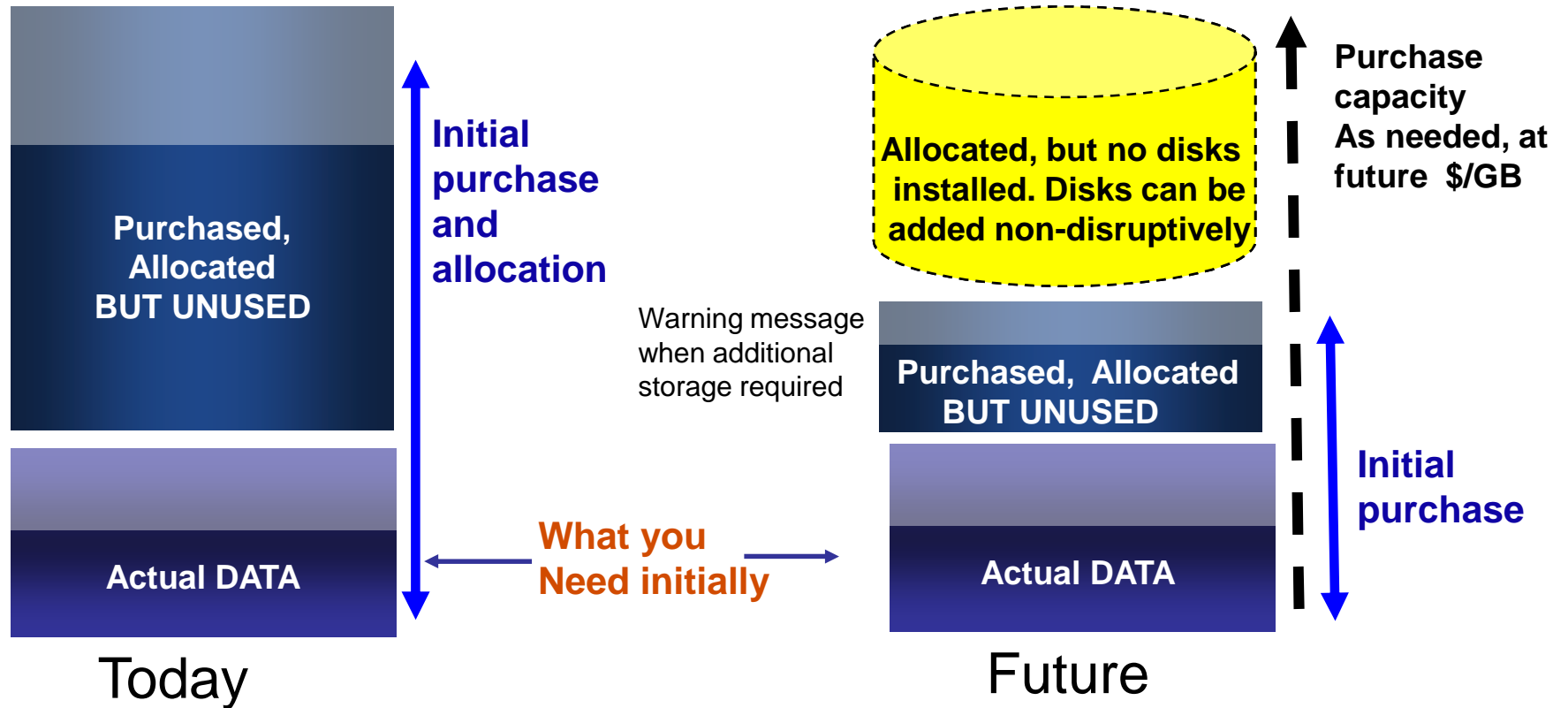


Hitachi Storage Software Innovations

“Thin” or “Dynamic” Provisioning

Introducing thin provisioning from Hitachi: Storage on Demand

- To avoid future service interruptions, today it is common to over-allocate storage by 75% or more
- With Hitachi Dynamic Provisioning you will be able to easily add disk capacity as needed, when needed...



