



Aktuelle Entwicklungen im Speicherumfeld

*GSE Frühjahrstagung 2016
z/VSE, z/VM, KVM und Linux on z Systems
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Welcome to the Cognitive Era:

A new era in technology, a new era in business



**Data is transforming
industries and
professions**



**The world is being
reinvented in code**



**Computing is
entering a new
Cognitive Era**

Where code goes, where data flows, cognition will follow.

Hybrid cloud is emerging as the springboard in this new era



75% of enterprises In the US plan to increase cloud investment¹

64% of cloud adopters are using some form of hybrid cloud²

“The best thing about having a hybrid environment is that all of our business plans become reality in one environment”
- IT Director, Consumer Products³

¹IBM Center for Applied Insights, “Global Tech Hot Spots: A country-level look at big data & analytics, cloud, mobile and social” ²IDC, “Don’t Get Left Behind - The Business Benefits of Adopting Greater Cloud Adoption” ³IBM Center for Applied Insights, “Driving up hybrid: Accelerating digital transformation”

Mastering hybrid cloud requires greater speed, freedom and efficiency

Deliver real-time business visibility and insights

““” *It is critical for the business to analyze what is the **most impactful information for our operations** at any given time.*
– *Lead Business Architect, banking company*

Accelerate speed of integration and innovation

““” *We need to have **built-in intelligence and flexibility in the platform to support different workloads and deployment models.***
– *Executive Technology Advisor, sporting events*

Ensure secure, compliant and efficient IT services

““” *The future of delivering unique experiences is about the **ability to tap into a wider ecosystem.***
– *IT Executive Director, healthcare provider*

Source: IBM Institute for Business Value, *New Technology, New Mindset*, 2015

What is happening inside our Clients?

- Conflicting requirements from traditional “System of Records” and new “System of Engagement” have culminated in separate modes of operations or even organizations within our client’s IT
- Gartner describes this as Bimodal IT: The practice of managing two separate, coherent modes of IT delivery, one focused on stability and the other on agility.
- In a recent Gartner research paper, establishing Bimodal IT was on the top of the agenda for CIOs from the DACH Region

What is happening inside our Clients?

Bimodal IT – the two Modes of operation in Storage

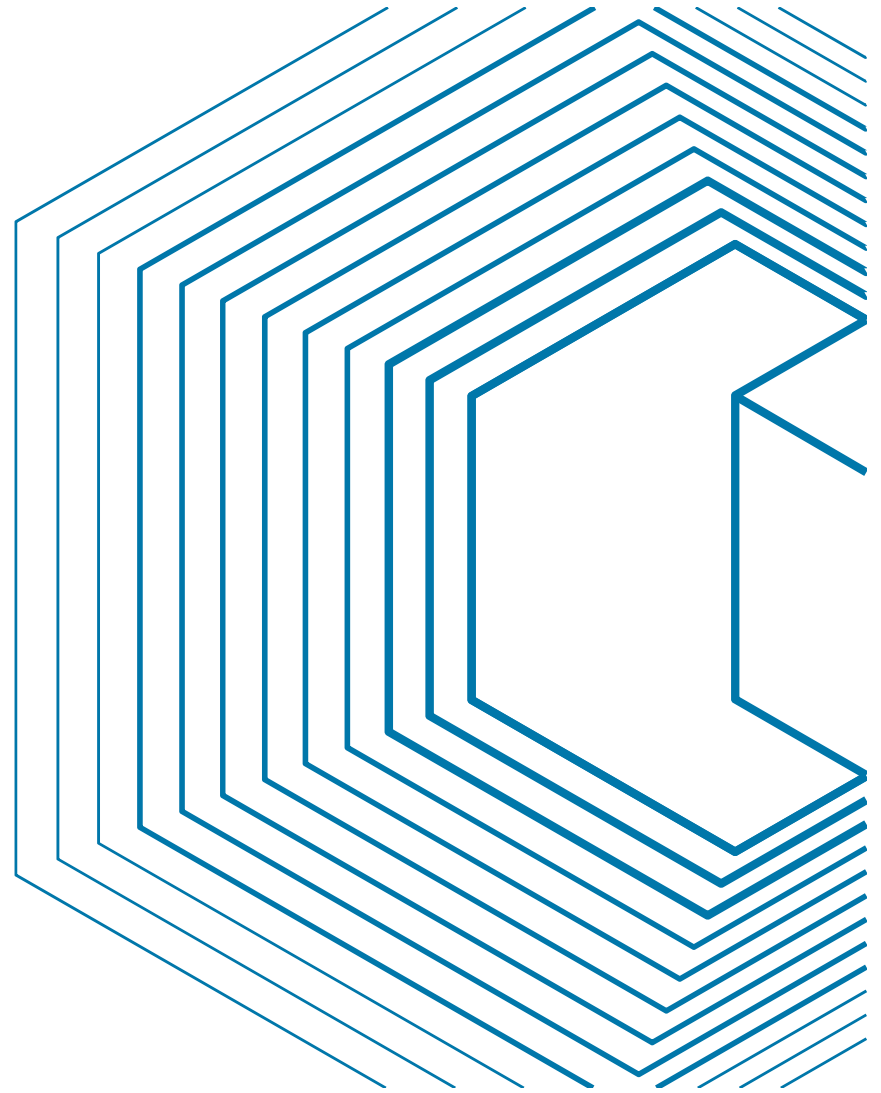
- The two modes of operation are characterized by the fundamental differences as they relate to storage.
- Both face rising capacity, performance and availability requirements
- Gartner suggests 3 key steps to be successful on the journey to bimodal IT in storage:
 1. Renovate the core
 2. Innovate at the edge
 3. Create an innovative culture
- Shifts in technology help on that journey but may also add complexity

Major technology-shifts / -improvements emerge

Clients have the choice from an increasingly complex portfolio of emerging technologies and vendors which can support the transformation towards digital businesses - but which also will add uncertainty and complexity

