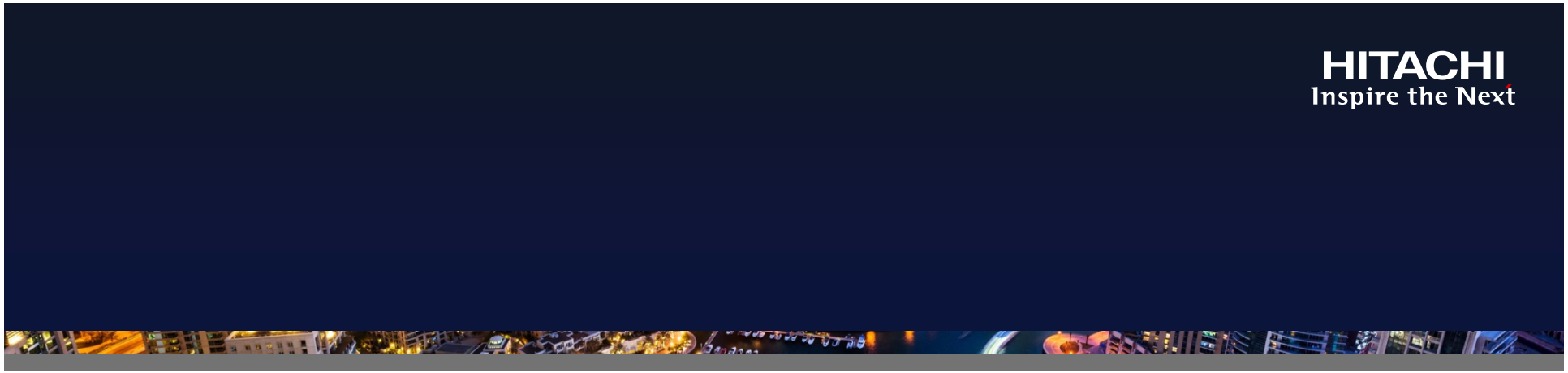

Hitachi Virtual Storage Platform Family

Advanced Storage Capabilities for All Organizations

Andre Lahrmann

23. November 2017

Vorweg:

Aus Hitachi Data Systems wird Hitachi Vantara

Agenda

HITACHI
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- Overview Virtual Storage Platform
- Hardware Architecture
- Flash Strategy and Portfolio
- Software Architecture and specific Features

ISO DATENTECHNIK

Agenda

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Hitachi Virtual Storage Platform (VSP)

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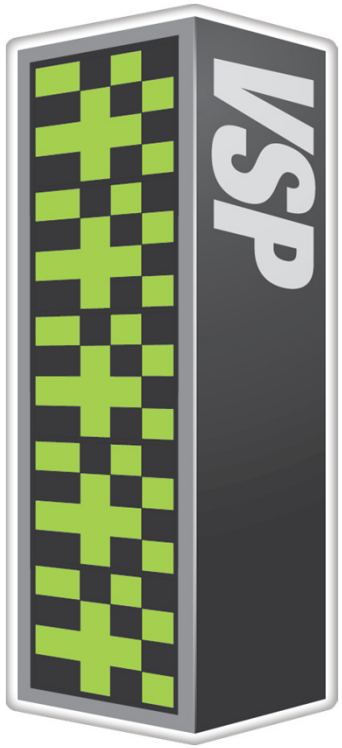
Leading performance to accelerate business
All-flash and hybrid solutions with up to 4.8 million IOPS

Built-in efficiencies for improved total cost of ownership (TCO)
No penalty flash compression and high-speed deduplication

Powerful automation to simplify IT
Provision and deliver resources in a fraction of the time

Proven resiliency for peace of mind
Eliminate disruption and guarantee data access

Best-in-industry virtualization for IT agility
Easily update resources without changing process



Choose the Right System

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VSP G Series	The most powerful enterprise array available ▪ Unmatched performance, automation and resiliency ▪ Maximum flexibility and choice in configuration
VSP F Series	The most resilient all-flash array on the market ▪ Intelligence and performance to power tomorrow's IT ▪ The easiest way to add all-flash to a Hitachi environment

Portfolio Positioning – Virtual Storage Platforms

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COMMON SOFTWARE AND MANAGEMENT

Hitachi Storage Virtualization Operating System (SVOS7) Feature Set Across Family

G200

G400

G600

G800

G1000

G1500

Hybrid Arrays

Fully Supported in Hitachi Command Suite

F400

F600

F800

F1500

AFA-All Flash Arrays

COMMON OPERATING SYSTEM

VSP G Series Overview

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Controller	2U
FE Ports	16
Drives	264
Capacity	2.5PB
Cache	64GB
Volumes	2,048
IOPS	270K

Controller	4U
FE Ports	64
Drives	480
Capacity	5PB
Cache	128GB
Volumes	4,096
IOPS	600K

Controller	4U
FE Ports	64
Drives	720
Capacity	7PB
Cache	256GB
Volumes	4,096
IOPS	800K

Controller	4U
FE Ports	80
Drives	1440
Capacity	14PB
Cache	512GB
Volumes	16,384
IOPS	1.4M

Controller	10U
FE Ports	192
Drives	2304
Capacity	8PB
Cache	2TB
Volumes	65,280
IOPS	4.8M

VSP F Series Overview

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Controller	4U
FE Ports	32
Flash Modules	192
Capacity (5:1)	13PB
Cache	128GB
Volumes	4,096
IOPS	600K

Controller	4U
FE Ports	32
Flash Modules	288
Capacity (5:1)	20PB
Cache	256GB
Volumes	4,096
IOPS	800K

Controller	4U
FE Ports	48
Flash Modules	576
Capacity (5:1)	40PB
Cache	512GB
Volumes	16,384
IOPS	1.4M

Controller**	10U
FE Ports	128
Flash Modules	576
Capacity (5:1)	40PB
Cache	2TB
Volumes	65,280
IOPS	4.8M

Agenda

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VSP G200, VSP G400, VSP G600 and VSP G800