Customer Benefits

- Hitachi Dynamic Provisioning (HDP)

- Allows customers to allocate “virtual” disk capacity based on their anticipated future needs, but with fewer physical disks actually installed
- Additional physical disks can be purchased later and installed transparently without an application service interruption
- The primary benefits of HDP are
 - Elimination of application service interruptions
 - Improved physical **disk utilization**
 - Improved **application performance** because the disk activity is spread across a shared pool of physical disks
 - Lower **power & cooling** requirements due to fewer disks
 - Administration is simplified because the physical disk installation and formatting is not tightly linked to the application



Hitachi Storage on Demand

Performance & Scalability

New Hitachi Dynamic Provisioning™ Software

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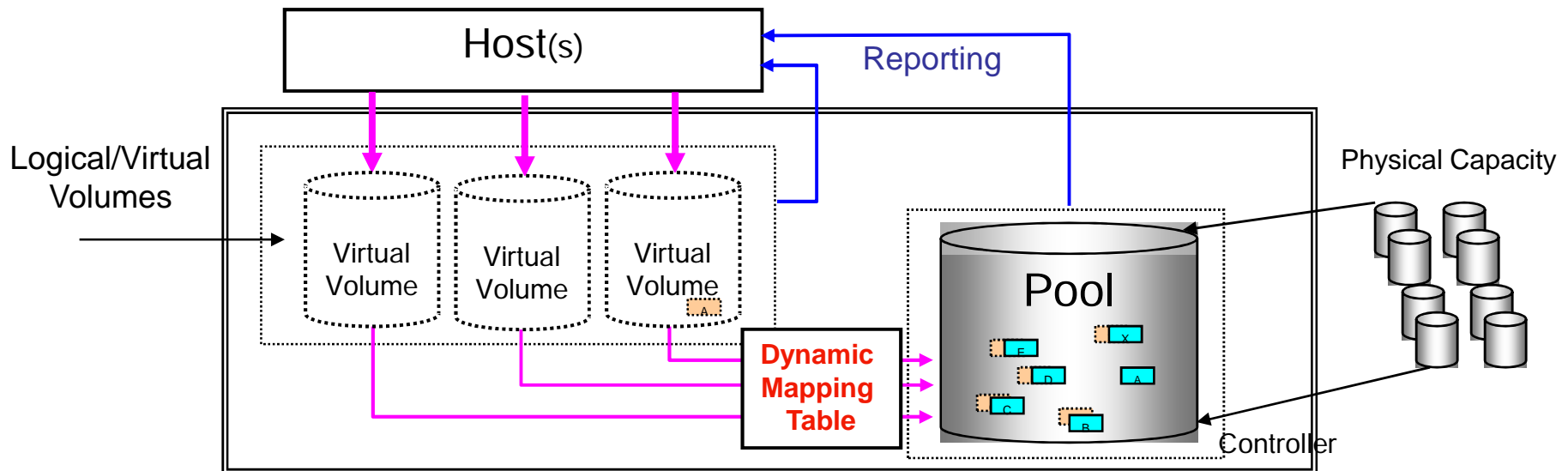
- Allows customers to allocate “virtual” disk capacity based on their anticipated future needs, but with fewer physical disks actually installed.
- Additional physical disks can be purchased later and installed transparently without an application service interruption.
- The primary benefits of Hitachi Dynamic Provisioning software are
 - Administration is simplified because the physical disk installation and formatting is not tightly linked to the application
 - Elimination of application service interruptions to install disks
 - Improved physical disk utilization
 - Improved application performance because the disk activity is spread across a shared pool of physical disks – “wide striping”
 - Lower power & cooling requirements due to fewer disks

