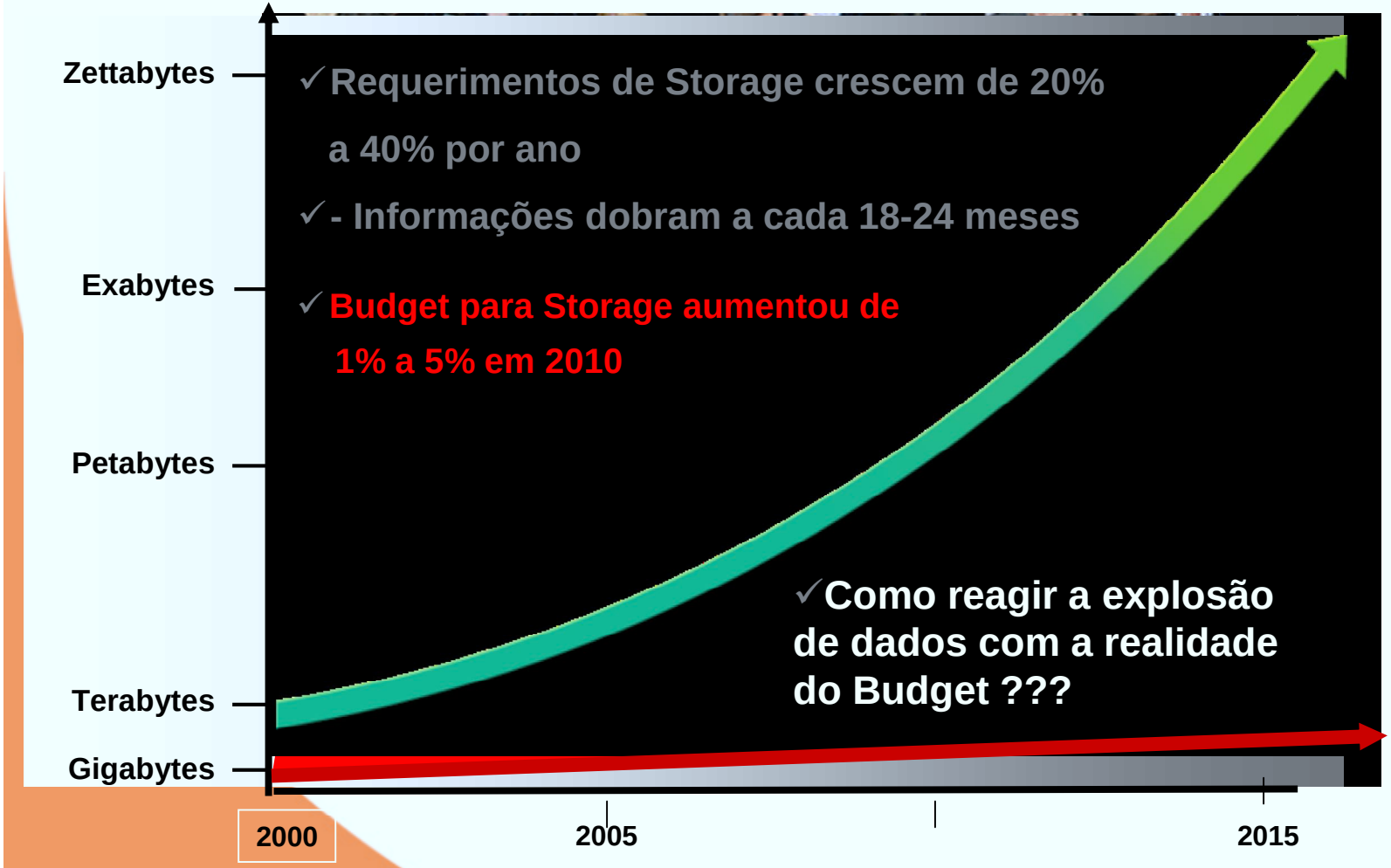
Nova Era de Eficiência em Storage

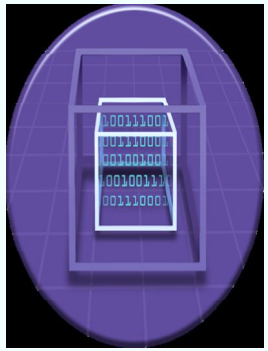
Daniel Cavalcanti
Mgr, Storage Products

Sistemas Inteligentes estão gerando uma explosão de dados

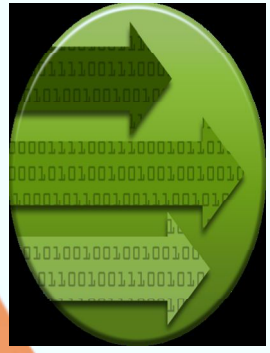


Instrumented.
Interconnected.
Intelligent.

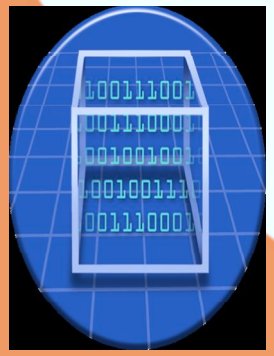
Estratégia da IBM para Eficiência de Storage



Armazene de forma racional

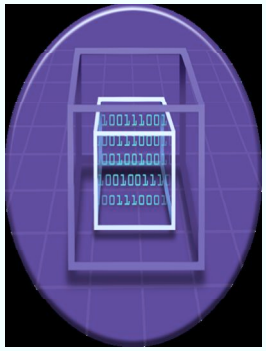


Mova o dado conforme sua importância



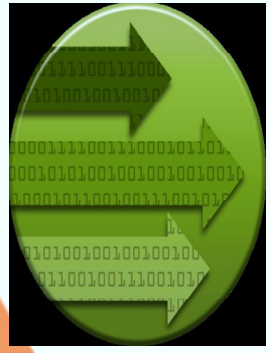
Maximize a utilização da InfraEstrutura

Estratégia da IBM para Eficiência de Storage



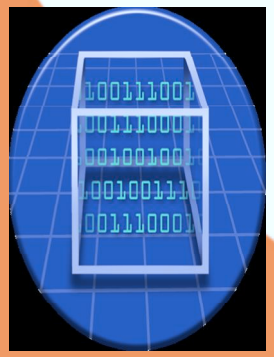
Armazene de forma racional

- ✓Data Compression
- ✓Data Deduplication



Mova o dado conforme sua importância

- ✓Automated Tiering
- ✓Automated Data Migration

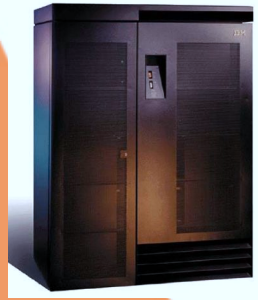


Maximize a utilização da InfraEstrutura

- ✓Storage Virtualization
- ✓Thin Provisioning

IBM – 60 anos de inovação em Storage

- ✓ 1950 – IBM 701 Tape Drive
- ✓ 1952 – IBM Magnetic Tape Drive Vacumm
- ✓ 1956 – IBM 350 Disk Storage
- ✓ 1965 – IBM 2134 Direct Acess Storage Facility
- ✓ 1971 – Disquete Floppy
- ✓ 1973 – IBM 3340 Winchester
- ✓ 1980 – IBM 3380 Disk System
- ✓ 1989 – IBM 3390 Direct Acess Storage Device
- ✓ 1999 – IBM Enterprise Storage Server “Shark”
- ✓ 2004 – IBM System Storage DS8000



Mercado de Storage

✓**A IBM America Latina cresceu 41% YTY em External Disk , enquanto o mercado cresceu 31% YTY (1H2010) ***

✓**A IBM Brasil cresceu 51% YTY em External Disk , enquanto o mercado cresceu 43% YTY (1H2010) ***

✓ **A IBM Brasil tem consolidado sua posição como líder de Mercado em External Disk nos últimos 5 anos ***

✓**Últimas aquisições da IBM Storage:**

✓ Janeiro de 2008: IBM anuncia a aquisição da empresa **XIV,** tecnologia de Storage em Grid.

✓ Abril de 2008: mais uma aquisição estratégica: da **Diligent Technologies** com sua tecnologia de deduplicação de dados ProtecTIER.

✓ Agosto de 2010, a IBM anuncia a aquisição da **Storwize**. A tecnologia para compressão de dados para Storage em ambientes de rede.

* Fonte de Dados: IDC

Anúncios Mundiais Storage – dia 07 de Outubro

- **IBM® Storwize® V7000:** Nova Geração de Discos de Classe Midrange com funcionalidades avançadas como Virtualização da infraestrutura de Storage, Easy Tier, Thin Provisioning e Interface de Gerenciamento Simplifcada baseada em XIV.
- **IBM System Storage™ SAN Volume Controller v6.1:** Interface de Gerenciamento completamente remodelada para facilidade de utilização (baseada na gerencia do XIV). Adição da funcionalidade de EASY TIER para otimizar o uso do Disco de Estado Sólido de forma automatizada, além de suportar até 4 x a capacidade de Virtualização do modelo anterior possibilitando a Virtualização de ambientes maiores.
- **IBM XIV Storage System: IBM XIV Storage System:** Nova interface de Gerenciamento que permite gerenciamento de até 64 Sistemas em um único ponto de controle. Foi também anunciado o XIV com suporte de até 180 TB com discos de 2 TB e opção de até 240 GB de Cache, aumentando a performance em até 25%.
- **IBM System Storage™ DS8800 : Novo modelo da família DS8000 com processadores POWER 6+ , conectividade 8Gbps , discos com form factor reduzido provendo maior performance em menor espaço físico.**

