IBM System Storage™ N series

Quick Reference Feature Guide

Aug 26th, 2008

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IBM System Storage™ N series

The IBM System Storage N series offers additional choice to organizations facing the challenges of enterprise data management. The IBM System Storage N series is designed to deliver high-end enterprise storage and data management value with midrange affordability. Built-in enterprise serviceability and manageability features help support your efforts to increase reliability, simplify and unify storage infrastructure and maintenance, and deliver exceptional economy.

N series System

- The N series products are simply one of the most versatile storage products in the industry today. They are designed to provide network attached storage for environments where customers have a need to utilize their storage investment in a multifaceted environment.
- The N series products provide a wide-range of network attachment capabilities to a broad range of host and client systems using multiple network access protocols including file system NAS protocols (CIFS, NFS) and block I/O protocols – including iSCSI and FCP – all from a single hardware platform, simultaneously!
- The N series products provides a tremendous amount of flexibility by allowing this solution to be populated with Fibre Channel , SATA and SAS disk drives (SAS only in N3300 and N3600)
  - An N series populated with Fibre Channel or SAS disk drives may be suitable for mission-critical high-performance data transaction environments.
  - An N series populated with SATA disk drives may be attractive to customers who wish an economical platform for disk-to-disk backup scenarios, disaster recovery scenarios, archive data, or data like home directories, which do not require high-performance transactional environments.

- All N series systems utilize a single operating system across the entire platform and offer a combination of multiple advanced function software features that provide one of the industry's most multifaceted storage platforms, ranging from comprehensive system management, storage management, onboard and outboard copy services, virtualization technologies and disaster recovery and backup solutions.

- In addition, optional non-erasable and non-rewriteable data protection software provides additional data security in regulatory environments where data must be stored in non-erasable and non-rewritable formats to meet the industry's newest and strict regulatory requirements for retaining company data assets.
- The N series portfolio of products offer ease-of-use tools that help customers manage database environments like Microsoft Exchange, Microsoft SQL Server, Microsoft Office SharePoint Server, SAP, IBM DB2 and Oracle. Patented RAID-DP helps ensure the highest availability and data loss prevention while using inexpensive SATA , Fibre Channel and/or SAS disk drive technology.

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- Installation - offers installation tools designed to help simplify installation and setup
- Increased Access - allows heterogeneous access to IP attached storage and Fibre Channel attached storage subsystems
- Flexibility - enables cross-platform file sharing for Microsoft Windows, UNIX and Linux environments that can help reduce network complexity and expense, and allow data to be shared across the organization
- IP SAN - support iSCSI protocols for IP SAN attached to a multitude of host servers including Microsoft® Windows, Linux, and UNIX systems
- Scalability - supports non-disruptive capacity increases as well as thin provisioning (dynamically allow the increase and decrease of user capacity assignments)
- Manageability - includes integrated system diagnostics and management tools, which are designed to help minimize downtime
- Redundancy - several redundancy and hot-swappable features provide the highest system availability characteristics
- Copy Services - provides extensive outboard services that help recover data in disaster recovery environments
- NearStore (near-line) Storage (3) - SATA drive technology enables on-line and quick access to archived and non-intensive transactional data
- Non-erasable, Non-rewriteable data protection (sometimes referred to as Write Once Read Many or WORM) - software and hardware features that offer non-erasable and non-rewritable data protection to meet the industry's highest regulatory requirements for retaining company data assets

The N series systems support a multitude of host attachment capabilities via FCP, CIFS, NFS and iSCSI protocols. See product “Interoperability Matrix” at www.ibm.com/storage/network for more information.