Hitachi Dynamic Provisioning Software - Benefits

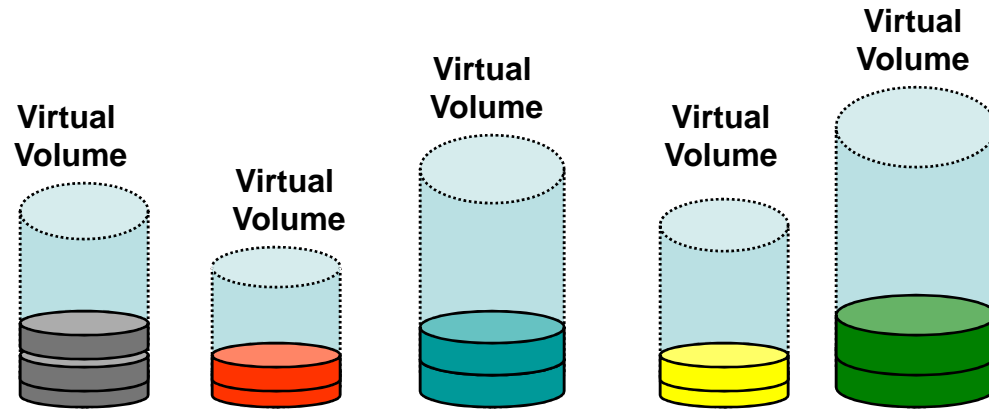
- Simpler administration, eliminate application interruptions to install additional capacity
- Management cost reduction
 - Remove the guessing from capacity planning
 - Install only what is needed and only when it is needed
- Performance optimization
 - Wide striping across all available disks in the pool uses all available actuators and eliminates “hot spot
- Interoperability with existing applications and software tools
 - virtual volumes appear as physical volumes to all applications
- Hitachi’s predictive tools provide sizing , monitoring and reporting
- Improved environmentals – fewer disks

Hitachi Dynamic Provisioning software - Implementation

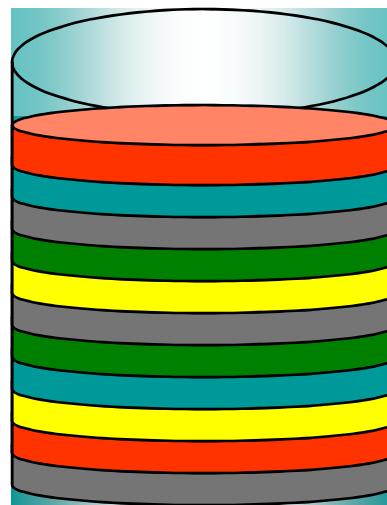
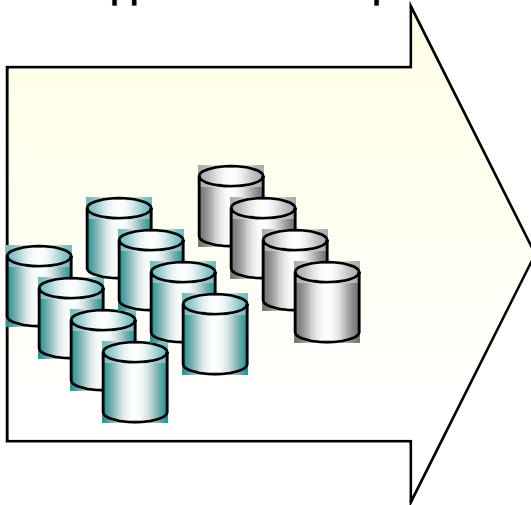
- Virtual Volume has a defined size and is viewed by host as any other normal volume
- Initially, Virtual Volumes do not use any physical storage capacity.
- Pool Volumes are the Physical volumes that store the actual data
- Data is written is striped across the pool volumes in a fixed size that is optimized to achieve both performance and storage area saving.
- Dynamic Mapping Table maps Virtual Volumes to Pool volumes



Hitachi Dynamic Provisioning software - Built-In Threshold Monitoring



When Pool is Nearly full, or Full
You can add additional capacity
with no application interruption