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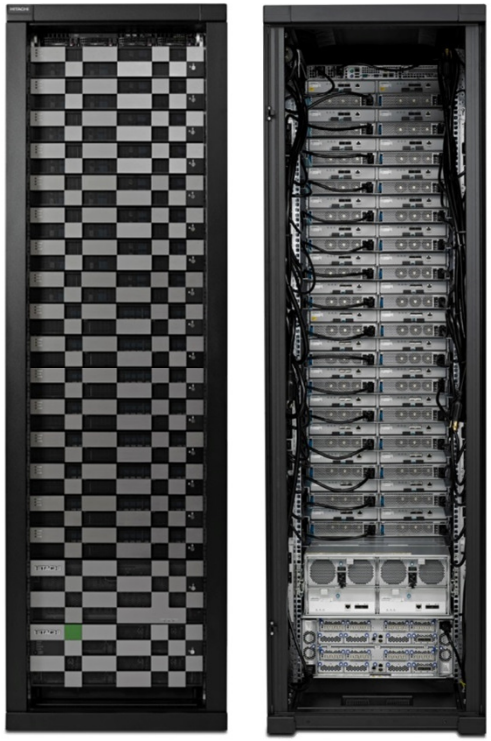
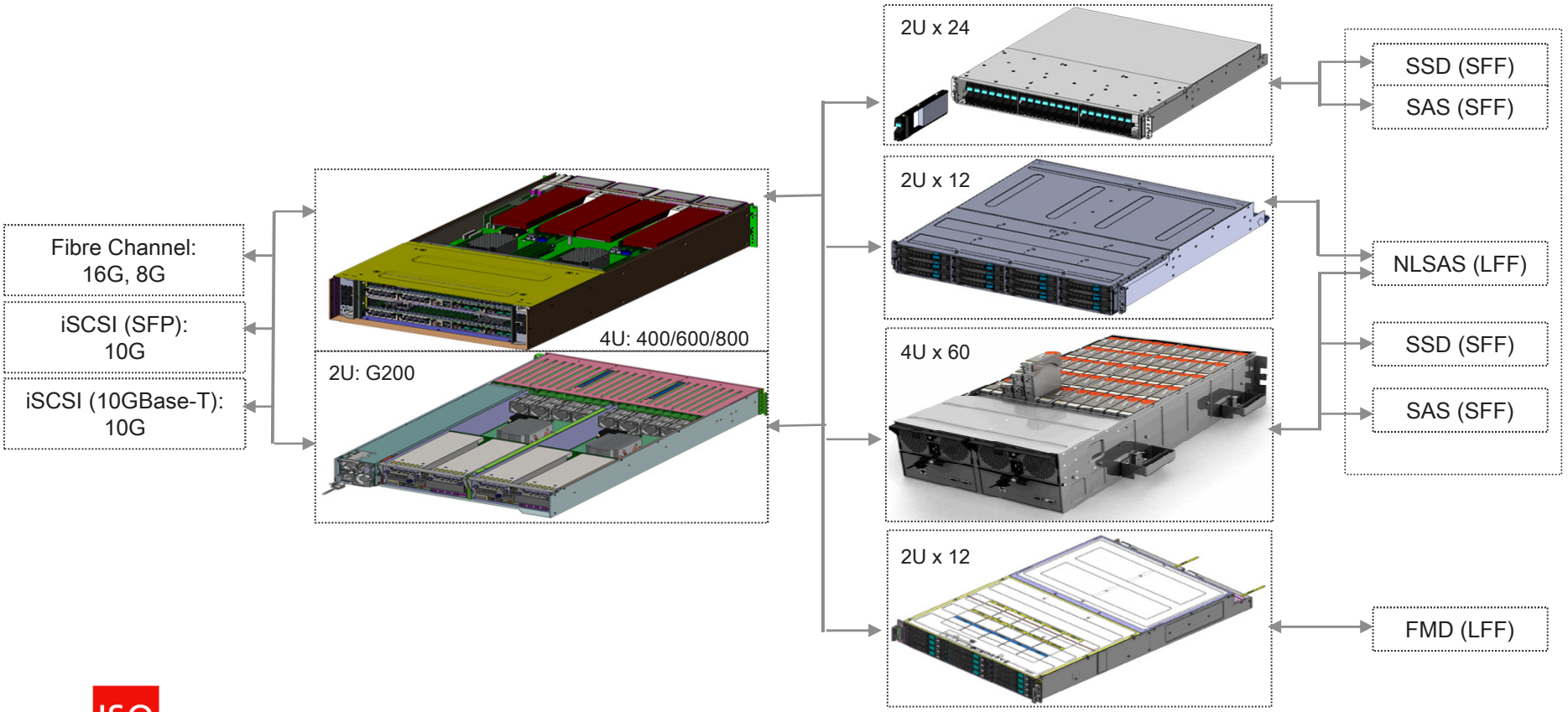


VSP G400, VSP G600, VSP G800

VSP G200

Hardware Overview



Available HDDs

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Type	HDD
SSD	480GB 960GB 1,9TB 3,8TB
SAS	600GB 1,2TB 1,8TB
NL-SAS	4TB 6TB 10TB
FMD	3,5TB 7TB 14TB

VSP Gxxx File Blade Specifications

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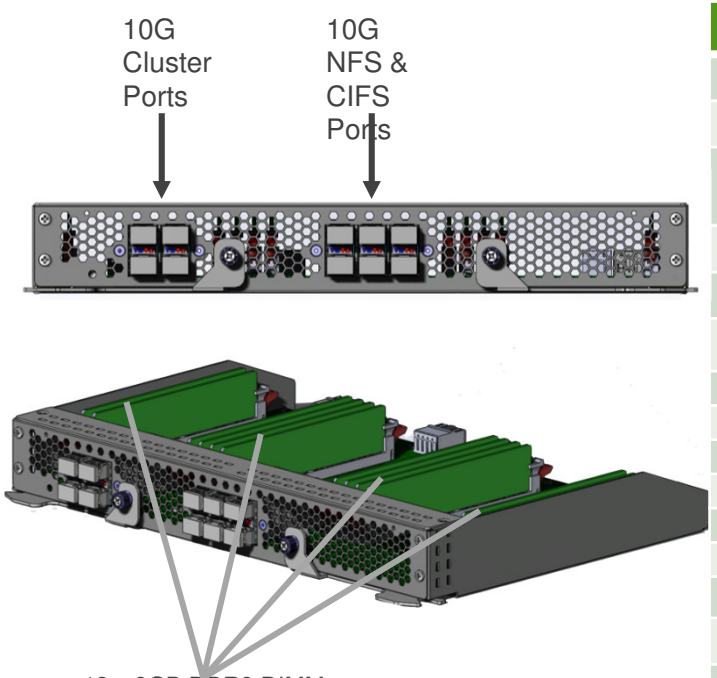

12 x 8GB DDR3 DIMM
96 GB memory
exclusively for NFS and
CIFS operations

IOPS/Throughput	VSP G400	VSP G600	VSP G800
NFS & CIFS Read Throughput	3 GB/s	4 GB/s	10 GB/s
NFS & CIFS Write Throughput	1.5 GB/s	2 GB/s	5 GB/s
NFS & CIFS Mixed (70% read & 30% write) Throughput	2 GB/s	3 GB/s	6 GB/s
NFS Spec2008 in IOPS	140,000	200,000	270,000
CIFS Spec2008 in IOPS	140,000	200,000	270,000
Scalability			
Max and Min blades per cluster!	2		
Max storage per entity	5 PB		
Max file system size	256 TB		
Max # of FS per Cluster	125		
Concurrent Open Files	96,000	512,000	1,024,000
Concurrent Connections	36,000	64,000	64,000
Port Speed			
Network	10 GbE	4 x Active	6 x Active
Cluster	10 GbE	2 x Active	4 x Active

File Blade VSP G400, VSP G600 and VSP G800

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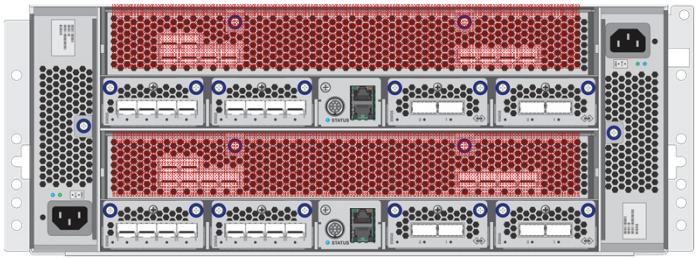