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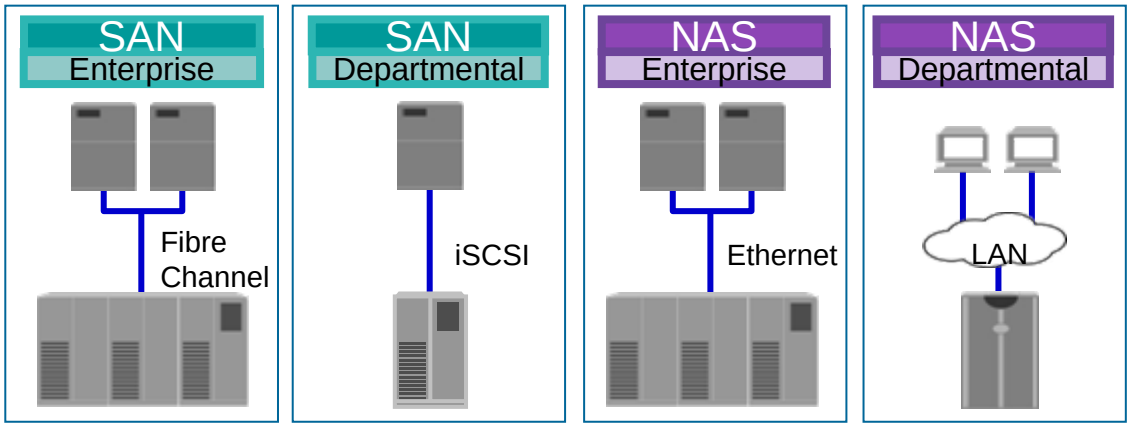
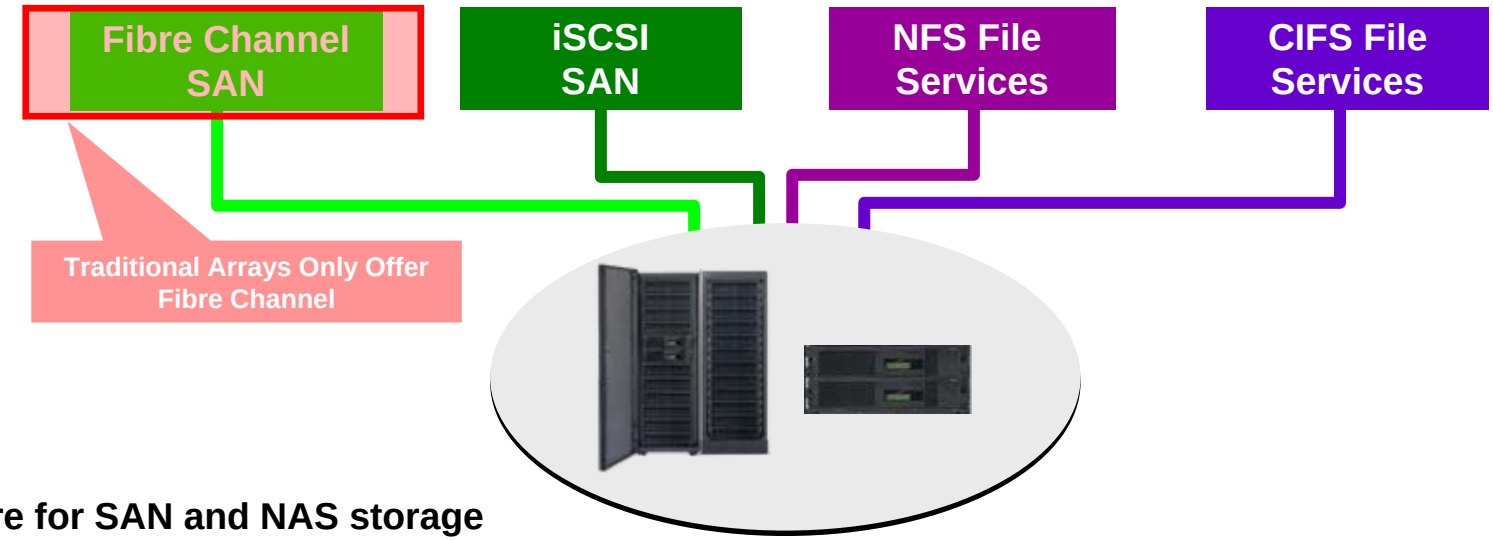
Storage Proliferation: Functional Silo Model



N series Versatility: Support for File and Block Protocols



- **One architecture for SAN and NAS storage**
- **Unique ability to consolidate file and block storage on single system**

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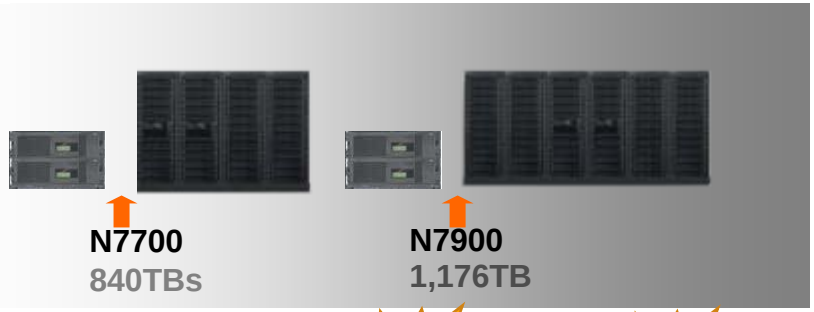
IBM® System Storage™ N series

Delivering value across the datacenter…

Highly-scalable storage systems designed to meet the needs of large enterprise data centers.