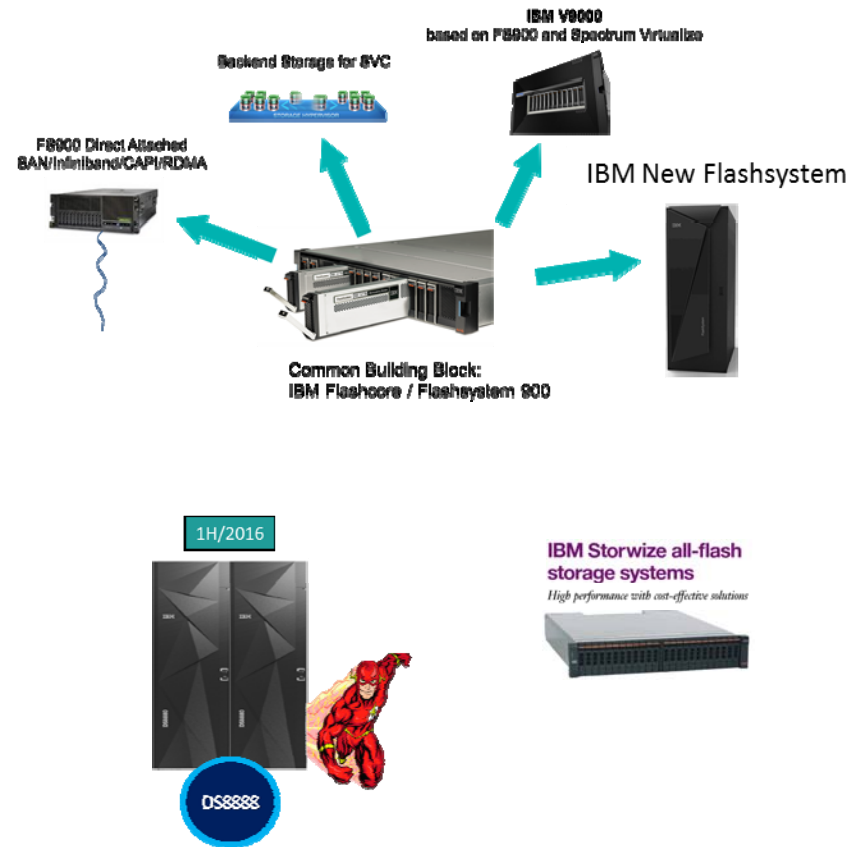
Hybrid Systems	➔	All Flash / Capacity Optimized Systems
Raw Capacity	➔	Data Reduction
Islands	➔	Virtualization / Unified Management
Subsystems	➔	Software Defined
File	➔	Object Storage
Infrastructure Layers	➔	Converged / Hyper converged Systems
Manual Processes	➔	Automation, Self Tuning, Self Healing
On-Premise	➔	Hybrid Cloud

IBM's Storage Positioning

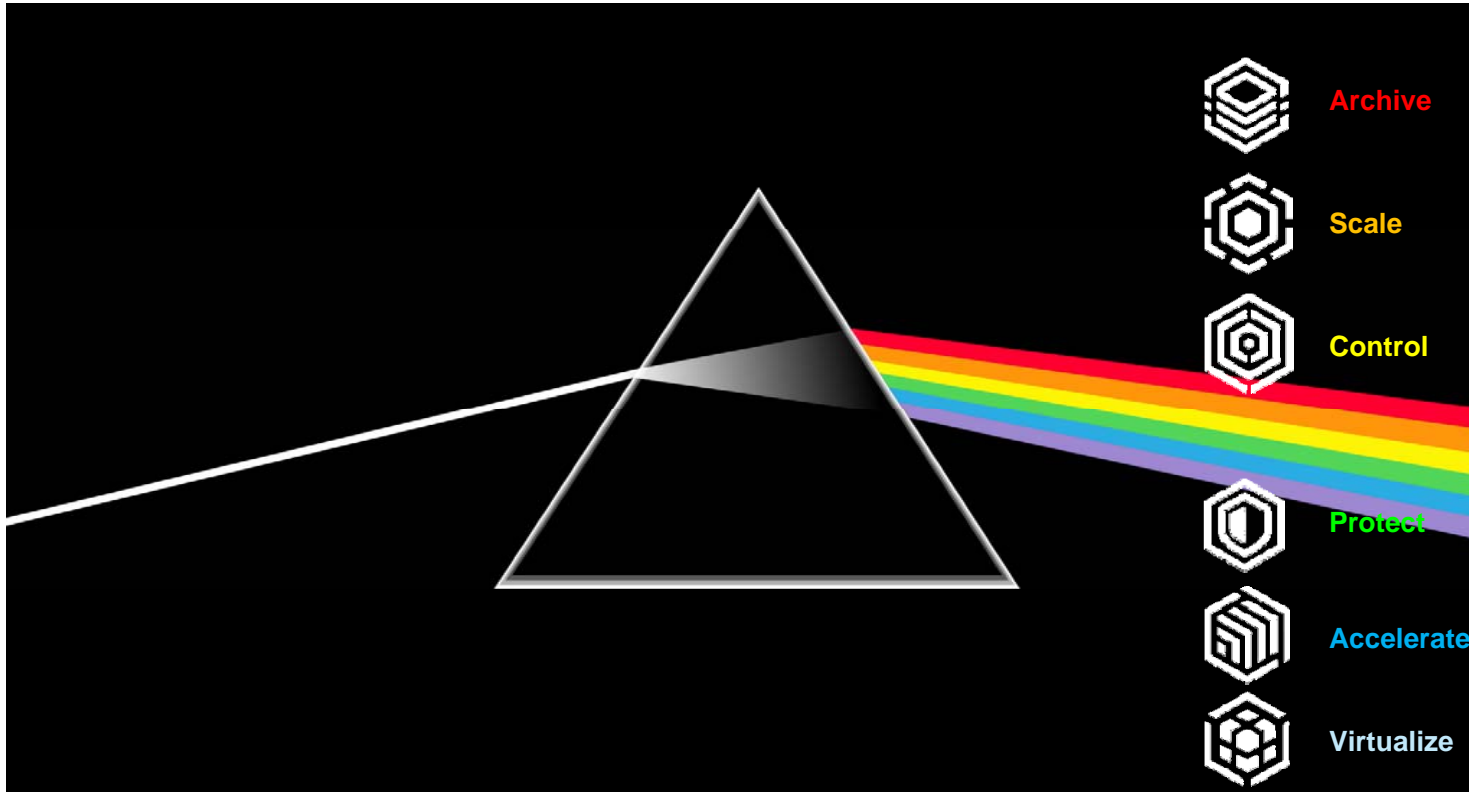


Flash Everywhere

- IBM has the most versatile and complete Flash Storage portfolio in the industry:
 - Flashsystem 900: Backend System for Spectrum Virtualize, native attached in use cases, where ultra-low latency is required.
 - V9000: Full Function Microlatency All Flash Array with Storage Management/Data Reduction. Clients who don't want to embark on virtualization
 - Coming soon: NEW Flashsystem: similar to V9000. Data deduplication and superior "Cloud Integration", Additional use cases like VDI, Complete Infrastructure Ecosystem.
 - Storwize All Flash: SSD-based all Flash Array. Consider when restrained budget, high Performance and lower capacities (~ <20TBs).
 - Coming soon: DS8888: Combination of highest availability, highest performance and mainframe capability and special integration into POWER platform. Will be probably focused on those environments.
- Replacement of Tier-1 Disk installations with All-Flash
 - Data Reduction Technologies allow solid Business Cases
- new Use Cases
 - POWER 8/CAPI, iSER etc.
 - Flash for DP&R, FLAPE