VSP G400, VSP G600, VSP G800

Agenda

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CPU Performance Development

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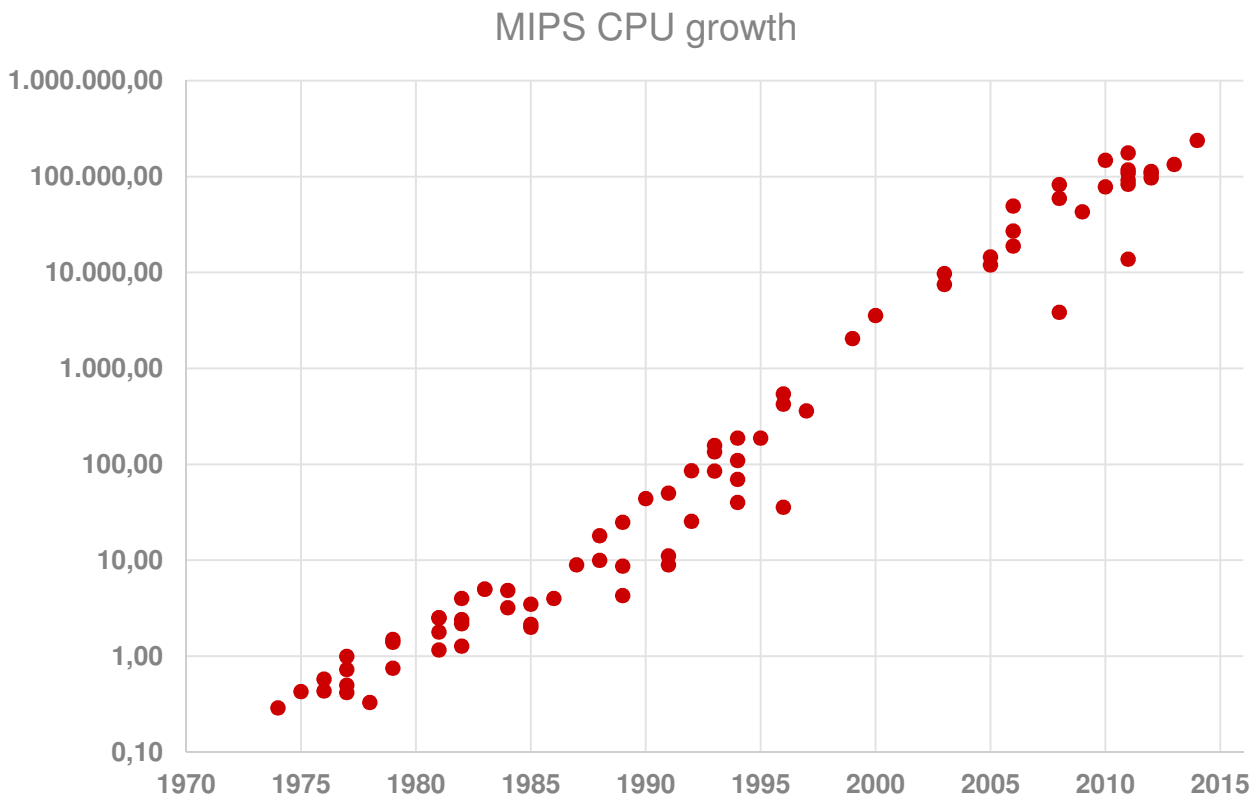

1980 until now
Appr. 300.000x-times
increase

Source: Wikipedia

HDD Capacity Growth vs. Performance

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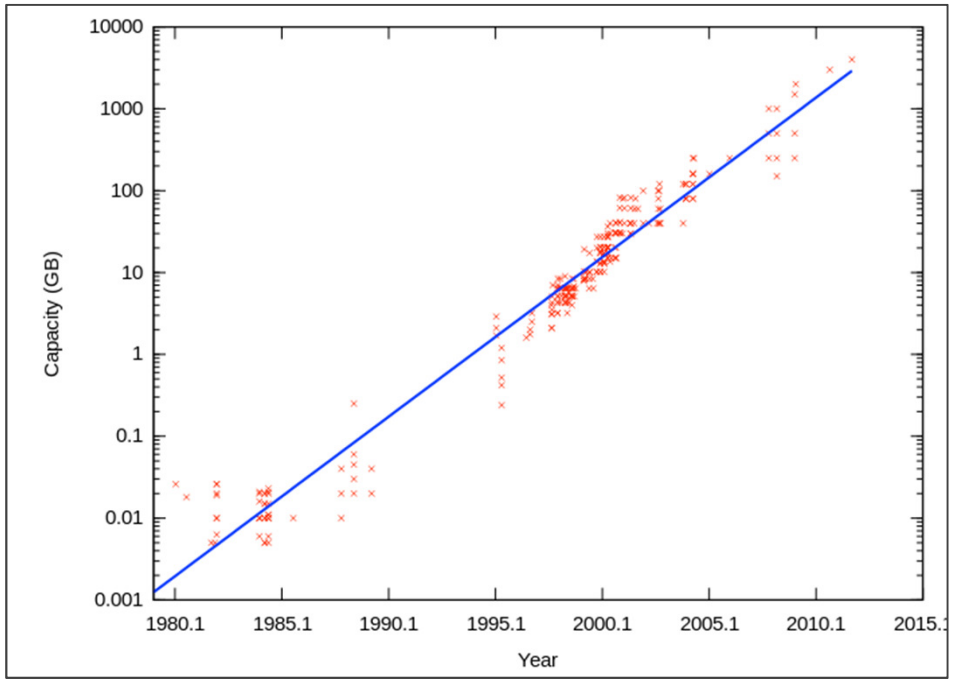

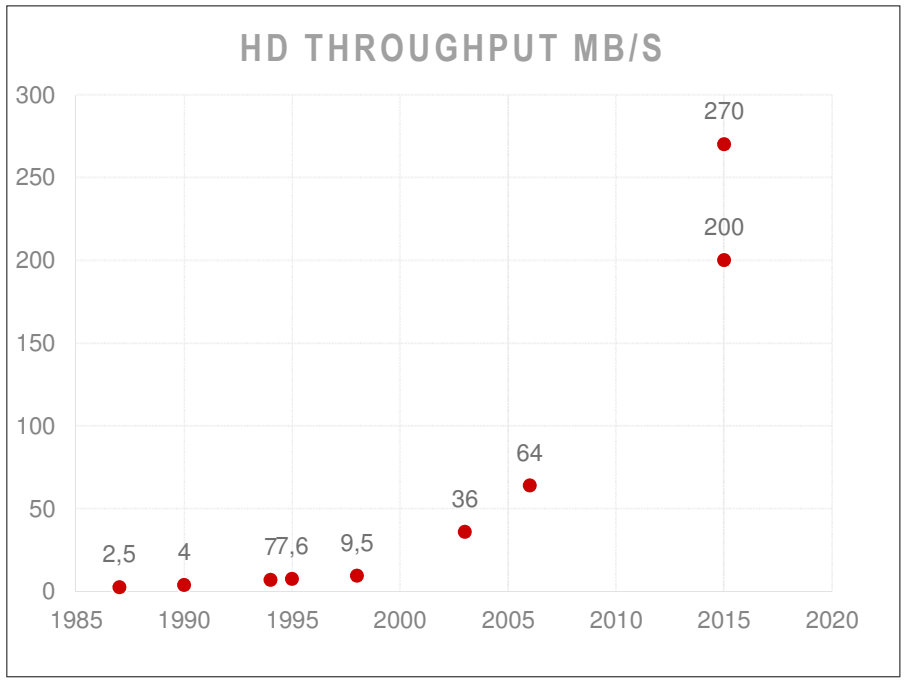

Max. HDD speed
15k UPM since 15 years constantly

22 Source: Wikipedia, University of California, Berkeley

What Will Drive the Flash Trend?