 **Disk POOL**
Hard Warning Pool is Full

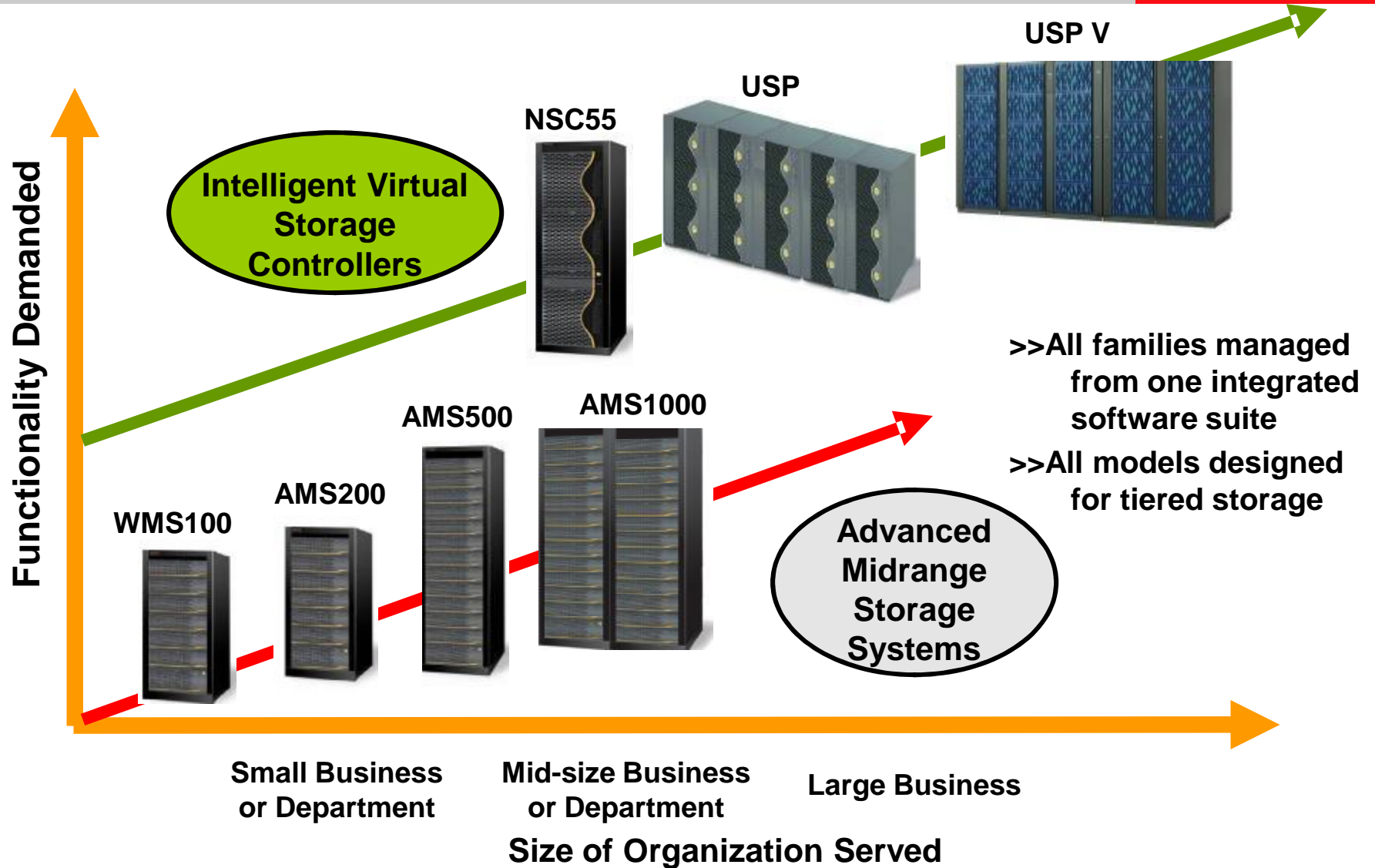
 **Disk POOL**
Soft Warning Alert

Disk Pool
Restricted & Confidential

- Universal Storage Platform V
- The USP V is a further evolution of the **Hitachi architecture** with refinements and extensions + new functionality + higher performance & scalability
- The USP V provides the best foundation for a Flexible, Adaptable Infrastructure
 - Proven, 4th generation parallel crossbar switch architecture
 - Faster Internal bandwidth and microcode enhancements to better exploit the bandwidth
 - 4Gb/sec end-to-end: + 40% improvement in system performance = 3.5M IOPS/sec
 - > 2x remote replication performance, and 6x external storage bandwidth
- Foundation for tomorrow's demanding storage requirements

Hitachi Storage Products

- Common Software, Common Management



 Hitachi Data Systems

