Meeting Increased Storage and Infrastructure Needs
Accelerate Business Success
Agenda

- IT Challenges
- Trends
- Standards
- Innovations & efficiencies
- Questions?
IT Challenges

Budgets/Funding
- As budgets go down, so does funding for IT.
- Many CIOs see budget decreases as an opportunity to improve by breaking down barriers, strengthening IT governance, developing creative solutions.

People
- Example: State of Washington
  - Of the 3,000 Full and Part time technology employees, more than 50% of the state IT workforce is over the age of 50.
  - 25% of the IT workforce has over 20 Years of Service and is over the age of 50 – they are Eligible to retire!
  - Less than 5% of the workforce is under the age of 30.
  - Salaries rose in Seattle but were reduced for Government employees.
    http://ofm.wa.gov/ocio/technology_strategy_022312.pdf

Growth & New IT Pressures
- Data is predicted to grow 800% in the next 5 years.
  *Gartner tech trends 2011
- Big Data/Unstructured Data and Video will account for 80% of the data growth in the next 5 years.
  *Gartner tech trends 2011
- Mobility/BYOD - 1 Trillion devices will be connected to the network in 2013 up from 35 Billion in 2010
  *Cisco Summit 2011

*Source: NASCIO-TechAmerica*
Is Your IT Infrastructure Good Enough?

Data Growth Impact on Business

Information Becomes a Propellant to Business

Data Becomes a Burden to IT Infrastructure

What’s Driving My Information Growth?
- Mobile Apps
- Decision Support / Analytics
- Machine Generated Data
- Systems of Record
- Systems of Engagement

Where Is My Inflection Point?
- Number of Apps
- % Unstructured Data
- Number of Objects
- Measured Performance vs SLA’s
- Measured Capacity and Growth Rate
Relentless Data Growth

A Decade of Monumental Growth*

If you were storing 100TB of online data in 2010, you will store:

- 1.1 PB in 2016 (11x)
- 2.5 PB in 2018 (25x)
- 5.8 PB in 2020 (58x)

* Based on industry average 50% annual growth

Projected Enterprise Workload Growth 2010-2015

Source: IDC Multi-Client Study, Storage Workloads 2011, September 2011
Gartner: IT Organizations Should looking at...

Key Infrastructure as a Service (IaaS) Storage Purchasing Criteria

- **Transparency**: Easy to use and integrate with little or no manual intervention; seamless installation and decommissioning of the storage resource
- **Scalability**: On-demand scaling of capacity, performance, and availability
- **Storage efficiency**: Built-in efficiency at every layer of the IaaS cloud
- **Intelligent caching**: Transparent automation that is optimized for cost-performance by application affinity and workload
- **Unified architecture**: Unified architecture for different workload requirements to reduce management complexity
- **Integrated data protection**: Transparent and seamless data protection for disaster recovery (DR), backup, and archive
- **Continuous operations**: Non-stop data availability with all layers of the IaaS cloud; transparent physical infrastructure life cycle management
- **Secure multi-tenancy**: Multi-tenant for shared storage resources
- **Service automation and analytics**: Accelerated troubleshooting tasks, improved response time, improved time to resolution

“The internal cloud requires a different storage model than the traditional data centers.”

The Journey from Physical to Virtual Silos

**Private Cloud:** behind the firewall of an enterprise, closed to public

**Public Cloud:** accessible via service providers for general purchase

**Hybrid Cloud:** private clouds linked to public clouds

Workloads moving increasingly to virtualized cloud infrastructure
From Physical to Virtual Silos

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Virtualized + Multi-tenant & Automated + Mobile
The Cost of the Data Center

- Networking: 19%
- Peripherals: 9%
- Servers: 27%
- PCs/Notebooks: 22%
- Storage: 23%

Source: IDC

- Cost of storage is current 2nd largest capital expenditure, and growing rapidly.
Unified Architecture

Benefit: One architecture for many diverse workloads

- Protocols: FC, FCoE, iSCSI, CIFS, NFS, pNFS
- Broad System Portfolio
- Capacity & Performance: SAS & SATA (2.5" & 3.5"), Cache, SSD
- Efficiency: SnapShots, Cloning, Compression, Deduplication