- Lower acquisition and administrative costs than traditional large-scale enterprise storage systems
- Seamless scalability, mission critical availability, and superior performance for both SAN and NAS operating environments

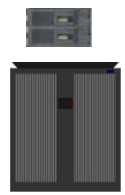


Excellent performance, flexibility, and scalability all at a proven lower overall TCO

- Highly efficient capacity utilization
- Comprehensive set of storage resiliency features including RAID 6 (RAID-DP™)

Entry level pricing, Enterprise Class Performance

- Centralize Storage in Remote & Branch Offices
- Easy-to-Use Back-up and Restore Processes



N series Gateways

Leverage existing Storage Assets while introducing advanced N series Software functionality

N series Unified Storage Architecture provides unmatched simplicity

*N5300 will be replaced by N6040 and N5600 will be replaced by N6070

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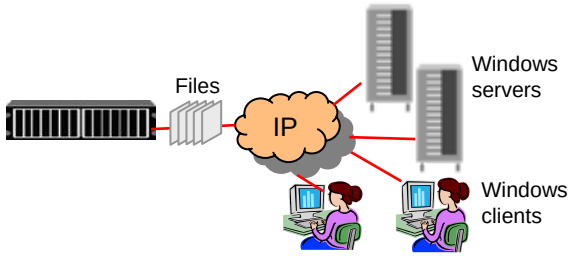
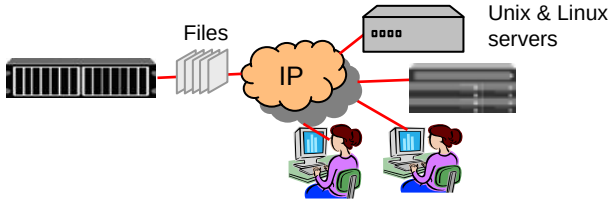
N series Software Feature / Capability

CIFS Feature



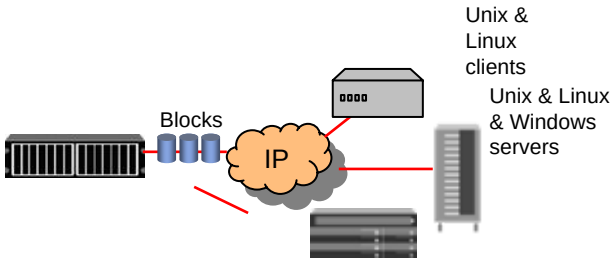
- Designed to allow Microsoft Windows servers & clients access over the IP network using CIFS file system protocols.
- Microsoft Windows client access licenses (CAL) are not required. Supports an active directory environment

NFS Feature



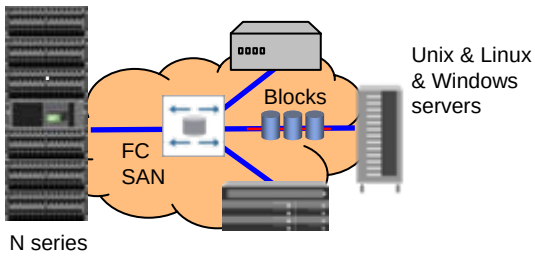
- Designed to allow UNIX and Linux servers and clients access over an IP network using NFS file system protocols.
- V2, V3, V4 supported

iSCSI Feature



- Designed to allow transfer of data between storage and servers in block I/O formats (iSCSI protocol).
- Enables the creation of IP SAN's for optimizing the transfer of database traffic in IP environments.

FCP Feature



- Designed to allow transfer of data between storage and servers in block I/O formats utilizing FCP protocols
- Enables participation of an N series storage solution within Fibre Channel SAN environments

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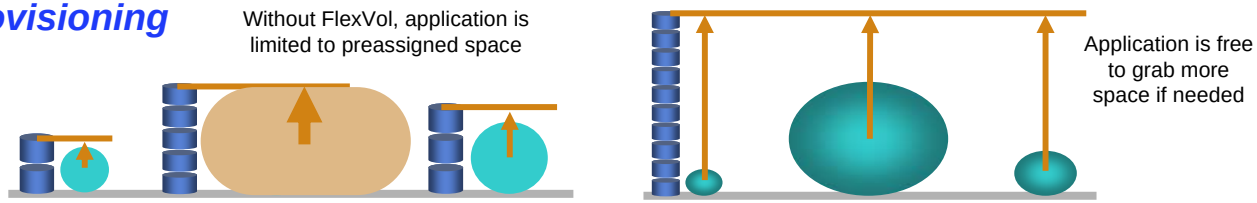
N series Software Feature / Capability

FlexVol®

Thin Provisioning



Designed to allow administrators to create multiple flexible volumes across a large pool of disks. Dynamic, non-disruptive storage (thin) provisioning; space- and time-efficiency.

