Go further, faster®

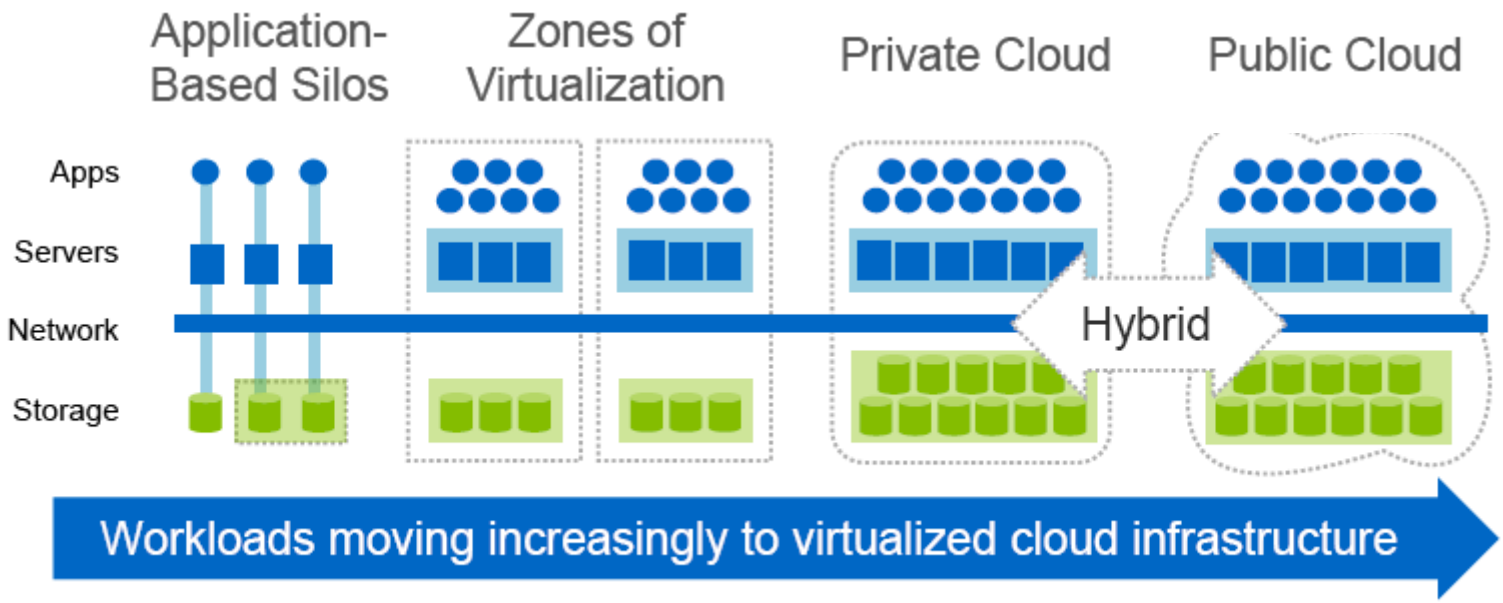
IBM DS Series
Storage for the Cloud

Oct. 2011

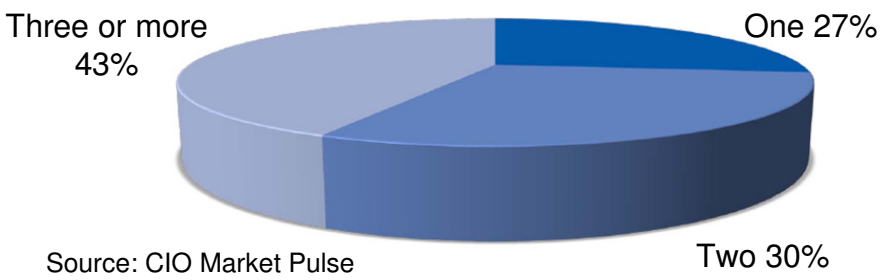
NetApp APBU Strategic Planner

Dennis Hahn

Transitioning to the Cloud



Number of cloud projects underway currently



Source: CIO Market Pulse
Cloud Computing Study, May 2011

Cloud Data Center Attributes?

