



**NetApp™**

Go further, faster™

# NetApp FAS/V-Series

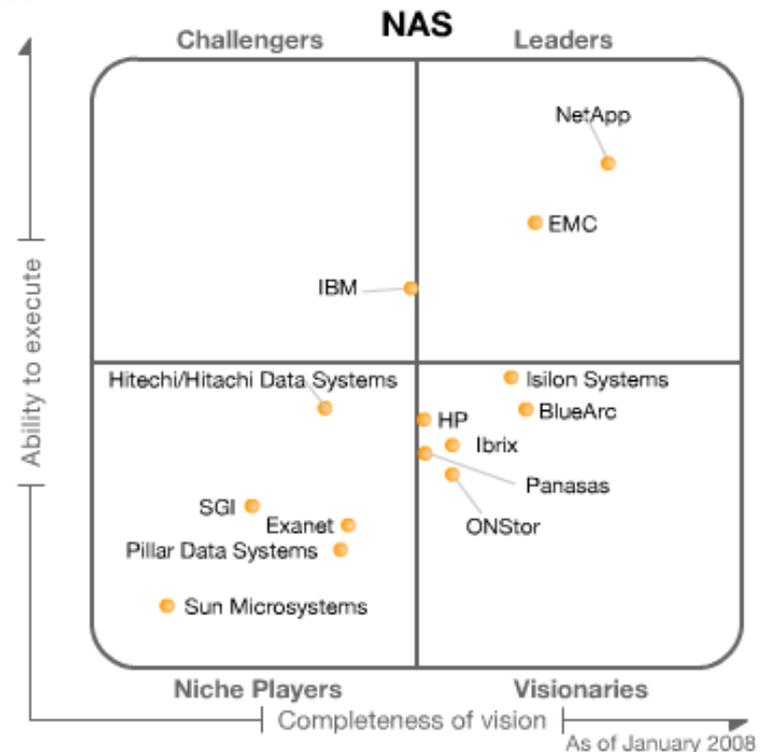
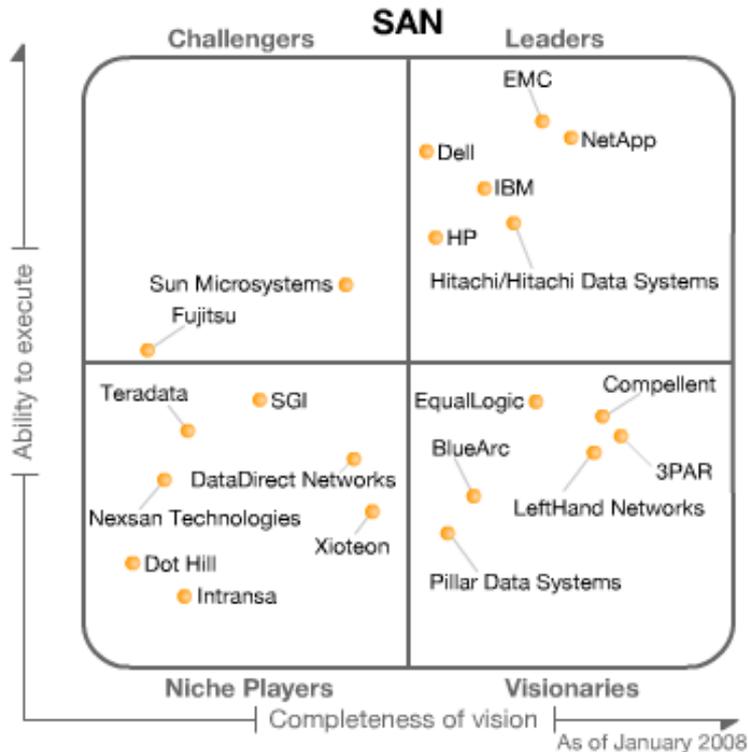
vladimir.loukota@arrowecs.cz  
*NetApp BDM*





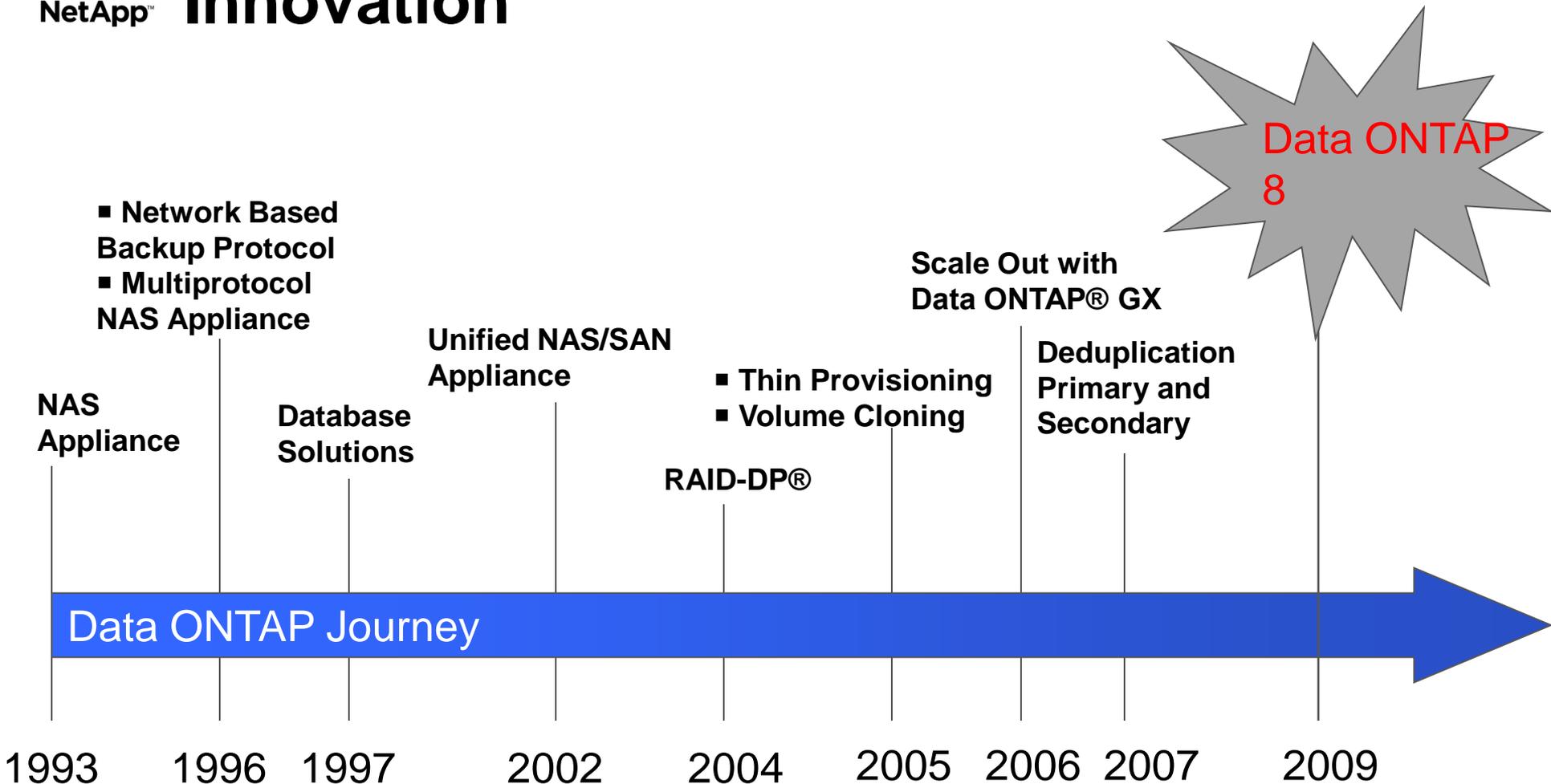
# Gartner Magic Quadrant: SAN & NAS Leader

MAGIC QUADRANT



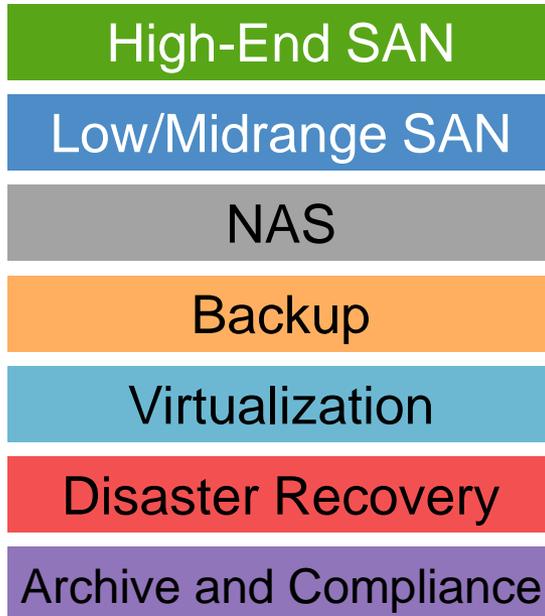


# The Data ONTAP Continued Path of Innovation



# Extend Efficiencies Everywhere

## Industry Approach



Different hardware  
Different software  
Different people  
Different processes

## NetApp® FAS and V-Series



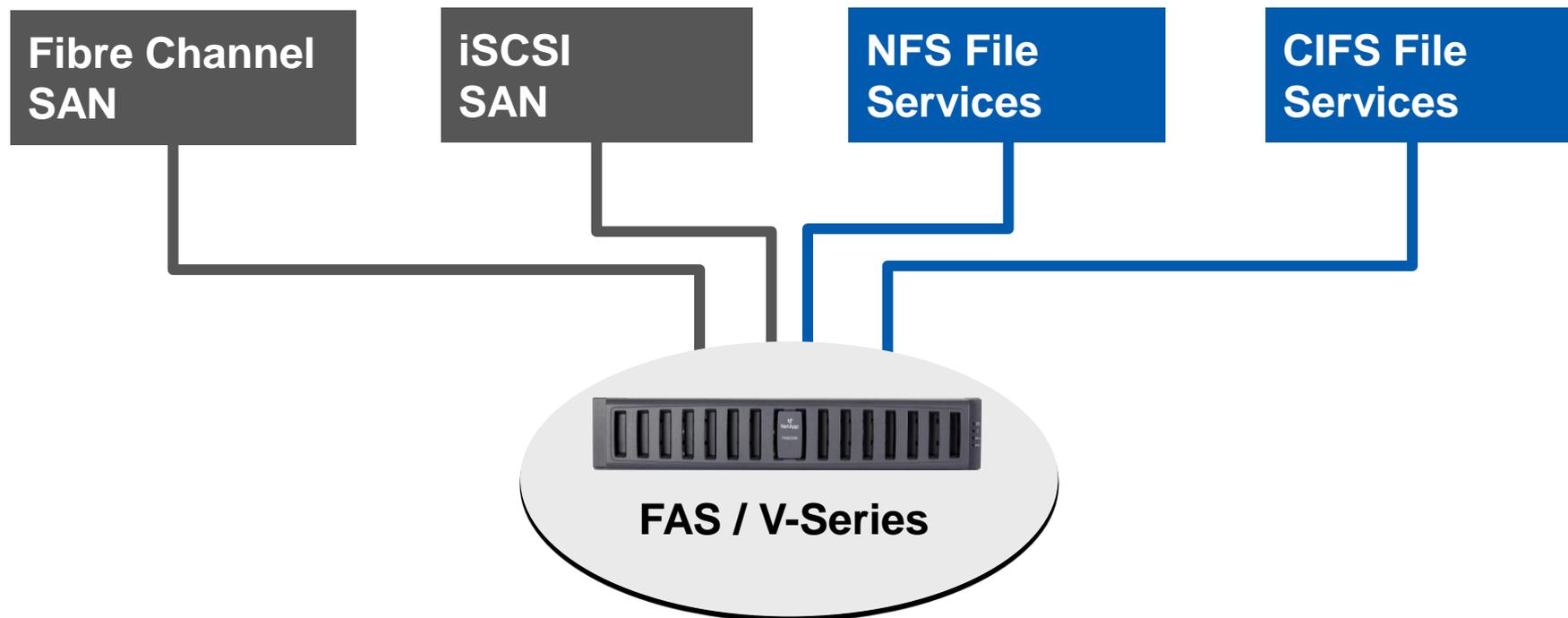
All run  
Data ONTAP®

Same hardware  
Same software  
Same people  
Same processes

- One platform for all workloads
- Learn once, deploy everywhere
- Improve IT and business efficiency

# Unified Storage Model

*Mix File and Block Protocols in the Same System*



- One architecture for SAN and NAS storage
- Unique ability to consolidate file and block storage on single system
- Can be used for either primary or secondary storage



# RAID-DP™: Cost-Effective Data Reliability

## The Problem

- ▶ Increasing disk capacity makes double disk failure a mathematical certainty
- ▶ RAID 5
  - ▶ Insufficient protection
- ▶ RAID 10
  - ▶ Double the cost

## NetApp RAID-DP Solution

- ▶ High-performance RAID-6 implementation
- ▶ Protects against double disk failure
- ▶ Same protection as RAID 10 at half the cost

	RAID 5	RAID 10	RAID-DP
Cost	Low	High	Low
Protection	Low	High	High



NetApp™

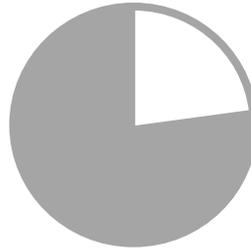
# Improved Storage Utilization

Vol 1

Vol 2

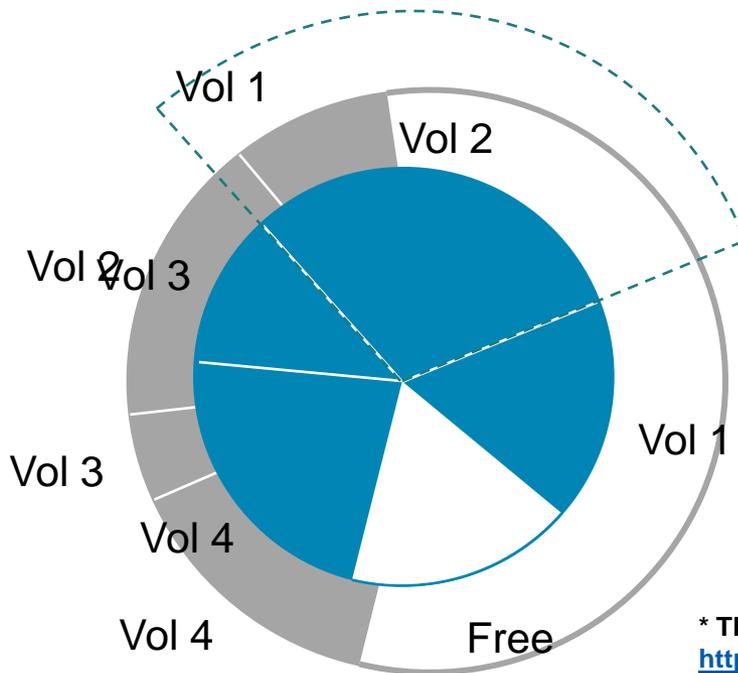
Vol 3

Vol 4



## Regular Volume

- Preallocated
- Free space fragmented



## FlexVol® Volume

- No preallocation
- Free space shared
- Free space reduced
- Thin provisioning\*

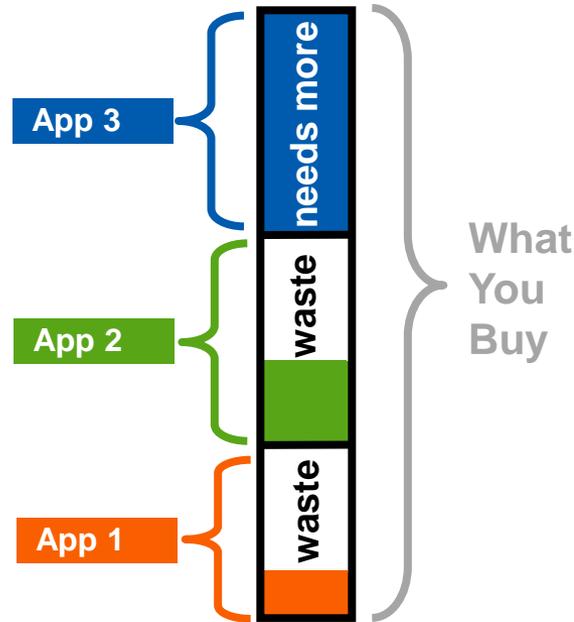
\* Thin Provisioning in a NetApp SAN or IP SAN Enterprise Environment, TR-3483  
<http://www.netapp.com/library/tr/3483.pdf>.