Unified Management

- Use one or limited processes: learn once, run everywhere
- Integrated data management
- Integrated storage efficiency
- Integrated data protection
- Unify across vendors
- Reduce complexity and risk
Storage System must haves

Address data growth
- Grow from small to large
- Respond immediately
- Simple, consistent management

Scale in 3 dimensions
50PB

Capacity

Performance

Operational

Linear

PBs per admin
Storage Efficiency

Benefit: Cost containment in an era of monumental growth

Low-cost components
- SATA drives
- Intelligent Cache

Data reduction
- Deduplication
- Compression

Increased utilization
- Thin Provisioning
- Unified architecture

Fewer full copies
- Space saving Clones
- Deduped backup

Cost

Data Growth Over Time

Uncontrolled Data Growth

- SATA
- Snapshot Technology
- Thin Provisioning
- Cloning
- Deduplication
- Compression
- Intelligent Cache
Using Software Efficiencies

**Deduplication**
Saves up to 95% for full backups; 25% to 55% for most data sets

**Virtual Clones**
Savings equal size of the original data set minus blocks subsequently changed in clone

**Thin Provisioning**
20% to 33% typical savings

**Thin Replication**
Disk-to-disk data protection saves up to 95%

**RAID-6**
Saves up to 46% versus mirrored data or RAID 10

**Snapshot Copies**
Snapshots do not require “copy” space, serve local backup purposes, delivers savings of up to 80%

**Thin Provisioning**
20% to 33% typical savings

**Thin Replication**
Disk-to-disk data protection saves up to 95%

**Virtual Clones**
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Florida – Department of Finance

1-Pager for Florida Dept of Financial Services

**Feature or Benefit**

**How We Do It**

**NetApp Savings**

**Deduplication**

Deduplication searches for and removes duplicate data. NetApp is the market leader in deduplication, with thousands of customers using NetApp deduplication across a broad variety of applications and storage tiers, including primary storage, replicated storage, backup storage, and archival storage.

66.39 TB

**Data Compression**

In-line data compression extends efficiency and increases utilization for file servers, engineering applications and non-RAID data.

202.6 TB

**Thin Provisioning**

NetApp thin provisioning allows users to provision the data volume, resulting in very high allocation models. Many of our customers report 90% or greater save on usable storage utilization based on thin provisioning alone.

32.37 TB

**FlexClone Writable Snapshot**

Writable snapshot clones are ideal in real-time environments. Instead of provisioning a large storage capacity to perform application testing, the production application data is “shared” with the test data, resulting in cost savings.

195.66 TB - 644.01 TB

**Thin Replication**

With SnapMirror® and SnapVault®, only incremental block changes are transferred after the baseline copy is made. These “thin transfers” reduce the storage space required at the destination, and they also reduce RAID-DP

As larger disk sizes are used to store more critical data, resiliency becomes paramount. NetApp RAID-DP protects against dual-disk failures, as a fraction of the capacity required by RAID nesting techniques.

497.02 TB - 945.38 TB

**High-Density SATA Disk Drives**

SATA drives used with RAID-DP® allow high-capacity drives to be used in demanding environments. Also, with the NetApp Performance Acceleration Module card, data is cached in secondary memory and disk access becomes less frequent. The result is that larger SATA drives can be used for higher performance applications.

213.15%
Agile Customer Example: AZ Dept of Economic Security

- 10,000 employees
- Annual Budget $4.5B
- 700 physical servers / 400 servers virtualized
- 30 to 40 servers per blade
- 30 to 1 storage consolidation
- Reduced Rack space by 93%
- Data lives on 50% less storage
- Full converged infrastructure
  - Private Cloud
  - Charge back
  - Bursty workloads
  - load balancing
Is Your IT Infrastructure Good Enough?