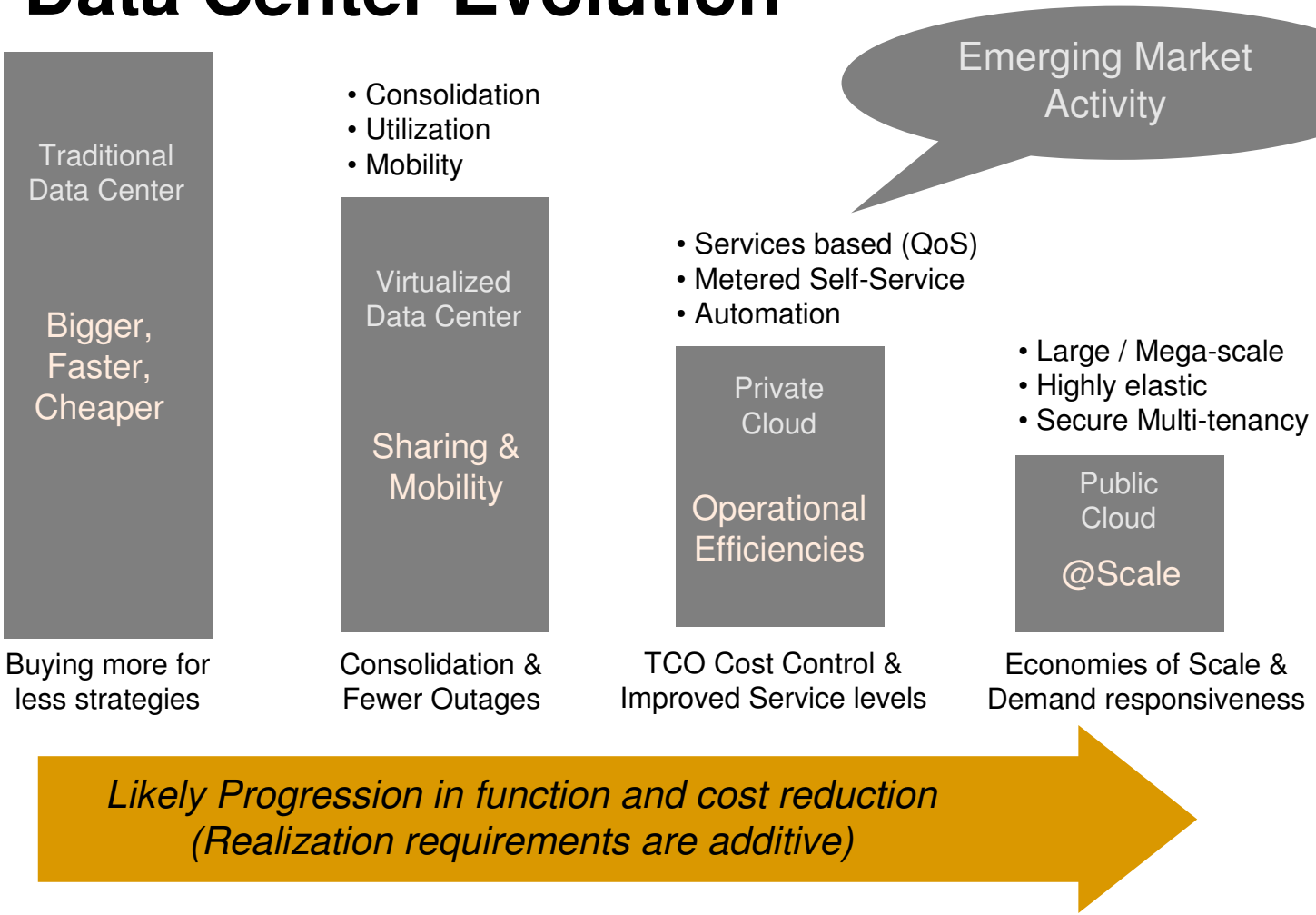
- *Secure Multi-tenant*
- *Dynamically provisioned*
- *Optimized infrastructure*
- *Automation*
- *Optimal service levels*