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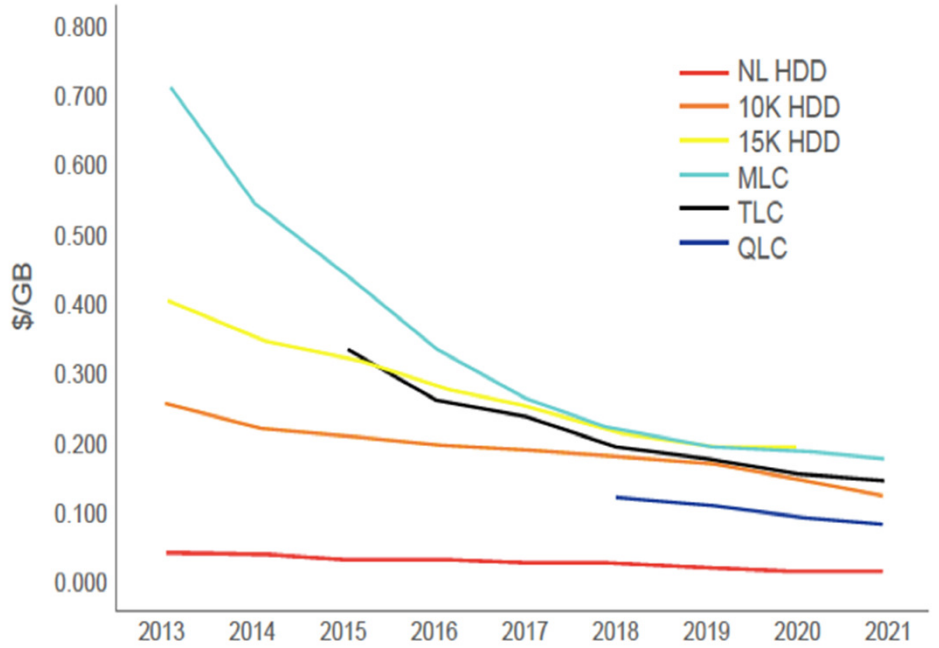
CONTINUING FLASH PRICE REDUCTIONS



Source: Consolidated Industry Analyst Data (Trendfocus, IDC, Gartner)

Enterprise Flash Deployment Growth

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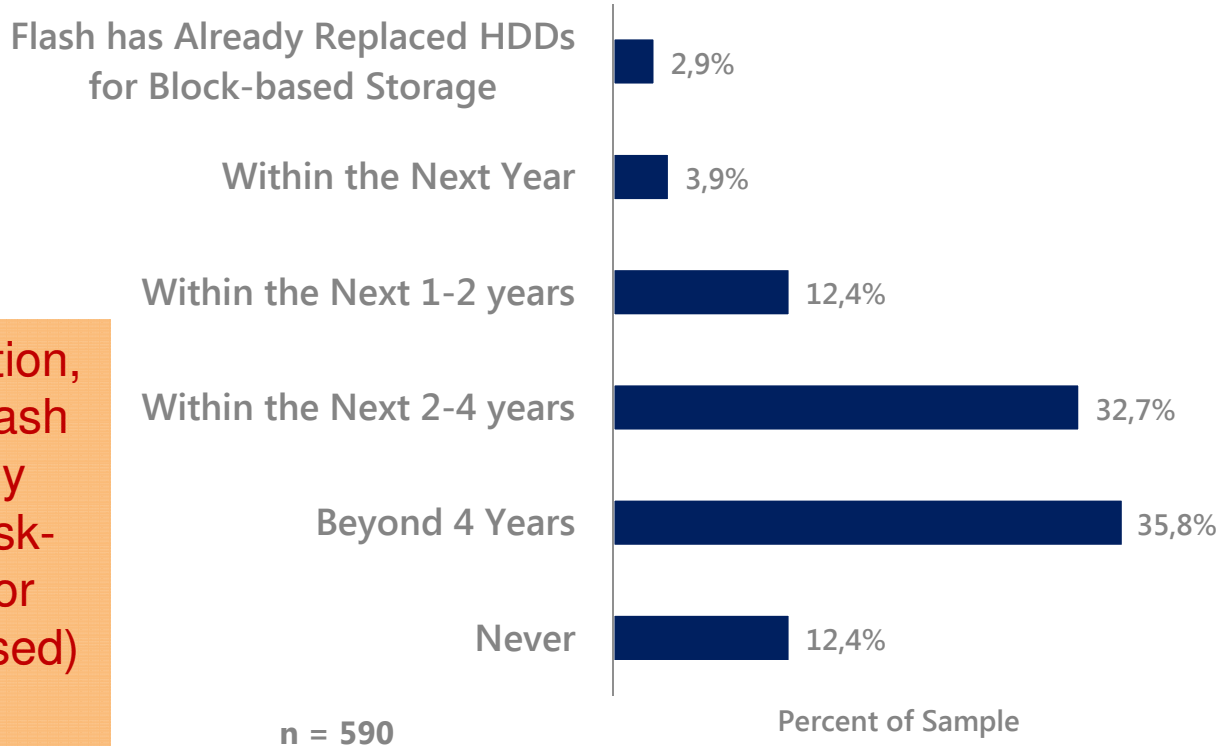
Within your own organization, when do you believe all-flash approaches will completely replace traditional hard disk-drive based approaches for block-based (i.e. SAN-based) storage workloads?



Source: 451 Research, Voice of the Enterprise: Storage, Q1 2016

Hitachi's FLASH INNOVATION

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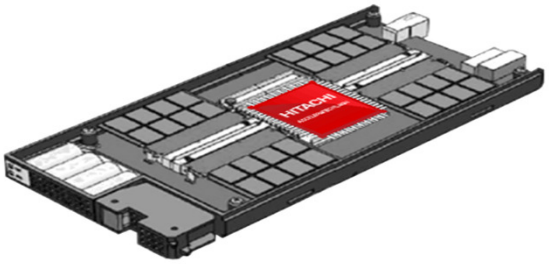