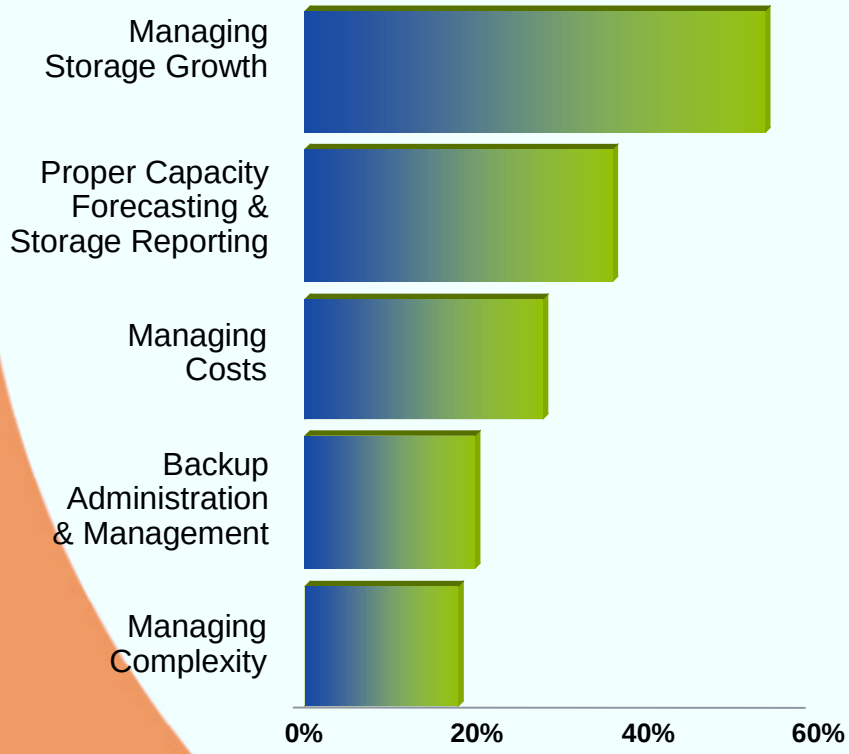
IBM System Storage DS8800 for the World's Most Demanding Customers

Daniel Cavalcanti
Mgr, Storage Products
cavalcad@us.ibm.com

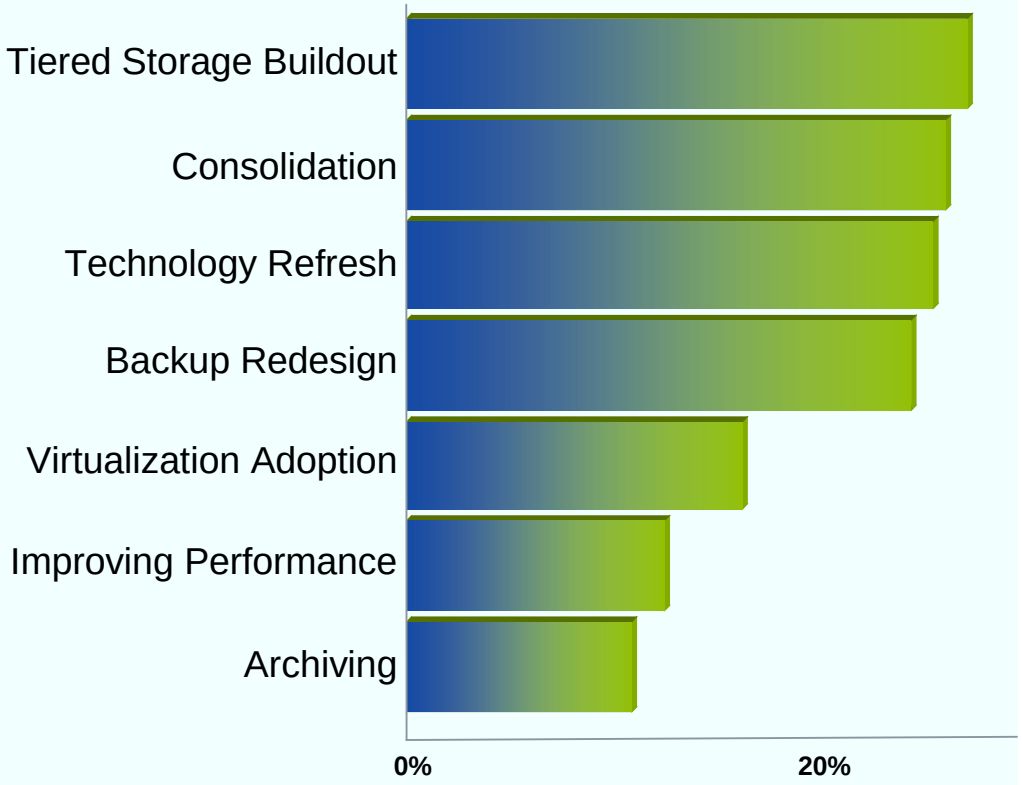
RIF: J-00019078-0

Top issues and key initiatives clients are facing

ISSUES



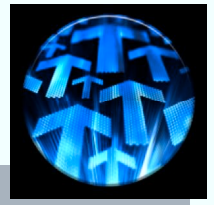
INITIATIVES



Source: TheInfoPro Storage Study (Dec2009).

Storage Efficiency

Getting the most from your Storage Resources



Tiered Storage

Build out an **automated tiered storage** architecture to maximize performance and reduce operating expenses

- fficiently use **solid state disk** to increase performance up to 300% on critical apps.
- educe costs by **migrating less critical data** to less expensive media.

Consolidated Storage

Consolidate storage to **reduce administrative costs and improve cycle time**

- **Scale out** storage to manage billions of files from a single, consolidated system.
- **cale up** storage with systems that can scale to store petabytes of structured data.

Virtualized Storage

Quickly provision storage, support virtualized servers and **increase flexibility**

- **ncrease utilization** of existing storage by up to 30%.
- Reduce TCO up to 66% by deploying **automated, virtualized storage.**

IBM System Storage DS8000 Series

Enterprise Disk for the World's Most Demanding Clients

Built on 60 Years of Enterprise Class Innovation

- IBM's Flagship Enterprise Storage Device
- Strong Synergy with IBM Servers (z, i, p)

Over 12,000+ DS8K systems sold worldwide!!!

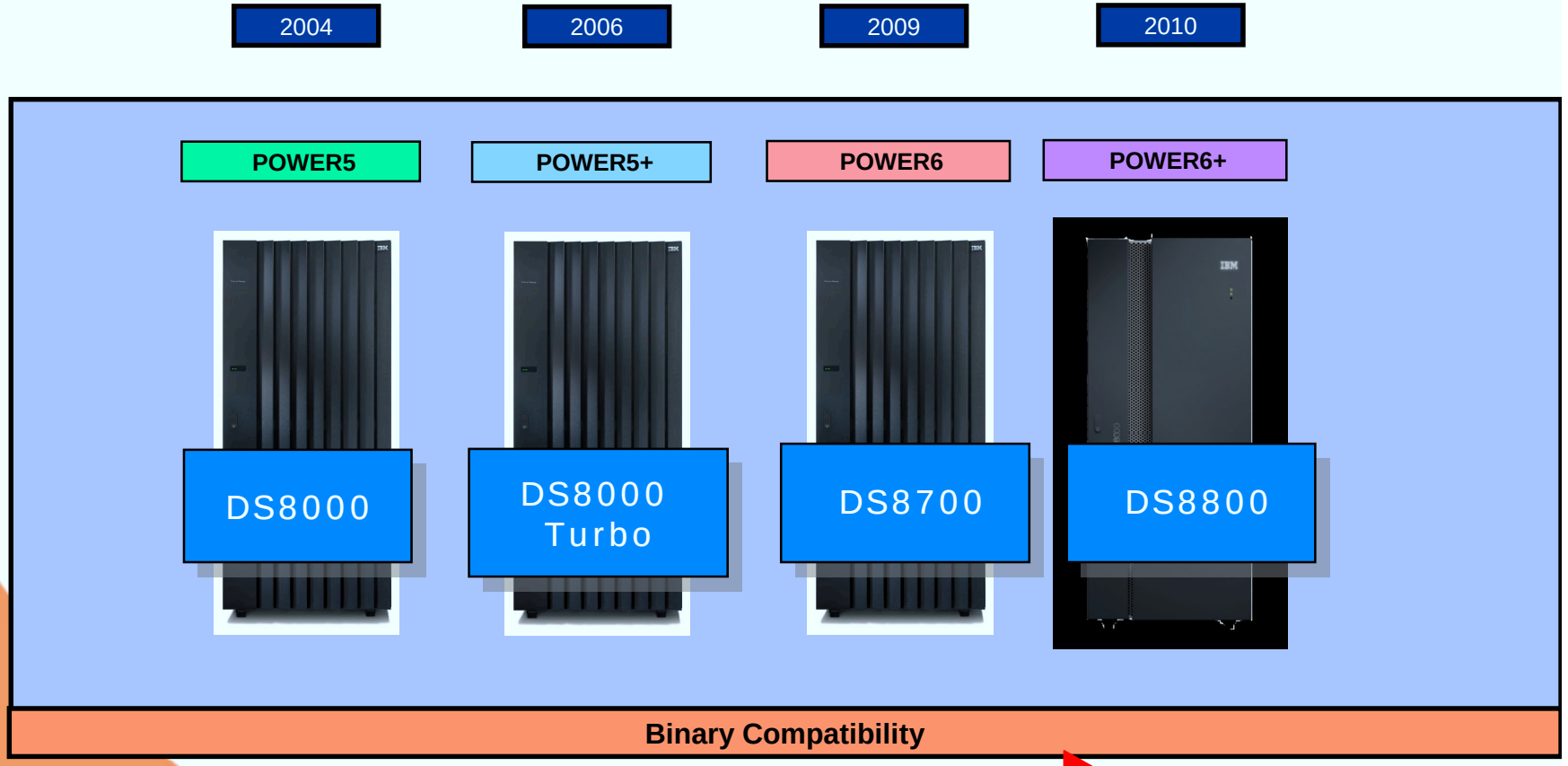
Over 500+ DS8K system sold Brazil

Performance, Resiliency, and Flexibility to Satisfy the World's Most Demanding Clients

- ***Performance*** – Architected for highest total throughput
- ***Availability*** – Designed for 24X7 Environments
- ***Resiliency*** – Outstanding Copy and Mirroring Capability
- ***Flexibility*** – High Performance, Online & High Capacity, Nearline Disk options to satisfy tiered storage objectives
- ***Storage efficiency*** – Up to 1 PB storage consolidation and Easy Tier for storage optimization
- ***Heterogeneous Server Support*** - *IBM z/OS, z/VM, OS/400, i5/OS, AIX, Linux, HP-UX, Sun SOLARIS, Novell, KVM, VMware and Microsoft, among others*
- ***Security –*** *Self-encrypting Disk Drives*
- ***Long-Term Cost Advantage*** – Enterprise Choice Warranty

4th Generation DS8000 enterprise disk system

The IBM POWER processor has been behind the success of IBM enterprise storage beginning with the Enterprise Storage Server in 1999



DS8800 builds on a market-proven, reliable code base!