Public & Private Cloud Benefits

		Benefits of PUBLIC cloud computing	Benefits of PRIVATE cloud computing
Able to buy and use resources on a per-need basis	More strongly associated with public cloud	77%	59%
Scale-up/scale-down to accommodate business needs		77%	65%
Reduction in provisioning times		72%	71%
Increased IT efficiencies/lowered costs	More strongly associated with private cloud	52%	71%
Less downtime/planned outages		47%	59%
Improved SLAs		42%	70%
More reliable security		22%	57%

Source: CIO Market Pulse Cloud Computing Study, May 2011

Data Center Evolution



Likely Progression in function and cost reduction
(Realization requirements are additive)

Cloud competitive advantage in operational efficiency is being turned into one of the new yard-sticks for IT operations.

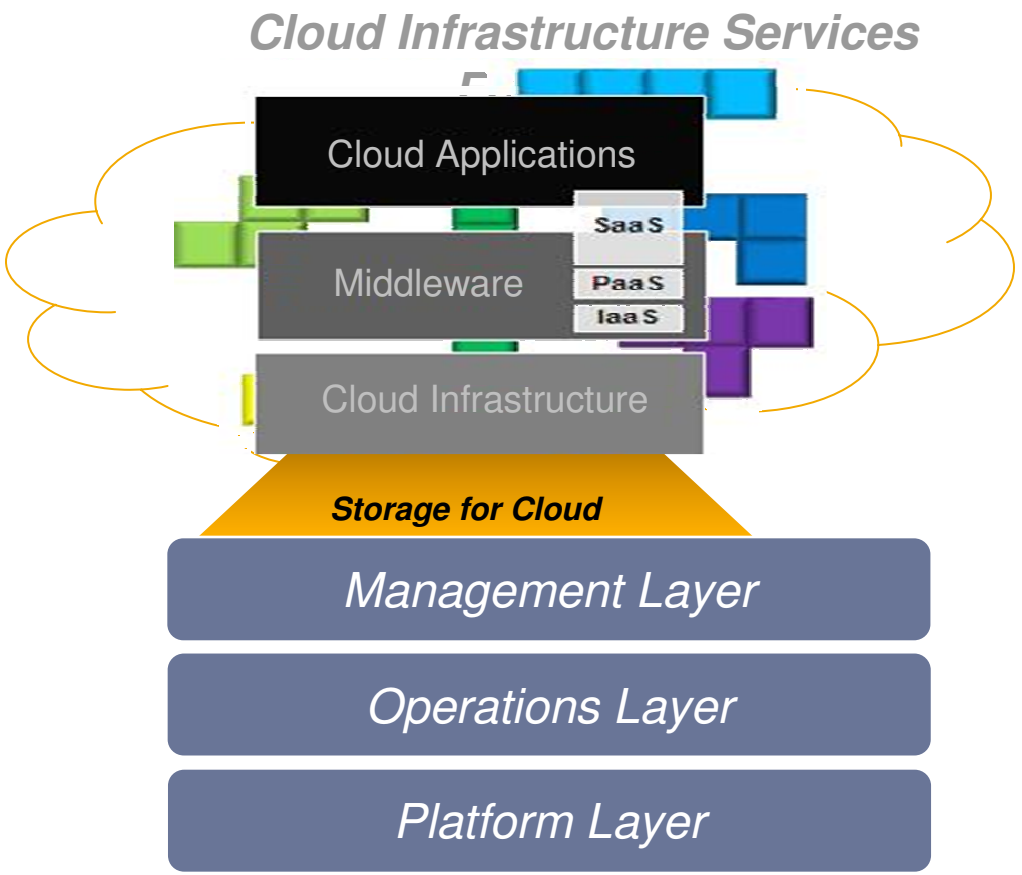
Storage for Cloud Computing

Compute & Network Cloud Characteristics:

- *Shared / Multi-tenant*
- *Non-stop infrastructure*
- *Scalability & Efficiency*
- *Automated Management*
- *User Self-service*

Storage for the Cloud Characteristics:

- *Performance*
- *Availability & Reliability*
- *Affordability*
- *Optimized footprint*



Many cloud infrastructures, just looking of the storage system fundamentals.