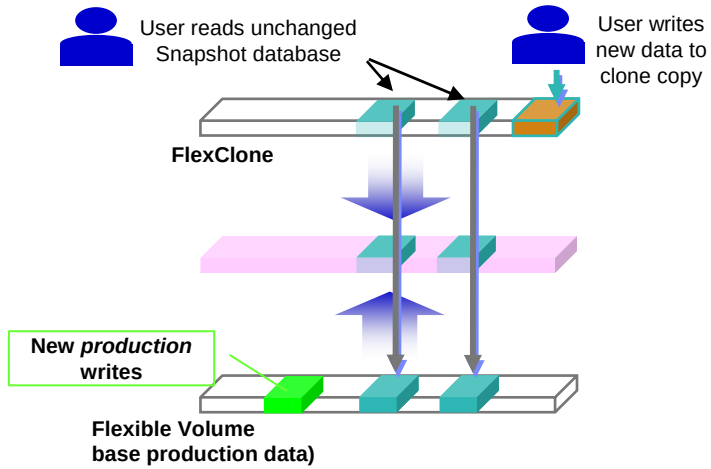
Allows applications and users to get more space dynamically and non-disruptively without IT staff intervention. Can enable more productive use of available storage and helps improve performance.

- **Dynamic, non-disruptive storage (thin) provisioning; space- and time-efficiency.**
- **Allows users to get more space dynamically and non-disruptively.**
- **Enables more productive use of available storage and helps improve performance**

FlexClone®

Writeable Snapshots

- Designed to provide instant replication of data volumes/sets without requiring additional storage space at the time of creation.
- Designed to allow the IT administrator to make a backup copy of a database and then modify and run testing against test (backup) database without affecting or taking the on-line database off-line.



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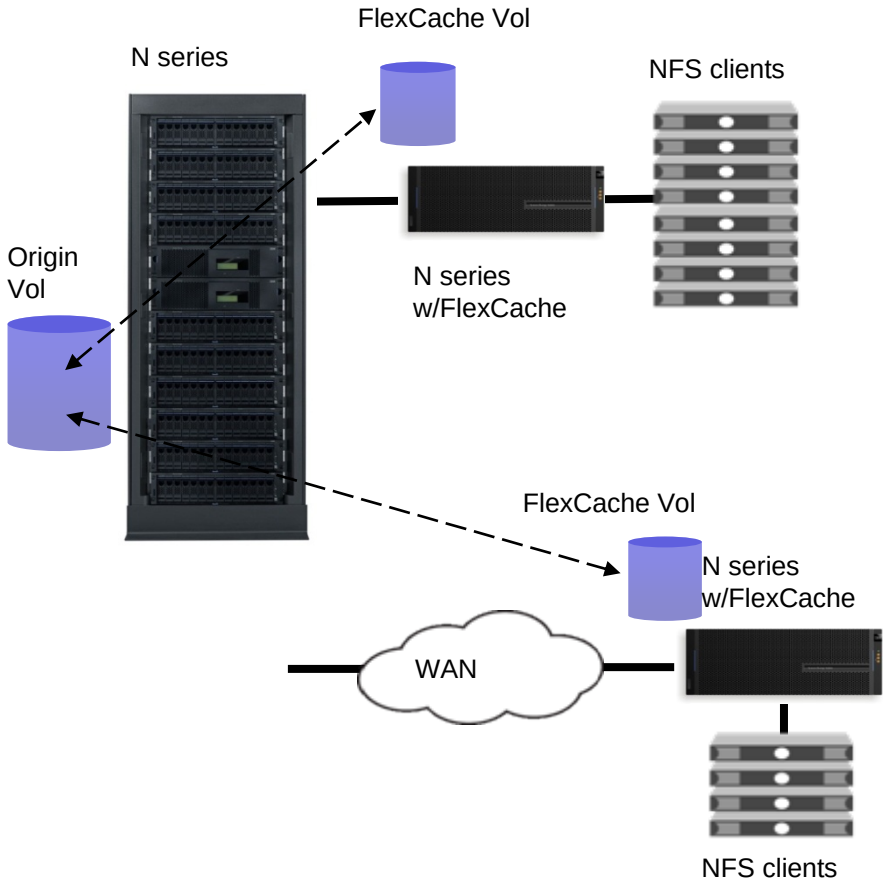
FlexCache

- **Performance accelerator**
  - Simple deployment
  - Scalable solution
- **Licensed ONTAP® feature**
  - Two (or more) controllers
  - Cache & Origin
- **Supports NFSv2/v3**
  - Volume granularity
  - Write-through cache
- **Cache Architecture**
  - Caches to disk & memory
  - Volume granularity
- **Simple concept**
  - Easy management



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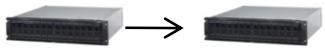
N series Software Feature / Capability

SnapMirror®

Interoperable with all N series systems and NetApp

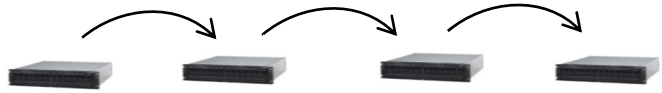
- Async, sync and semi-sync remote replication over inexpensive Internet protocols. Full backup is followed by incremental block updates.
- FCP supported