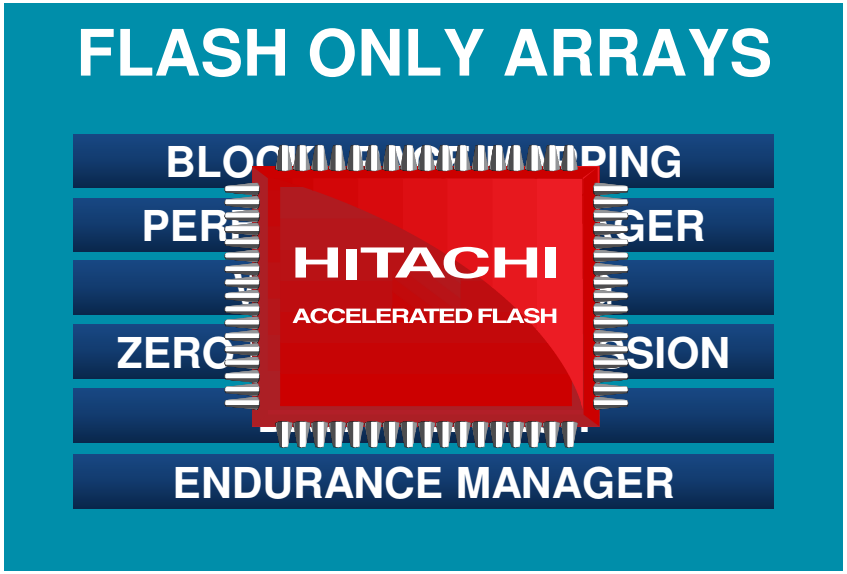

KEEP THE ENTERPRISE FUNCTIONALITY THAT WORKS

OFFLOAD FLASH MANAGEMENT FUNCTIONS TO HARDWARE

Hitachi Innovation: Flash Module Drives

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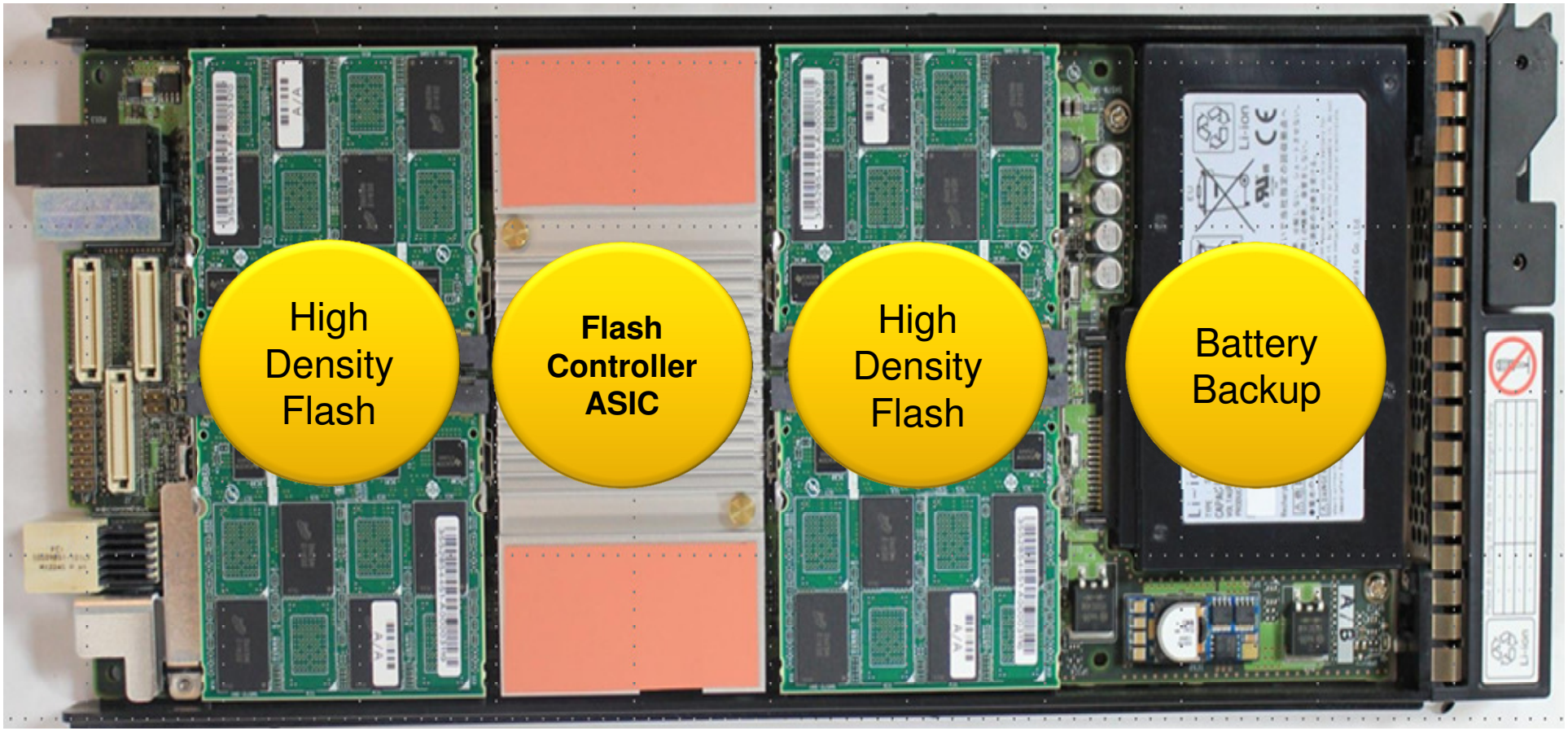

New 14TB and 7TB FMD HD

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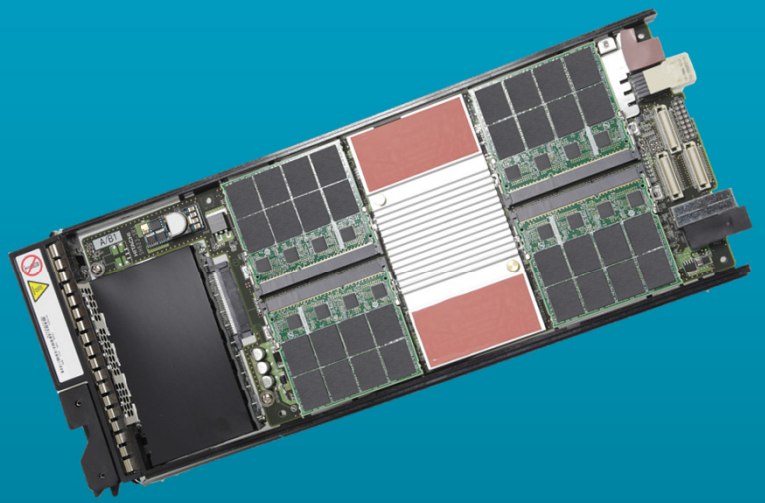
Built on 15nm NAND (128GB) flash

- Industry leading 14TB capacity option
  - Targeting large capacity systems
  - Available on all VSP G/F
- With 2:1 compression, up to 28TB effective capacity each
- A single 7+1 represents ~196TB effective capacity