DS Series – Cloud Optimized Platform

#3 *Management Layer*

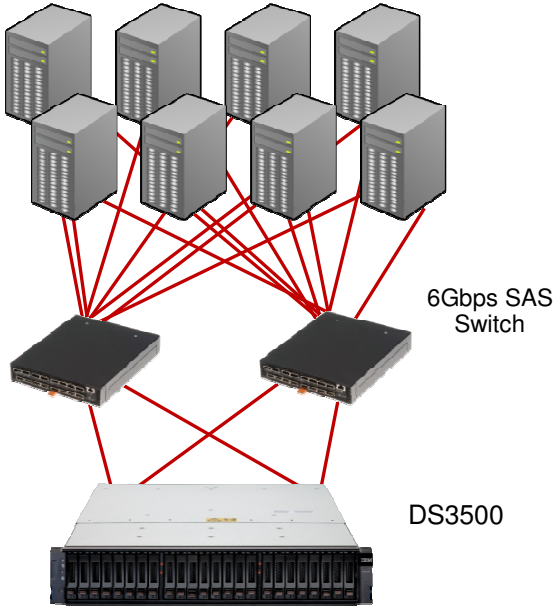
#2 *Operations Layer*

#1 ***Platform Layer***

- Key Cloud Considerations
  - Modular scaling blocks
  - High availability
  - Performance
  - Environment & Green
- DS Series for the cloud
  - Affordable enterprise redundancy
  - Start small & grow big scaling
  - Balanced mixed-load performance
  - Excellent $/performance
  - Green performance /watt efficiencies
  - NEBs Certifications & DC options

IBM DS3500 & SAS Switch
Cloud enabling infrastructure

- New Level of Functionality for SAS connectivity
  - Efficiently connect multiple servers to multiple storage
- "Start Small, Grow Big" Scalability
  - Lowers acquisition cost without sacrificing expansion capabilities
- Low Cost, Higher Performance Storage Interconnect
  - 6Gbps performance
- Higher Bandwidth & Lower Latency in Switched Topologies
- Reduce Complexity with Simple Management Software



Additionally, IP SAN 1GB/s or 10GB/s available for cloud environments!

DS Series – Cloud Operations

#3 *Management Layer*

#2 ***Operations Layer***

#1 *Platform Layer*

- Key Cloud Considerations
  - Resiliency and data integrity
  - Affordable & secure interfaces
  - Data protection
  - Non-stop operation
- DS Series for the cloud
  - Connectivity SAS & iSCSI (& others)
  - Storage Partitioning / Virtual DAS
  - RAID 6 & Dual controller fail-over
  - Turbo & caching performance options
  - Premium operational features
    - FlashCopies & Scheduler
    - Volume Copy