1 to 1



1 to Many (Star)

1 to Many (Cascading),



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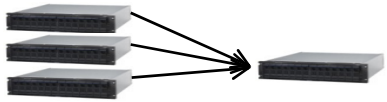
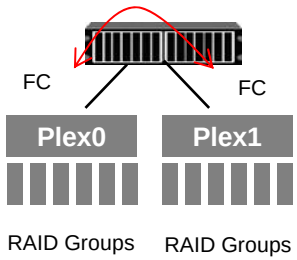


Key Benefits

- Simplifies deployment and management
- Simple set up and recovery
- Single product across all storage systems
- Leverages SnapManager®, ensuring replication of application consistent snapshots
- Cost-effective solution
- Mirror between FC and ATA systems
- Leverages Snapshots – efficient storage and bandwidth utilization
- Puts DR copy to active business use Remote read access for centralized backup, data distribution to remote sites
- Remote clones for app testing, QA and production staging
- Space efficient copies without impacting production system

SyncMirror®



Synchronous local mirroring from one volume to another volume attached to the same filer.
Includes volume mirroring between two clustered nodes.

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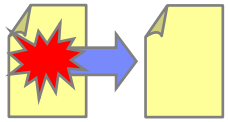
N series Software Feature / Capability

Snapshot™

Space-Efficient; only uses space to store meta data and pointers to data blocks.

Additional Snapshots copy pointers to new blocks since last snapshot

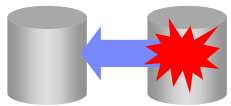


Instant self-service file backup & recovery for end users. Only block level changes are stored thus requiring a minimal amount of space for each subsequent snapshot

Up to 255 per volume; up to 127,000 per system
(max # per system varies by N series model)

SnapRestore®

End-user self recovery; File, Volume or system level recovery. Near instantaneous recovery from Snapshots – data movement typically not required



Instant self-service volume recovery for large individual files. Allows volumes to be restored with a single command vs. the file level restores that Snapshot offers

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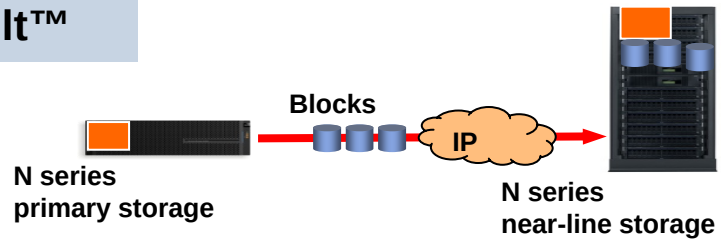
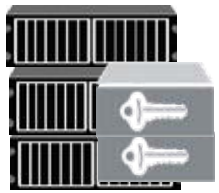
N series Software Feature / Capability

SnapVault™



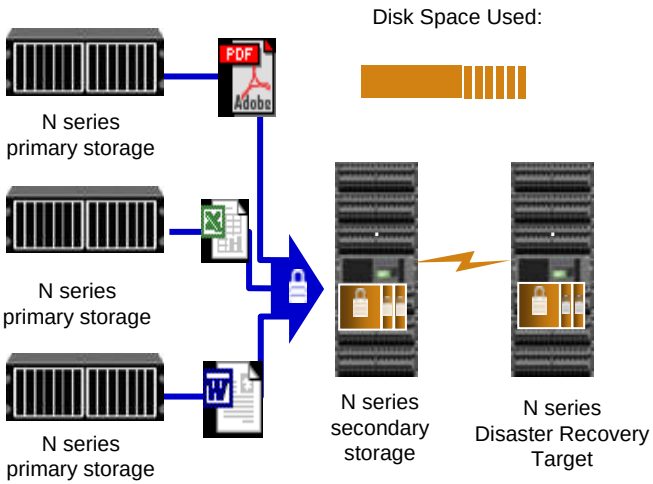
- Provides homogeneous super-efficient hourly disk-based online backup and restore by periodically backing up a Snapshot copy to another system
- **Full volume, native format copies** of primary N series systems reside on backup system and only incremental **block changes** are sent to backup system for efficient space management

SnapLock™



SEC-compliant disk-based WORM technology. **Provides non-erasable and non-rewritable data protection that helps enable compliance with government and industry records retention regulations.** The entire box or a portion of the box can be partitioned to store WORM protected data.