Hitachi Flash Module (FMD) Advantage

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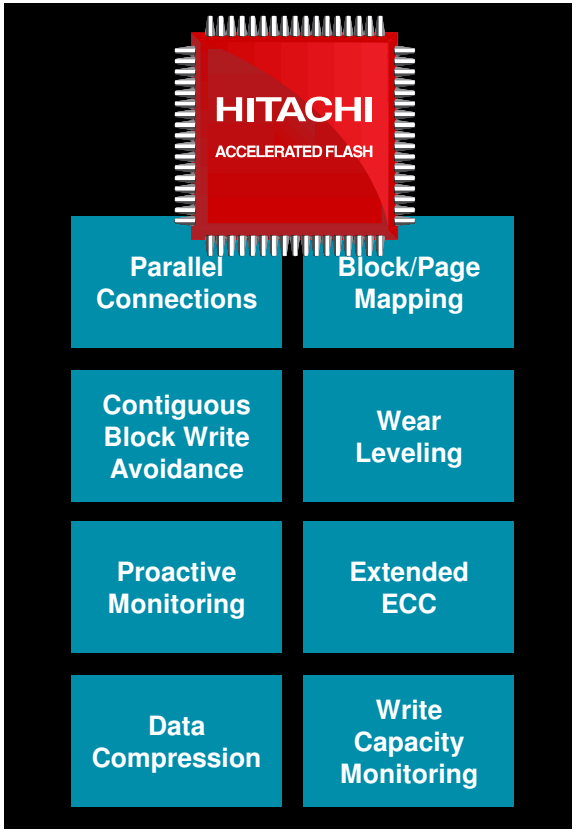
- Accelerates more workloads with fewer resources
  - Up to 3x the read, 5x the write performance of SSDs
  - Delivers 4x the system throughput (24Gb/sec) of competitors
- Increase capacity with no performance penalty
  - Uses inline compression 10x faster than competitors
  - Provides 4x more effective capacity for a lower TCO
- Including
  - 20% Spare Flash, Self Healing, Write Depletion Monitoring



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SVOS – Storage Virtualization OS

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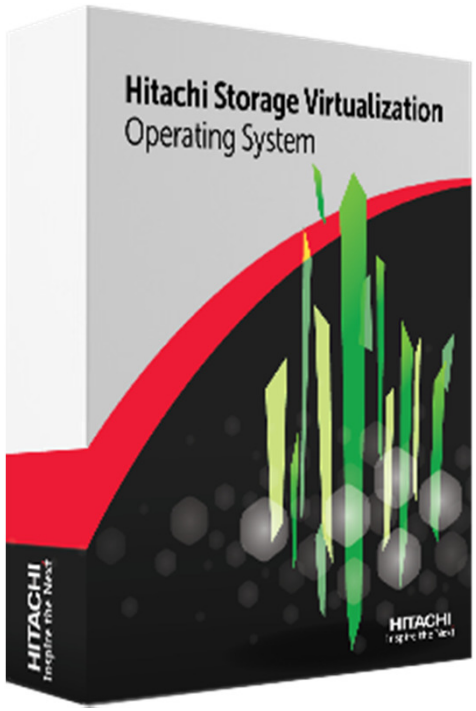

- Virtual
  - Virtual LDEVs for hardware abstraction and implementation of an unified virtual storage layer
  - Volume Migration
  - Virtual storage machines and external storage virtualization
- Available
  - 100% Data Availability Warranty
  - Non-disruptive Microcode-Update
  - Remote-Replication
  - Global-active device and nondisruptive data migration

Hitachi Storage Virtualization Operating System
Virtualizes Externally Attached Storage

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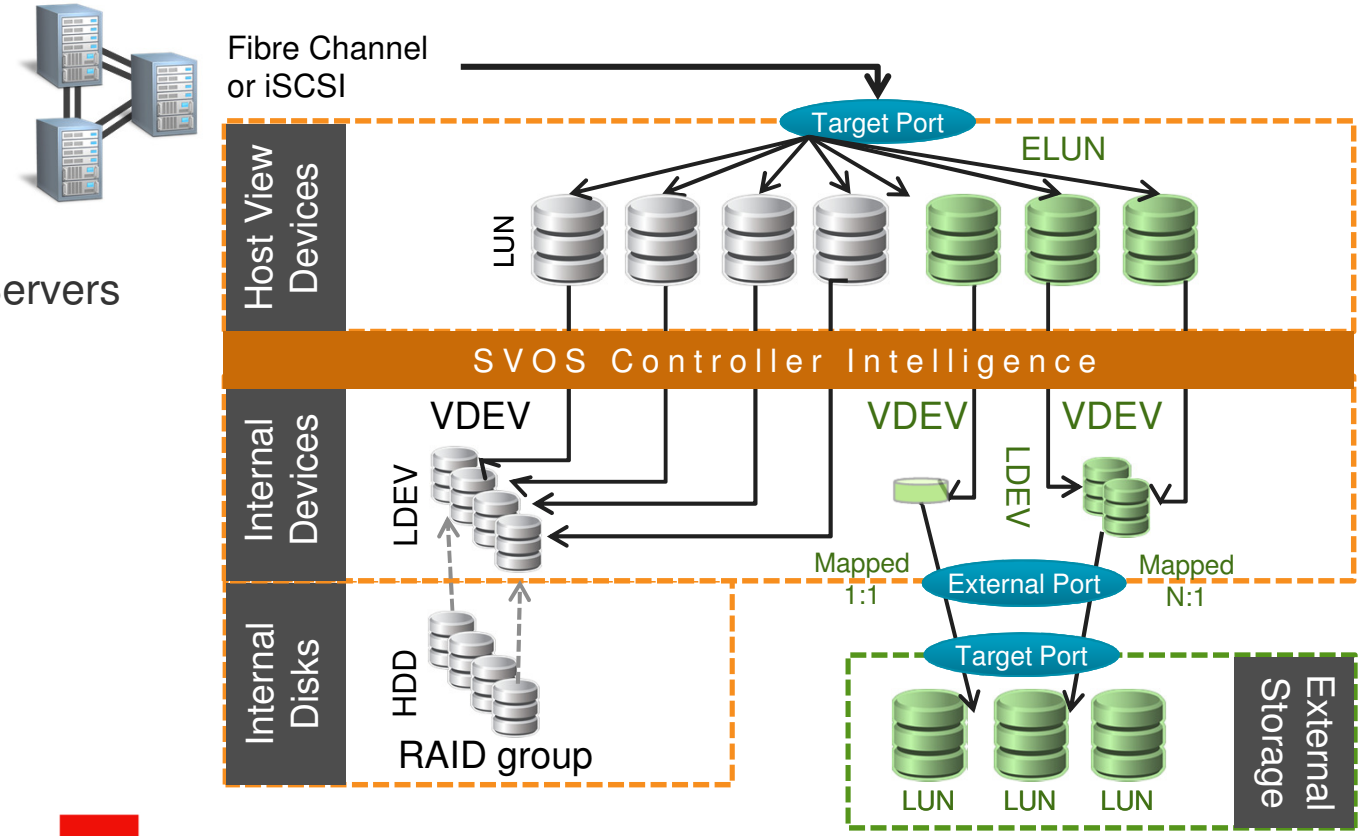

VSP Gx00 MicroCode Update

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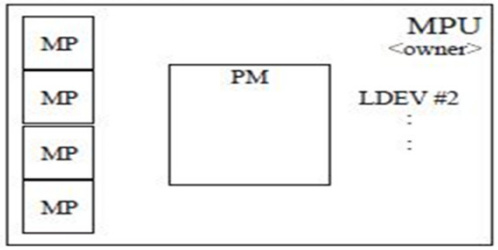
Write Cache is **NOT** disabled during Micro-Update because the MP could be updated one by one or in groups.