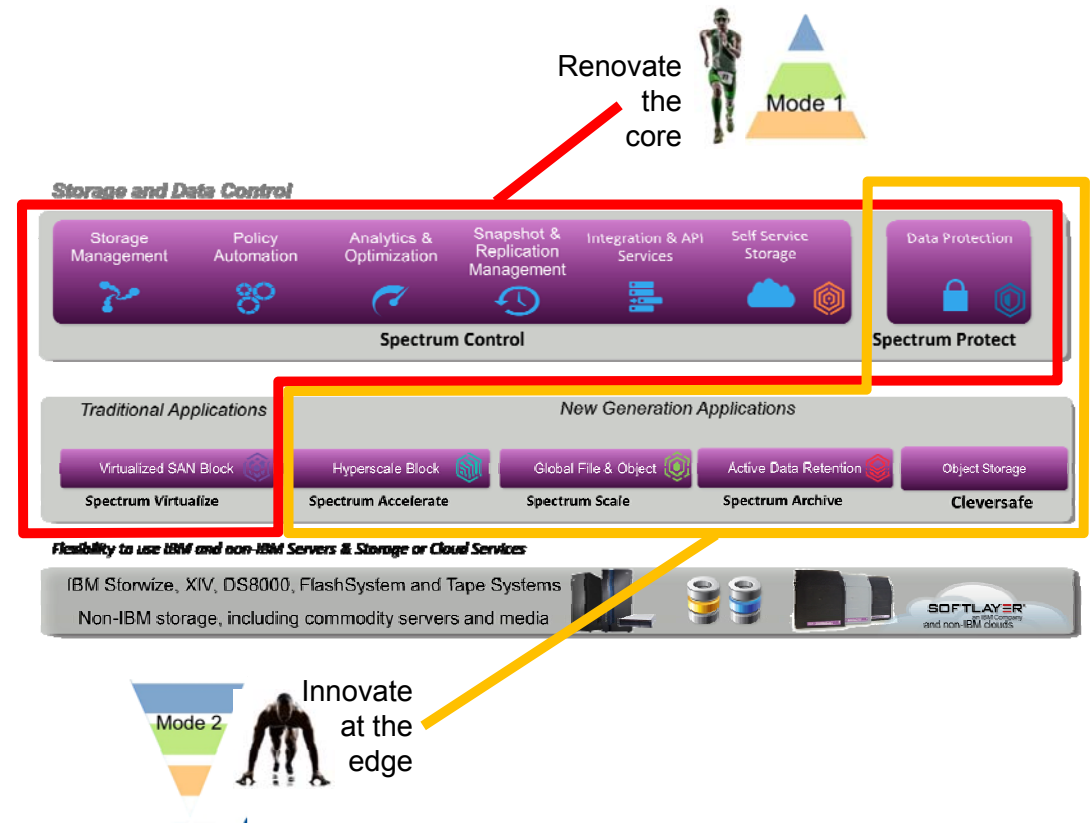


IBM Spectrum Storage

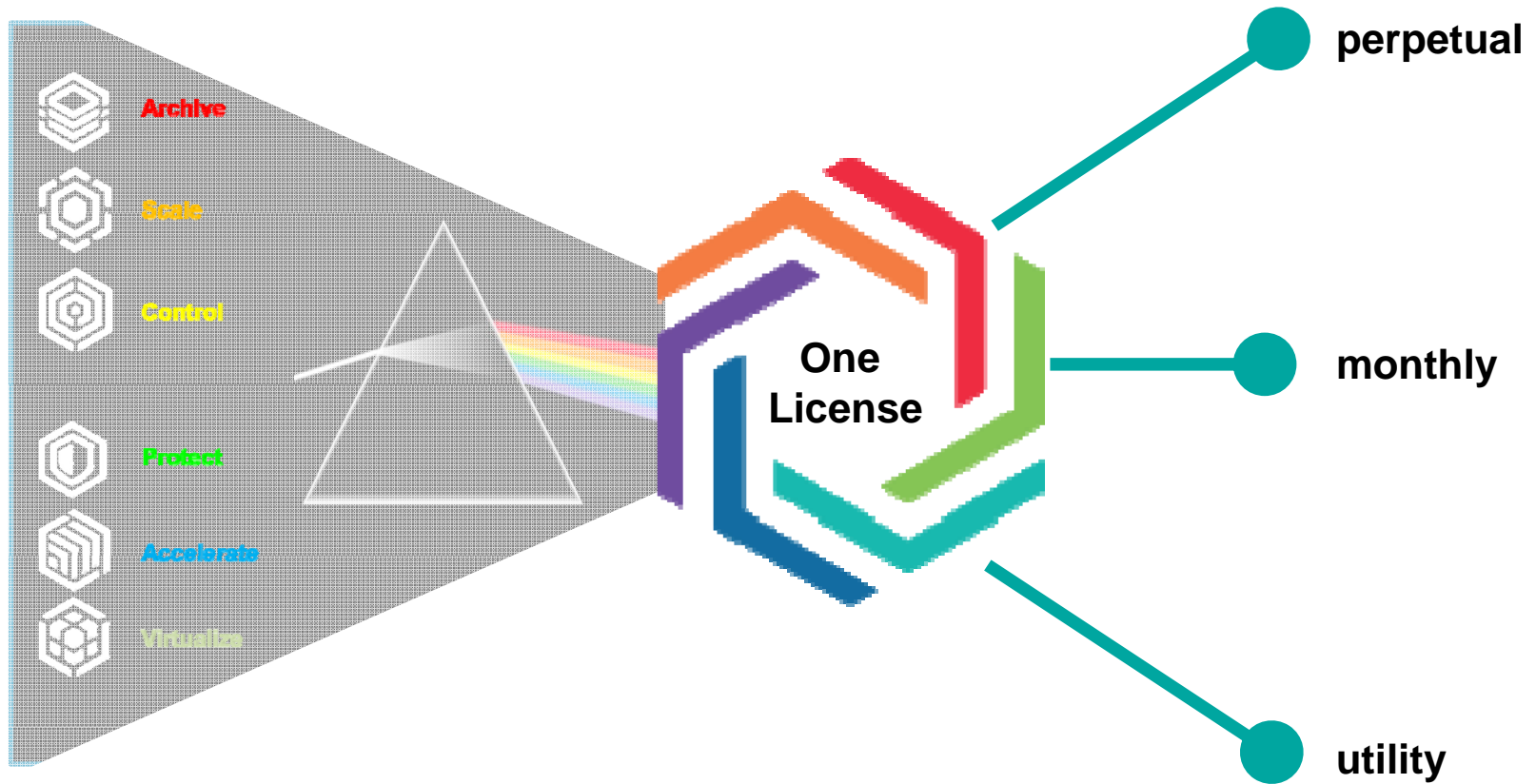


IBM Spectrum Storage for the World of Bimodal IT

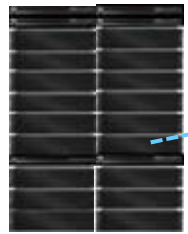
- IBM Spectrum Storage is the core Storage offering for the world of Bimodal IT
- One stop shopping, one “construction kit” for all storage-requirements of future digital business
 - Renovate the core by virtualizing and automating with Spectrum Control, Spectrum Virtualized, Flash
 - Innovate at the edge with Software Defined Storage (Block, File and Object), Hyperscale, Cleversafe
 - Spectrum Protect for both Modes (DPaaS, DP to Cloud, Onpremise, Block, File and Object Storage)
- One license for all components of the “construction kit” (if desired) to enable flexible response to all business requirements
- All based on proven, mature technology
- This is UNIQUE in the industry



IBM Spectrum Storage Suite



IBM Storage Appliances



IBM ESS



IBM SVC



IBM XIV...