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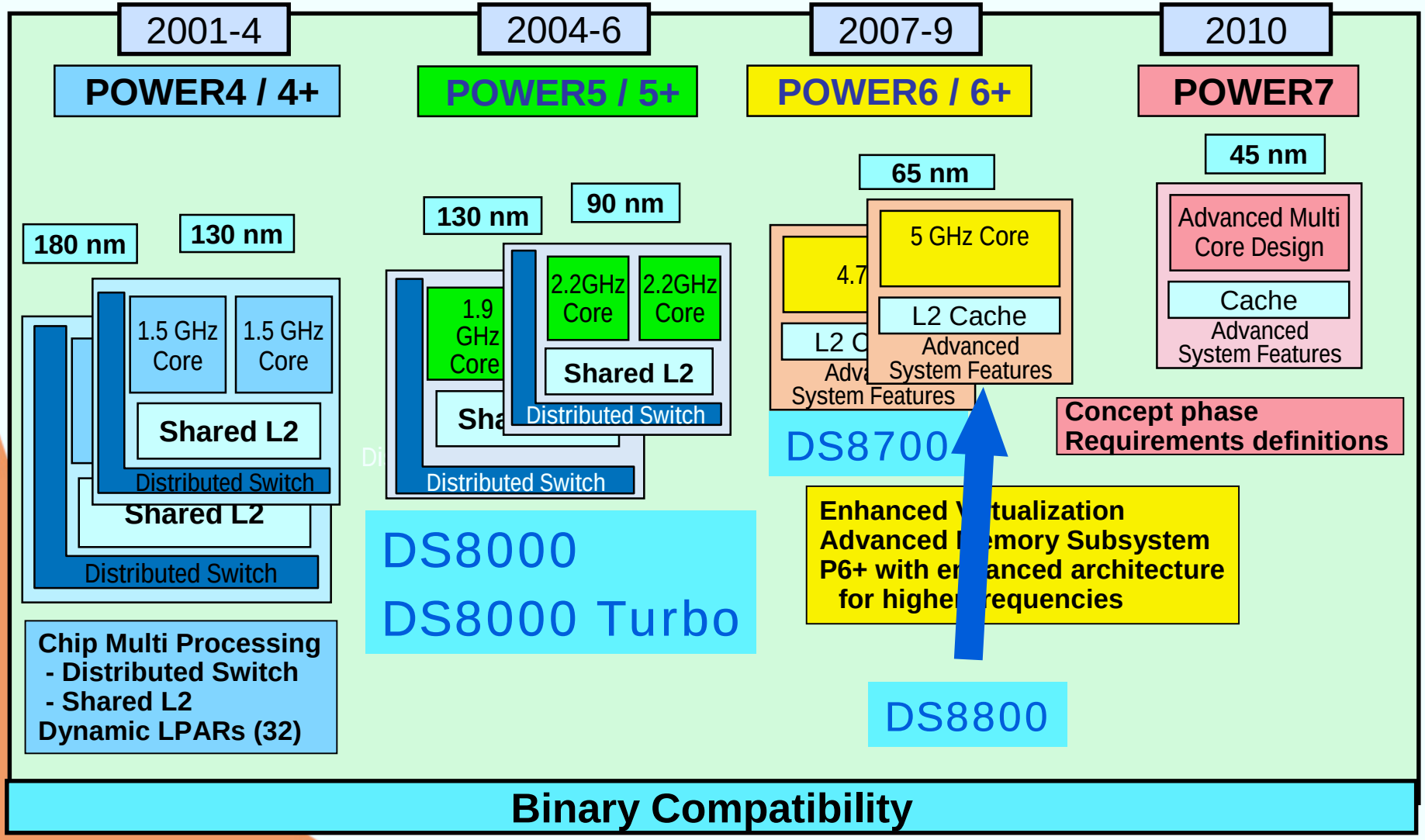
IBM POWER Processor Roadmap



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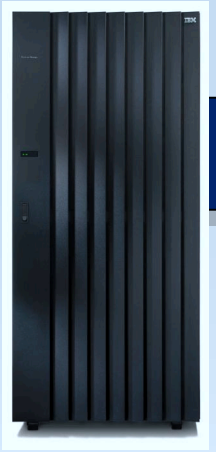
IBM DS8000 family models

Two base models with scalable controllers and capacity



DS8700

- POWER6 controllers (2-way and 4-way)
- 4 Gb/s and 2 Gb/s host and device adapters
- 3.5” Enterprise Fibre Channel drives

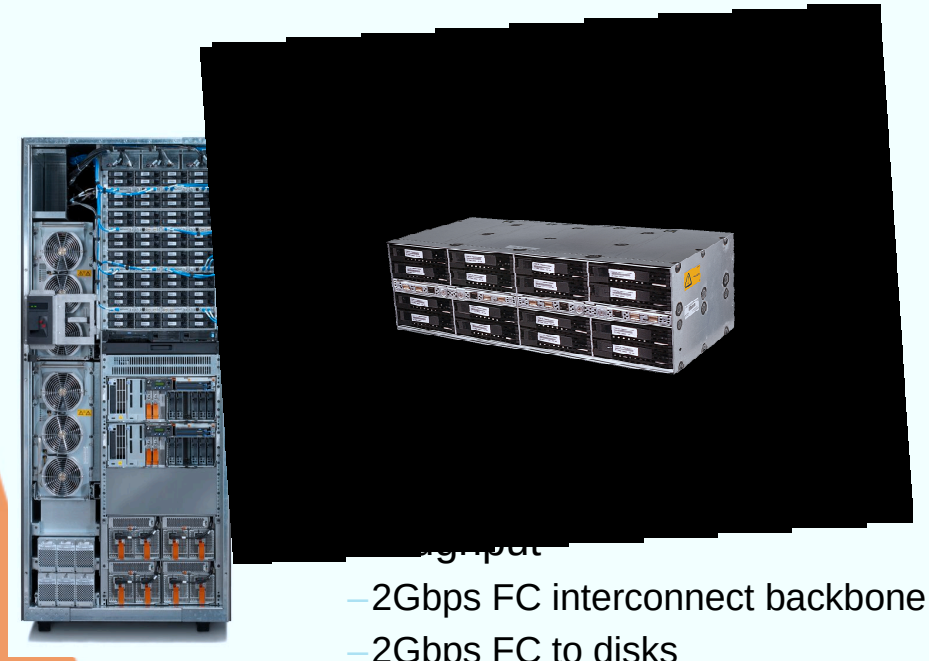
40% increase in performance and 90% more drives in same single-frame

DS8800

- POWER6+ controllers (2-way and 4-way)
- 8 Gb/s host and device adapters
- 2.5” Enterprise SAS-2 drives

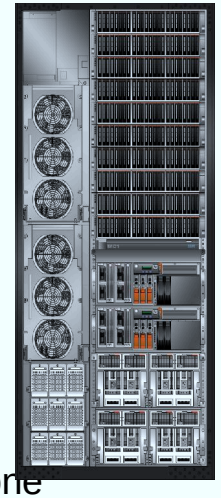
Disk enclosure comparison

New high-density enclosures



- [illegible]
  - 2Gbps FC interconnect backbone
  - 2Gbps FC to disks
- Density
  - Supports 16 disks per enclosure
  - 3.5U of vertical rack space
- Cabling
  - Passive copper interconnect
- Modularity
  - Rack level power
  - Rack level cooling

DS8800 Gigapack

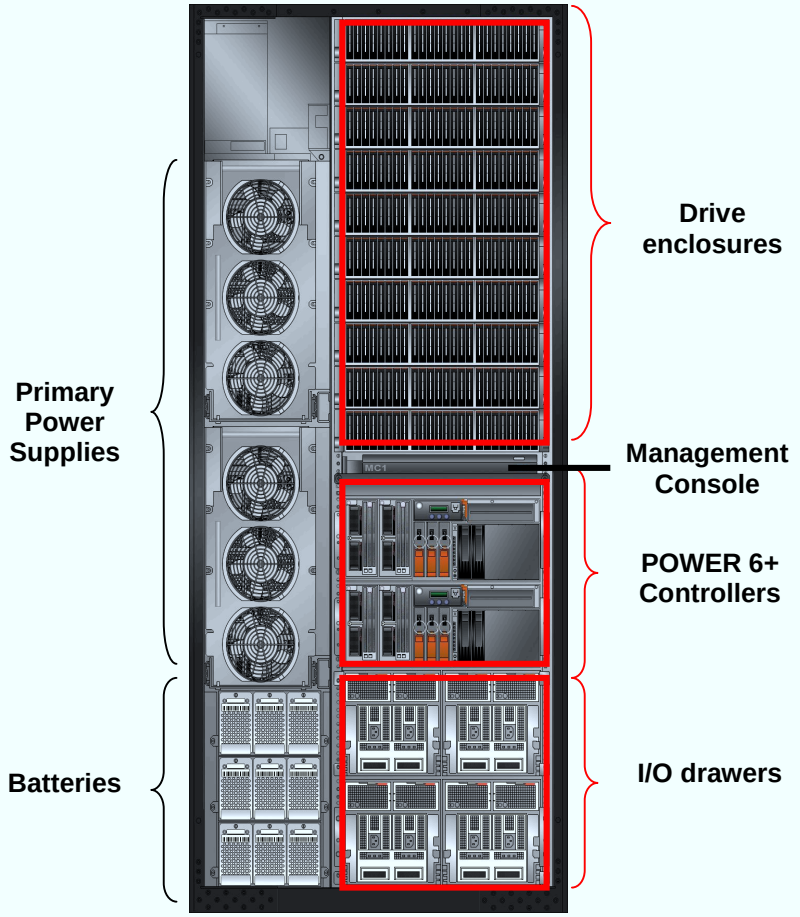


- Disk Technology
  - 2.5” (SFF) SAS
- Throughput
  - 8Gbps FC interconnect backbone
  - 6Gbps SAS to disks
- Density
  - Supports 24 disks per enclosure
  - 2U of vertical rack space
- Cabling
  - Optical short wave multimode interconnect
- Modularity
  - Integrated power
  - Integrated cooling

DS8800 hardware upgrades

Higher performance and efficiency

- Compact and highly efficiency drive enclosures
  - 2.5” small-form-factor drives
  - 6 Gb/s SAS (SAS-2)
  - Enclosures support 50% more drives
- Upgraded processor complexes
  - IBM POWER6+ for faster performance
- Upgraded I/O adapters
  - 8 Gb/s host adapters
  - 8 Gb/s device adapters
- More efficient airflow
  - Front-to-back cooling
  - Aligns with data center best practices