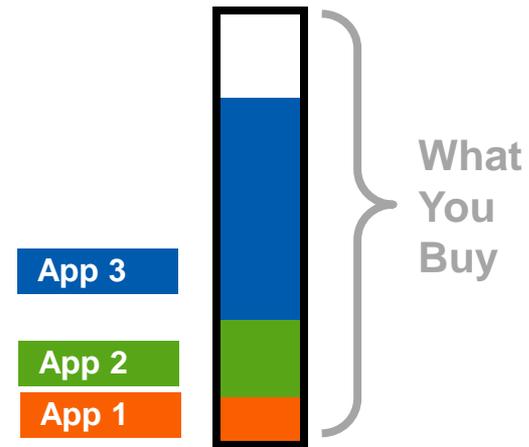
# Thin Provisioning— Higher Storage Utilization

*Storage Industry Model <40% Utilization*

*NetApp Model >60%+ Utilization*



- Lots of excess capacity, but never where you need it
- Lost productivity



- Dramatically higher utilization
- Policy-based provisioning
- Reduced operator intervention

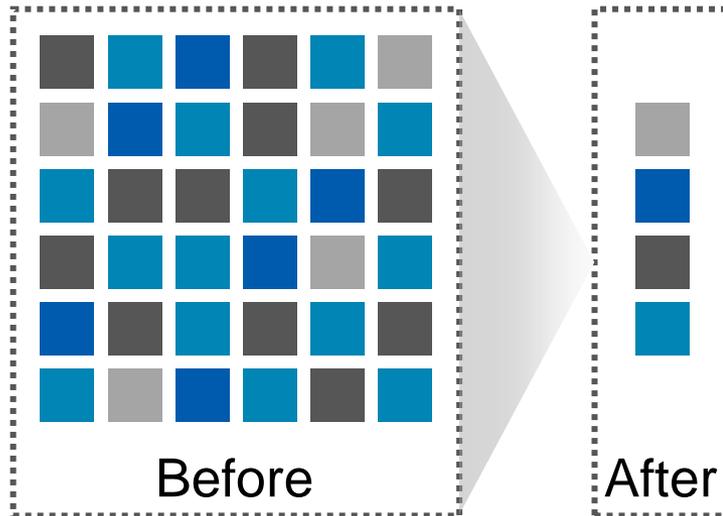
***“Our storage utilization went from 43% to 76% once we moved to NetApp FlexVol®.”***

**Beaumont Hospitals**



# NetApp Deduplication: End-to-End

NetApp Deduplication  
20:1 or Greater for Backup

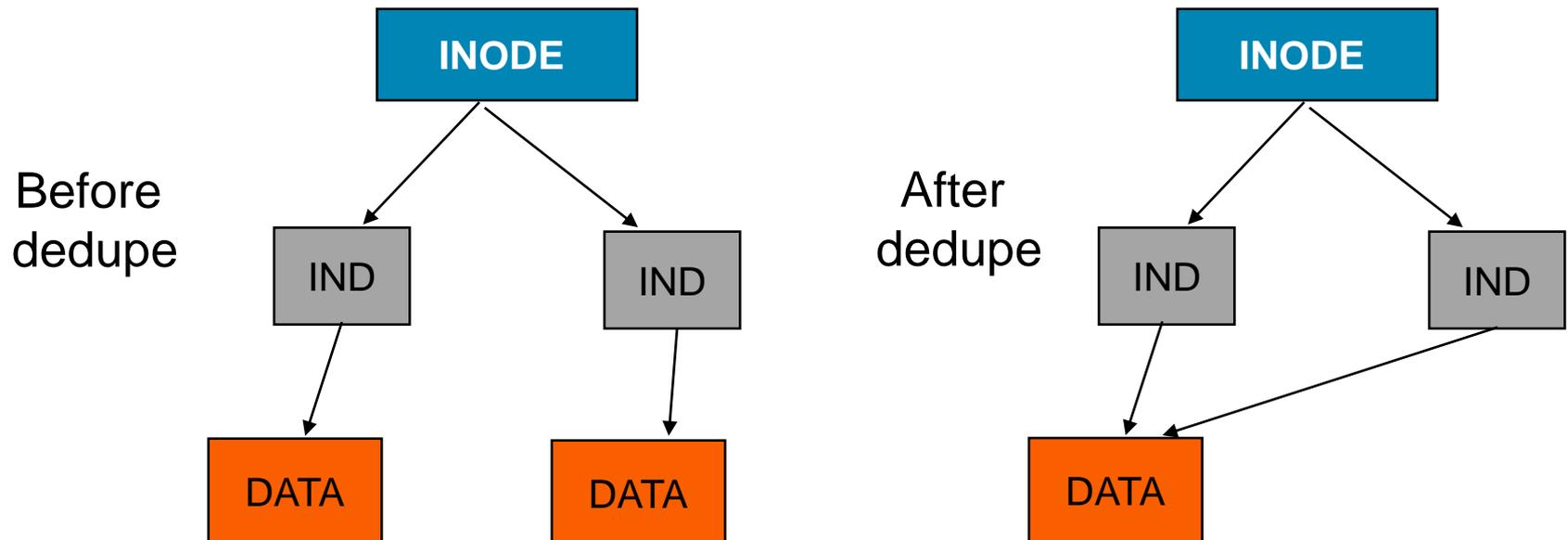


- Integrated with Data ONTAP®
  - General-purpose volume deduplication
  - Identifies and removes redundant data blocks
- Storage-efficient VMs
  - 50-90% reduction for VMware® space requirements
  - OS image management
- Application agnostic
  - Primary storage
  - Backup data
  - Archival data

“We decided to utilize NetApp SnapMirror® for replication and deduplication, and these became a driving factor in our solution [achieving 80% storage savings on VMware backup data with deduplication].” - A Global Financial Services Firm

# Deduplication – how it works

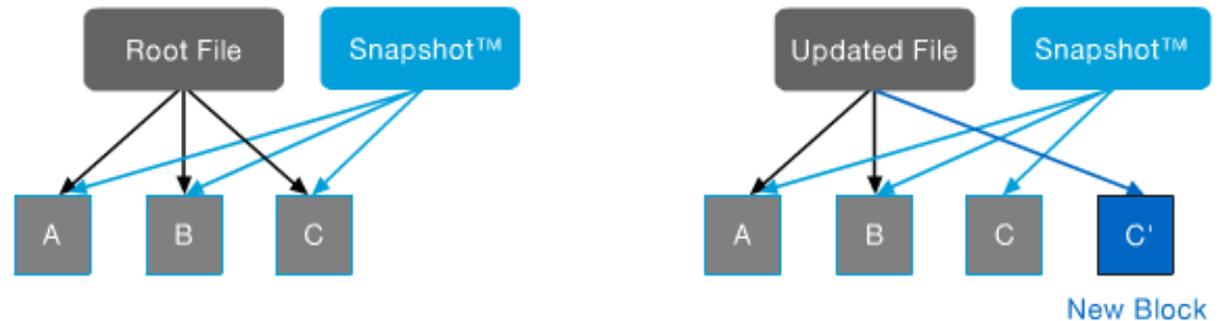
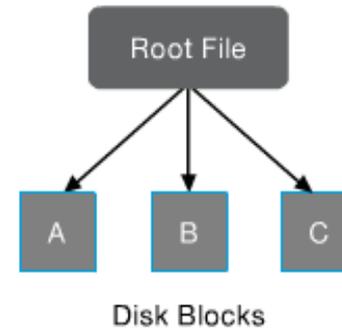
- 4K blocks with identical checksums identified as deduplication candidates
  - Checksums computed by RAID-DP® and stored in fingerprint file
- Byte for byte comparison to prevent false duplicate checksums
- Duplicated blocks are deleted – frees up space
- Use multiple reference pointers to each duplicated block



# Increasing Infrastructure Efficiency

## NetApp Snapshot: Efficiency and Performance

- Save only changed blocks
  - NOT write-in-place copy
- No performance penalty
- Core functionality built into Data ONTAP®

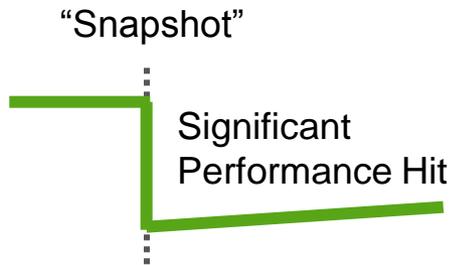
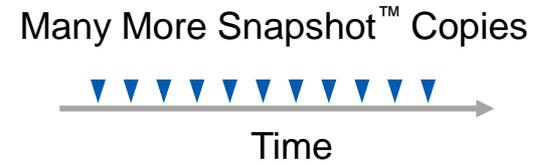


# Near Instantaneous Recovery

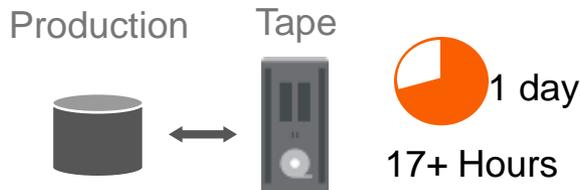
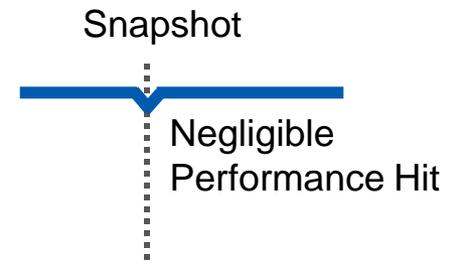
## Competitors



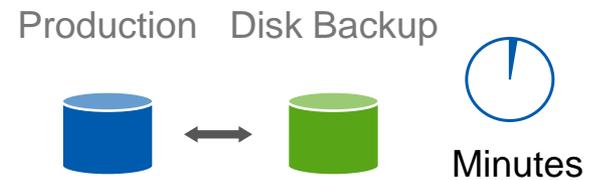
## NetApp



Negligible Performance Overhead



Faster Backup and Recovery



**OLIVER WYMAN**

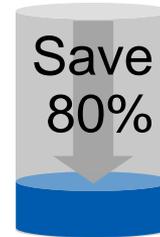
“NetApp customers reported at least 2X faster restores than competitor’s customers.”