IBM Spectrum Storage



IBM Spectrum Scale

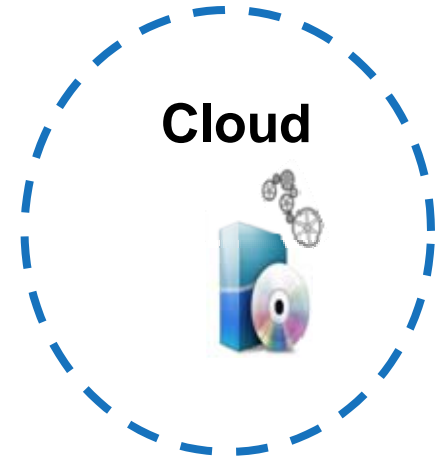


IBM Spectrum Virtualize



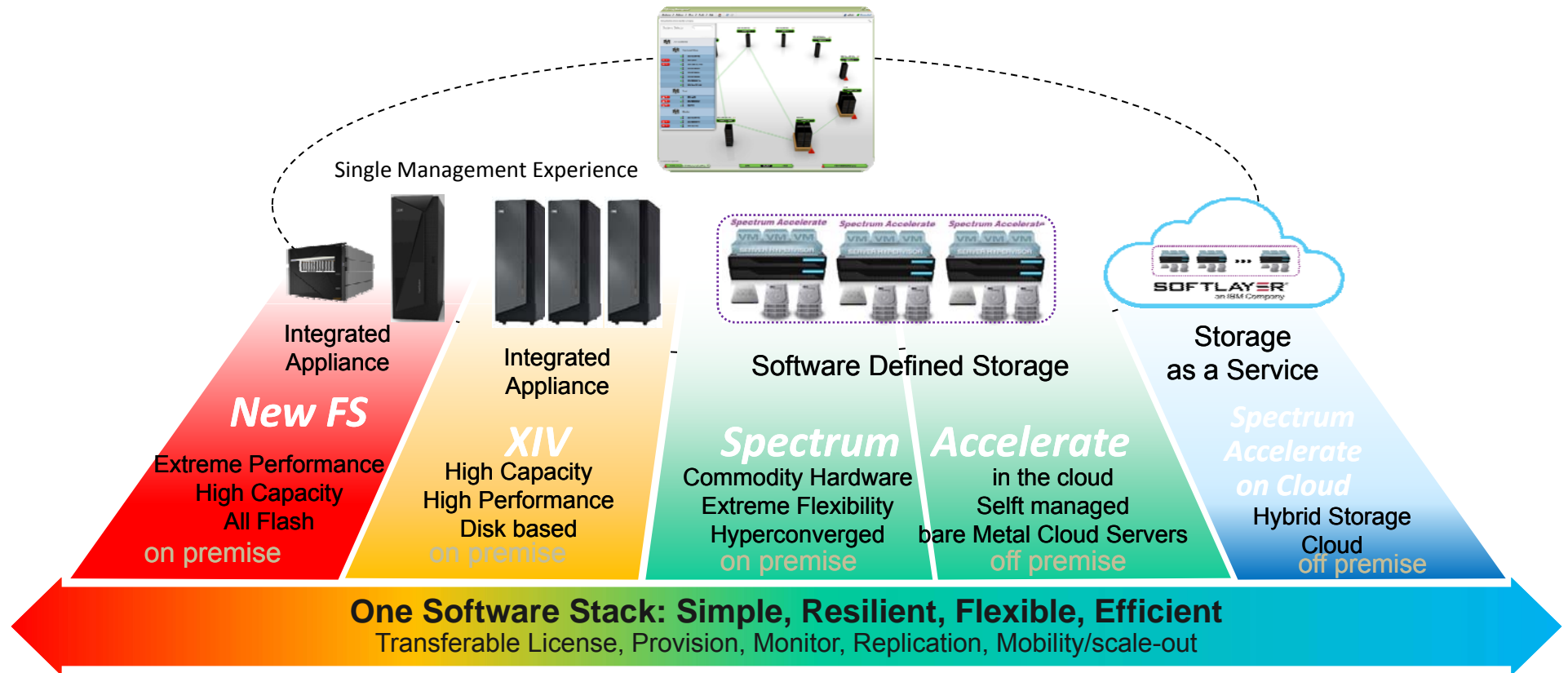
IBM Spectrum Accelerate

IBM Storage Software



Cloud

the XIV and Spectrum Accelerate Storage Infrastructure Ecosystem



IBM Spectrum Storage

Storage and Data Control



Flexibility to use IBM and non-IBM Servers & Storage or Cloud Services



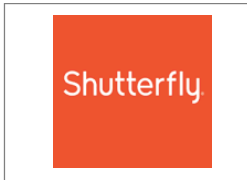
Web-scale Enterprise and Video Services



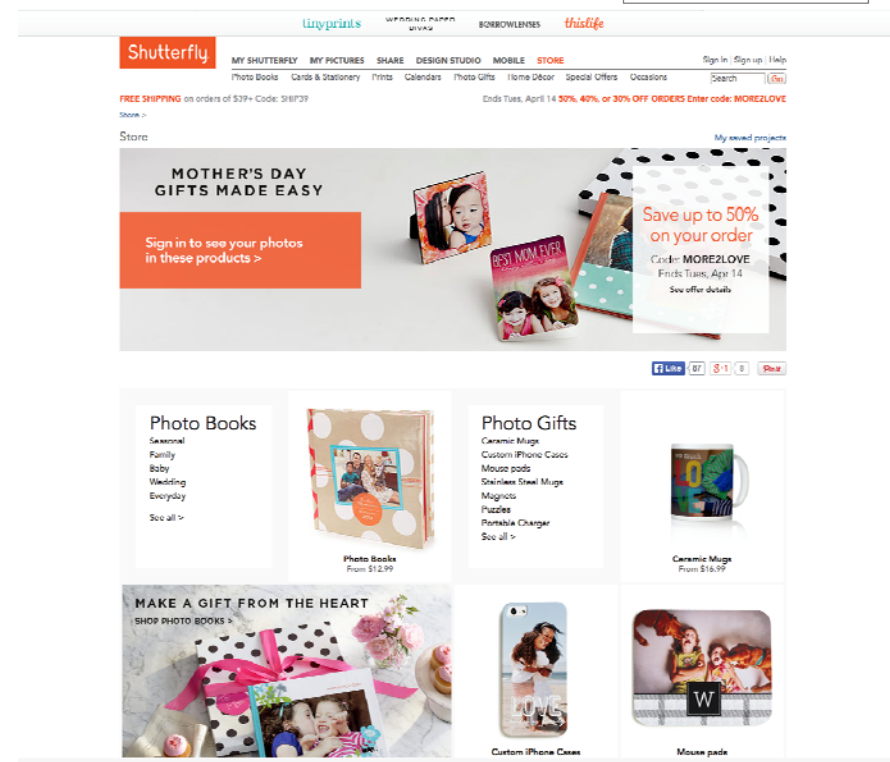
- **Services for UK-based media company, Europe's media leader**
- **Scale:** 5 petabytes and growing
- **Security:** zero touch security for all content
- **Availability:** always-on availability for 2.5 years and new capacity in minutes
- **Manageability:** lower overall data center cost with high service levels
- **Economics:** 80% savings over old (legacy storage) approach and 43% over Amazon Web Services S3



Shutterfly: Best Practice of Speed & Space



- **Scale** – 130 petabytes and growing: more than 50 Billion images stored
- **Security** – 50,000+ uploads per minute with zero touch security
- **Always-on availability** – SLA of 100% download on demand – even during CA to Nevada datacenter move
- **Manageability** – 3 Administrators manage entire environment
- **Economics** – Operating costs reduced by more than 70%



What is Object Storage?