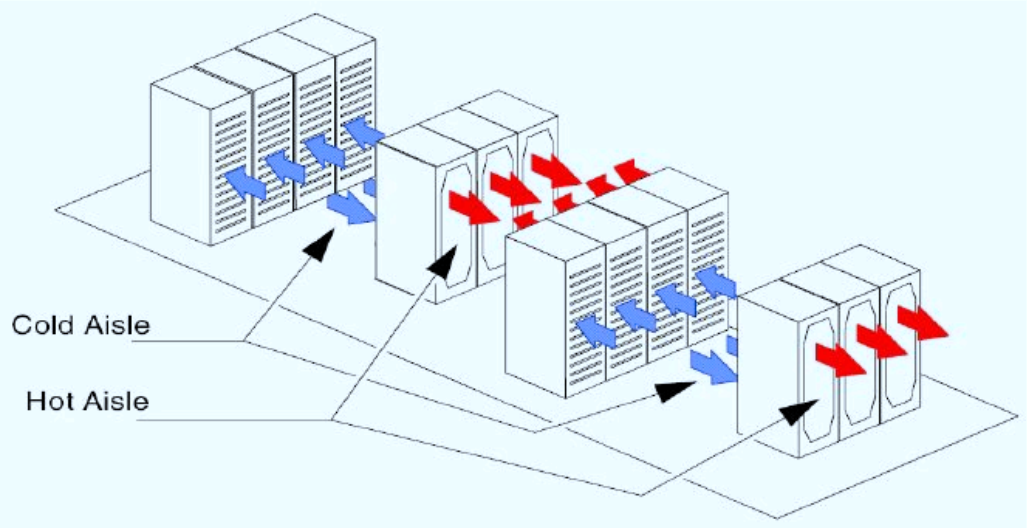
Front view

Dramatic efficiency and performance benefits

New airflow design is also more energy efficient

Front-to-back airflow for hot-aisle-cold-aisle data centers

- More data centers are moving to hot aisle / cold aisle designs to optimize energy efficiency
- DS8800 is now designed with complete front-to-back airflow

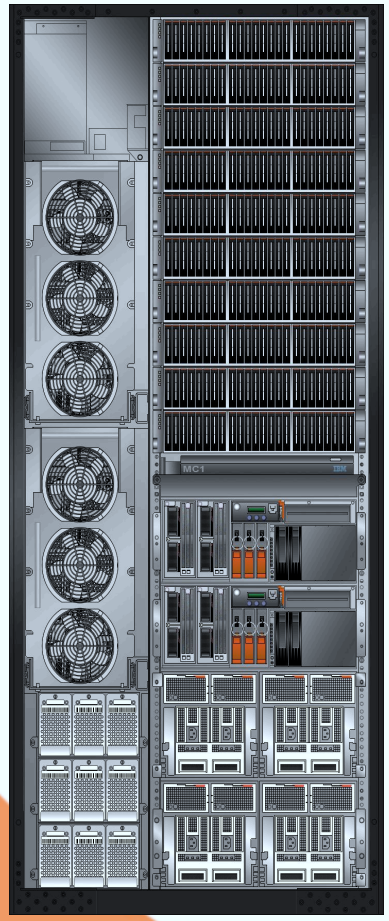


Benefit: Greater energy efficiency and contributes to lower energy costs

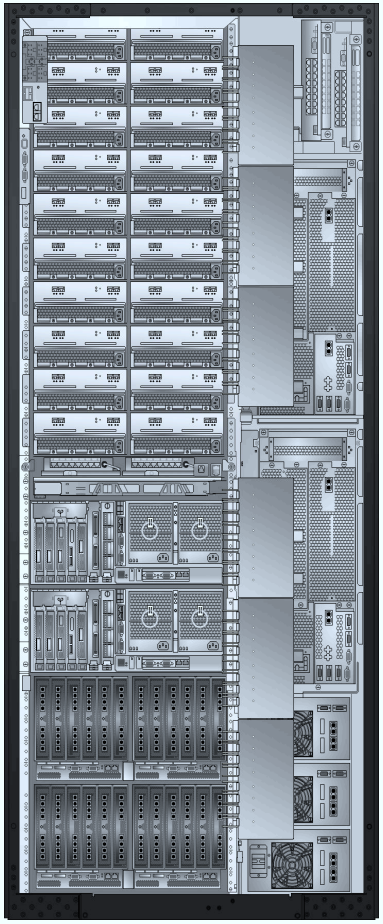
DS 8800 Front and Rear View

Capacity up to 240 disks in a single frame

A Frame (Front)



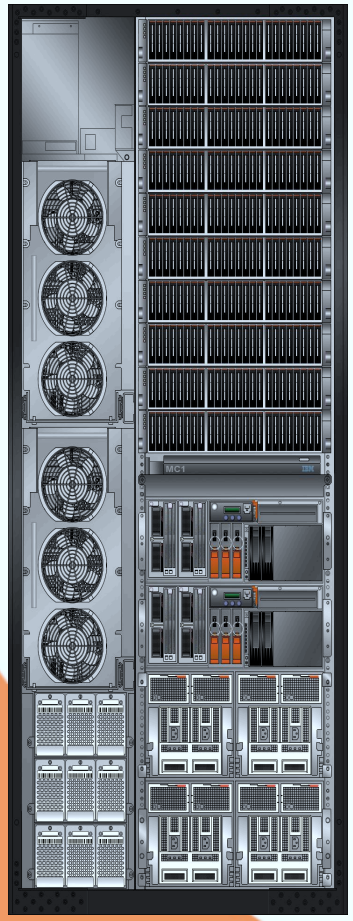
A Frame (Rear)



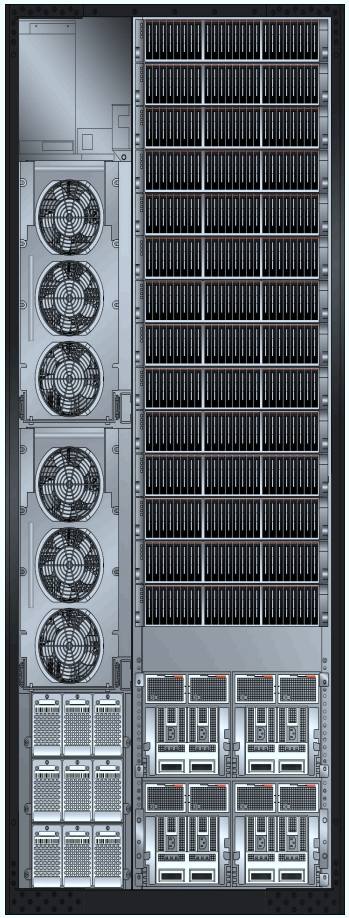
DS 8800 Front and Rear View

Capacity up to 576 disks in 2 frames

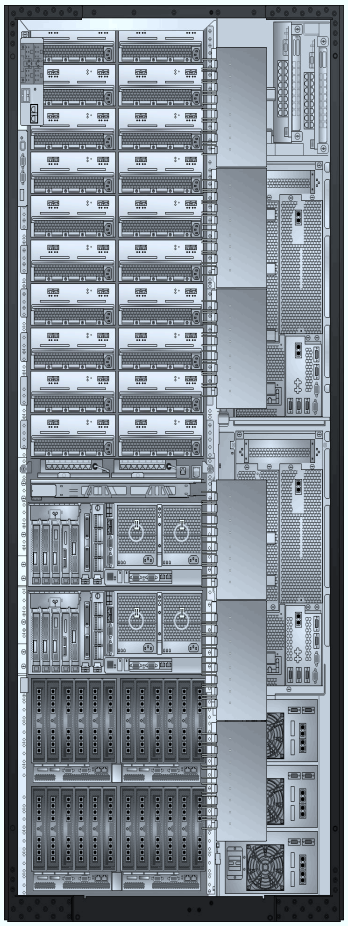
A Frame (Front)



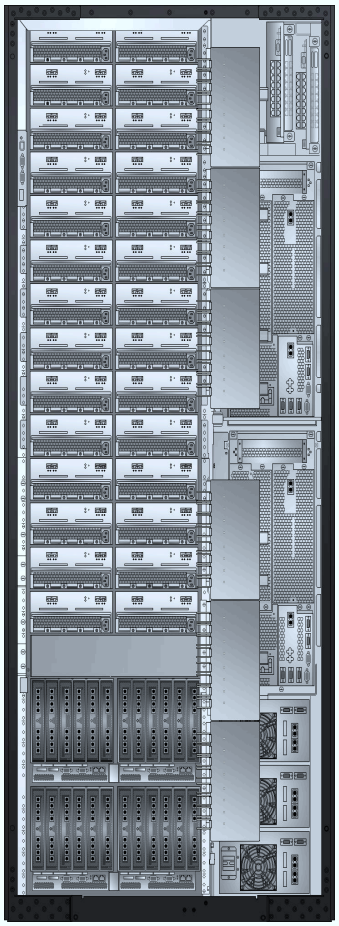
B Frame (Front)



A Frame (Rear)