LockVault™



- Design to enable IT administrators to "lock" a Snapshot copy in a non-erasable and non-rewriteable format for compliant retention
- Nightly Snapshot backups save only changed blocks; full backup image preserved
- ComplianceJournal™ logs changes between Snapshot copies

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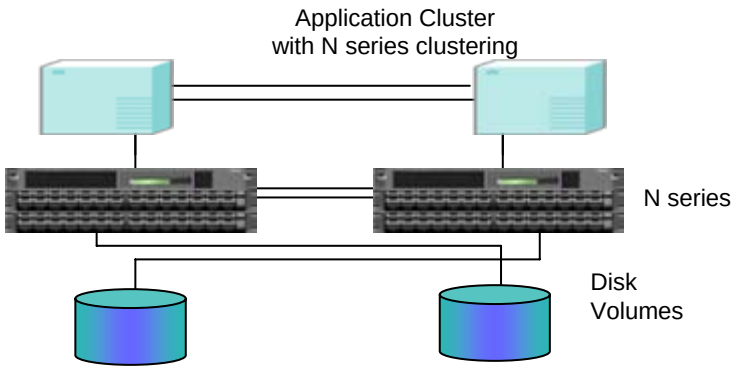
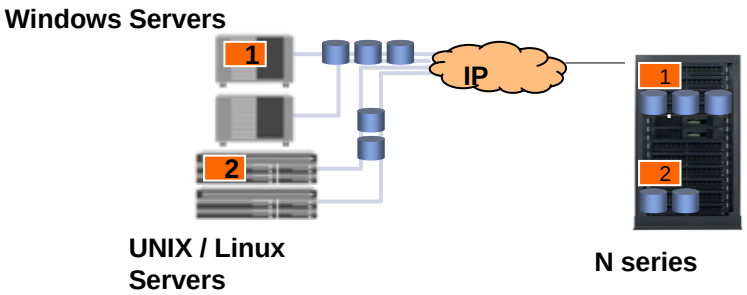
Clustered Failover (CFO)



- Automatic failover with notification provides continuous data availability for an unavailable storage controller and notifies administrator of failover.
- Manual failover and giveback enables planned maintenance on a storage controller without impacting data availability
- Transparent failover: end users are not impacted by a failover; clients continue to access data the same way after a failover.
- Active/active configuration; both clustered controllers are doing useful work; no resources sit idle waiting for a failover to occur

Open Systems SnapVault (OSSV)



- Provides Heterogeneous super-efficient hourly disk-based online backup and restore by periodically backing up changes to an N series system
- **Full volume, native format copies** of data from open system DAS systems reside on backup system but only incremental **block changes** are stored on backup system for efficient space management
- Enables you to provide incremental backup copies from Open Systems with DAS to N series disk systems

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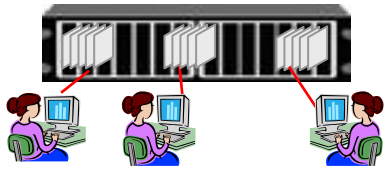
N series Software Feature / Capability

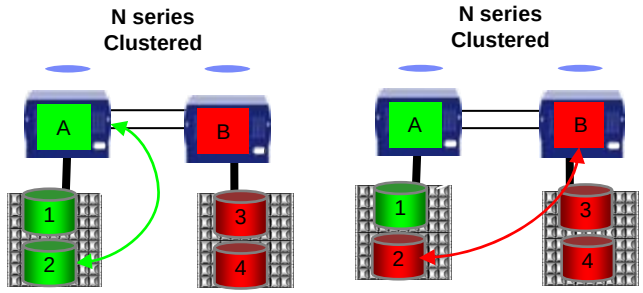
MultiStore®



- MultiStore is designed to let you quickly and easily create separate, private logical partitions in filer network and storage resources.
- Each virtual storage partition is designed to maintain separation from every other storage partition to prevent different enterprise departments that share the same storage resources from accessing or finding other partitions.
- MultiStore helps prevent information on any virtual partition from being viewed, used or downloaded by an unauthorized users.
- Similar to LUN masking on a Block Storage System

SnapMover®

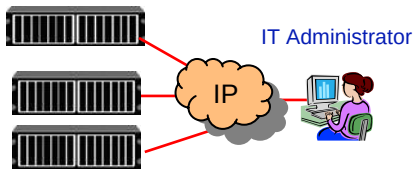
- Local data migration solution for optimizing workloads across N series sharing a common disk array.
- Designed to allow you to migrate ownership of a volume from one filer to another filer with a single command.
- Designed to allow better resource utilization and performance amongst multiple N series devices
- MultiStore and Clustering are prerequisites



SnapMover Ownership Migration
Filer B takes ownership of Volume # 2

FilerView™

GUI Management Standard with all N series systems. Manage local and remote systems from any web browser. (no additional management console hardware needed)



- A web-based administration tool that allows IT administrators to fully manage N series systems from remote locations.
- Simple and intuitive web-based single-appliance administration
- **No requirement for separate management server**