- S3-Interface
- Openstack Swift
- Simple Object API



Web-Scale

- Objects 1000x larger
 - HD video/images
 - Genomic/seismic data
- Large and growing storage
 - 40-60% annual growth
 - Petabytes to exabytes+
- Legacy storage won't work
 - Architectures can't scale
 - Replication drives \$\$\$\$

Web-scale requires new storage architecture



Recent IBM Acquisition



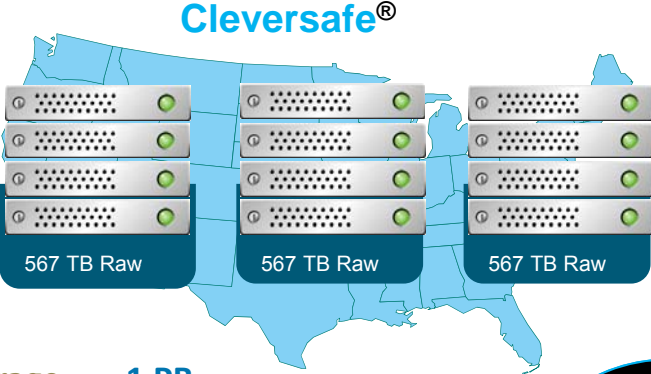
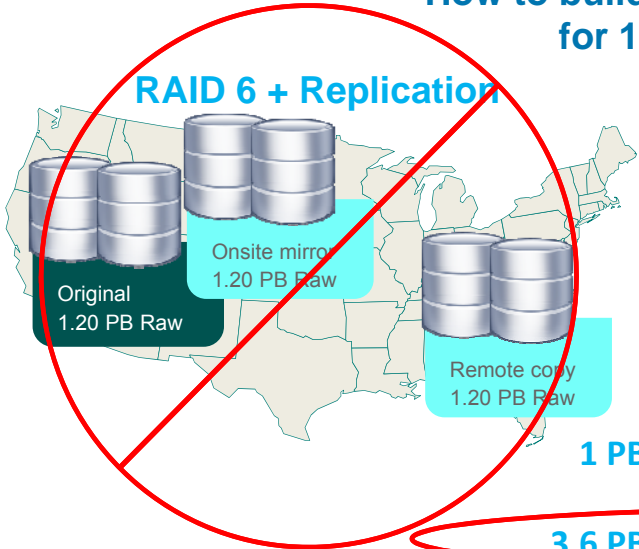
Storing and Retrieving Data



It's `http:// PUT & GET`

Efficiency

How to build a highly reliable storage system for 1 Petabyte of usable data?



	1 PB	Usable Storage	1 PB
	3.6 PB	Raw Storage	1.7 PB
	900	4TB Disks	432
	3.6x	Racks Required	1.7x
	3.6x	Floor Space	1.7x
	3 FTE	Ops Staffing	.5 FTE
Replication/backup		Extra Software	None

\$
70% +
TCO Savings

Cleversafe use cases



Active Archive



Enterprise Collaboration



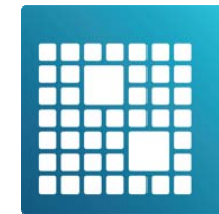
Business Continuity



Back-up



Content Repository

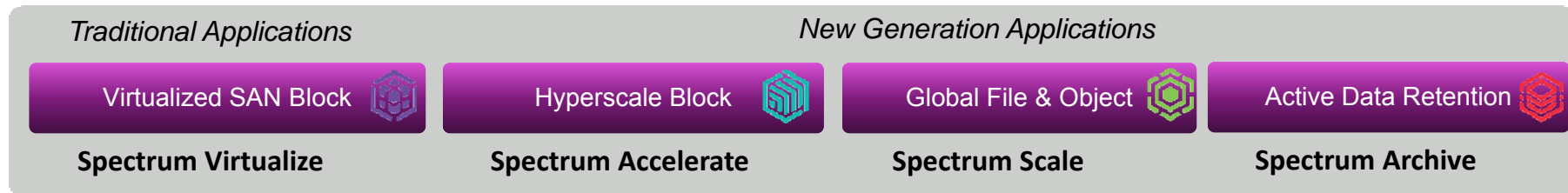


Storage as Service

Storage and Data Control



Data Access



Flexibility to use IBM and non-IBM Servers & Storage or Cloud Services



IBM DS8880

High End Storage for your High End Business



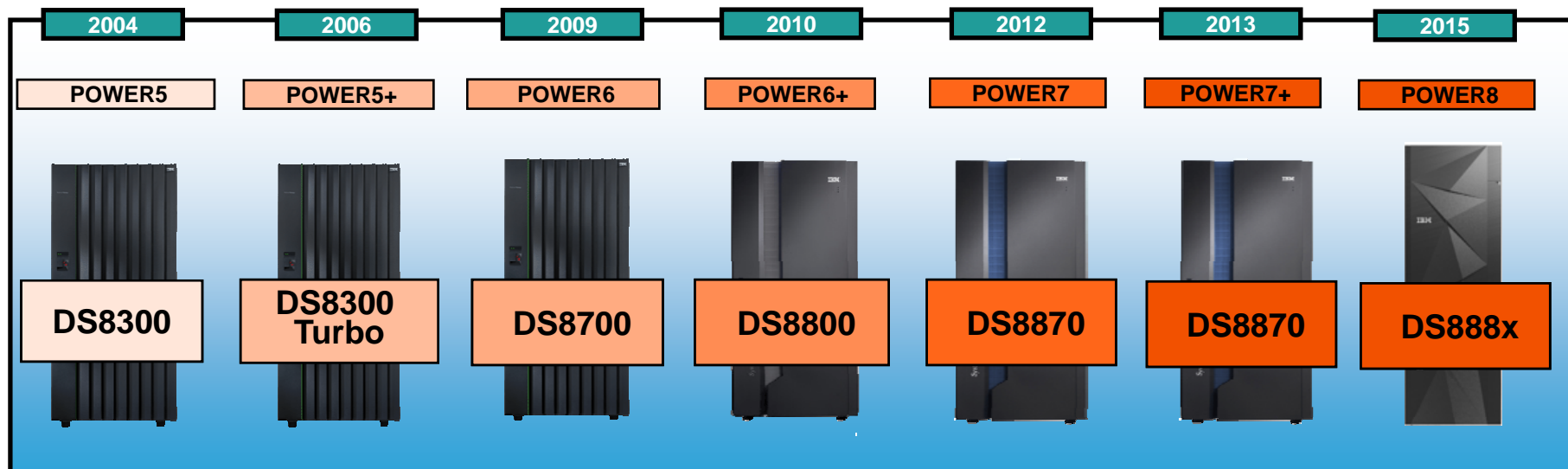
Data Systems optimized for the cognitive era

- **92 of the largest 100 banks** run on z Systems
- **Most of the top 20** world banks use DS8000 and z Systems for core banking
- **DS8000 is #1** storage for z Systems
- IBM DS8880 Data Systems are designed to deliver **greater than 6-nines availability**
- **IBM DS8000 was the First** to integrate High Performance Flash into Tier 1 Storage



7th-generation DS8000 enterprise disk system

Building on a market-proven, reliable code base!