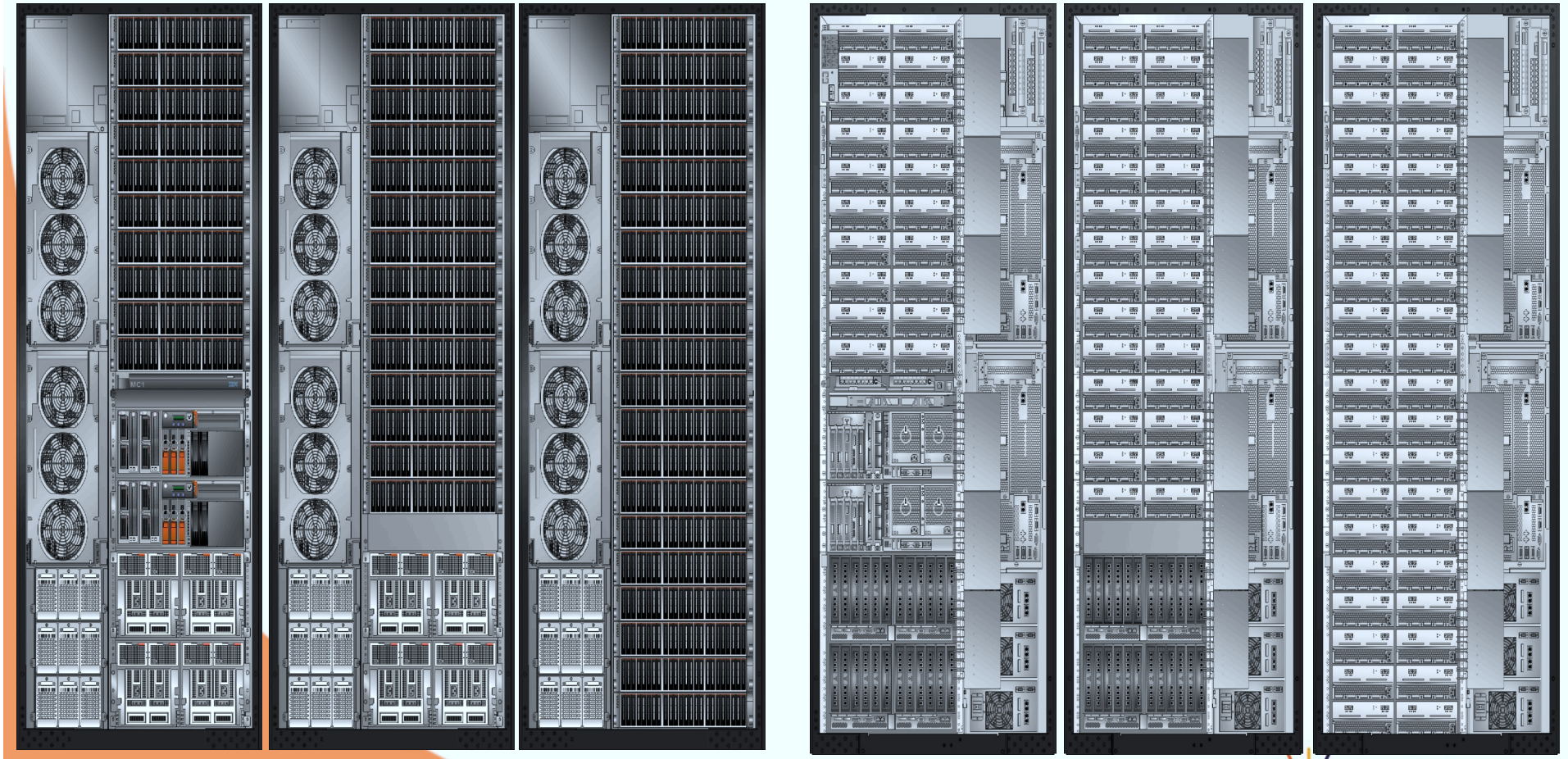
B Frame (Rear)



DS 8800 Front and Rear View

Capacity up to 1056 disks in a 3 frames

A Frame (Front) **B Frame (Front)** **C Frame (Front)** **A Frame (Rear)** **B Frame (Rear)** **C Frame (Rear)**

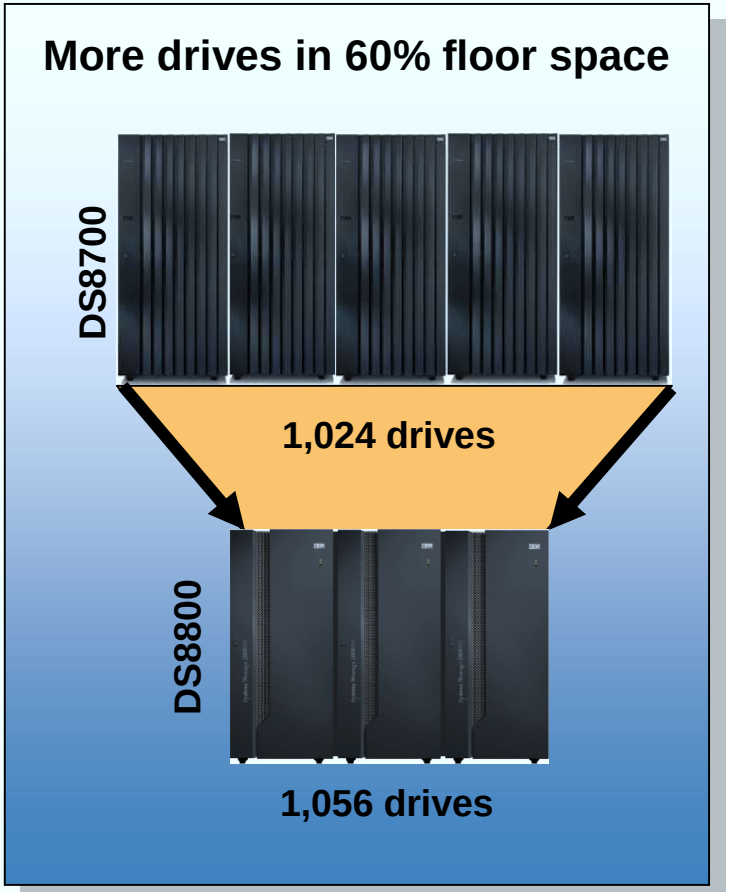


RIF: J-00019078-0

Storage efficiency with space-saving design

Saving money with high-density drives, enclosures, frames

- Space saving design
  - Small-form-factor drives
  - High-density drive enclosures
  - Almost double the drives in same frame footprint
- Benefits
  - More effective consolidation lower operating costs
  - Support more workloads with smaller footprint
  - Reduce number of systems to manage
  - Reduce power and cooling costs



Substantial footprint reduction

DS8800 Power Improvements

- 2.5” drives consume considerably less power as compared to 3.5” disks
- Table below takes into account controller card power, power efficiencies, power for cooling, and power for disks.

DS8700 and DS8800

	DS8700	DS8800
Power per Disk	**18.4 Watts**	**10.2 Watts**
Power per Enclosure	**310 Watts**	**245 Watts**

Energy consumption comparison

DS8800 compared to DS8300

DS8800 with 1056 drives

- Base frame: 6.8kW
- Exp frame: 5.4kW
- Exp frame: 6.5kW

TOTAL: 18.7kW

DS8700 with 1024 drives

- Base frame: 6.8kW
- Exp frame: 7.1kW
- Exp frame: 6.1kW
- Exp frame: 6.1kW
- Exp frame: 3.0kW

TOTAL: 29.1kW

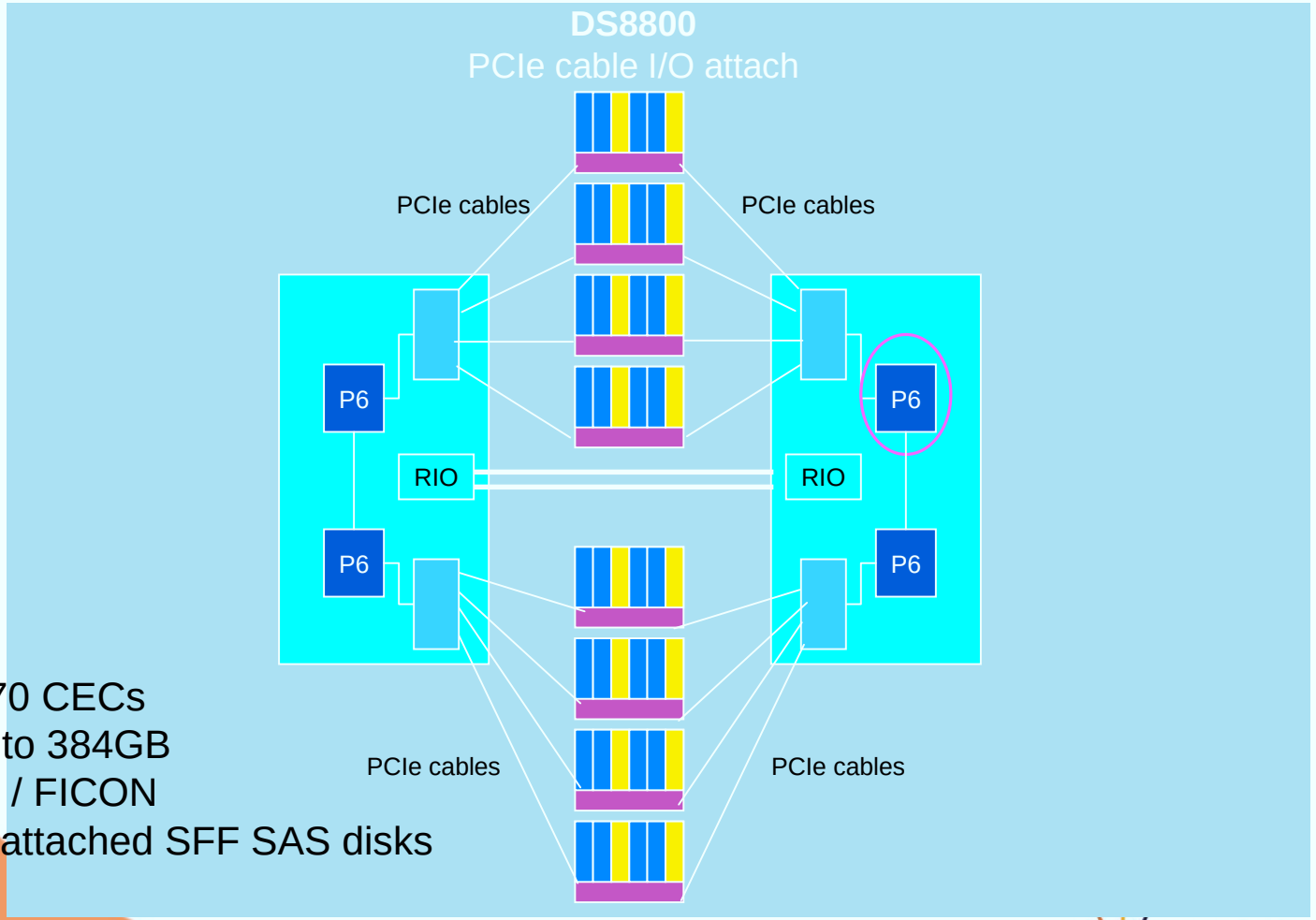
3-year cost savings

- **36% less energy usage; 40% less floor space**
- **$41,336 less for power/cooling** (KW = $ 0.147)
- **$71,624 less for floor space**

Saves $112,960

DS8800 Architecture I/O fabric

- IO bays are directly connected via point-to-point PCI-e cables.
- The server to server communication path uses RIO isolated from IO traffic.