# Efficiency Is Built In



## Deduplication

Reclaim up to 95% capacity for full backups; 45% on average



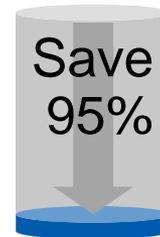
## Snapshot™ Copies

Save 80% capacity; only changed data uses storage



## Thin Provisioning (FlexVol®)

Liberate 20% to 33% of your capacity



## Thin Replication

Save up to 95% capacity with our disk-to-disk data protection



## Double Parity RAID (RAID-DP®)

Use up to 46% less capacity versus mirrored data or RAID10

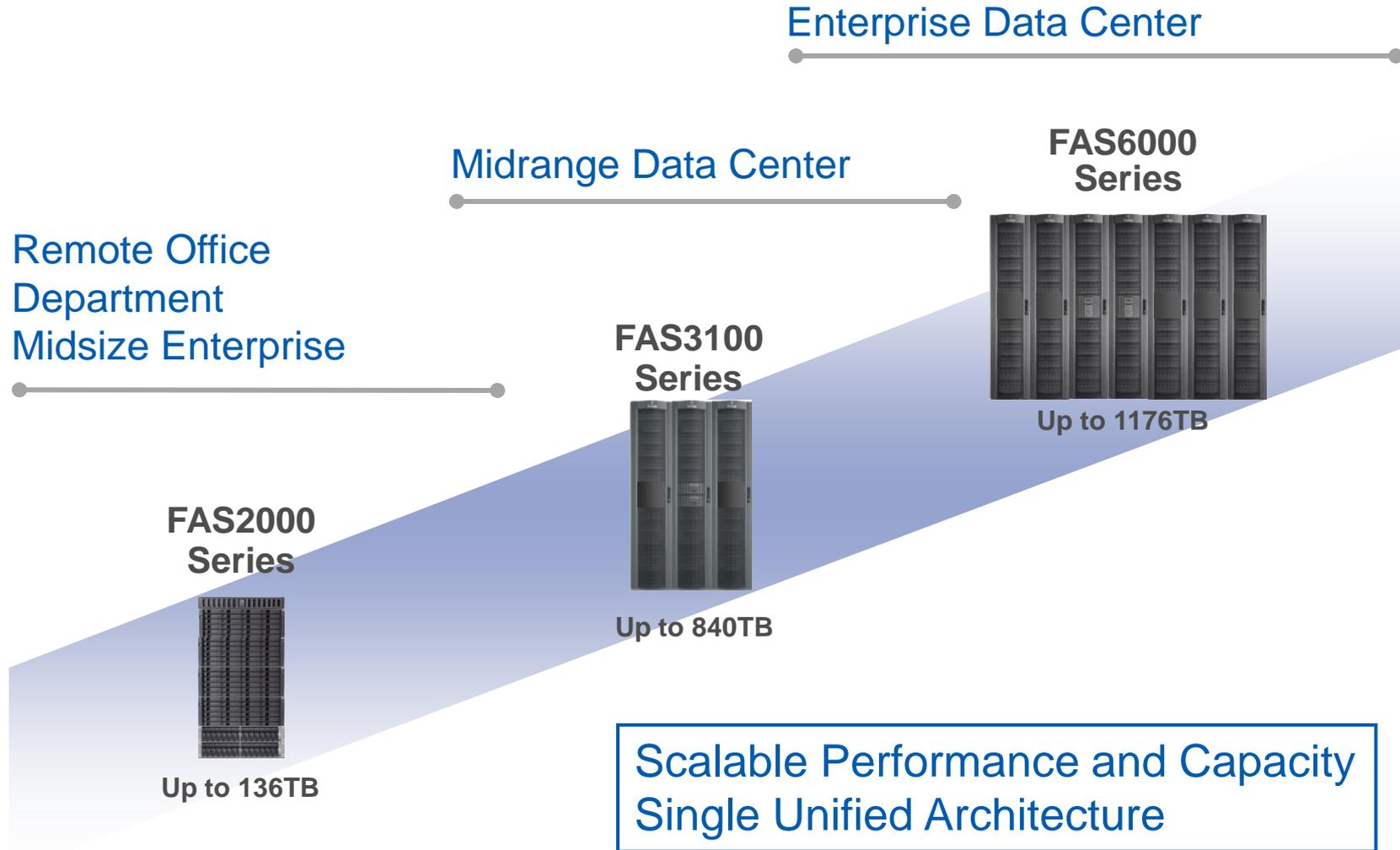


## Virtual Clones (FlexClone®)

Save up to 80% using writable virtual copies; only changed data uses capacity



# NetApp Storage System Family

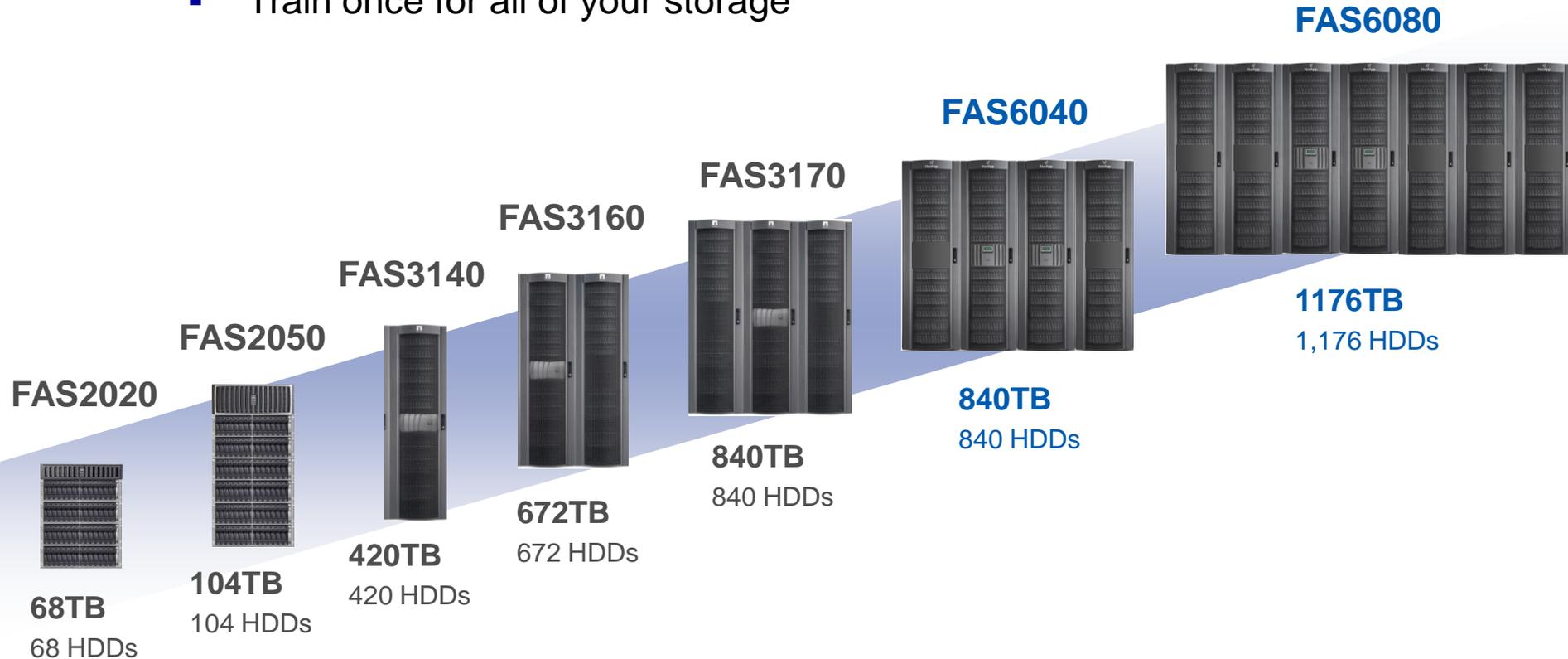




# NetApp FAS Family with Unified Architecture

## FAS Family of Enterprise Storage Systems

- Unified storage architecture with FC SAN, NAS, and iSCSI connectivity
- Data ONTAP® provides a single application interface
- One set of management tools and software
- Simple, pain-free upgrades
- Train once for all of your storage

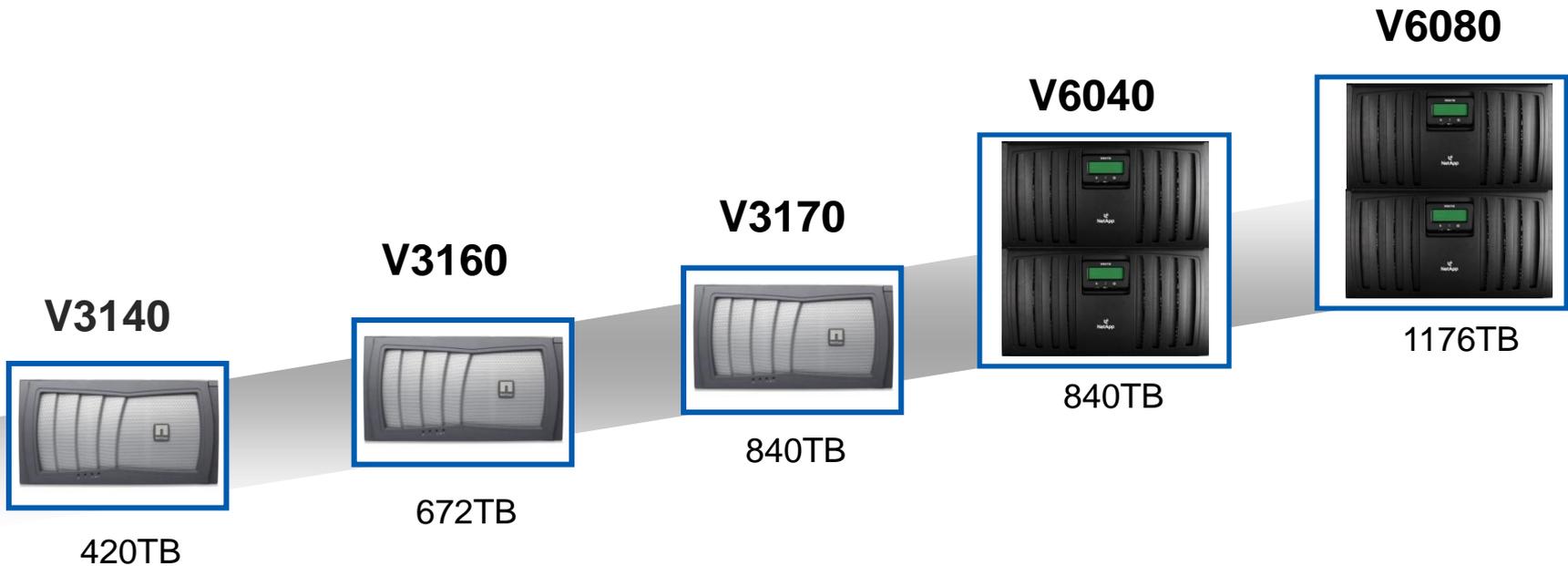




# New V-Series Products Overview

## Transform Your Current Storage

NetApp® V-Series virtualizes SAN storage from multiple vendors into a single pool for file or block access to provide the benefits of Data ONTAP® and the NetApp manageability software family.



Supporting Disk Arrays from These Storage Vendors

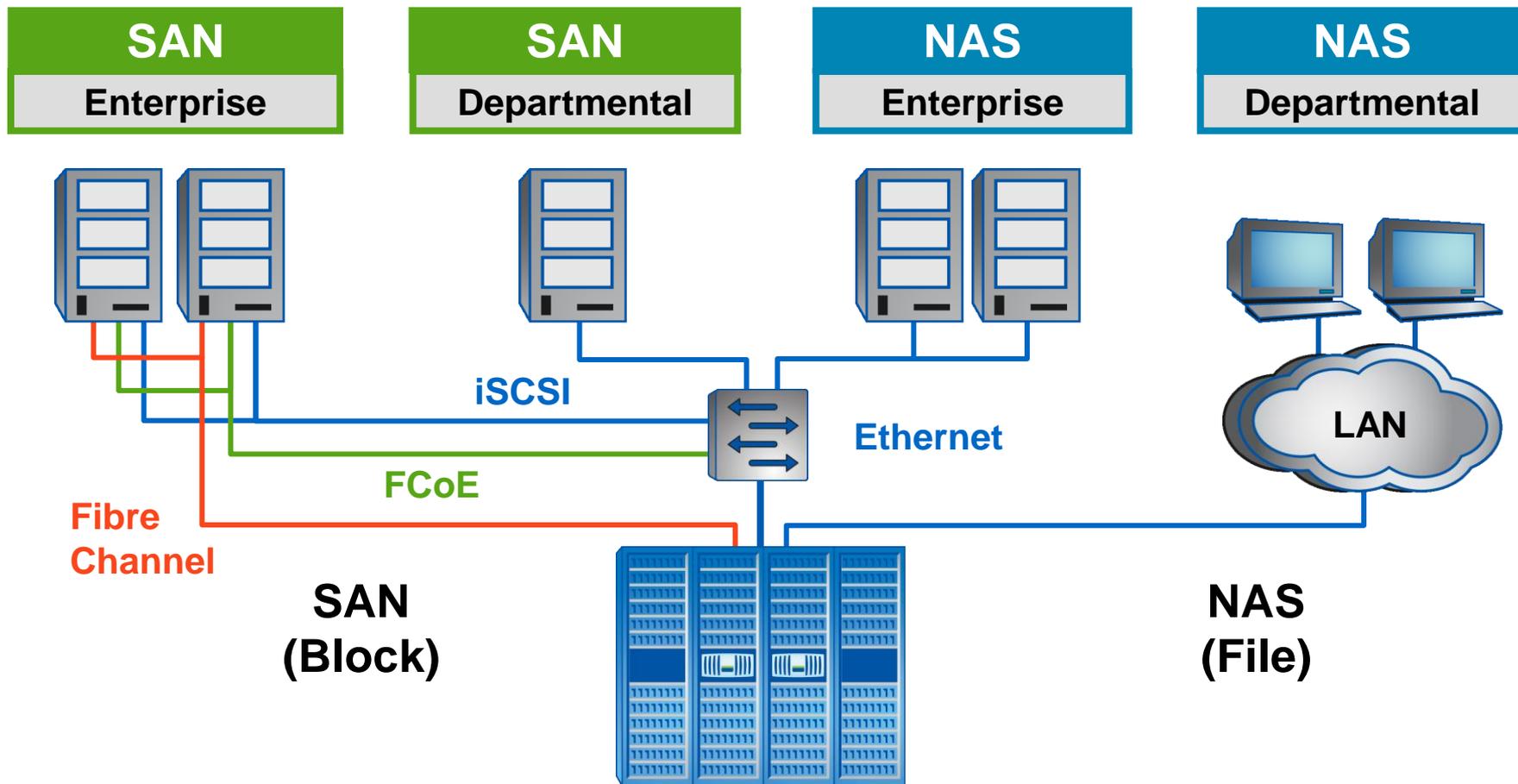




NetApp™

# What Does NetApp FAS Enable?

*Flexible deployment of multiprotocol, unified storage*



**Integrated ♦ Simple ♦ Flexible**



# Virtualization: What Does It Mean?

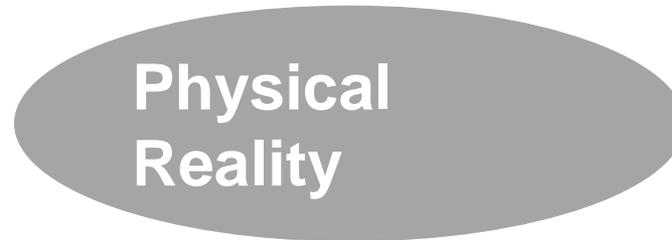
**What You Want:**



**Virtualization  
Layer**



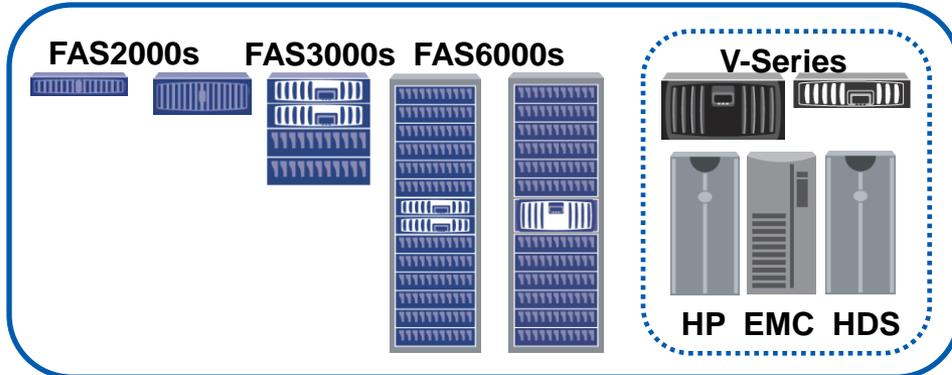
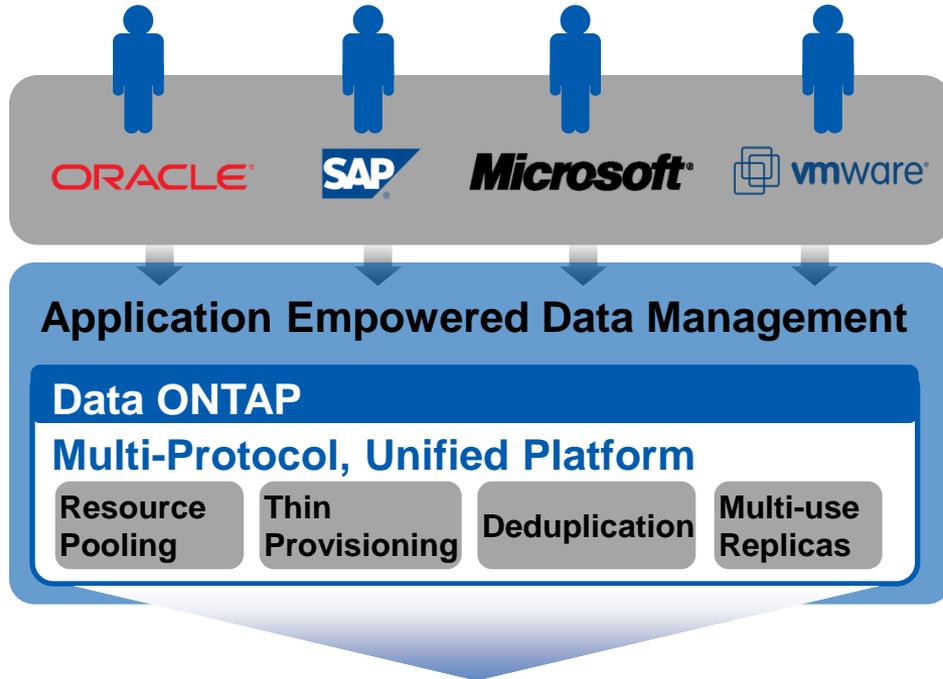
**What You Have:**





# Data ONTAP

## Provides Foundation For Application-Centric Storage



### Manage Data from applications:

- ▶ Application Admin's self-manage within established storage policy
- ▶ Reduced Admin h/c & training needs
- ▶ Increase flexibility of entire IT org.
- ▶ Application Synchronization
- ▶ Recover from interruptions

### Start with one Storage Virtualization Engine:

- ▶ Manage storage pools instead of hardware
- ▶ The heart of Virtualized Data management

### Simplify Elements to be Managed:

- ▶ Select: Capacity, Performance & Cost
- ▶ Supports: SAN & NAS Protocols
- ▶ Architected: for availability & simplicity



# NetApp FlexShare Makes Large-Scale Consolidation Practical

## NetApp® FlexShare®

- Enables workload prioritization at volume level
- Provides more effective storage consolidation
- Critical workloads get fastest response when controller is fully loaded
- Storage administrator can make on-the-fly adjustments
- Standard feature of Data ONTAP® 7.2+