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Data Becomes a Burden to IT Infrastructure

Business Velocity

2010

2020

Inflection Point
Thank you
The Big Data Push

- Enterprise Applications
  - Shared, Virtualized Infrastructure
  - Integrated Data Protection
  - Secure Multi-Tenancy

“Big Data”
- High Bandwidth Throughput
- Big Data Content

“Decision Support”
- High Speed Analytics

- Tier 1 BP
  - OLTP

- Tier 2 BP
  - OLTP
  - App Dev
  - Web Infra

- Collaboration
- Tier 2 BP
- OLTP

- DSS/DW
- No SQL
- Columnar DBs
- Content Repositories

- Large Block, Sequential I/O
  - 100s GB/sec

- Small Block, Random I/O
  - (100s KIOPS)

- Performance

- Data Structure
  - High
  - Low

- NetApp
  - High
  - Low

- HPC
- Sat Ground Stations
- FMV
- DVS
- HomeDirs
Ethernet Speeds push File Protocols to Lead Storage by 2015

Worldwide Enterprise Storage Systems 2010-2015 Forecast,
Source: IDC
<table>
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<tr>
<th>Month</th>
<th>SATA Storage (TB)</th>
<th>SATA Disk %</th>
<th>Dedupe Enabled (TB)</th>
<th>Dedupe Not Enabled (TB)</th>
<th>Dedupe Coverage %</th>
<th>Dedupe Efficiency Factor</th>
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**Monthly Raw and SATA Storage Trend**

- **SATA Storage**
- **Non SATA Storage (TB)**
- **% of SATA Storage**

View as: SATA Storage
Agile Customer Example: Iowa Workforce Development

- Deployed 1,500 Virtual Desktops across the State of Iowa in 6 Months
- Implemented 2x the Targeted Number of Virtual Access Points
- Reduced Storage by 50%
- Saved $6.5 Million Annually
UH Storage Challenges

- **Security**
  - Administrative Rules (Firewalls) Don’t Work for Education & Research
  - Safe But Accessible
  - Compliance
    - EAR, FERPA, FISMA, HIPPA, ITAR

- **Not All Storage Is Not Equal**
  - What works for business does not work for big data research

- **Big Storage Needs Big Bandwidth**
UH Research and Big Data

• Pan-STARRS 2 (2014): 3 Terabytes/Night
• UH HPC Condominium (2014): 100teraFLOP Cluster connecting to other HPC Clusters across the country (teraFLOP: 1 Trillion Floating Point Operations/Second)

• Three Storage Needs
  • Temporary
  • Processor Intensive
  • Archival
Big Storage Needs Big Bandwidth

Time to Copy 1 Terabyte
On a...
• 10 Mbps network: 300 hrs (12.5 days)
• 100 Mbps network: 30 hrs
• 1 Gbps network: 3 hrs (are your disks fast enough?)
• 10 Gbps network: 20 minutes (fast disks and fast filesystems)

These figures assume some headroom left for other users
UH Storage Solutions

• Network: 10 Gb
• Security: Appliance, Research Network DMZ
• Compliance: Store in USA
• Storage to Meet Every Need
  ▪ Google: Average – 330 Mb/user
  ▪ Local Storage: Fast or Archival in IT Center
  ▪ Collaborative Cloud: Condo of Condos, Net+
T3: Meeting Increased Storage & Infrastructure Needs
The world’s capacity to store information

This chart shows the world’s growth in storage capacity for both analog data (books, newspapers, videotapes, etc.) and digital data (CDs, DVDs, computer hard drives, smartphone drives, etc.)

In gigabytes or estimated equivalent:

**2007**

**ANALOG**
- Paper, film, audiotape and vinyl: 6%
- Analog videotapes (VHS, etc.): 94%
- Portable media, flash drives: 2%
- Portable hard disks: 2.4%
- CDs and minidisks: 6.8%

**DIGITAL**
- Computer servers and mainframes: 8.9%
- Digital tape: 11.8%
- DVD/Blu-ray: 22.8%
- PC hard disks: 44.5%
- Others: < 1% (incl. chip cards, memory cards, floppy disks, mobile phones, PDAs, cameras/camcorders, video games)

% digital:
- 1%
- 3%
- 25%
- 94%

Access to the right information – anywhere, any time, any mission, securely and reliably

T3: Meeting Increased Storage & Infrastructure Needs
T3: Meeting Increased Storage & Infrastructure Needs
Summary

- Be aware of the security requirements and adhere to the most stringent requirement
- Keep current on trends
- Join the Data Loss Prevention team, Open Data team, Business and IT Reengineering team, or the Data Center Consolidation team