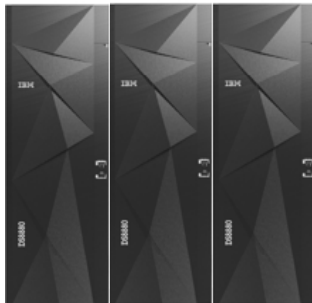


- Designed for over 5-9's availability natively
- Designed for over 6-9's availability when configured with Metro Mirror and IBM HyperSwap

Introducing the new DS8880 family of Data Systems

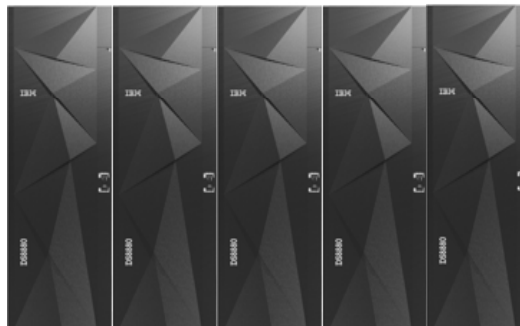


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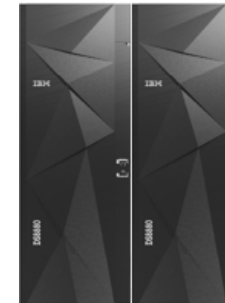
DS8884

- Fast
- Hybrid Flash
- 256 GB Cache (DRAM)
- 64 Ports
- 768 HDD/SDD + 120 flash cards
- 19" Rack



DS8886

- Faster: 2X Performance
- Hybrid Flash
- 2 TB Cache (DRAM)
- 128 Ports
- 1536 HDD/SDD's + 240 flash cards
- 19" Rack



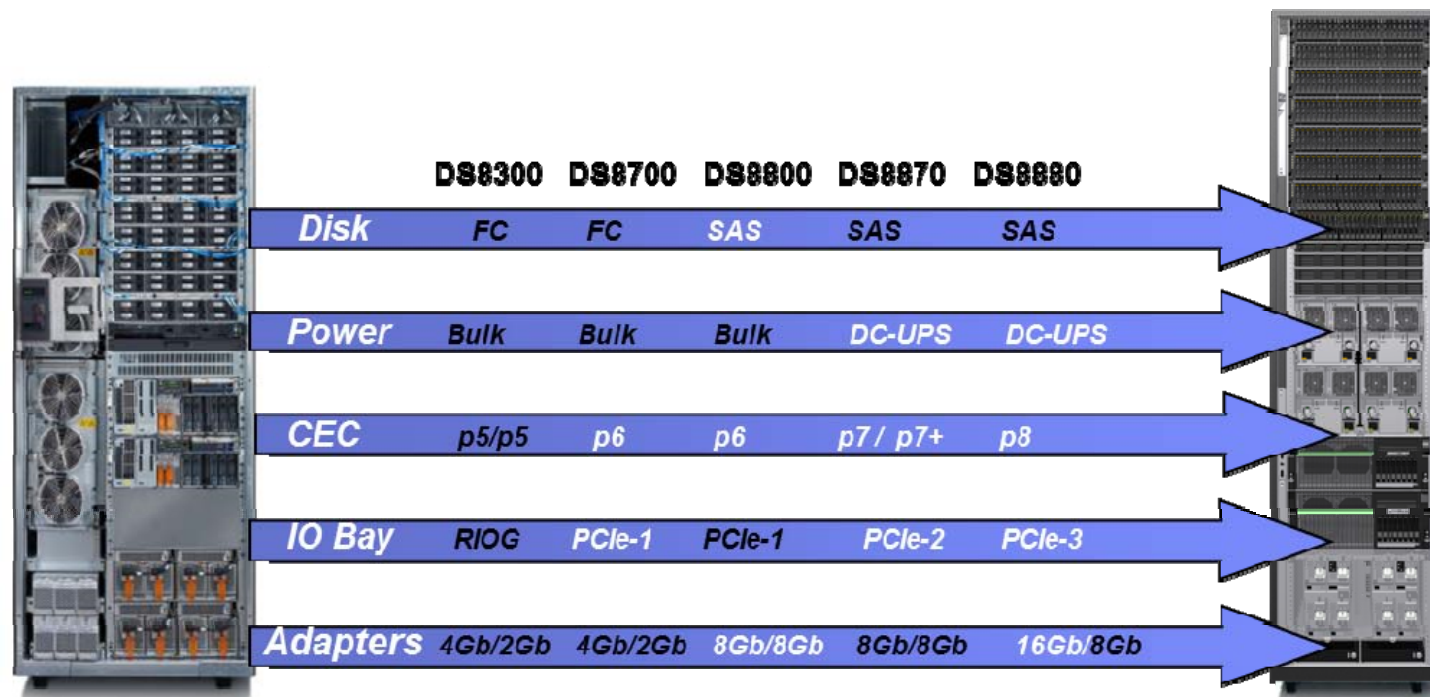
DS8888

- Industry's Fastest T1 Subsystem
- All-flash
- 2 TB Cache (DRAM)
- 128 Ports
- 480 Flash Cards
- 19" Rack

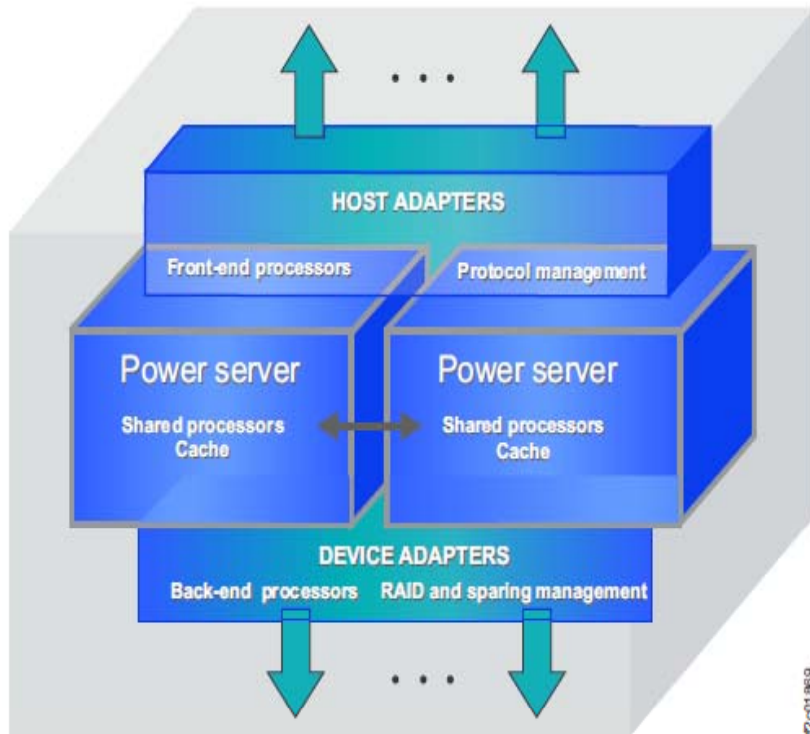
IBM is introducing a family of **business-critical hybrid data systems** that span a wide range of price points. The family is powered by the **next generation of IBM's proven DS8000 platform** and delivers critical application acceleration, uncompromising availability and industry-leading capabilities.