DS Series – Cloud Manageability

#3 ***Management Layer***

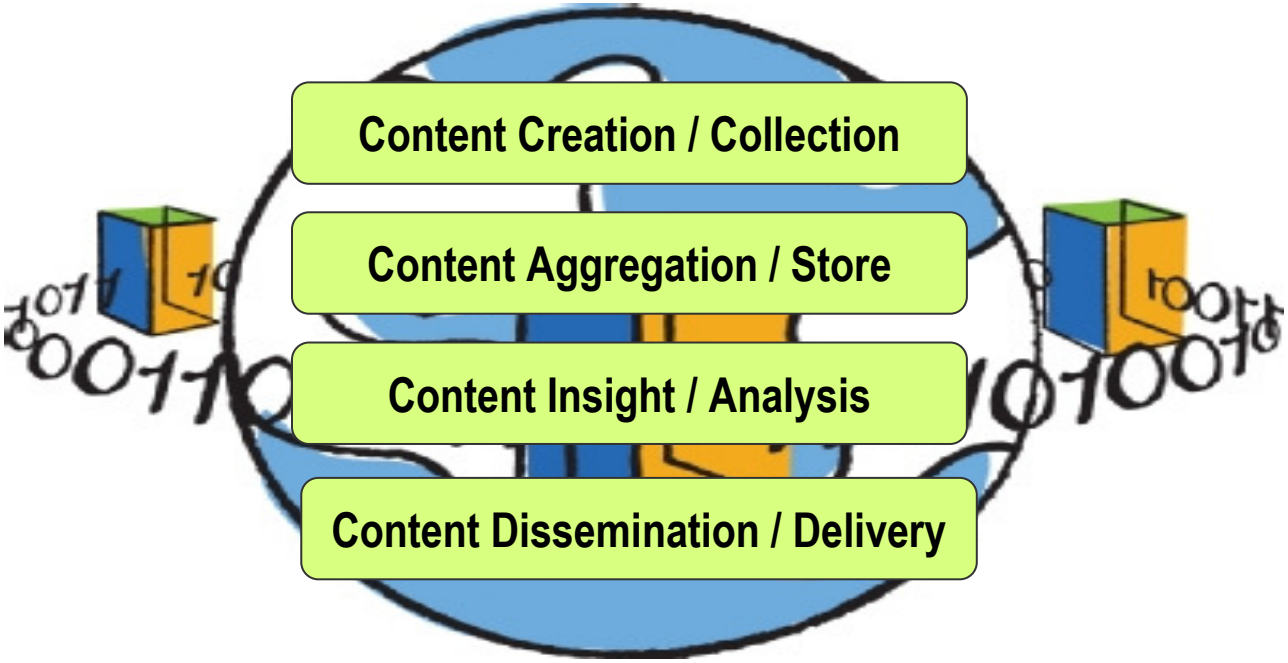
#2 *Operations Layer*

#1 *Platform Layer*

- Key Cloud Considerations
  - Powerful with robust functionality
  - Easy expansion & provisioning
  - Configure and manage protection
  - Manage data availability
- DS Series for the cloud
  - Control to tune any system attribute
  - Large number of partitions & volumes
  - Various RAID levels & stripe sizes
  - Dynamic configuration / re-configuration
  - Critical config. info stored on every drive
  - Simple upgrades and expansion
  - Perf. Monitor supports informed decisions

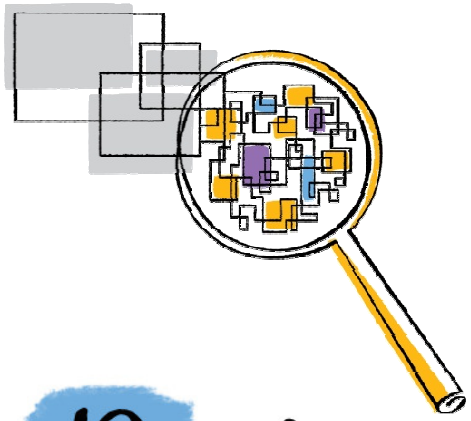
Big Data & New Apps

Big Data: Workloads with data scale so large and demanding that they stress traditional data processing approaches.



Both Cloud and Big Data share the same ideas of scale
Cloud is both a source of data and a data-processing layer!