Reboot Pattern	Reboot pattern	Description	Standard	Replacement time	Effect on performance of DKC
	By 1/2 (*1)	Reboot half of all MPs at once.	Approx. 10 minutes	Short	Big
	By 1/4 (default)	Reboot a quarter of all MPs at once.	Approx. 15 minutes	:	:
	By 1/8.	Reboot 1/8 of all MPs at once.	Approx. 20 minutes	:	:
	By One	Reboot by minimum reboot unit.	Approx. 30 minutes	Long	Small

Hitachi Global Storage Virtualization

Clustered Active-Active Systems

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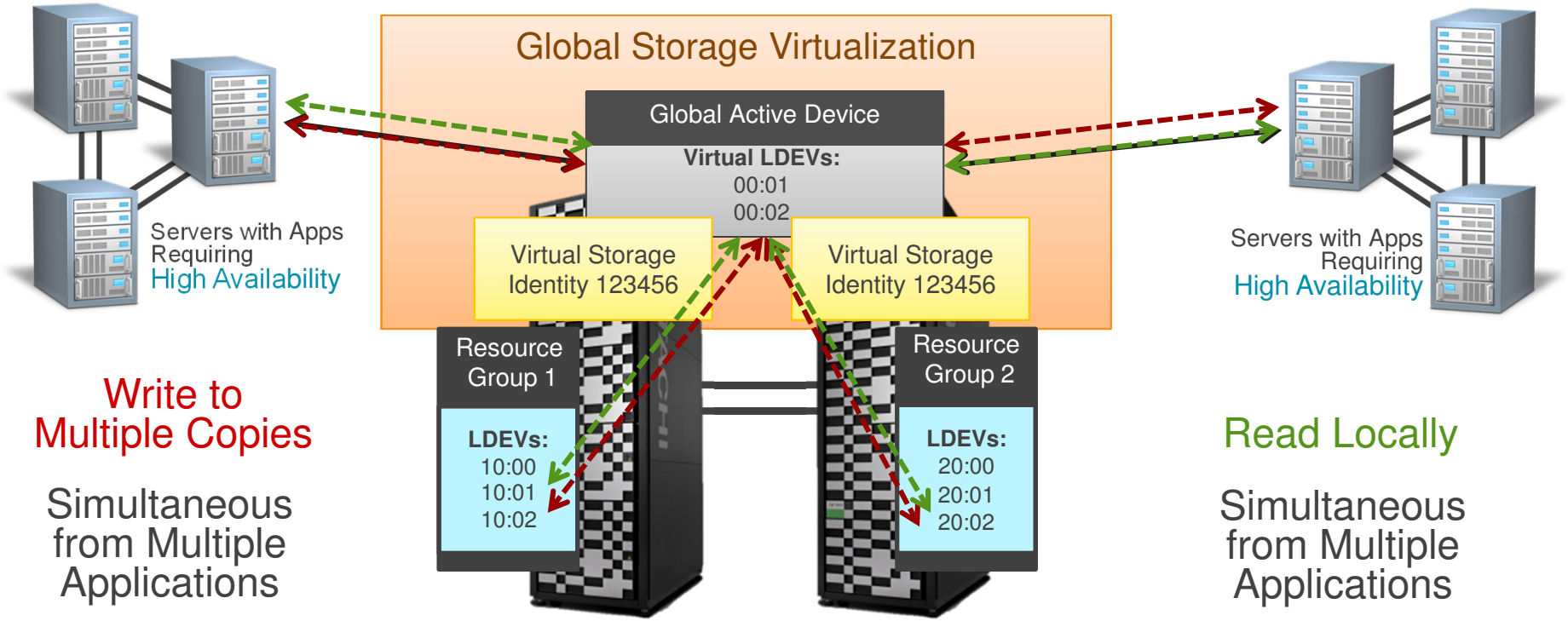

Write to Multiple Copies

Simultaneous from Multiple Applications

Read Locally

Simultaneous from Multiple Applications

GAD Enhancements

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- Active-Active for every LDEV
- Transparent Failover and Failback for Applications
- Configurable with Shortest Way for Hosts
- Needs a Quorum (virtual or physical) per iSCSI or FC

SVOS – Storage Virtualization OS

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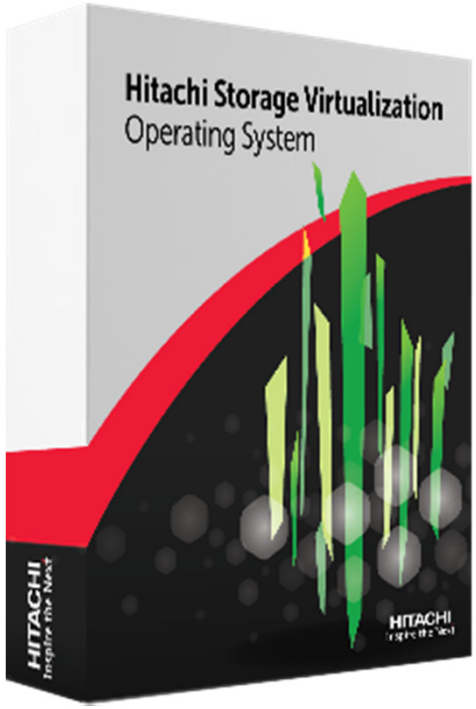

- Secure
  - Data at rest encryption
  - Volume Shredder
- Efficient
  - Thin Provisioning and Disk Pooling
  - Hitachi Dynamic Tiering
  - Deduplication and Compression (Flash)
- Fast
  - Flash performance acceleration and optimization
  - Quality of service (QoS) for consistent performance

Active Flash - Performance & Efficiency Evolution

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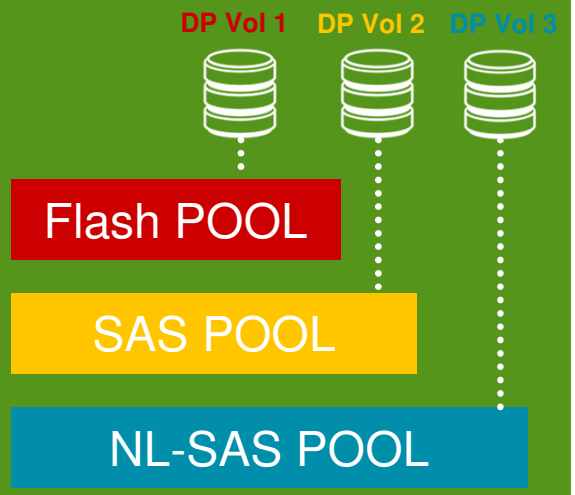
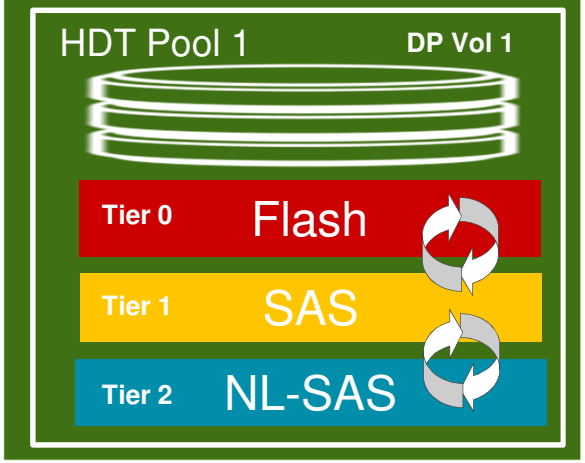
HDP

-Thin provisioning for efficiency
-Wide striping for performance
-Fixed workload assignment