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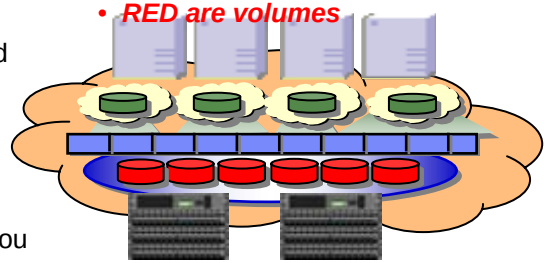
N series Software Feature / Capability

SnapDrive™

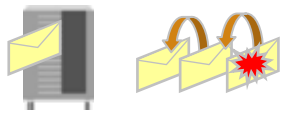
- Designed to allow optimized usage in database environments
- Virtualized “local” disk to Windows® servers (FCP or iSCSI). Storage managed by SnapDrive logically appears to come from a locally attached storage subsystem.
- SnapDrive is designed to allow administrators to easily create virtual disks from pools of storage that an be distributed among several storage appliances.
- With SnapDrive you add, delete, map, unmap, and mirror virtual disks online. You can expand capacity on-the-fly with no impact to application or system performance.

- ***GREEN are LUN’s***
- ***BLUE is aggregate***
- ***RED are volumes***



SnapManager®

For Exchange and SQL server



- Host software for managing Exchange and SQL Server backup and restore. SnapManager software simplifies Exchange data protection by automating processes to provide hands-off, worry-free data management.
- SnapManager also delivers built-in high availability, with features that allow you to expand Exchange databases online.
- Designed to enable you to schedule and automate Exchange database backups, use policy-based backup retention management, and simplify the migration of existing databases to IBM N series systems.
- It also offers tight integration with Microsoft Cluster Server (MSCS) and Multi Path I/O (MPIO) and with the N series Clustered Failover option and SnapMirror for simplified disaster recovery implementation.

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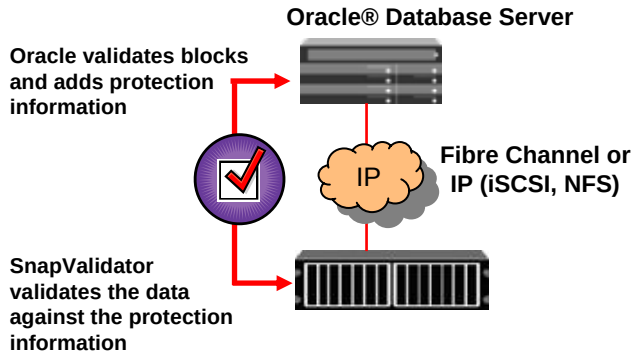
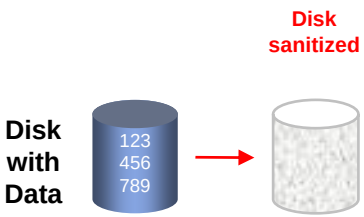
N series Software Feature / Capability

SnapValidator™

- SnapValidator detects and prevents potential corruptions of Oracle data before they happen.
- Oracle system assigns a unique value to each write request based on the sum of the data and sends the data set down the I/O path to the N series system. Upon receipt, SnapValidator calculates the sum of the data and compares it to the Oracle value.
- **Meets Oracle HARD initiative and provides the highest possible level of protection for Oracle data.**
- If the identifiers do not match, the system prevents the data corruption and produces an alert.



Disk Sanitization™



- Disk sanitization (disk scrubbing) is the process of physically obliterating data by overwriting disks with specified byte patterns or random data in a manner that helps prevents recovery of current data by any known recovery methods.
- This feature is designed to enable you to carry out disk sanitization by using three successive byte overwrite patterns per cycle and a default six cycles per operation

* Not supported on the N3700

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N series Software Feature / Capability