The A-B-C's of Big Data

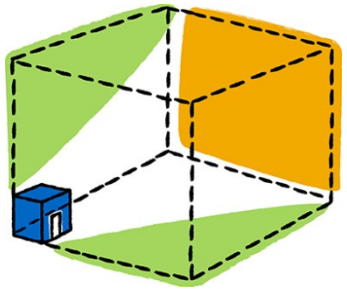


Analytics

High-performance solutions for traditional and new analytics

Bandwidth

High-bandwidth solutions for advanced video and surveillance



Content

High-capacity solutions for managing large content repositories

Big Data

Hadoop

Full motion video

Real-time analytics

Rich media

Big Analytics

Big Bandwidth

NewSQL

Dense video archives

Sensor Data

ColumnarDB

NoSQL

HPC

Hi resolution cameras

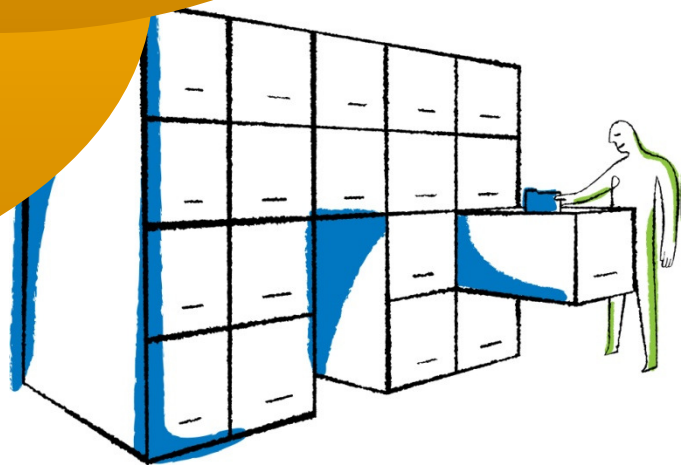
Dynamic Data Sets

Grid

Object Store

Unstructured Data

Big Content



Big Data & Cloud Scaling Blocks

Many times Big Data & Cloud are designed cookie-cutter and scaled as "bricks"

- DS3500 Cost conscious scaling block
  - Medium scale IOPS demands w/ 2.5" performance drives
  - Low scale bandwidth and capacity w/ 3.5" near-line drives
- DS3500 Turbo – Performance scaling block
  - High IOPS and MB/s, realize a 2X performance improvement over base
  - Most environments of medium or larger size, can realize benefits
  - Consider EFD for really "hot" data volumes
- DCS3700 Densest rack scaling block
  - When 60% reduction in rack density, over the base matters (4U 60-drive enclosure)
  - Best for compute and bandwidth intensive workloads
- DS5000 & DS3500 Traditional data center SANs
  - Consolidated business applications and SAN environments

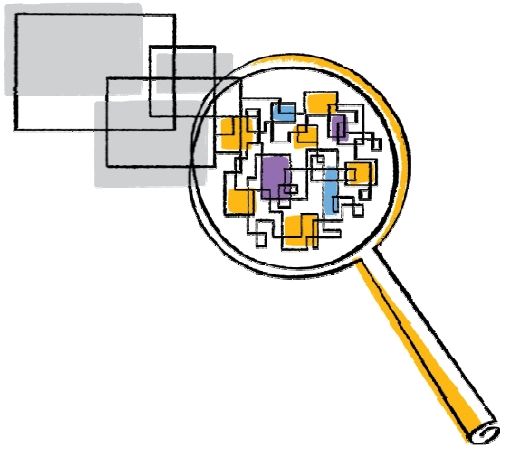
Big Data: Analytics

Customer Challenges/Requirements

- Highly scalable, cost effective compute farms
- Complexity - speed of deployment and difficult to administer
- Efficiency of compute & storage
- Data (metadata) reliability

Use Cases

- Traditional structured (row-based):
- Modern structured (columnar):
- Unstructured (file):



Solutions

- Real-time analytics (ex: Oracle) – DS3500 Turbo w/2.5” drives
- Batch analytics (ex: Hadoop) – DS3500 w/3.5” 2TB drives

Big Data: Bandwidth

Customer Challenges/Requirements

- Extremely high ingest rates/performance
- Rack density (GB/s/RU)
- Complexity of system

Use Cases

- Full-motion video capture
- Digital video surveillance
- High performance computing

Solutions

- Video sized to capacity and number of streams
- HPC sized to ingest rate and capacity

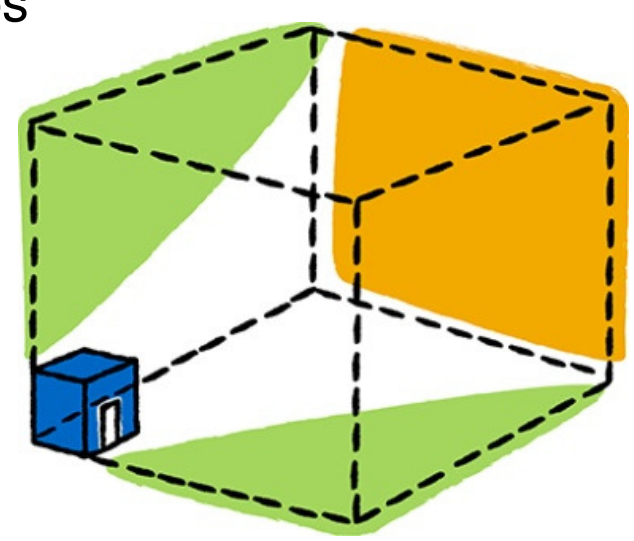
Big Data: Content

Customer Challenges/Requirements

- Very large data container (10's PBs)
- Scale of data management
- System efficiencies
- Integrating object techniques with legacy apps