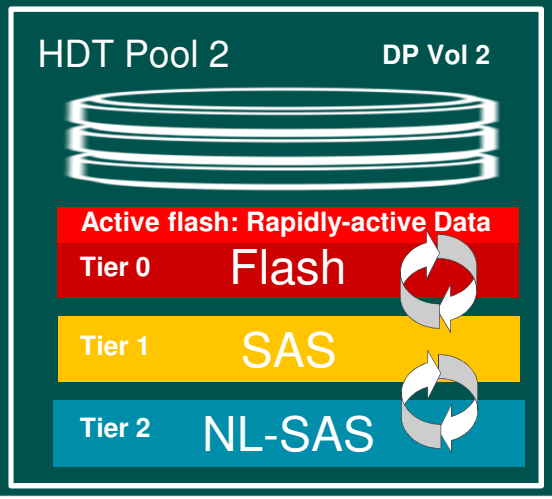
HDT

-Automatically moves the most active data to the fastest tier for max performance; least active to lower cost tiers
-30 min to 24 hour cycle time
-Inherits HDP advantages



Active flash

Seconds to sub-seconds cycle time!
-HDT with LOWER RESPONSE TIME capabilities
-Inherits HDT & HDP advantages



Deduplication and Compression

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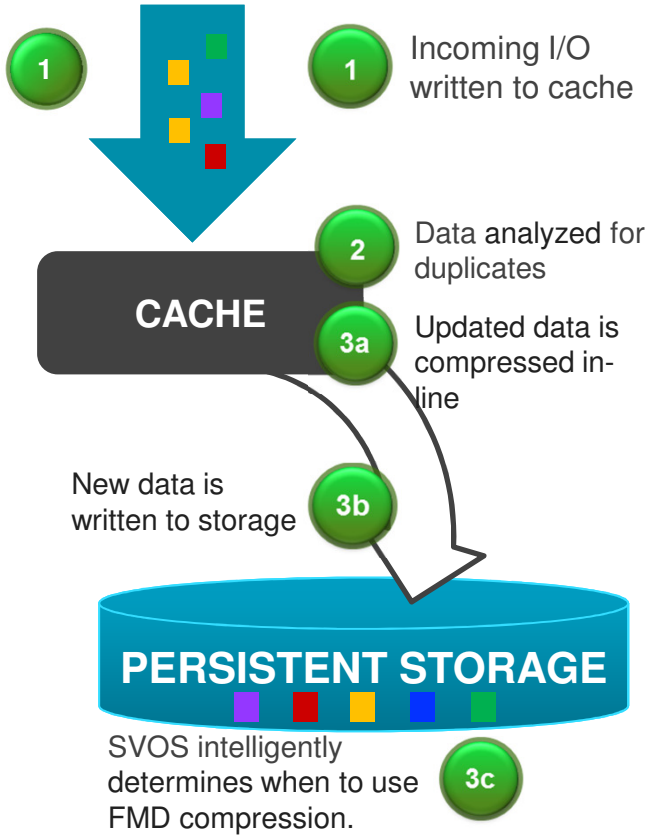
- Intelligently adjusts mode to minimize latency
  - SVOS detects if data pattern already exists
  - Compresses existing data inline
  - Final de-duplication is handled post process
- Optimizes data handling for performance
  - Application I/O prioritized for customer experience
  - Smart selection prioritizes “stable” data first
- Manages services used based on configuration
  - If FMDs detected, FMD compression used
  - If encryption required, SVOS compression used



SVOS 7: Enhance Customer Experiences

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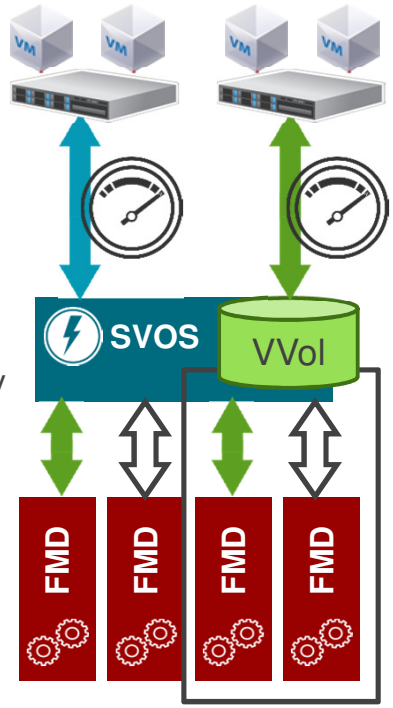
- Quality of service (QoS) for consistent performance
  - Prevents workloads from monopolizing bandwidth
  - Prevents monopolization of data reduction cycles
  - Integrates with VMware Virtual Volumes (VVols) for end-to-end QoS

- Flash-aware I/O stack for long term, low latency
  - Prioritizes application I/O over background tasks
  - Rebalances data placement to prevent hot spots
  - Offloads tasks to FMDs for scalable low latency

NEW
QoS: Predictable user experience

NEW
SVOS: Flash-aware low latency

NEW
SVOS / FMD: Managed flash ongoing high performance



Be Ready for Your Next Deployment Need

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Operating System Support	Hypervisor Support	Cluster Support	Certification
vmware	vmware	vmware	vmware
Windows Server	Windows Server 2012 Hyper-V	PowerHA	Microsoft
AIX	PowerVM	redhat	suse
redhat	CITRIX	Windows Server	ORACLE 11g Database Real Application Clusters ORACLE
suse		hp	CITRIX
solaris		symantec	symantec
hp UX			

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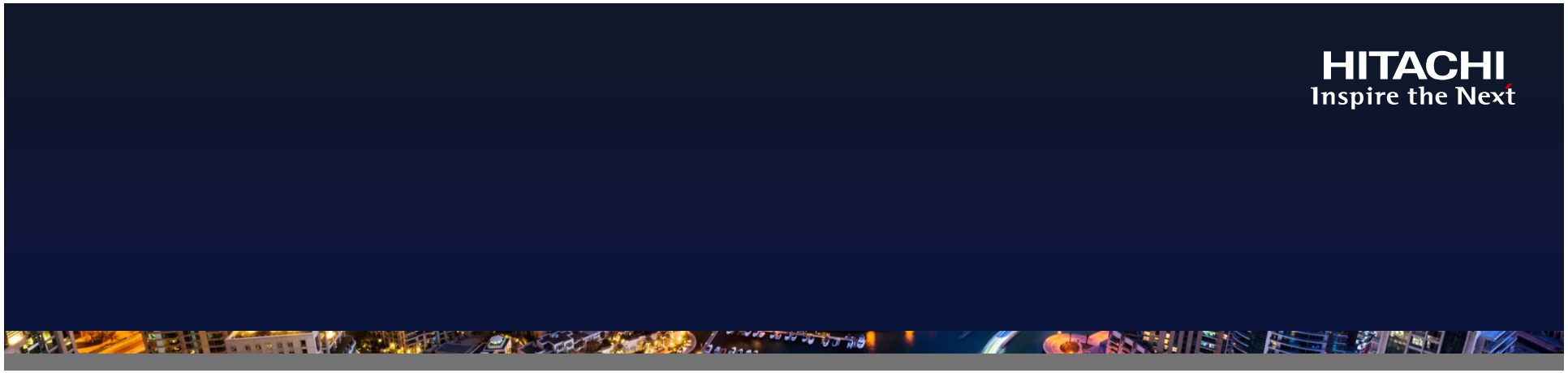

Questions and Discussion

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