# NetApp Deduplication Space Savings

*NetApp provides real-world space savings without compromise*

NetApp®  
22 Disks

Legacy Arrays  
61 Disks

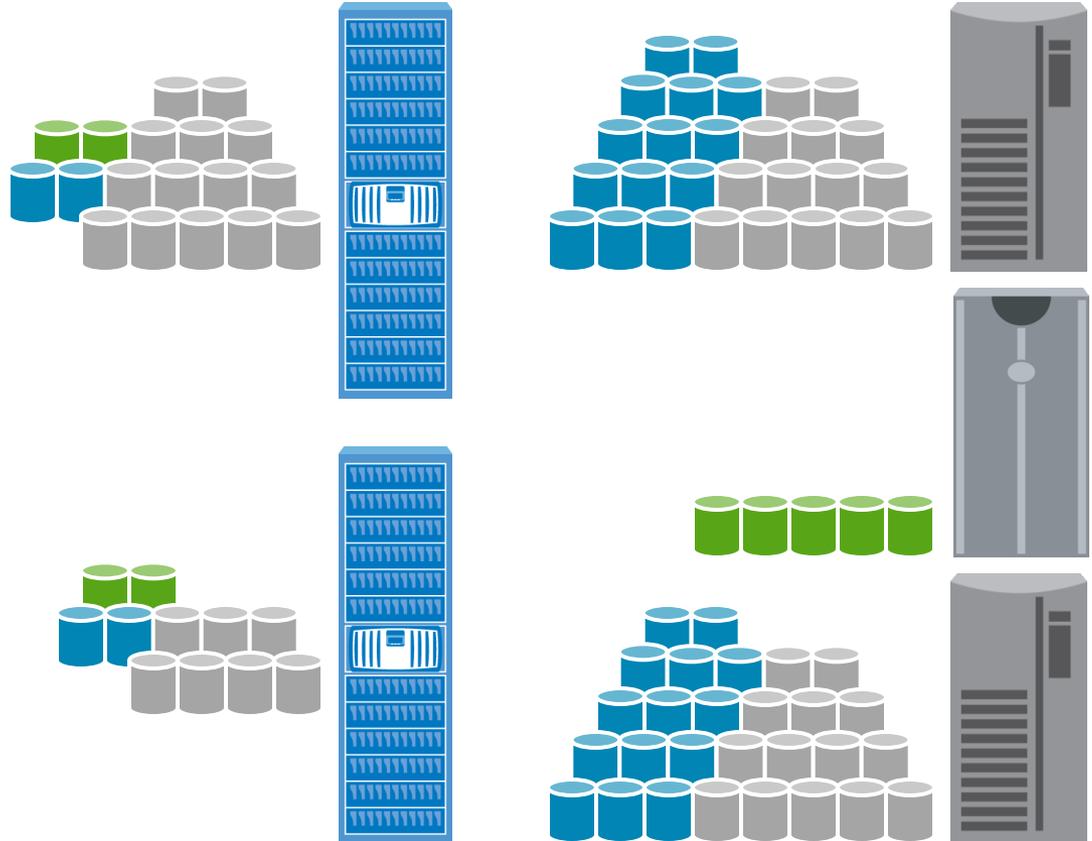
 Primary Storage

 Double Disk  
Data Protection

Deduplicate  
Primary Data

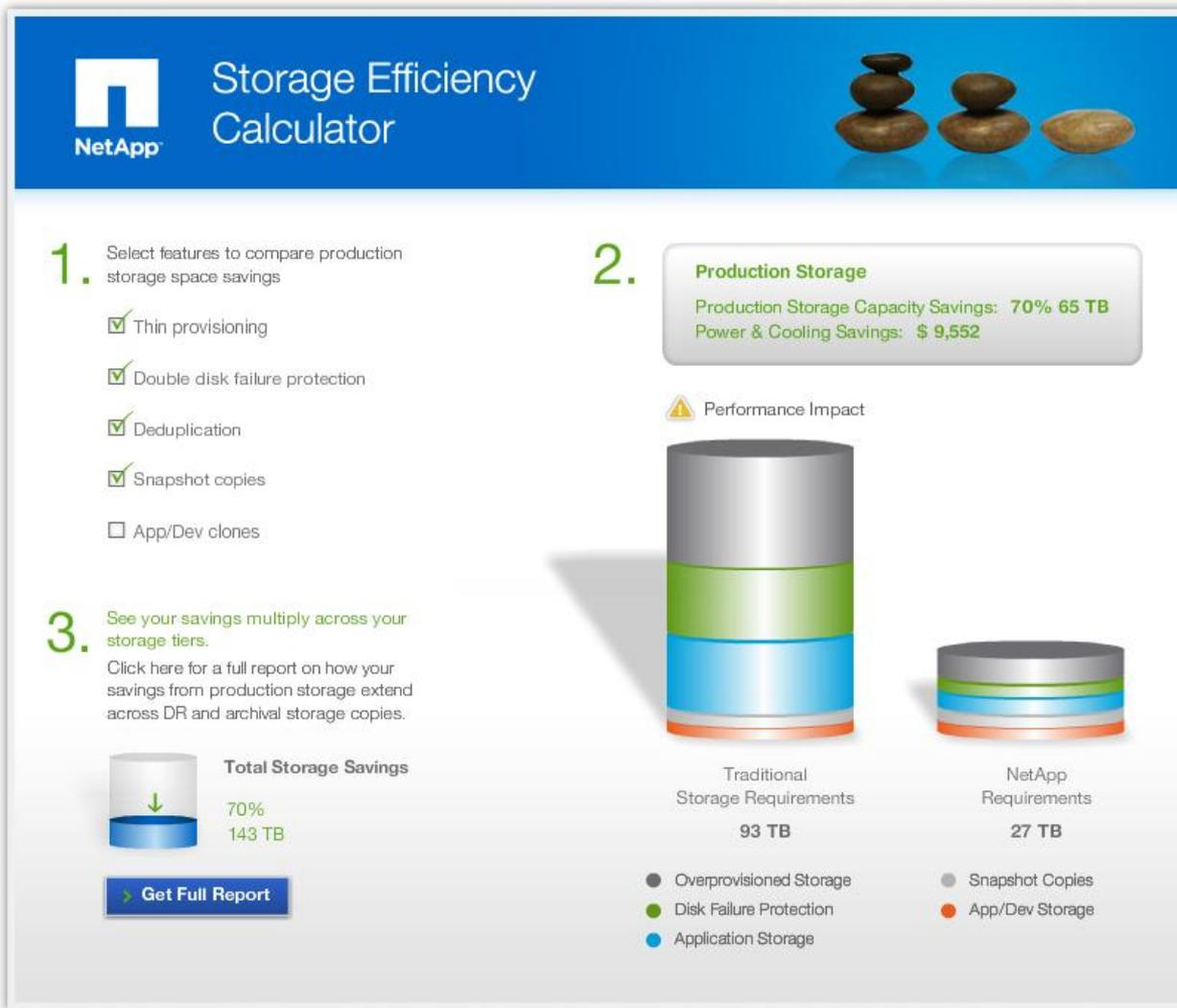
 Add VMware® Disk-  
Based Backup

Add VMware SRM



Storage virtualization should drive cost reductions

# Evaluate Your Potential Savings Online



**Storage Efficiency Calculator**

1. Select features to compare production storage space savings

- Thin provisioning
- Double disk failure protection
- Deduplication
- Snapshot copies
- App/Dev clones

2. **Production Storage**  
 Production Storage Capacity Savings: **70% 65 TB**  
 Power & Cooling Savings: **\$ 9,552**

⚠ Performance Impact

3. See your savings multiply across your storage tiers.  
 Click here for a full report on how your savings from production storage extend across DR and archival storage copies.

**Total Storage Savings**  
 70%  
 143 TB

[Get Full Report](#)

**Traditional Storage Requirements: 93 TB**

**NetApp Requirements: 27 TB**

Legend:

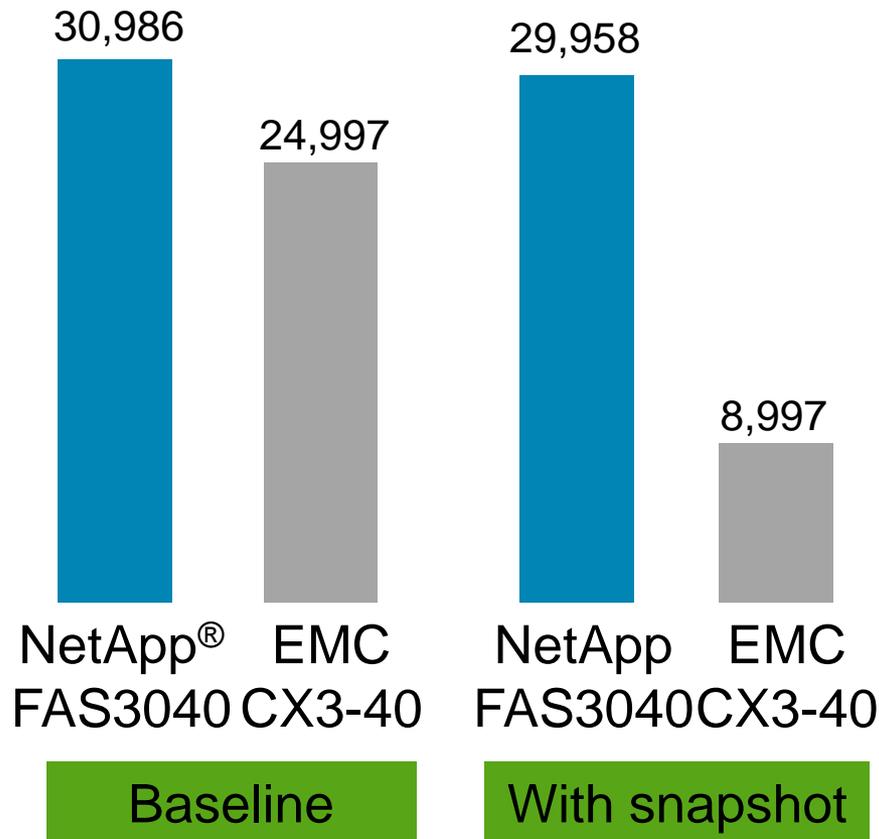
- Overprovisioned Storage
- Disk Failure Protection
- Application Storage
- Snapshot Copies
- App/Dev Storage

- See your primary storage savings
- Interactively illustrates benefits of NetApp® features
- Calculates power and cooling savings
- Also evaluates:
  - Archiving
  - Backup
  - DR
  - Dev/test



# Industry's Best SAN Performance

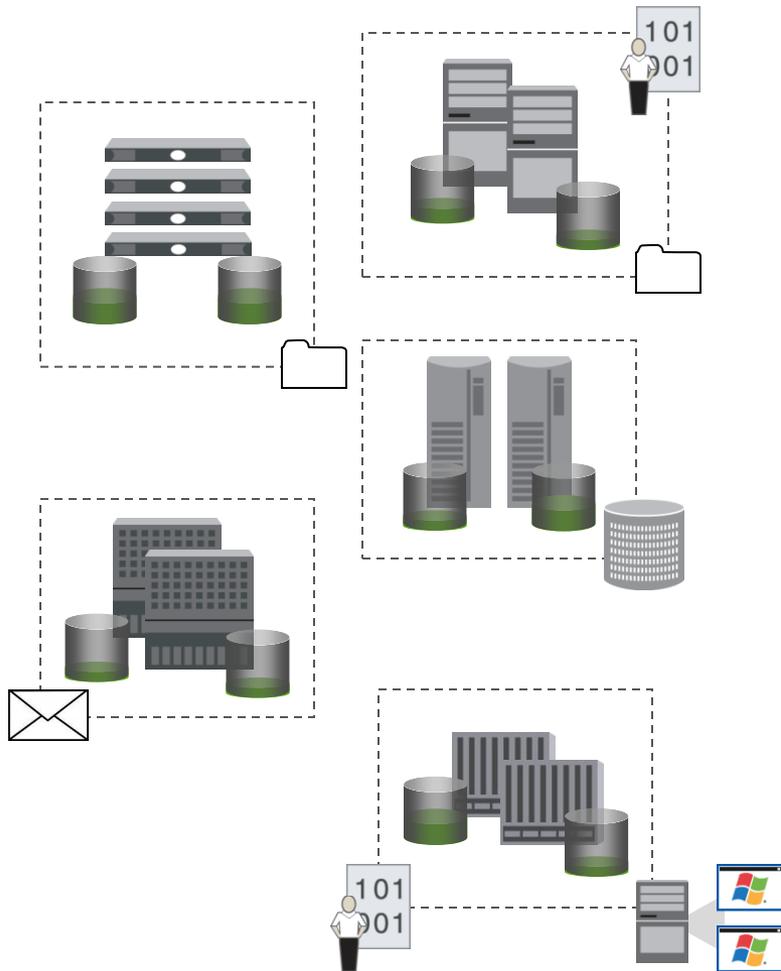
## SPC-1 IOPS Performance



- NetApp outperforms EMC CLARiiON by 24%
- Gap increases to 234% with Snapshot™ turned on
- The NetApp Advantage:
  - Higher performance
  - First use of RAID 6 for SPC-1
  - First use of Snapshot for SPC-1
  - Near zero Snapshot overhead

Source: SPC-1 benchmarks January 29, 2008, <http://www.storageperformance.org>

# Reduce Complexity



Dedicated storage for individual workloads

## Challenges

- Storage sprawl to handle different Windows® workloads
- Poor storage and server utilization
- Budgets and IT personnel stretched thin

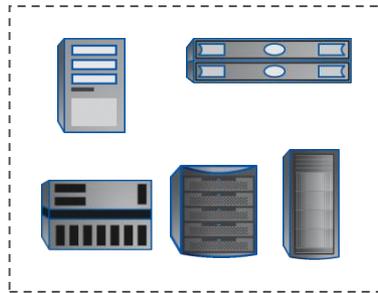


# NetApp Solution: Consolidating Storage for Windows Environments

NetApp® Unified Storage Architecture



Silos of Storage



Windows®



Exchange



SharePoint®



SQL Server®



Windows® files



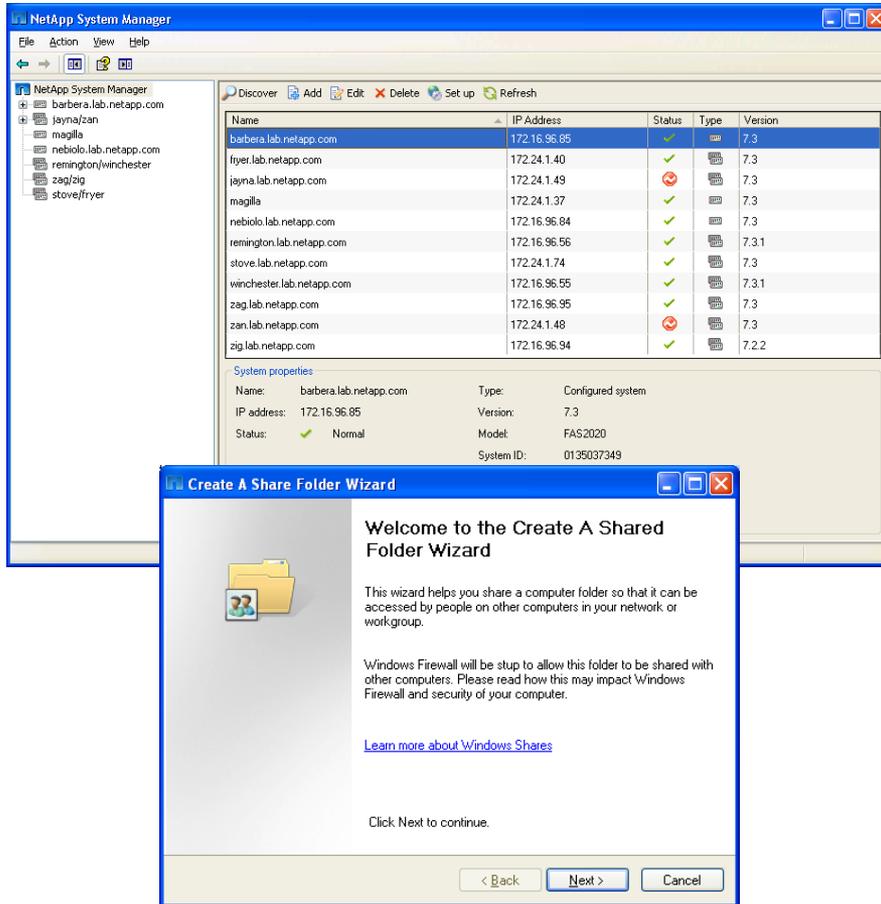
Virtualization

# Deployment and Management Challenges

- Setup and ongoing management of NetApp<sup>®</sup> storage systems
  - Admin may be unfamiliar with Data ONTAP<sup>®</sup> (FilerView<sup>®</sup>)
  - Scripts are difficult to manage and maintain
- No time to learn a new tool
  - Little or no time to learn the details and best practices associated with storage
- Increased responsibilities with same or reduced resources
  - Data exploding
  - Productivity declining