Use Cases

- Large file pools & data grids
- Semi-structured apps (i.e. SharePoint)
- Large scale object repositories



Solutions

- DCS3700 with IBM GPFS™
- Other FS (ex: Lustre) DCS3700 for rack density

DCS3700 … with IBM GPFS™ Clustering

- GPFS – IBM's highly scalable and high performance file management system. Designed for handling, managing and striping data across different hardware, clusters, and data management pools.
- Combining IBM's GPFS clustered file management software and the DCS3700, creates an extremely scalable and dense file-based management system
- Using a flexible architecture, "building blocks" of DCS3700+GPFS can be organized

	Single Building Block	Two Building Blocks
Configuration	2 GPFS x3650 Servers 3 DCS3700	4 GPFS x3650 Servers 6 DCS3700
Capacity: Raw Usable	 360TB 262TB	 720TB 524TB
Streaming Rate: Write Read	 Up to 4.8 GB/s Up to 5.5 GB/s	 Up to 9.6 GB/s Up to 11.0 GB/s
IOP Rate (4K trans.) Write Read	 3,600 IOP/s 6,000 IOP/s	 7,200 IOP/s 12,000 IOP/s

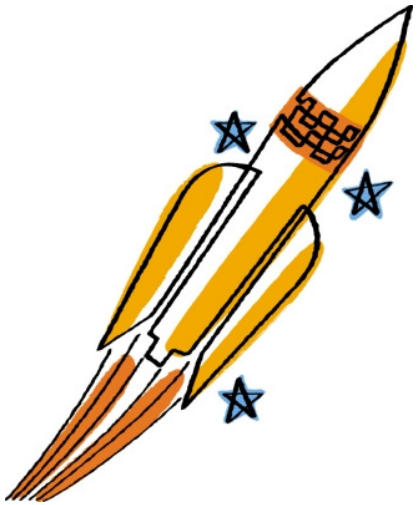
Ensuring Storage Fundamentals

Reliability

Deliver High RAS

- Continuous availability
- Data integrity
- Trusted dependability

Performance



Help business go faster

- Get to market faster
- Get to knowledge faster
- Respond to business faster

RAS: Reliability, Availability & Serviceability

DS Series Positioning Summary

Midrange & Entry Storage System
Backing-store for Cloud infrastructure
Big Data solution element

NetApp

Thank you

Go further, faster

DS3500 Enhanced Value

Scalability – Keep Up with Growth and Performance

Maximum Drive Quantity

- DS3000 – 48 drives
- DS3500 (10.70) – 96 drives
- DS3500 (10.75) – 192 drives

Cache IOPs (Reads)

- DS3000 – 104,000 ***48 drives***
- DS3500 (10.70 and 10.75) – 140,000 ***96 or 192 drives***
- DS3500 (10.70) *Turbo* – 200,000 ***96 drives***
- DS3500 (10.75) *Turbo* – 200,000 ***192 drives***

Random IOPS (reads)

- DS3000 – 20,000 ***48 drives***
- DS3500 (10.70 and 10.75) – 30,000
- DS3500 (10.70) *Turbo* – 40,000 ***96 drives***
- DS3500 (10.75) *Turbo* – 65,000 ***192 drives***

Random IOPS (Writes)

- DS3000 – 4,600 ***48 drives***
- DS3500 (10.70 and 10.75) – 7,500 ***96 or 192 drives***
- DS3500 (10.70) *Turbo* – 12,500 ***96 drives***
- DS3500 (10.75) *Turbo* – 15,000 ***192 drives***