IBM DS8000 – the story of an architecture evolution

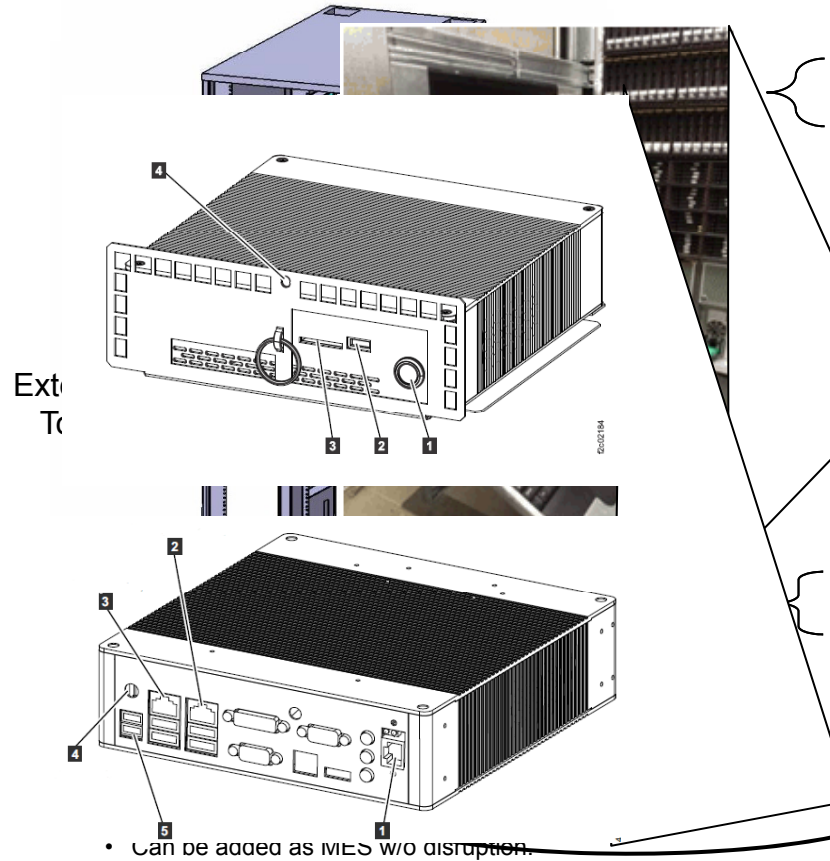


DS8000 Three Layer Architecture



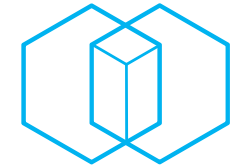
- **Layer 1: Up to 32 distributed PowerPC / ASIC Host Adapters (HA)**
 - Manage the 8/16Gbps Fibre Channel host I/O protocol to servers and perform data replication to remote DS8000s
- **Layer 2: Centralized POWER 8 Servers**
 - Two symmetric multiprocessing processor (SMP) complexes with up to 96 cores, manage two monolithic data caches, and advanced functions
- **Layer 3: Up to 16 distributed PowerPC / ASIC Device Adapters (DA); up to 8 dedicated Flash enclosures**
 - DA's manage the 8Gbps FC interfaces to internal HDD/SSD storage devices
 - Flash Enclosures manage optimized performance and latency of Flash cards
 - Both manage RAID protection and sparing

IBM DS8880 HW Architecture



- SSD/DDM Media Enclosure
- High Performance Flash Enclosure
- I/O Bay Enclosure
- DC-UPS

IBM DS8884



Mission critical enterprise system in a space savings, lower cost package

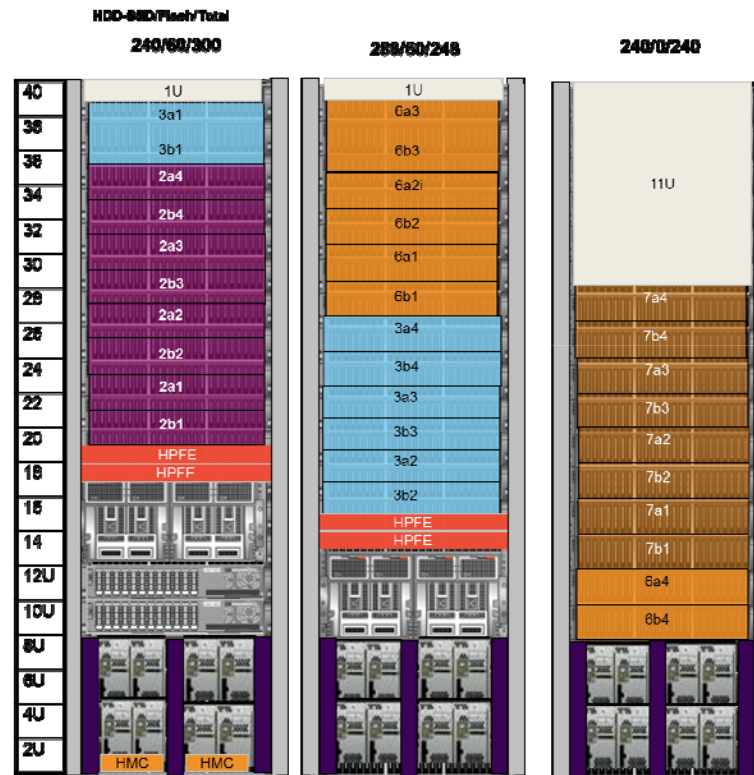
For clients running critical workloads on mainframe, power or distributed in single or mixed modes needing high end functionality on a lower cost, flexible and space savings solution.

- S822 2S2U Power 8 processor
- Up to 12 cores
- 256GB Total system memory
- 64 16GB FCP/FICON ports
- 768 HDD/SSD drives + 120 Flash Cards
- 19", 40U rack

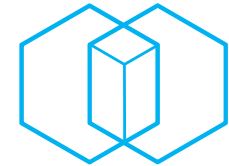


IBM DS8884 Architecture

- 19" 40U rack
- 2x P8 2U controller single processor socket
- 2x IO Bay Pairs
 - 1x IO Bay Pair in A Rack
 - 1x IO Bay Pair in B Rack (B Rack can be ordered with out IO bay Pair)
- Max of Host 64 Ports
 - 4 port 16Gbps FCP / FICON
 - 4 port and 8 port 8Gbps FCP / FICON adapters
 - Max 16 ports per I/O Bay
- Max 4 DA Pairs
- Max of 768 DDMs/32 Gigapack drawers
- Max of 4 High Performance Flash Enclosures -120 flash drives
 - 2 HPFE Drawers in A Rack
 - 2 HPFE Drawers in B Rack
- 2x 8U DC-UPS 60A Single Phase
- 1 or 2 HMC option
- Max of 3 Racks



IBM DS8886



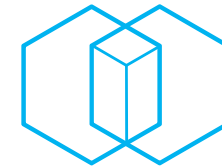
Scalability and accelerated performance with world class storage services

Up to 2X better performance, highly scalable, with unmatched capability for multisite replication in a dense yet expandable package.