# Easy to Deploy and Manage



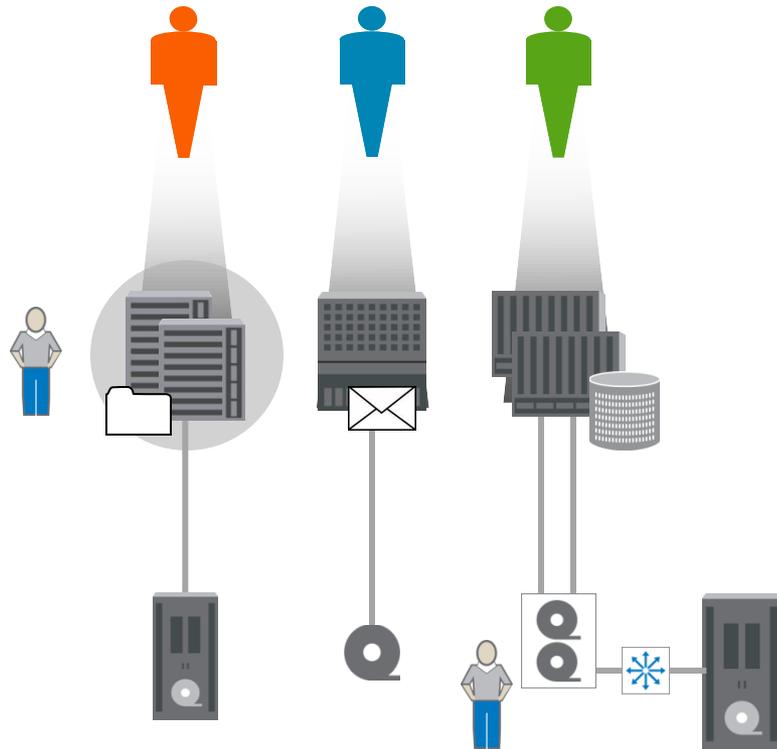
Free Windows®-based management application for NetApp® storage systems

- Out-of-box setup
  - Simple active-active pair setup
  - CIFS, NFS, iSCSI, FC configuration
- Simple device management
  - Intuitive Windows MMC 3.0-based GUI
  - Disk aggregate management
  - Storage provisioning
  - Storage efficiency mgmt. (e.g., dedupe)
  - SnapDrive® integration
  - Snapshot™ management
- Availability
  - NOW™ site download
  - No entitlement checking
  - Replaces FAS Easy Start Wizard CDs

*“Just wanted to say that I LOVE this interface... elegant and powerful. MUCH better than FilerView®.”*

*- Large entertainment & distribution organization -*

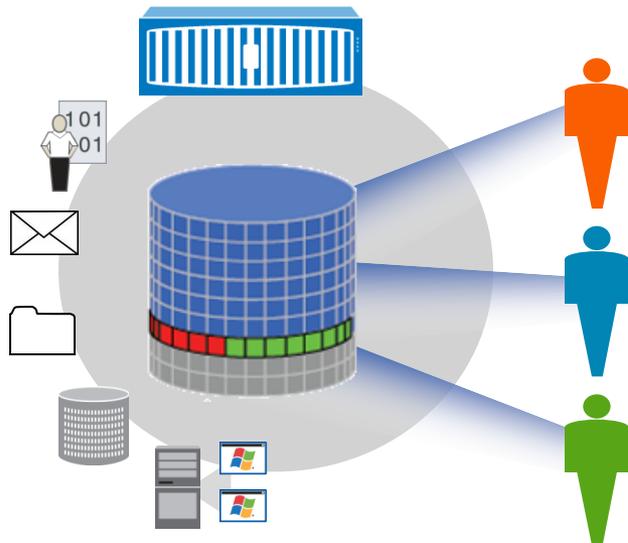
# Improve Backup and Recovery



## Challenges

- Long, disruptive backups
  - Infrequent because of overhead and disruption
- Windows® application downtime
  - Lack of coordination between application and storage
- Complicated restoration
  - Multiple administrators and systems
  - Inability to quickly and reliably restore the right data

# Backup and Restore in Minutes not Hours



## Our Solution

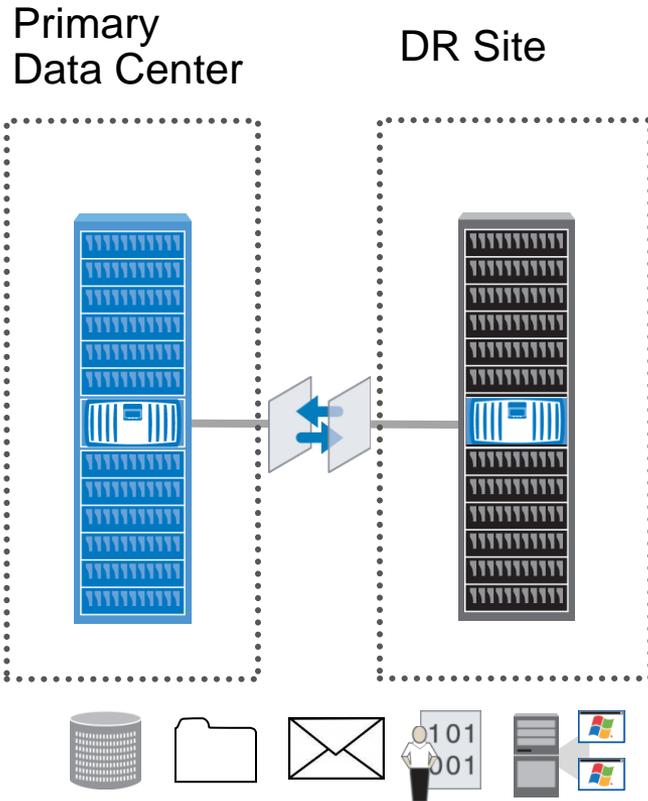
- Near-instant backups of all data
  - Eliminate backup windows and application downtime
  - Frequent automated backups
- Application-aware backup
  - Integration with Exchange, SQL Servers®, and SharePoint to produce consistent backup
- Simple user-service restores
  - Presents view of previous backups and restores individual files and single mailboxes
  - Integrates with Windows® Virtual Shadow Copy Service

ARUP

“Backup times were reduced 99%, from 36 hours to 20 minutes, and e-mail restores take 25 minutes instead of 24 hours.”



# Reduce Downtime by 50%



## Our Solution

- Highly available platforms
  - Availability designed in
  - RAID-DP®, active-active cluster
- Mirror data to minimize downtime
  - Cost effective
  - Less overhead
- Implement automated failover with minimal disruption
  - Simple installation and cost-effective operation
- Applicable for file, application, and virtualization



First American Trust

“By minimizing the chance of any downtime, the NetApp® systems have more than paid for themselves.”



# Add Capability As Needs Grow

## Easy-to-order high-value software packs

### Foundation Pack

Automate provisioning, backup, and restore  
Includes: SnapRestore®, SnapVault® Primary, Provisioning Manager

### Protection Pack

Data protection and replication  
Includes: SnapMirror®, SnapVault Secondary, Protection Manager

### Server Pack

Simplified backup and recovery for VMware® ESX  
Includes: SnapManager Virtual Infrastructure, SnapDrive®, DSM

### Application Pack

Simplified backup and recovery for key business applications  
Includes: SnapManager®, SnapDrive, DSM, Single Mailbox Recovery

Server Pack

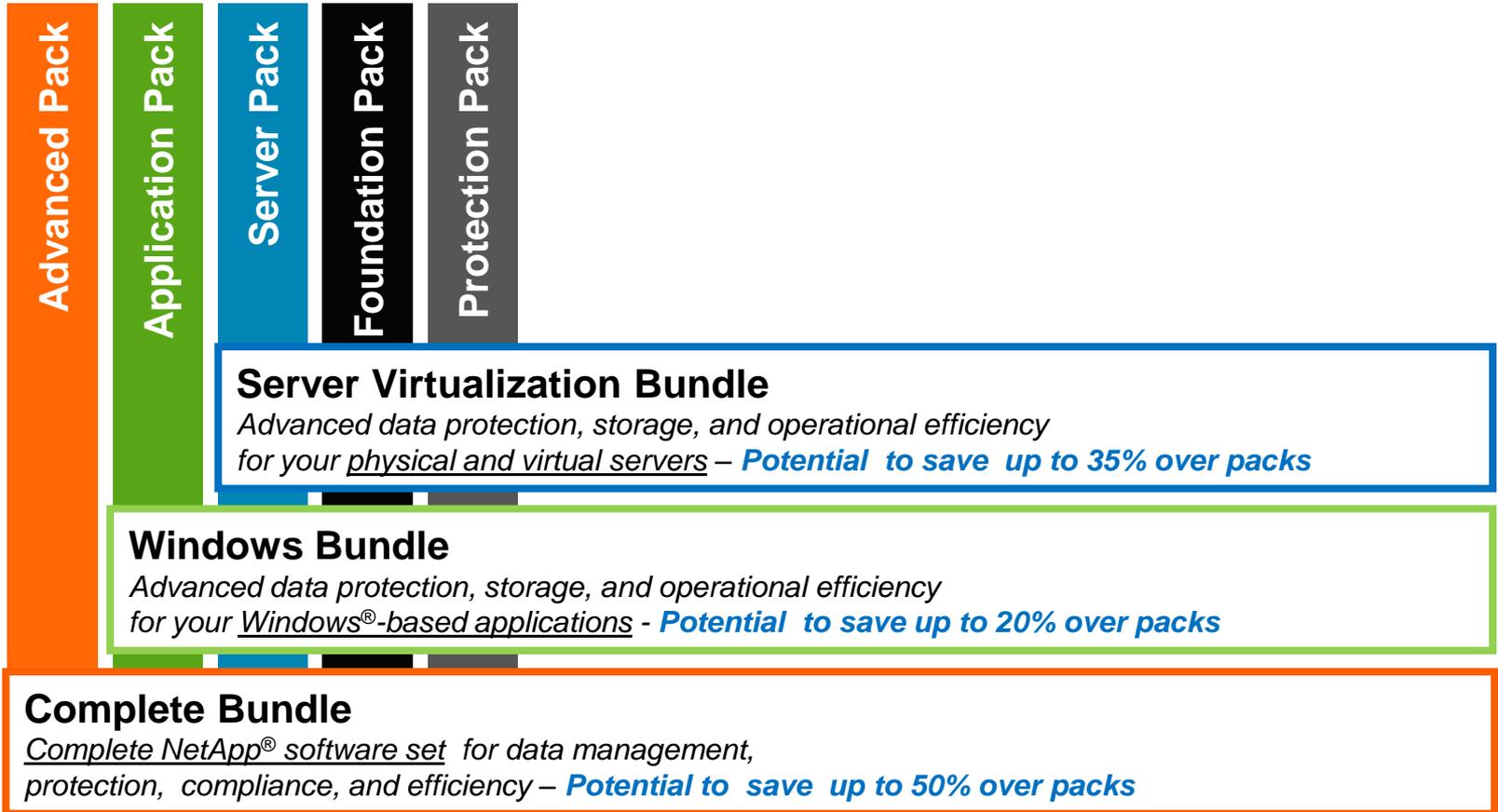
### Advanced Pack

Instant virtual clones; data permanence and secure partitioning  
Includes: FlexClone®, MultiStore®, SnapLock®



# Or Start with a Bundled Solution

NetApp Select™ Bundles Offer Best Value



# Scales Easily and Affordably

More Capacity

FAS2040<sup>1</sup>

FAS2020



**68 Drives**  
SAS or SATA Internal,  
FC or SATA Expansion

FAS2050



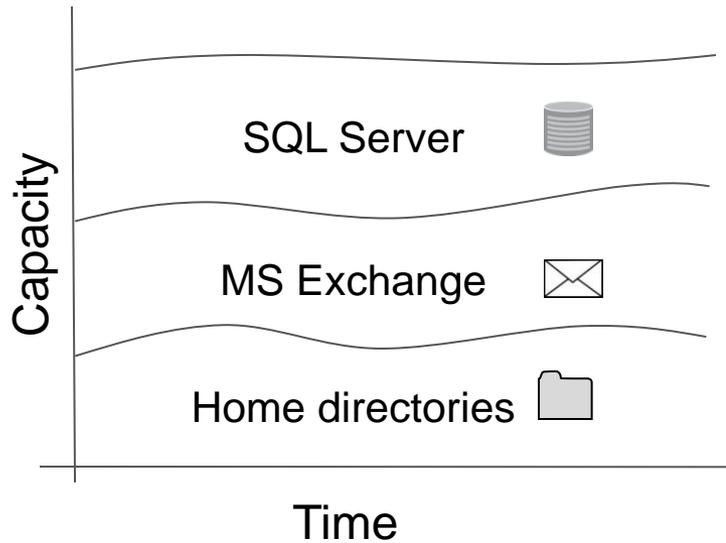
**104 Drives**  
SAS or SATA Internal,  
FC or SATA Expansion



**136 Drives**  
SAS or SATA Internal,  
FC, SATA, or SAS Expansion

<sup>1</sup> Max spindles requires a mix of (2x) DS14 and (4x) DS4243 (available for FAS2040 Dec. '09)

# Pool Storage and Change in Minutes

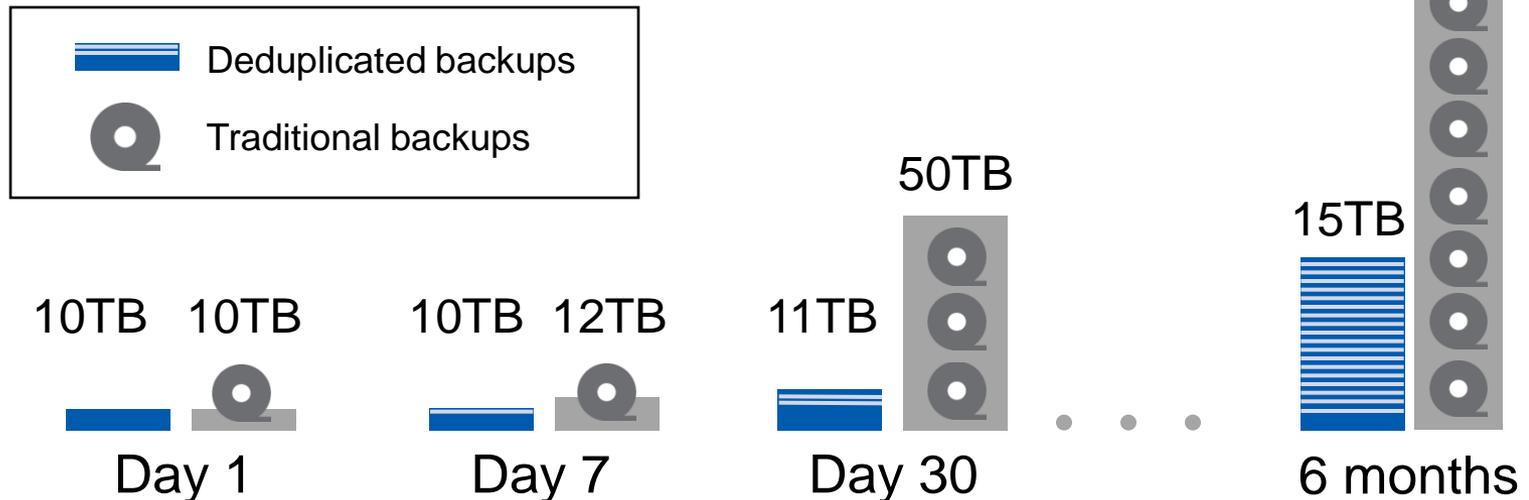


## Our Solution

- Scale performance and capacity
  - Handle NAS and SAN
  - Current and future needs
- Allocate, grow, and shrink storage
  - Flexible (thin) provisioning
  - Better control
  - Higher efficiency
- Consolidate multiple storage systems
  - Share and prioritize resources for different workloads
  - Add new storage services with ease

# Reduce Costs by Higher Storage Efficiency

- Achieve higher storage efficiency
  - Pooled storage that can flexibly change
  - Deduplicate primary and backup data
- Achieve real space savings
  - 30% to 50% for primary storage
  - Up to 95% for backups





# NetApp Solution for Windows Storage

## Value

## NetApp Benefit

Consolidate

Consolidate different silos of DAS, SAN, and NAS.

Eliminate storage sprawl and double your storage utilization.

Manage

Manage applications, data, storage, and services.