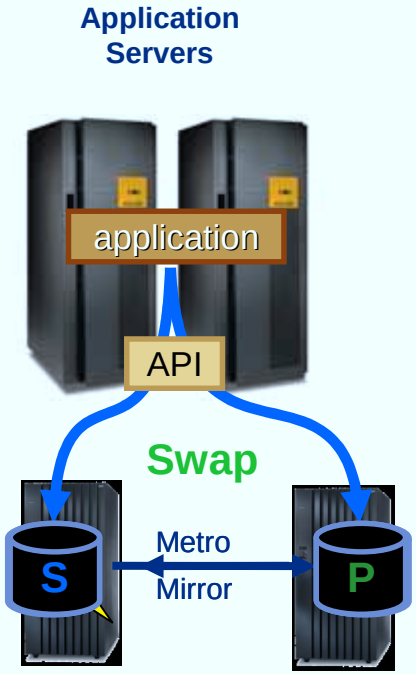


- 5 Ghz P6+ 570 CECs
- Cache 32GB to 384GB
- 8Gb/s HA FC / FICON
- 8Gbs FC DA attached SFF SAS disks

High Availability with TPC for Replication V4.2

Open HyperSwap for IBM AIX environments

- **Ability to swap IBM DS8000 volumes in seconds**
  - Can be command driven or can be automated upon a storage system failure
  - Designed to scale to multi-thousands of volumes
- **Switches *Metro Mirror* primary storage system to the secondary storage system**
  - No operator interaction is needed for event driven operation
  - Function is configured and managed by TPC-R
- **Feature is non-disruptive**
  - Applications keep using same device addresses
- **Integration with AIX 5.3 (or later) provides higher availability for AIX environments**

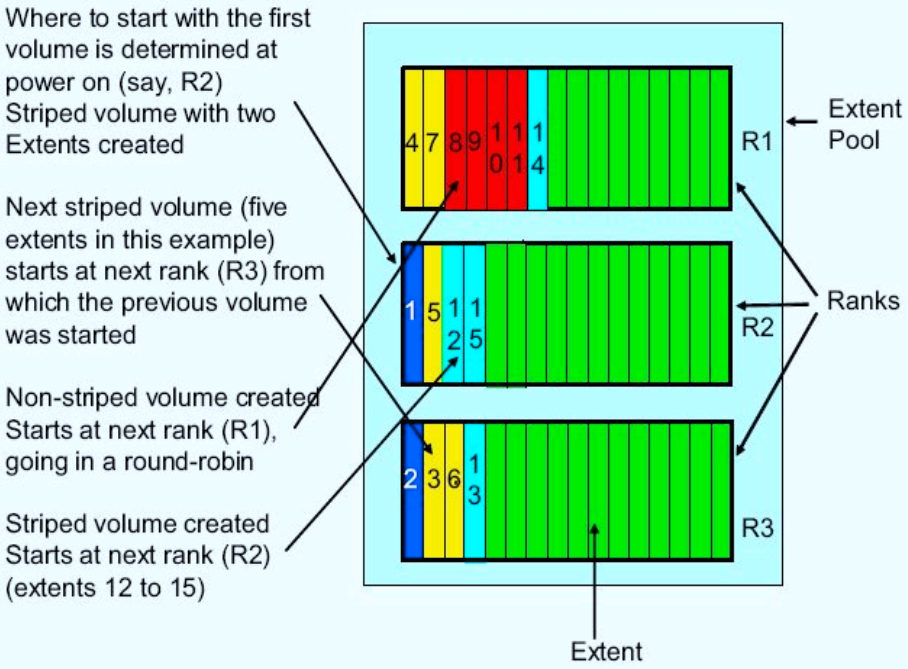


Available on TPC-R Windows, AIX, Linux and z/OS installations with the TPC-R 2 Site BC License

DS8800 Extent Allocation Method

PROVIDES BETTER RANDOM IO PERFORMANCE

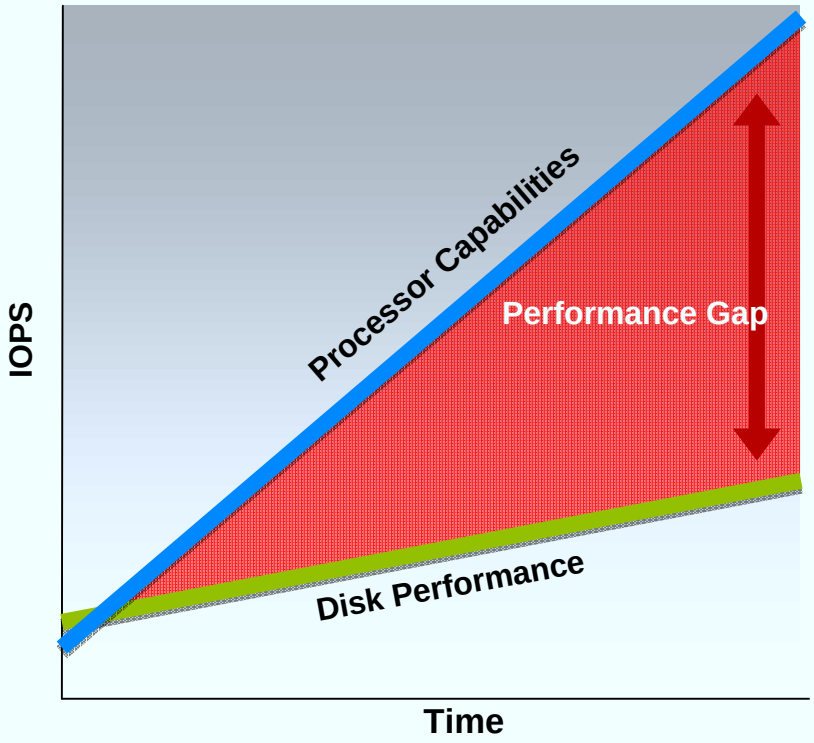
- Blue, Yellow & Turquoise Volumes are Rotate by Extent
- Red Volume is Rotate by Volume



EAM default allocation Rotate by Extent

Performance continues constrained

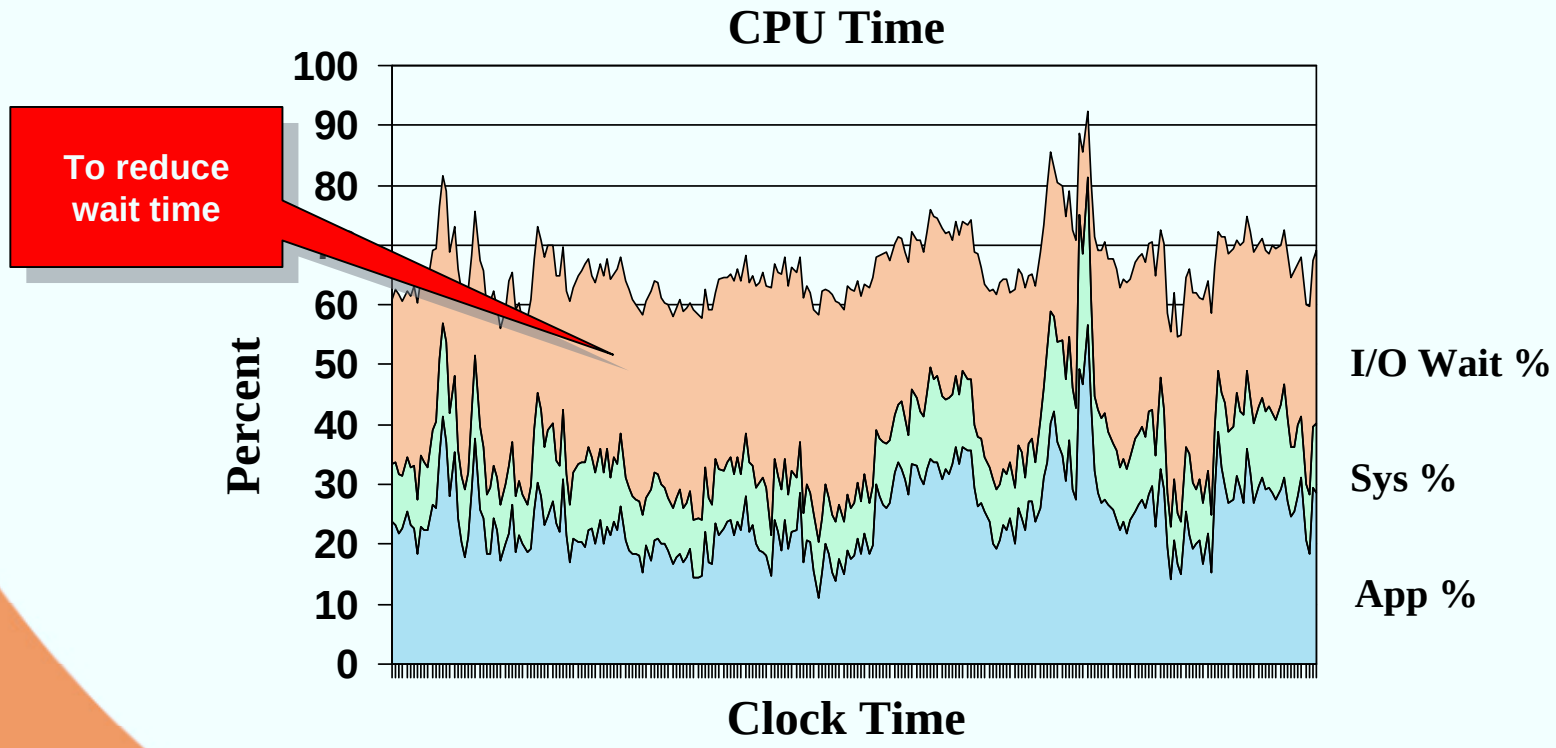
- Processor capabilities are out-stripping disk drive and RAID controller performance
  (rotational speed and IOPS)
- Servers and storage systems become more unbalanced between CPU/controller capability and storage performance
- Clients add more drive spindles to improve performance



Performance gains through HDDs has become ineffective and wasteful

How to reduce IO wait time?