- S824 2S4U Power 8 processor
- Up to 48 cores
- 1TB Total system memory
- 128 16GB FCP/FICON ports
- 1536 HDD/SSD drives + 240 Flash Cards
- 19", 46U rack



IBM DS8888 all Flash



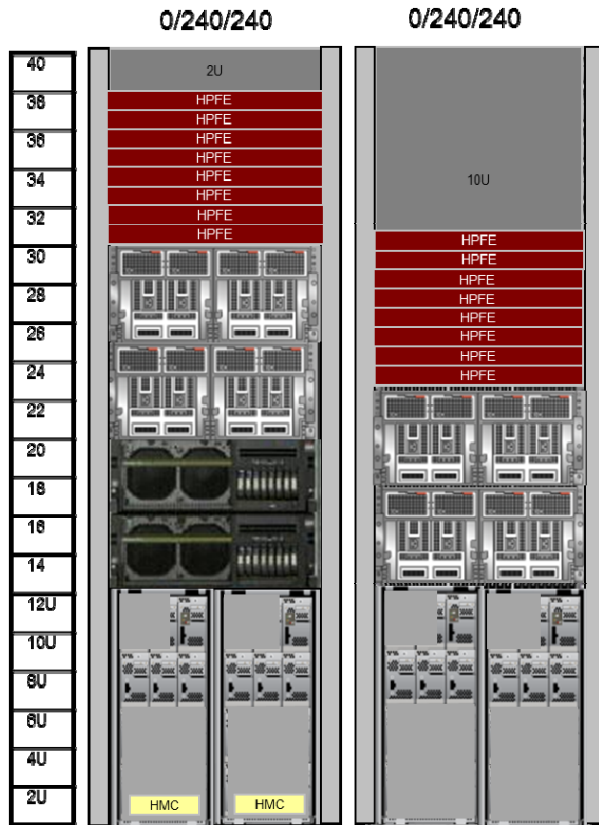
Extreme performance for applications where time equals money

When performance is as critical as the data it serves: for applications and workloads where time equals money and you want more of each.

- E850 4S4U Power 8 processor
- Up to 96 cores
- 2TB Total system memory
- 128 16GB FCP/FICON ports
- 480 Flash Cards
- 19", 40U rack



IBM DS8888 architecture



- HDD-
SDD/Flash/Total
- 19" 40U Rack
 - Max of 2 Rack
 - 2 P8 Alpine 4S4U CEC's
 - 4x IO Bay Pairs
 - 2x IO Bay Pair in A Rack
 - 2x IO Bay Pair in B Rack
 - Max of 128 Ports Host Ports
 - 128 ports with 8Gb 4/8 port Host Adapter
 - 128 ports with 16Gb 4 port Host Adapter
 - Max 0 DA Pairs Supported
 - Max of 16 HPFE Drawers/480 flash drives
 - 400GB Flash Drives for 192TB Raw
 - 800GB Flash Drives for 384TB Raw (3Q/16)
 - Will support intermix of 400GB/800GB in system. (Not in enclosure)
 - 2 12U DC-UPS Three Phase per Rack 1 or 2 HMC option
 - Single BSM set
 - No Single Phase DC-UPS/Three Phase DC-UPS intermix
 - 1 or 2 HMC option

DS8880 Supported Drives

Hard Disk Drives

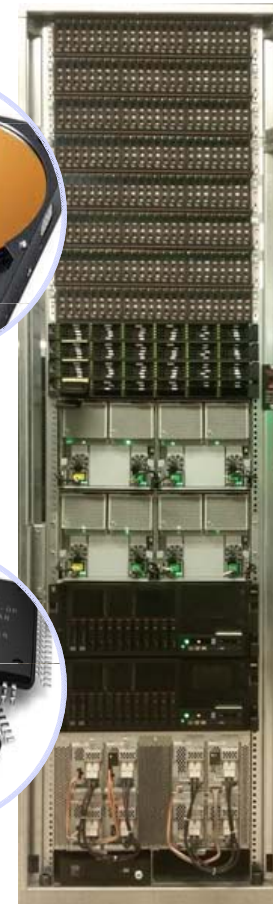
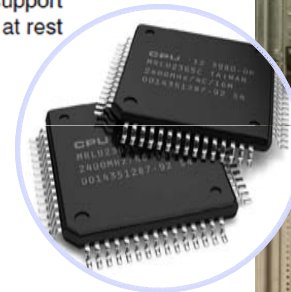
- 4TB 7.2K SAS E half drive set
- 1.2TB 10K SAS E drive set
- 600 GB 10K SAS E drive set
- 600 GB 15K SAS E drive set
- 300 GB 15K SAS E drive set

Flash Media

- 200GB SSD drive set
- 400GB SSD drive set
- 800GB SSD drive set
- 1600GB SSD drive set
- 400GB flash cards



All drives support encryption at rest



146 GB 15K
900 GB 15K
3 TB 7.2K

DS8880 – R8 Code Bundle

Base function (BF) License

- ✓ Thin provisioning
- ✓ Easy Tier
- ✓ Database protection
- ✓ I/O Priority Manager
- ✓ zDDB.
- ✓ Encryption

Copy Services (CS) License

- ✓ Point in Time Copy
- ✓ SE (no more TSE)
- ✓ Metro Global Mirror
- ✓ Metro Mirror
- ✓ Global Mirror
- ✓ Multi Target Mirror

z-synergy Services (zsS) License

- ✓ FICON
- ✓ HP FICON
- ✓ RMZ
- ✓ RMZ Resync,
- ✓ PAV
- ✓ HyperPAV.



DS8880 Performance

	Units	DS8800 P6 4 Core	DS8870 P7+ 16 Core	DS8884 P8 6 Core	DS8886 P8 24 Core	DS8888 P8 48 Core Targets (Actual)
Rd Seq	GB/s	11.8	22	22	42.1	~47 (53)
Wr Seq	GB/s	6.6	11	12.3	25.5	~35
DB zOS	K IO/s	204K	900K	680K	1650K	~2500K
DB open	K IO/s	198K	1096K	575K	1760K	~2500K (2500K)

Increased IOPS and Bandwidth

- The new Multi-thread Performance Accelerator algorithm with more cores/threads provided greater IOPS
- PCIe Gen3 I/O fabric increases bandwidth
 - 4x IO Bay bandwidth

Why server + storage synergy matters

“A system is the server plus its storage”



IBM owns the System z[®] I/O architecture

It's shared technology between server team and storage team

Competitors lack access to this collaboration and experience

IBM is best positioned for earliest delivery of new server support

IBM extends this server/storage integration to Power i and Power AIX

Designing, developing, testing and providing support together is key to unlocking true value

System z Integration



- Others offer interoperability, but only IBM offers deep integration for true optimization
- EMC and HDS support new System z features late or never at all!

Examples of IBM exclusives

Sequential Performance
DS8000 List Prefetch Optimizer boosts database scans by
8x
for faster operational analytics

Only
IBM

Transactional Performance
DS8000 Easy Tier API boosts transactional workloads by
10x
for real-time analytics

Only
IBM

High Availability
DS8000 Metro Mirror with GDPS HyperSwap enables
99.9999%
availability

Only
IBM

High Availability
DS8000 Global Mirror recovery point (RPO) as low as
3 seconds
for near-continuous uptime

Only
IBM



Many Thanks !

IBM System Storage