Reduce your administrative overhead by nearly 60%.

Protect

Take frequent backups and simplify disaster recovery.

Reduce disruptions to your end users by as much as 50%.

Scale

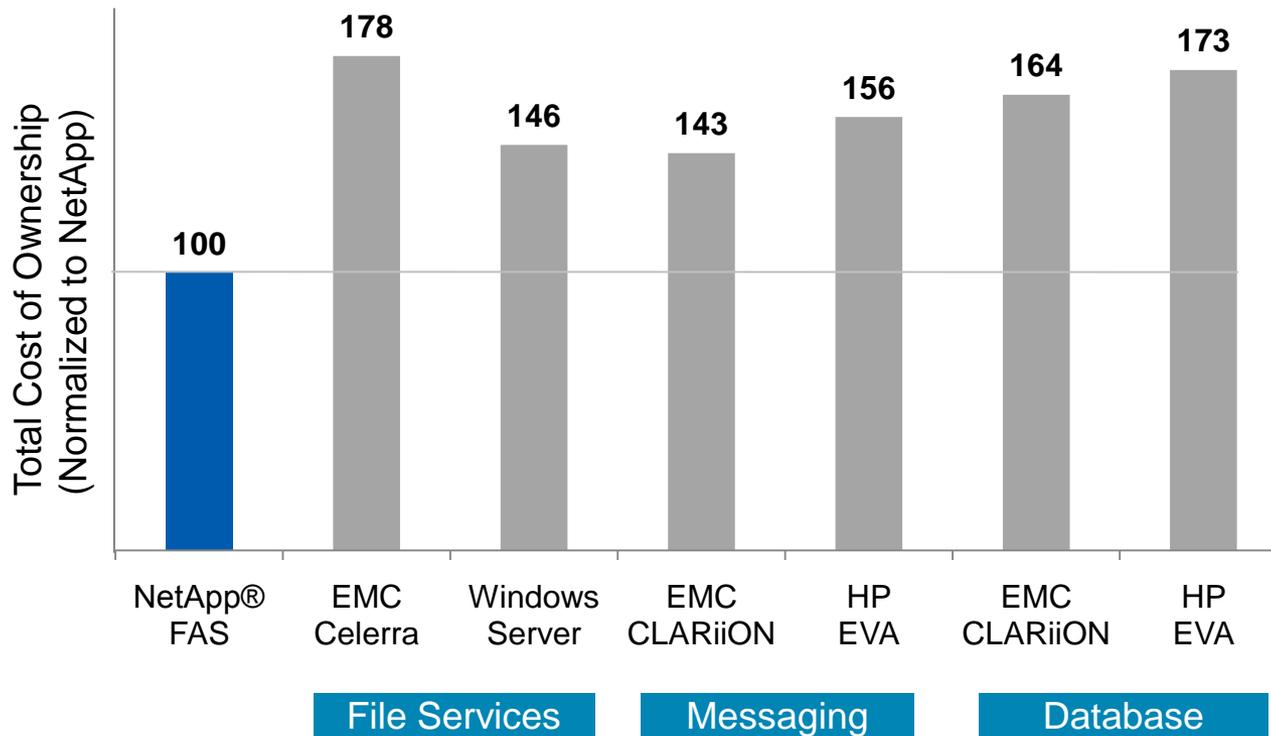
Use pooled storage to scale the business needs.

Flexibly provision storage and storage services in minutes.

Lower costs and increase productivity with NetApp®



# Windows Storage: Comparing TCO



## Key Findings

- More efficient storage including higher utilization
- Faster and lower cost of implementation
- Faster backup and easy data restore
- Less time spent administering with automation and tools
- Lower facilities costs (power, cooling, and space)

Source: Oliver Wyman, Total Cost Comparison Interviews, 2007 & 2008



# Industry-Recognized Leadership



## AutoSupport

Has led the industry in alerting and automation for 13 years

## Premium AutoSupport

Delivers intelligent services to scale customer IT resources

## Remote Support Diagnostics Tool

Cuts case resolution times in half



# NetApp Saves You Money



## Lower Total Cost of Ownership

- 44% lower TCO for file services
- 42% lower TCO for Oracle
- 39% lower TCO for VMware
- 35% lower TCO for archive

## Operational Efficiency

- 50% less rack space
- 52% less power; 51% lower heat

Source: Mercer and Oliver Wyman TCO studies



**NetApp™**

Go further, faster™

**Thank you!**





# NetApp Snapshot Technology

*Get More Through Less*



# NetApp Snapshot Technology

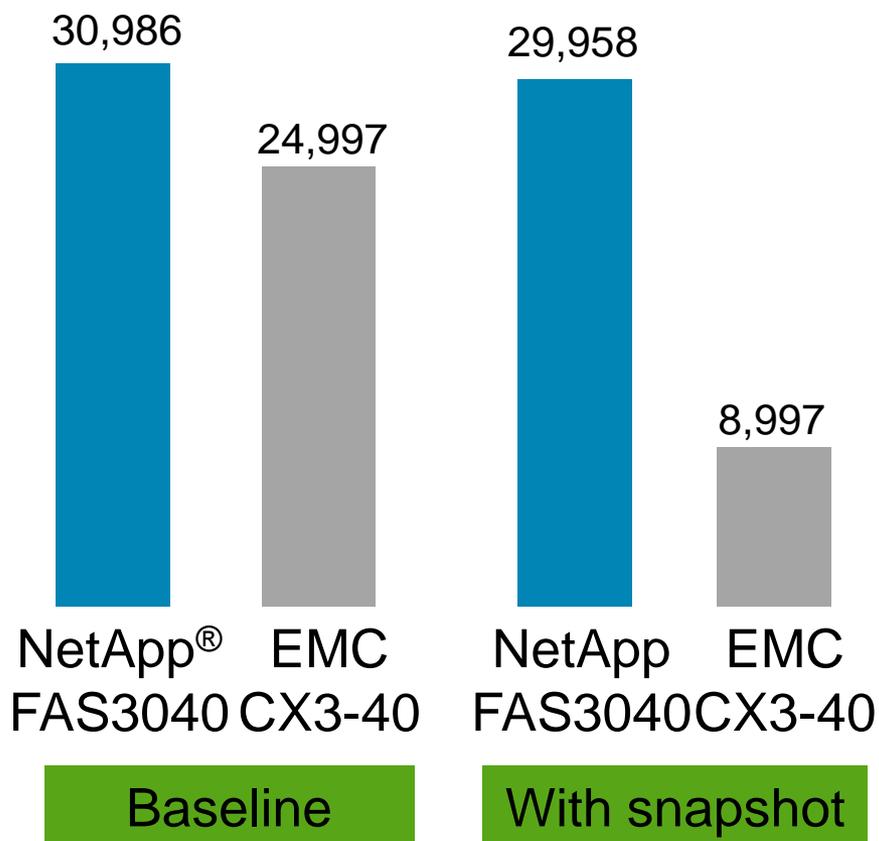
*Instant zero-space copy*

- NetApp® WAFL® writes all data to available free space without writing over the previous data
- Creating a Snapshot™ copy involves merely retaining pointers to the original data blocks
- Performance impact is near zero because no additional disk operations are required beyond normal write behavior
- Space is efficient because only new data written takes up incremental space on disk



# Industry's Best SAN Performance

## SPC-1 IOPS Performance

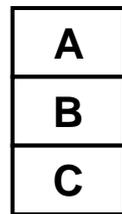


- NetApp outperforms EMC CLARiiON by 24%
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  - First use of Snapshot for SPC-1
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Source: SPC-1 benchmarks January 29, 2008, <http://www.storageperformance.org>

# NetApp Snapshot Technology

**Blocks in  
LUN or File**



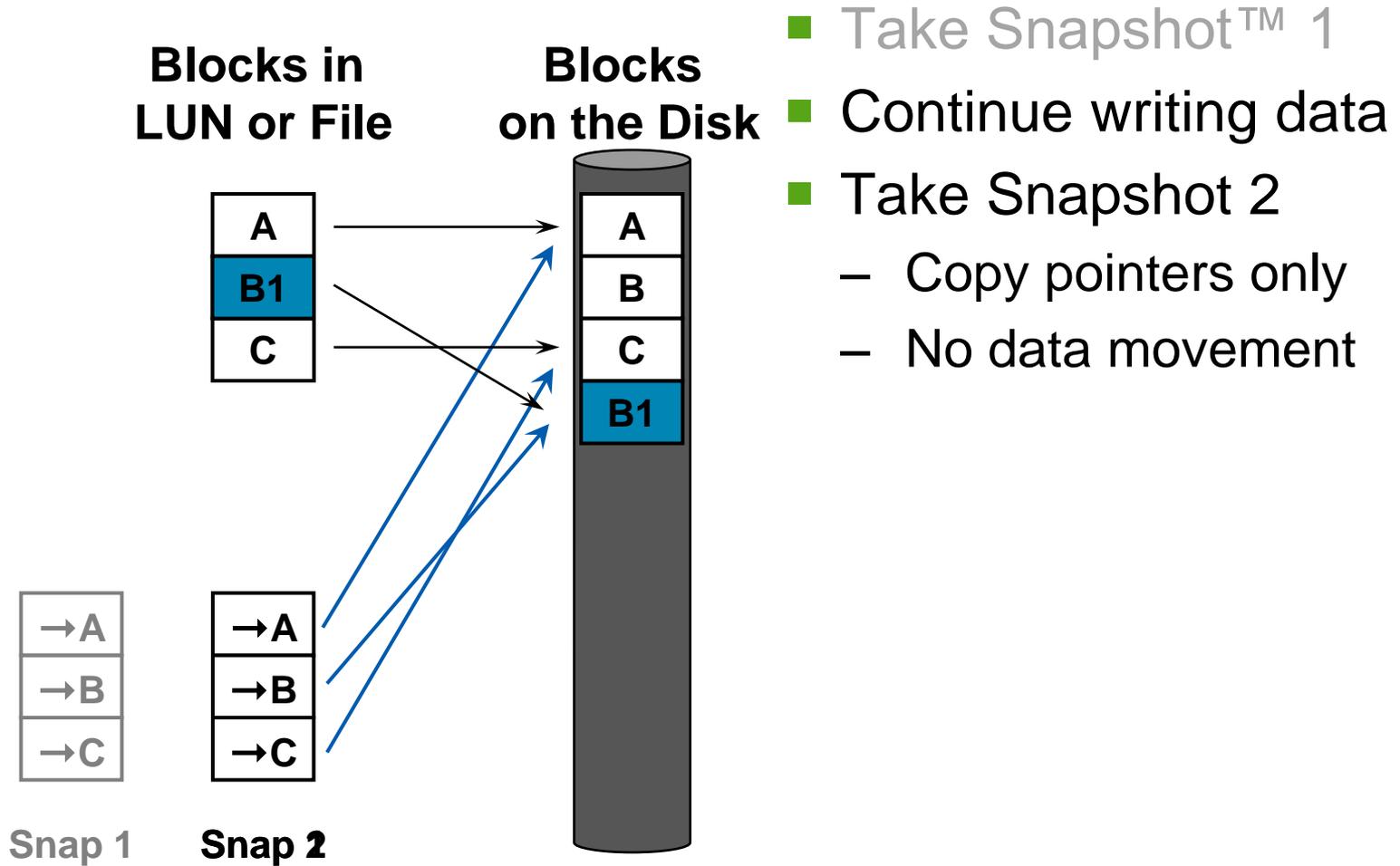
**Blocks  
on the Disk**



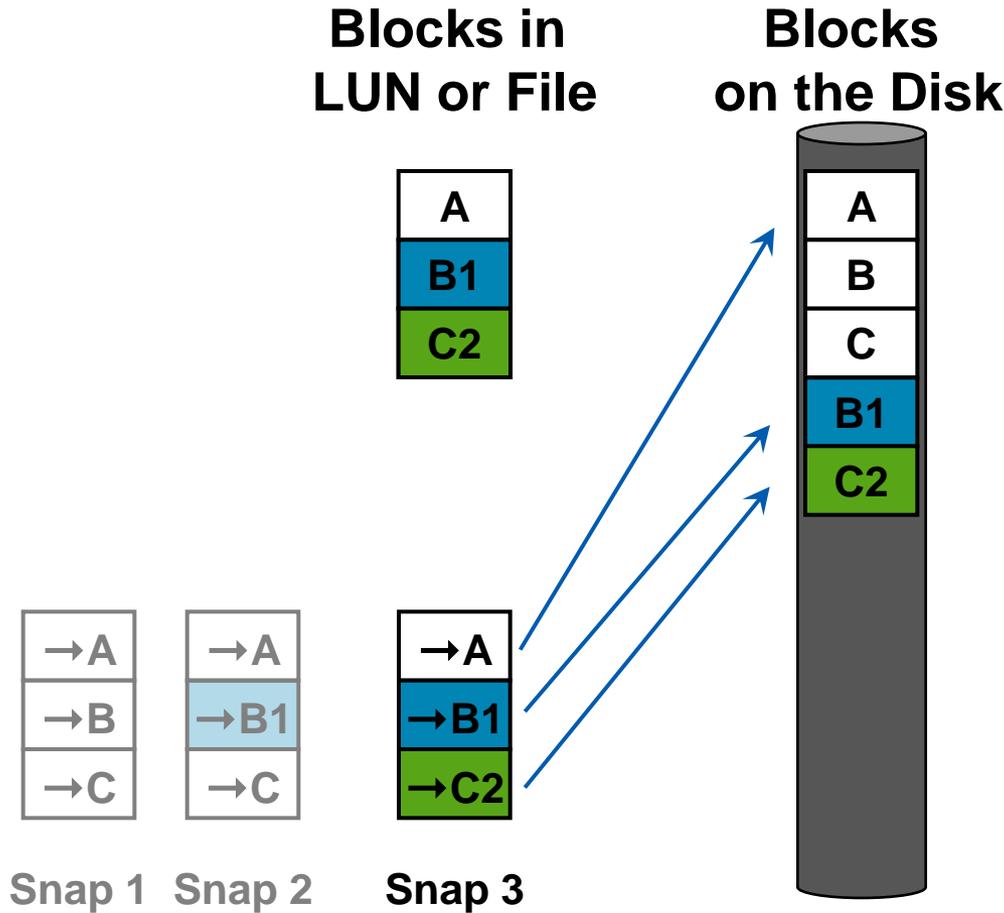
**Snap 1**

- Take Snapshot™ 1
  - Copy pointers only
  - No data movement

# NetApp Snapshot Technology (cont.)



# NetApp Snapshot Technology (cont.)



- Take Snapshot™ 1
- Continue writing data
- Take Snapshot 2
- Continue writing data
- Take Snapshot 3
- Simplicity of model
  - Best disk utilization
  - Fastest performance