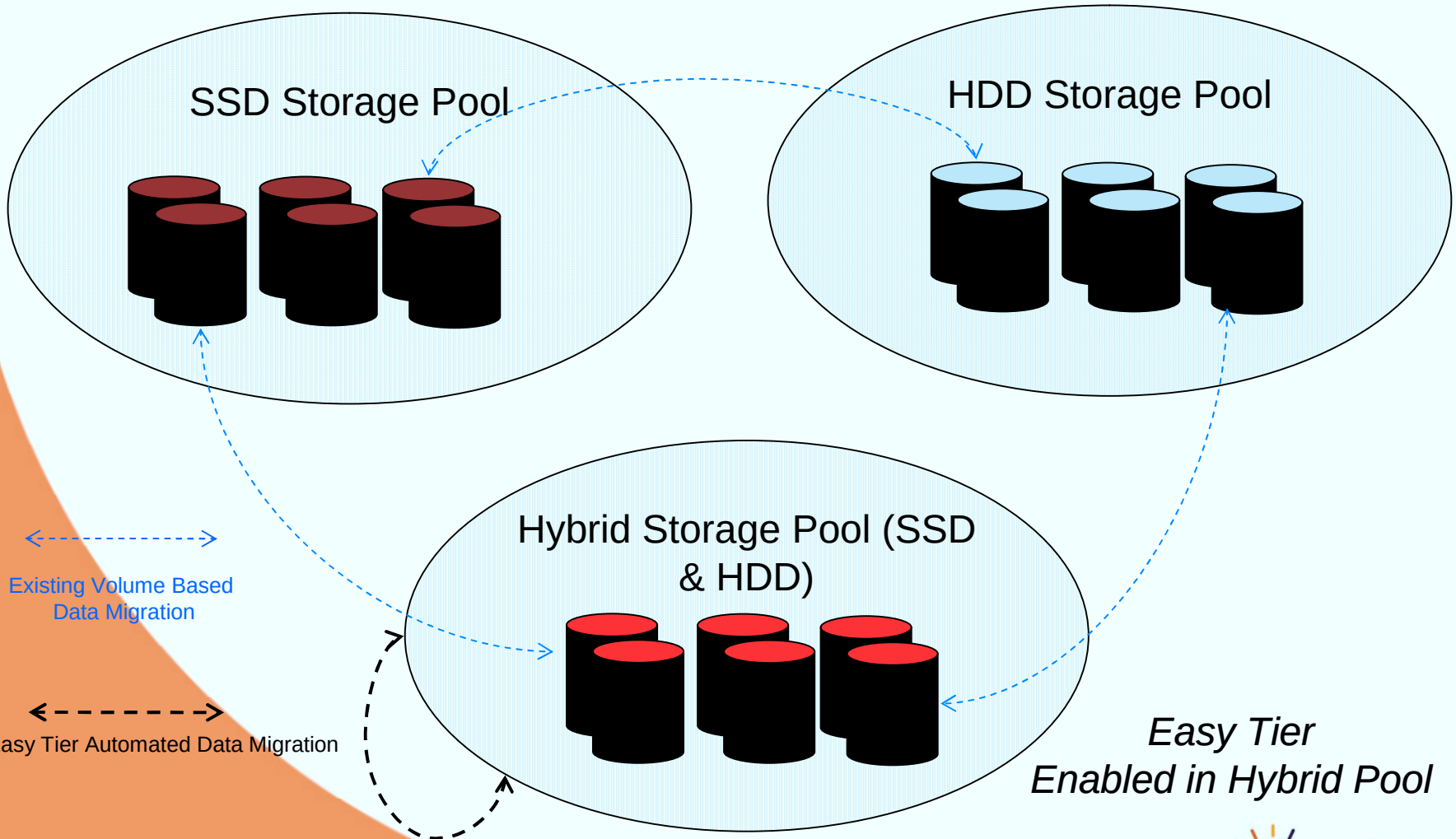
- Database Example – Use of Rotating Disk Drives
  - Reducing I/O wait time can allow for higher server utilization



Even well-tuned databases have the opportunity to improve performance and reduce hardware resources

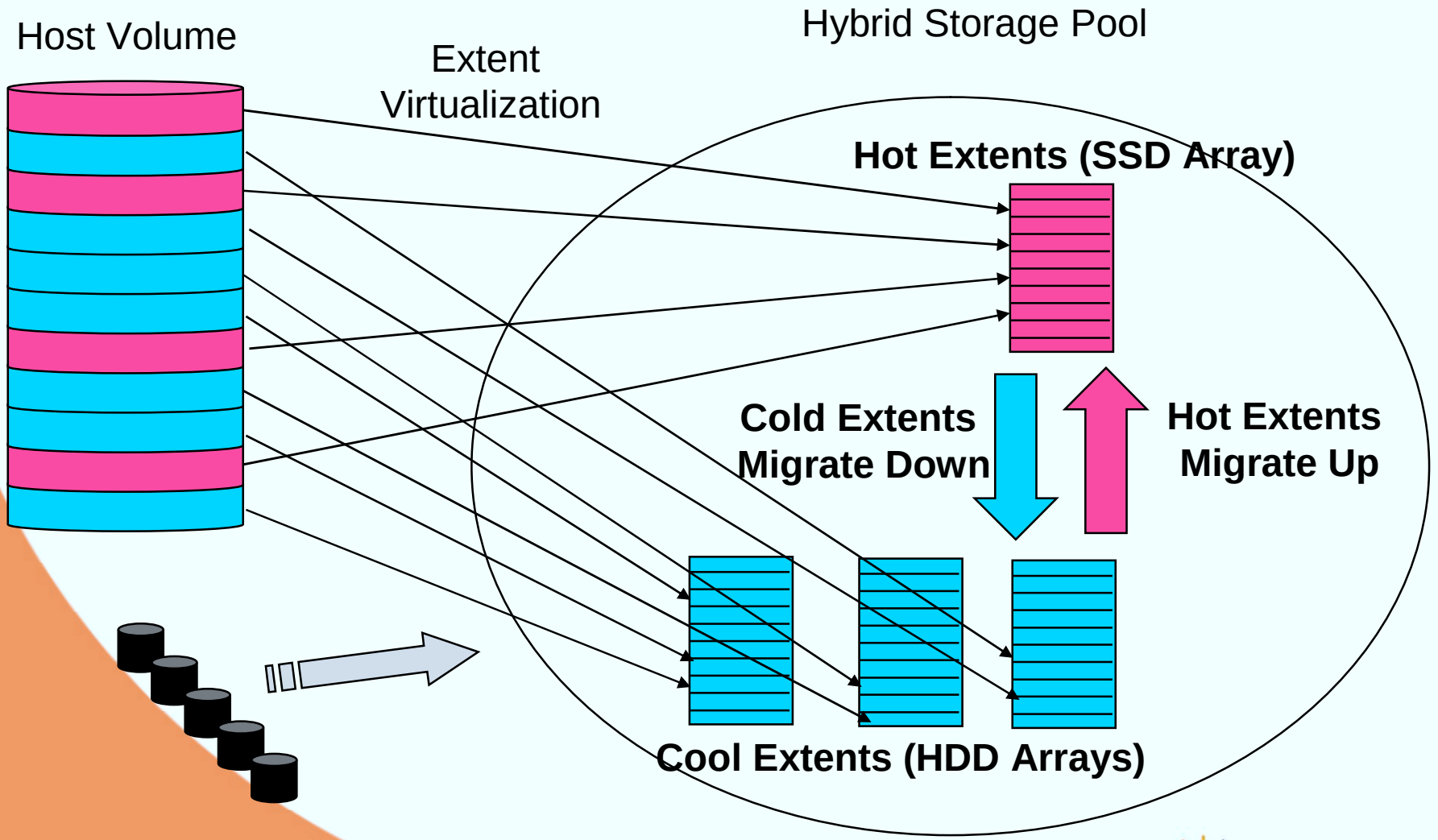
Storage Efficiency Dynamic Data Migration

At Sub LUN level



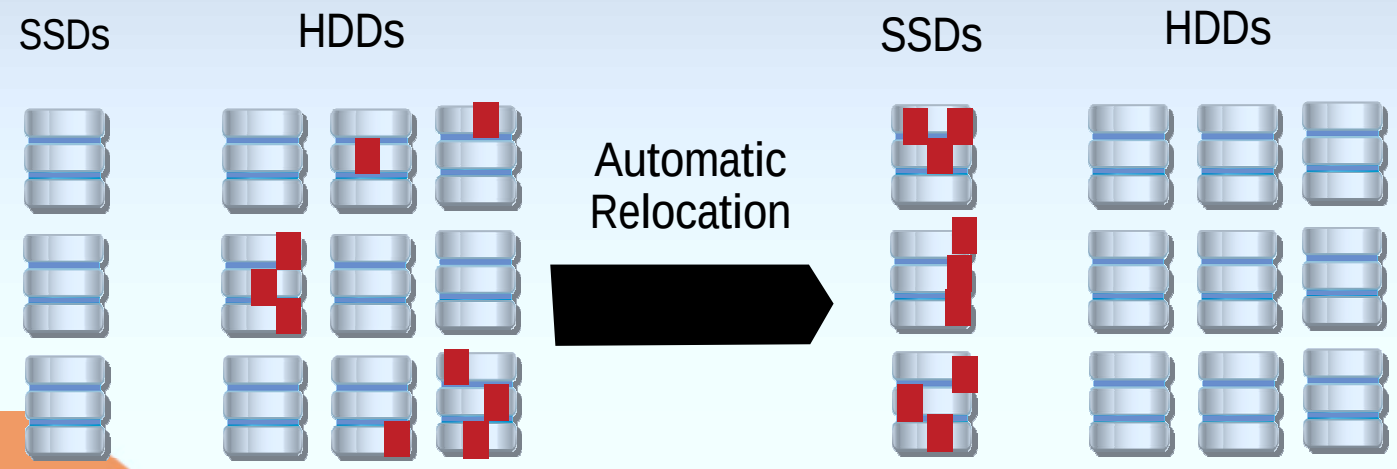
Storage Efficiency IBM Easy Tier

Automated Data Relocation



Improving Efficiency with Easy Tier

- Automated tiering with IBM Easy Tier
  - Busiest data extents are identified and automatically relocated to highest performing Solid-state Disks
  - Remaining data extents can take advantage of higher capacity, price optimized disks
- Match the cost of your storage to match the value of the information you are storing