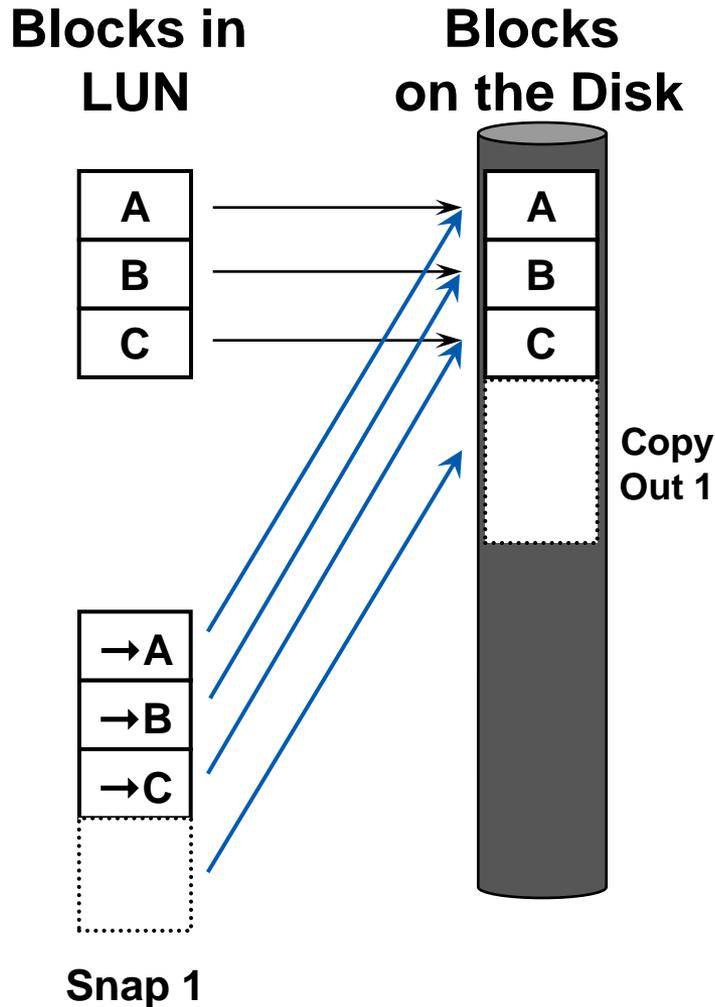
# Legacy Snapshot Technology

*Copy on write—The only way with static virtualization*



# Legacy Snapshots

*Older, less flexible architecture; more operational overhead*



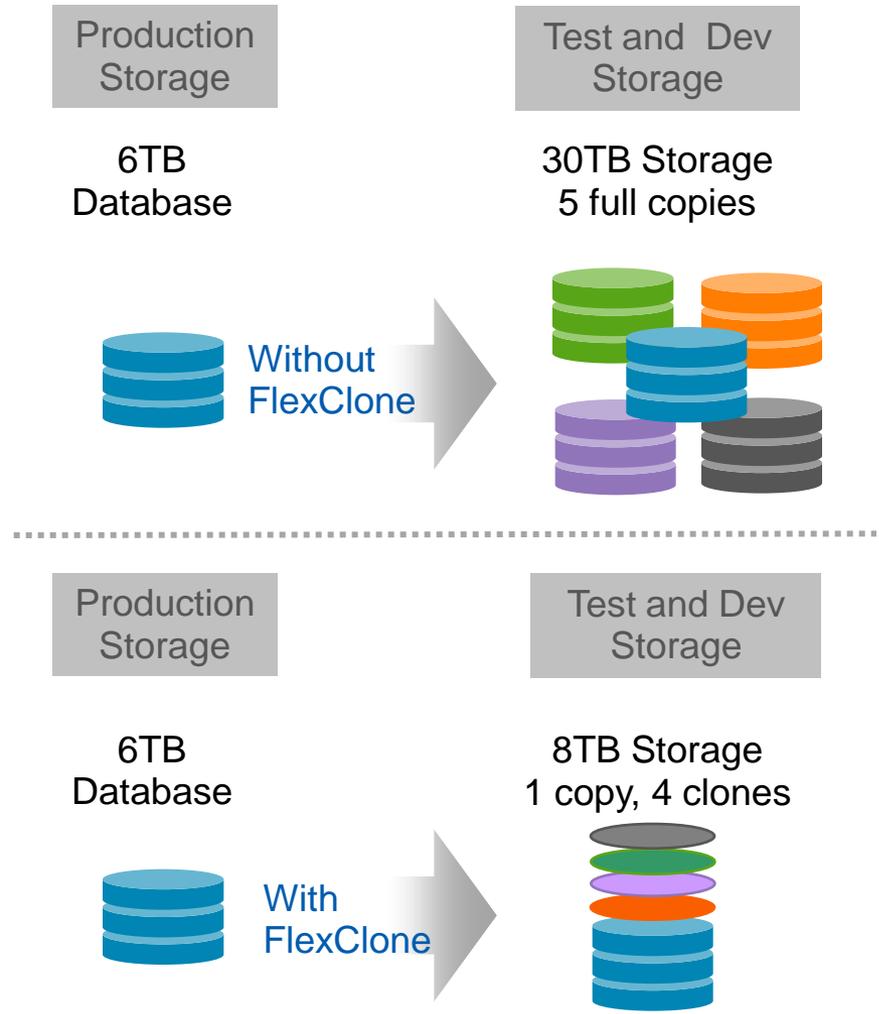
- Take Snapshot™ 1:
  - Create copy-out region 1
  - Create pointers to old blocks and copy out



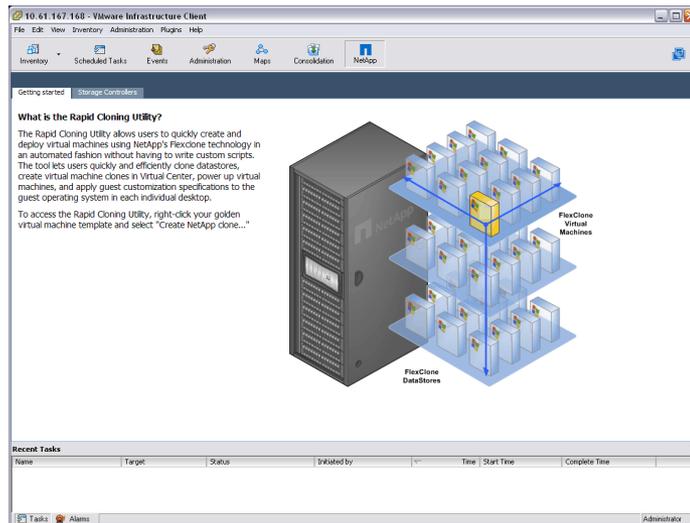
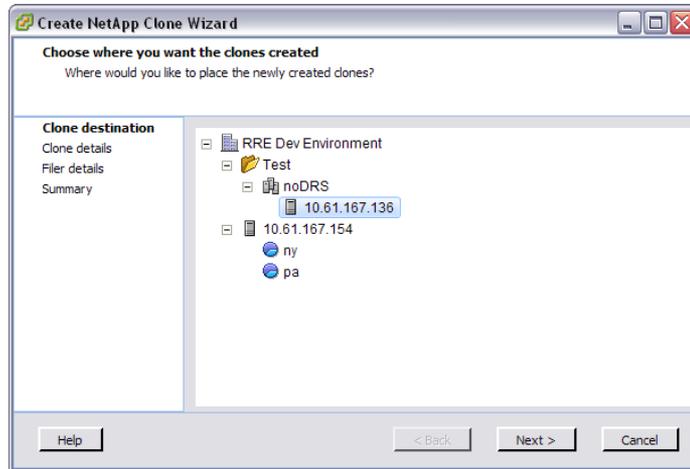
# NetApp FlexClone

# Virtual Volume Copies: FlexClone

- FlexClone® improves storage efficiency for applications that need temporary, writable, and instantaneous copies of data sets
- Creates a virtual “clone” copy of the primary data set and stores only the data changes between parent volume and clone

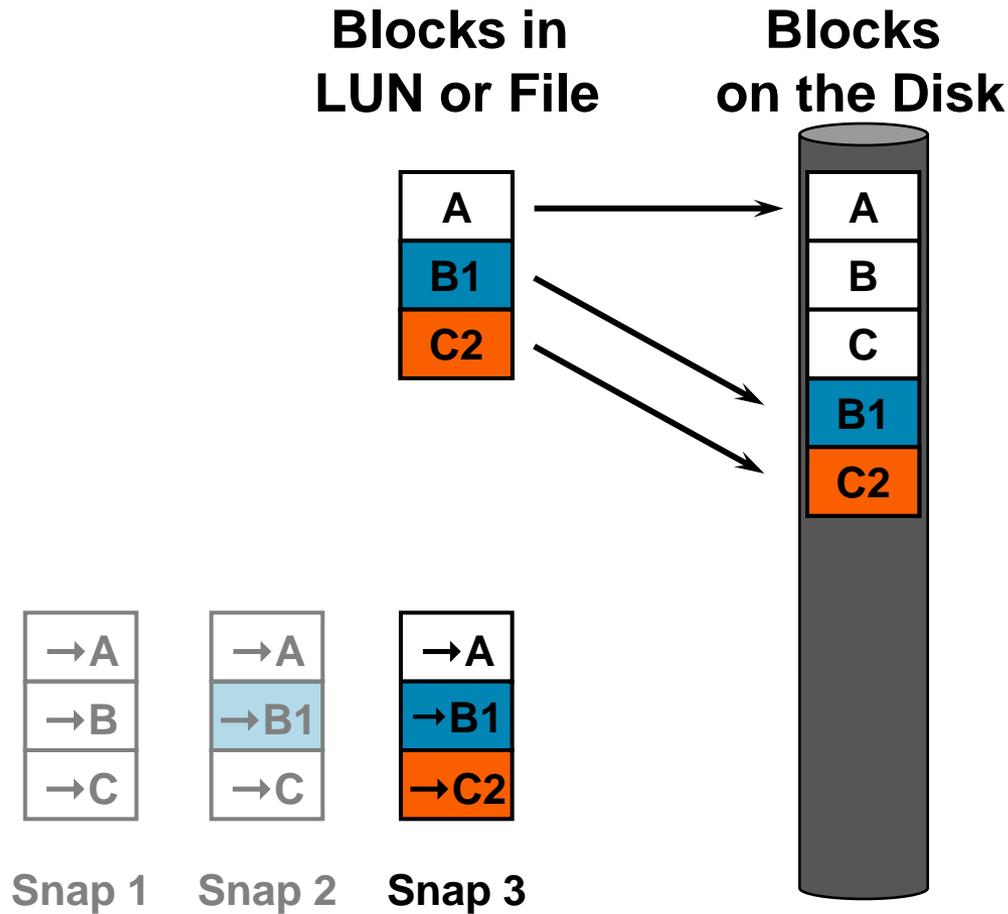


# Virtual File and LUN Copies: FlexClone



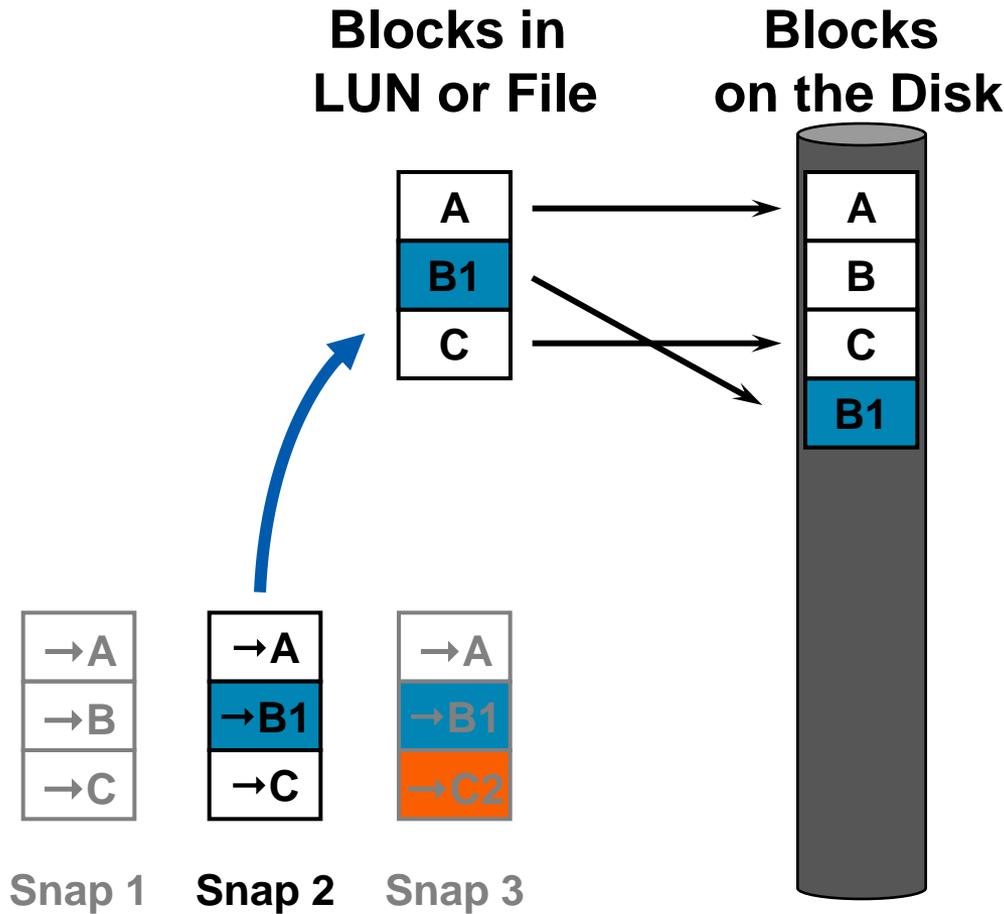
- **Ideal for virtual server and desktop environments**
  - Rapid server provisioning
  - Scaling of virtual desktops
- **Benefits**
  - 100% space efficient
  - Dramatic cost savings
  - Provisioning in minutes
  - Easily extends virtual infrastructure
- **NetApp® Rapid Clone Utility (RCU)**
  - GUI-based tool that rapidly creates one to thousands of VMware® virtual machines
  - VMware vCenter plug-in
  - Import into VMware View Manager

# Using FlexClone to Restore and Test





# Using FlexClone to Restore and Test (cont.)

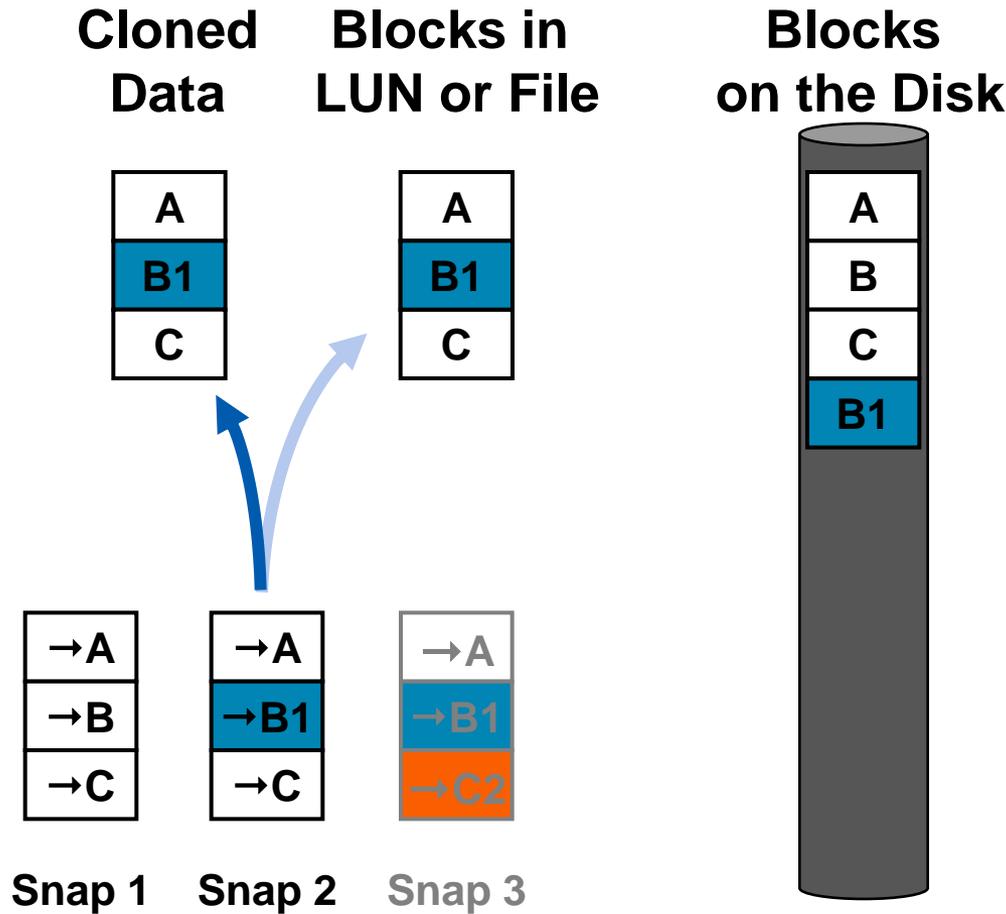


Block C2 is corrupted;  
you want to restore and  
reproduce the error

- Restore from snap 2



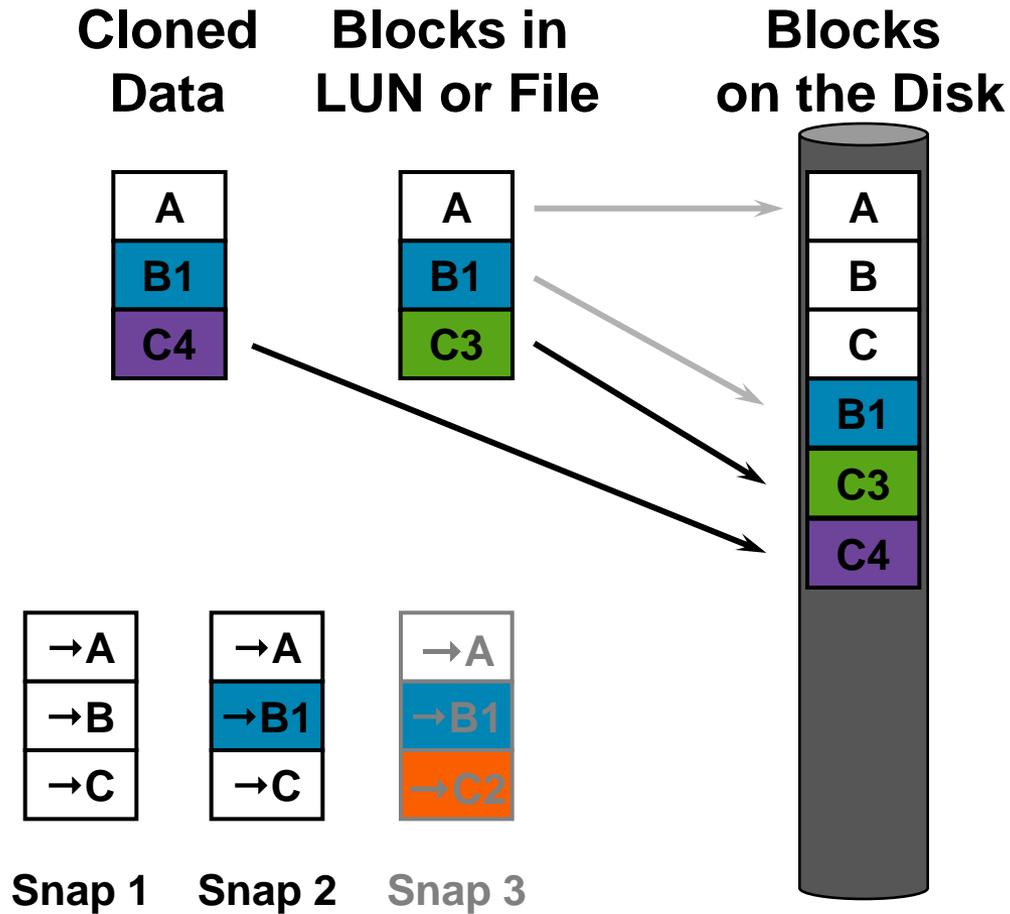
# Using FlexClone to Restore and Test (cont.)



Block C2 is corrupted;  
you want to restore and  
reproduce the error

- Restore from snap 2
- Clone from snap 2

# Using FlexClone to Restore and Test (cont.)



Block C2 is corrupted; you want to restore and reproduce the error

- Restore from snap 2
- Clone from snap 2

Results:

- Both file systems can make edits
- Both file systems share common blocks
- Enables large-scale parallel testing



# FlexClone: Common Use Cases

- Test and development
  - Testing using large production databases
  - Remote site testing
- SAN boot
  - Reduce space required for duplicate OS images when booting off SAN
  - Multiserver deployments where small variations in the OS image are required, such as grid computing
  - Clones can be made at the file level
- Data mining where R/W is required



# Faster Time to Market for Activision



Activision, Inc. is a leading international publisher of interactive entertainment software products. 2007 sales topped \$1.5B.

- Adopted a new development process for aggressive time to market
- Slashed cloning time from days to hours
- Cut database recovery time by 80%
- Increased margins by 7%
- Shrank storage requirements by 50%
- Added robust DR
- Added complete regulatory compliance
- Protecting remote studio data with a new backup solution

# NetApp Success Stories

## Representative Petabyte Customers

	80 PB		6.5 PB
	9.5 PB		1.9 PB
	12 PB		1.1 PB
	2.0 PB		18.0 PB
 NSA	2.0 PB		1.1 PB
	1.7 PB		2 PB
	1.5 PB		1.5 PB
	1.3 PB		1.1 PB
	2.0 PB		6.0 PB



# FAS2000 Specifications



FAS2020

FAS2040

FAS2050

Maximum raw capacity	68TB	136TB <sup>2</sup>	104TB
Maximum disk drives	68	136 <sup>2</sup>	104
Internal drive type	SAS or SATA (up to 12)	SAS or SATA (up to 12)	SAS or SATA (up to 20)
Controller architecture	32 bit	32 bit	32 bit
Controller form factor	1 or 2 controllers in a single 2U chassis	1 or 2 controllers in a single 2U chassis	1 or 2 controllers in a single 4U chassis
Memory	2GB	8GB	4GB
Maximum 4Gbps FC ports	4	4	8 <sup>1</sup>
Maximum Ethernet ports	4	8	8 <sup>1</sup>
Onboard SAS port	—	2	4 <sup>1</sup>
10GbE support	—	—	Yes
FCoE support	—	—	Yes
Multipath expansion	—	—	Yes
SAS Dual Port HBA	—	—	Yes
Storage protocols	FCP, iSCSI, NFS, CIFS	FCP, iSCSI, NFS, CIFS	FCP, iSCSI, NFS, CIFS
Data ONTAP® support	7.2.2L1 and later 7.3 and later No 8.0 support	7.3.2 and later 8.0 GA (target)	7.2.2L1 and later 7.3 and later No 8.0 support

All specifications are for dual-controller, active-active configurations. <sup>1</sup> Maximum ports combine integrated ports with I/O expansion cards. <sup>2</sup> Max spindles requires a mix of DS14 and DS4243 (availability for FAS2000 Dec. '09)



# Key FAS/V3100 Series Features

## HA Controllers\*

	FAS3020	FAS3140	FAS3040	FAS3160	FAS3070	FAS3170
Processors	2 x 32-bit single-core	2 x 64-bit dual-core	4 x 64-bit single-core	4 x 64-bit dual-core	4 x 64-bit dual-core	4 x 64-bit dual-core
Processor Cores	2	4	4	8	8	8
Memory	4GB	8GB	8GB	16GB	16GB	32GB
NVRAM	NV5 (1GB)	NV7 (1GB)	NV6 (1GB)	NV7 (4GB)	NV6 (1GB)	NV7 (4GB)
Expansion Slots	6 x PCI-X	8 x PCIe	6 x PCIe	8 x PCIe	6 x PCIe	8 x PCIe
Onboard FCP	8 x 2Gb	8 x 4Gb	8 x 4Gb	8 x 4Gb	8 x 4Gb	8 x 4Gb
Onboard GbE	8 GbE	4 GbE	8 GbE	4 GbE	8 GbE	4 GbE
Max Spindles	168	420	336	672	504	840
Max Capacity	84TB	420TB	336TB	672TB	504TB	840TB
Data ONTAP®	7.0 +	7.2.5 +	7.2.1 +	7.2.6 + 7.3.1 +	7.2.1 +	7.2.5 +

\*Items highlighted in light blue represent new functionality over prior generation.



# FAS/V3100 Expansion Slots and Interfaces

Active-active configurations include:

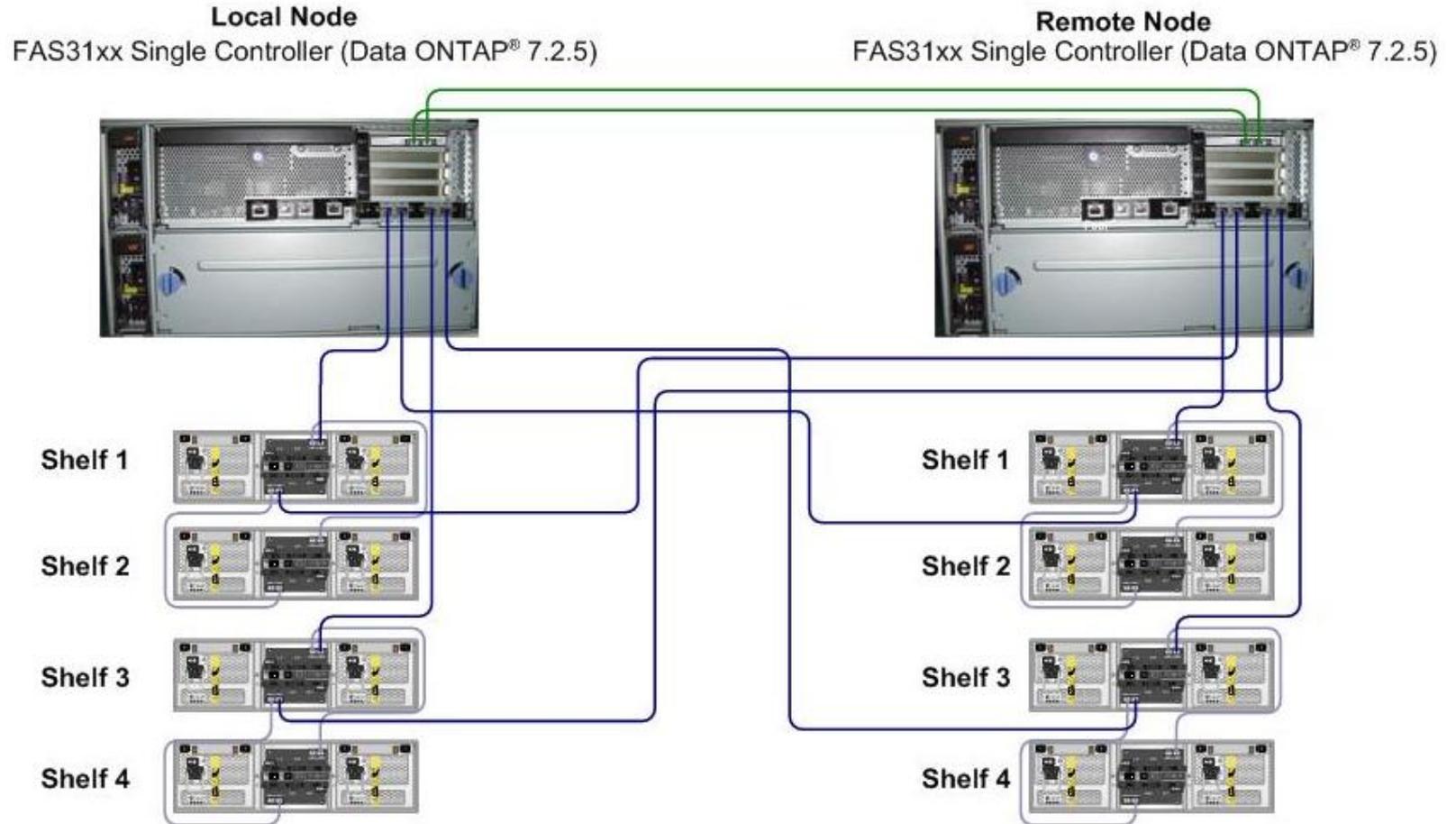
- 8 PCIe expansion slots (4 per controller)
  - Top three are 8x and full height, full length
  - Bottom slot is 4x and full height,  $\frac{3}{4}$  length
- 8 FCP ports (4-, 2-, 1Gb/sec) (4 per controller)
- 4 GbE Ethernet ports (2 per controller)
- 2 serial console ports (1 per controller)
- 2 RLM ports (10/100) (1 per controller)
- 2 e0M Data ONTAP<sup>®</sup> management ports (10/100)



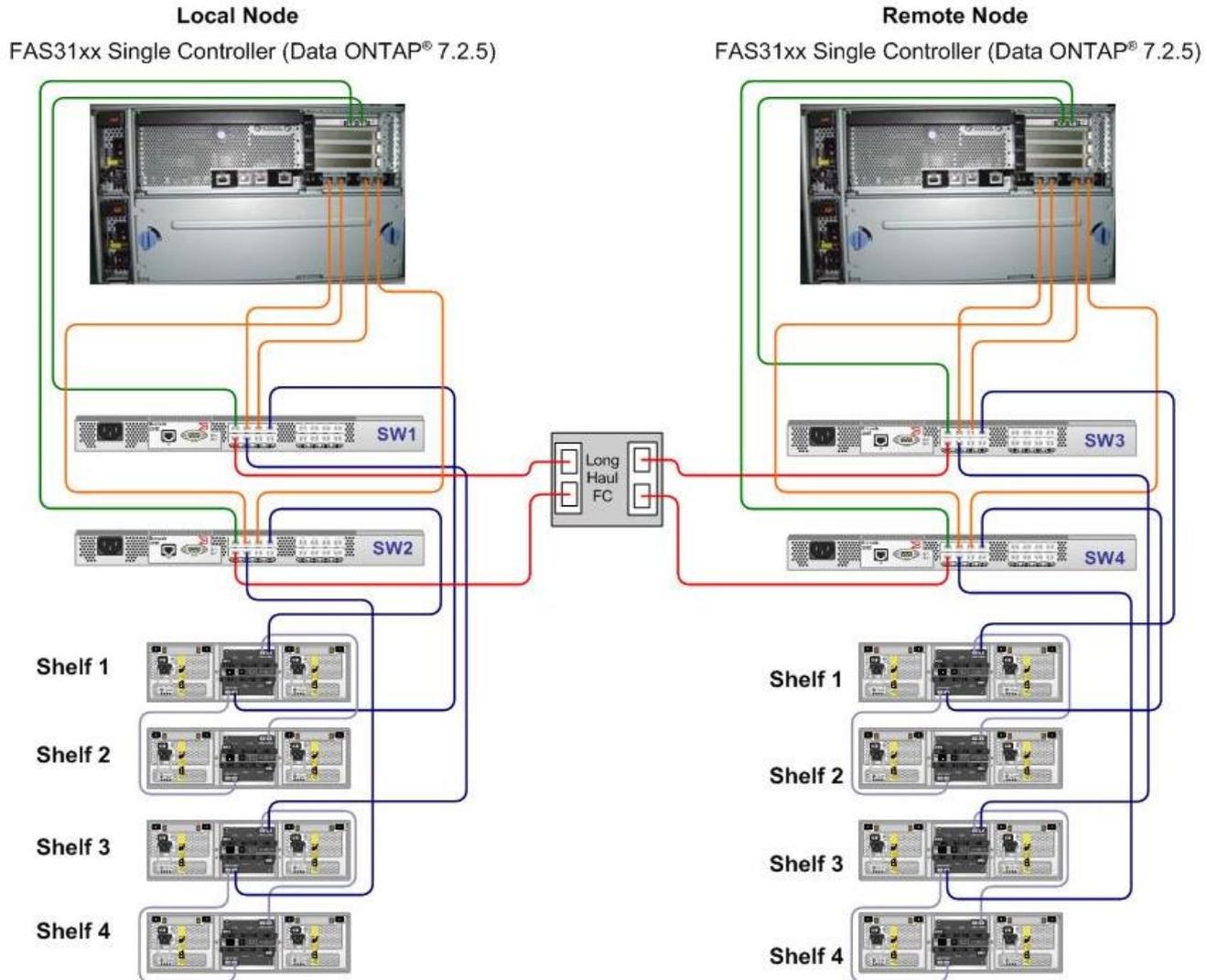
# FAS/V3100 MetroCluster Deployments

- Stretch and fabric MetroCluster are supported at FCS.
- Both configurations require using one PCIe FC-VI card per controller and attached external cables.
  - FC-VI card goes into expansion slot 1.
  - Remember—NVRAM resides on the motherboard, and, in a “standard” HA configuration, each controller’s NVRAM is connected via the chassis backplane.
- Standard MetroCluster configuration has one controller per 6U chassis.

# FAS/V3100 Stretch MetroCluster



# FAS/V3100 Fabric MetroCluster





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