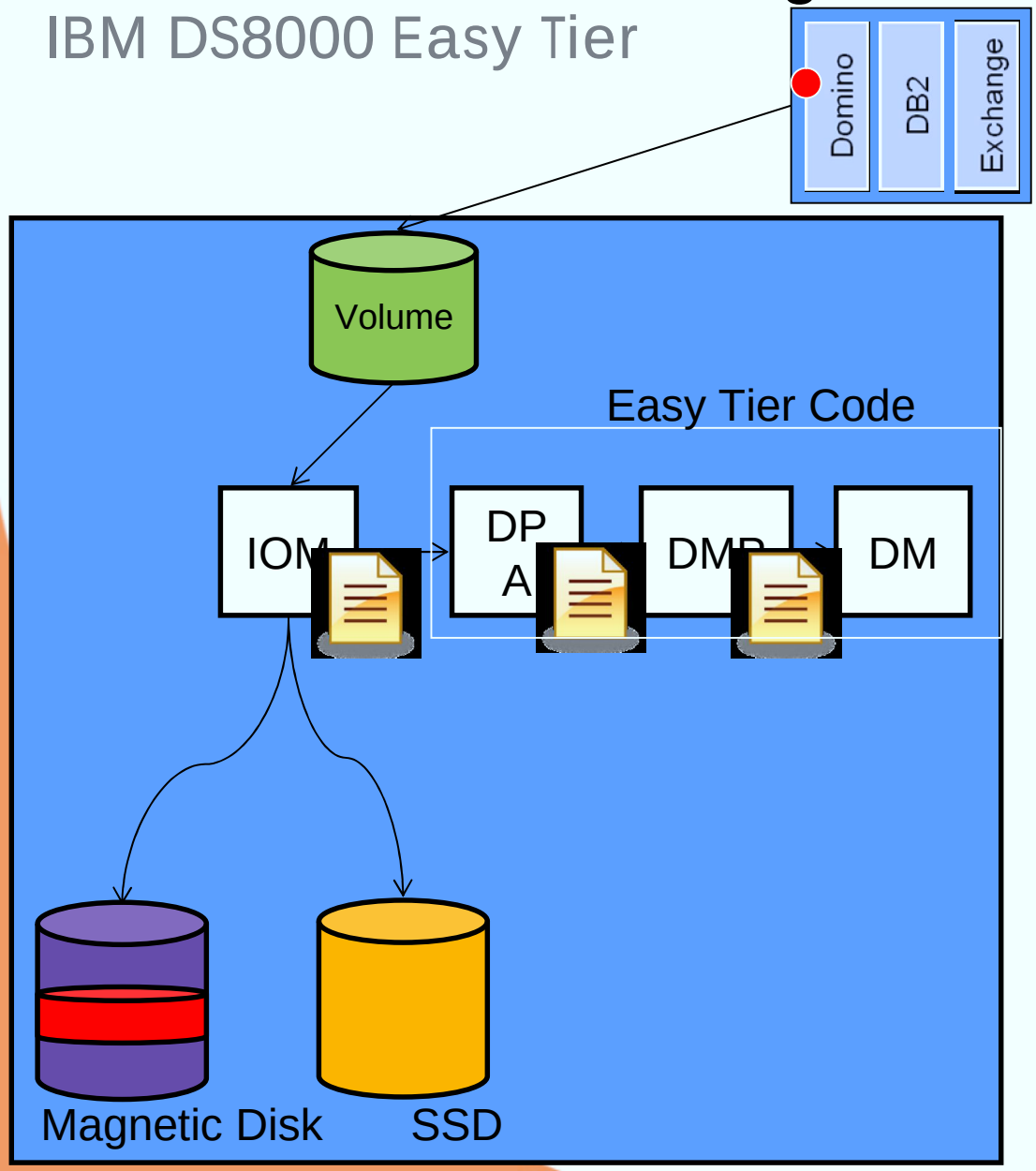


Hot-spots due to poor data layout.

Optimized performance and throughput.

IBM Workload Learning

IBM DS8000 Easy Tier



An application makes frequent use of the same area or extent of a volume in the Magnetic Disk

The **IOM (I/O Monitor)** captures access patterns and generates usage statistics Send to the **DPA (Data Placement Advisor**)

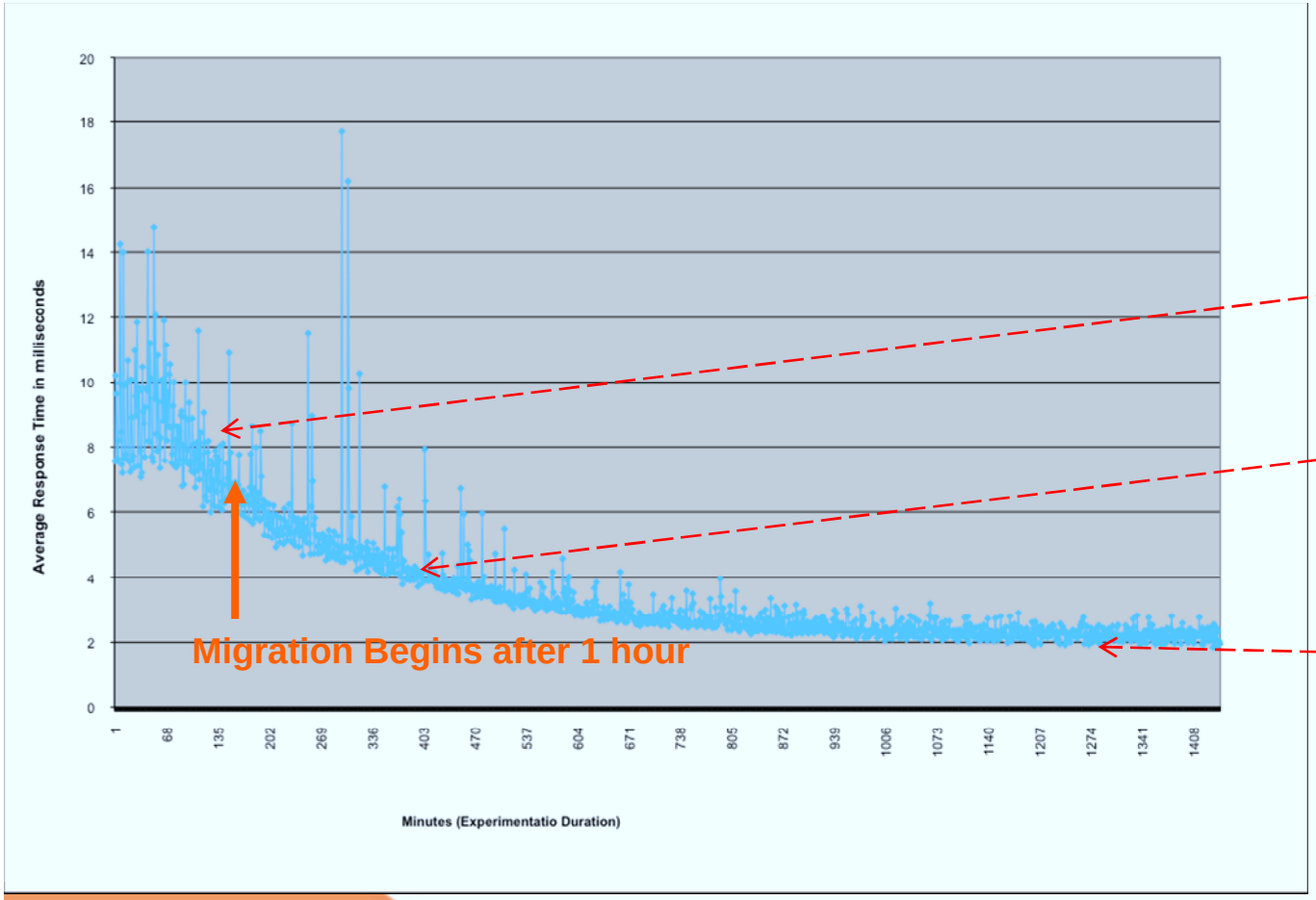
The **DPA** identifies hot extents potential data migrations
to the **DMP** (**Data Migration Planner)**

The **DMP** performs analysis and deliver migration plan to the **DM (Data Migrator**)

DM (**Data Migrator)** confirms and schedules data migration activity relocating the data to higher performing storage without any application interruption

IBM Easy Tier

Significant Improvement on Application Response Time



IBM Easy Tier - Smart data placement

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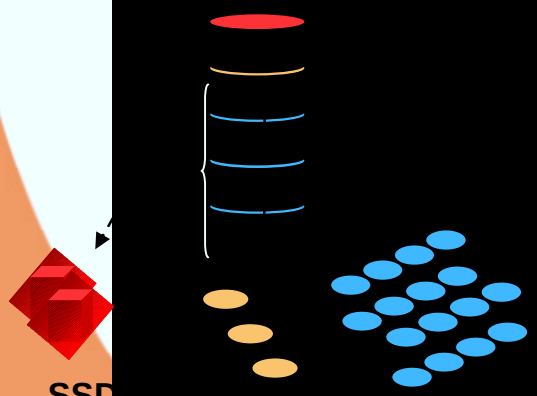
Increase of **400%!**

Easy Tier



Whitepaper on database benchmark with **POWER 7, DS8700** and **DB2.**

System configuration (base):
POWER7 (Model 9117-MMB)
DB2 9.7 FP1
DS8700 w/ 4.6 TB SSD + 38.4 TB 15K FC HDD)

Performance comparison across DS8000 models

CKD and Open Results Summary

DS8800 Full Box Results– RAID5

384x 15K RPM HDDs, 48x 10K RPM HDDs, 8x DA Pair, 16x HA w/ 32x 8Gb ports

		DS8300	DS8700	DS8800	% increase (vs. DS8300)
FICON Seq Read	GBps	4.1	9.4	10.0	6% (144%)
FICON Seq Write	GBps	2.1	5.6	5.7	2% (171%)
zHPF 4K Write Hits	4KB K IOps	124	159	175	10% (41%)
zHPF 4K Read Hits	4KB K IOps	344	423	440	4% (28%)
zHPF DB zOS	4KB K IOps	165	201	204	2% (24%)
FICON DB zOS	4KB K IOps	124	174	181	4% (46%)

DS8800 Full Box Results– 96x RAID5 Arrays

768x 15K RPM HDDs, 16x SSDs, 8x DA Pair, 16x HA w/ 32x 8Gb ports

		DS8300	DS8700	DS8800	% increase (vs. DS8300)
Seq Read	GBps	3.9	9.7	11.8	22% (203%)
Seq Write	GBps	2.2	4.7	6.7	43% (205%)
Database Open	4KB K IOps	165	191	196	3% (19%)
4K Read Miss	4KB K IOps	111	137	160	17% (44%)
4K Read Hits	4KB K IOps	425	523	530	1% (25%)
4K Write Hits	4KB K IOps	164	203	222	1% (35%)

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