FlexShare

Prioritization of tasks, applications, workloads

- FlexShare gives administrators the ability to increase processing utilization without sacrificing the performance of critical business needs.
- Allows administrators to consolidate different applications and data sets on a single storage system.
- FlexShare gives administrators the control to prioritize applications based on how critical they are to the business and provides a priority mechanism to give preferential treatment to higher priority tasks.
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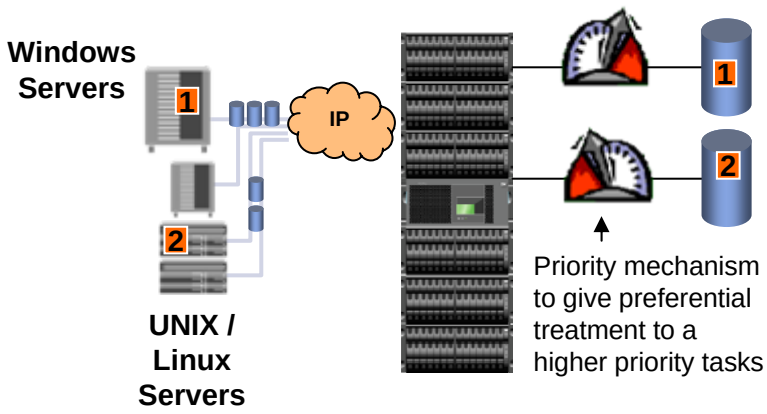
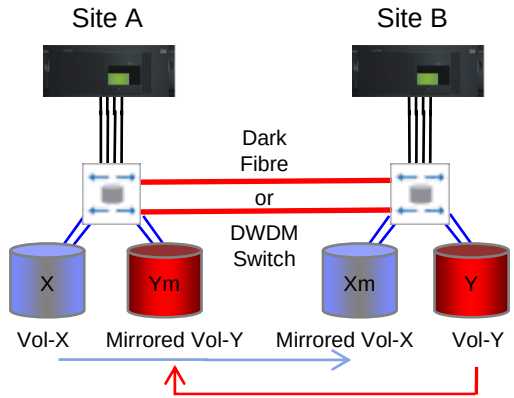


- **Benefits include:**
  - **For more effective storage consolidation**
  - **Critical workloads get fastest response when controller is fully loaded**
  - **Storage administrator can make on-the-fly adjustments**

MetroCluster

Split dual node system into 2 single-node systems located in different locations provides both High Availability and Disaster Recovery

- Extends cluster failover capabilities from primary to a remote site
- Replicates data from the primary site to the remote site to ensure that data there is completely up-to-date and available
- If Site A goes down, MetroCluster allows you to rapidly resume operations at a remote site minutes after a disaster.
- Stretch MetroCluster provides a disaster recovery option at distances up to 500 meters between each N series system.
- Fabric MetroCluster provides a disaster recovery option at distances up to 100Km using a Fibre Channel switched network.



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N series Software Feature / Capability

Operations Manager

(previously DataFabric® (DFM) Manager) ***Core License***

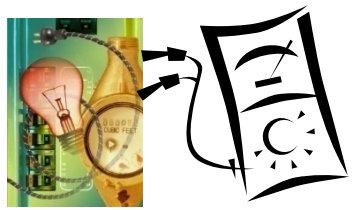
- This feature provides the base Operations Manager installation.
- Designed to provide a central point of control and provide alerts, reports, and configuration tools.
- These tools are designed to help manage storage and content delivery infrastructure, consistent with business requirements, and help maximize availability and reduced total cost of ownership.

Business Continuance Option

Withdrawn – replaced by Protection Manager

- Provides advanced function for Operations Manager.
- Designed to help you minimize downtime by notifying you that customized preset thresholds and conditions have exceeded operational limits.
- This feature requires the Operations Manager Core feature

Storage Resource Management Option



- Provides advanced function of Operations Manager.
- Designed to provide detailed storage utilization reports to aid capacity planning, consumption management, data migration, and chargeback.
- This feature requires the Operations Manager Core feature

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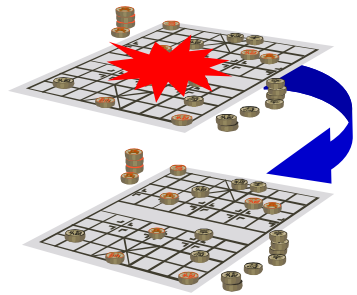
N series Software Feature / Capability

SnapManager® for Oracle

- SnapManager automates and simplifies the complex manual and time-consuming processes associated with the backup, restore, recovery and cloning of Oracle databases.
- It provides the ability to create, use, and clone a database for use by non-production team capability.
- SnapManager automatically identifies the backup data set and puts the database in hot backup mode while a Snapshot copy is created to ensure consistency.
- Any backup can be immediately verified, or verification can be deferred.
- Backups can be performed at regular intervals throughout the day and ensures that restores occur quickly with minimal disruption to ongoing operations.
- It also integrates with native Oracle technology such as RAC, RMAN, and ASM and across iSCSI and NFS protocols to allow IT organizations to:
  - Scale their storage infrastructure
  - Meet increasingly stringent SLA commitments
  - Improve the productivity of databases storage administrator across the enterprise



SecureAdmin™

- SecureAdmin is standard feature of Data ONTAP that enables authenticated, command-based administrative sessions between an administrative user and Data ONTAP over an intranet or the Internet.
- SecureAdmin can be used to authenticate both the administrative user and the N series system, creating a secure, direct communication link to the N series system.
- It helps protects administrative logins, passwords, and session commands from "cleartext" snooping by replacing rsh and telnet with the strongly encrypted SSH protocol

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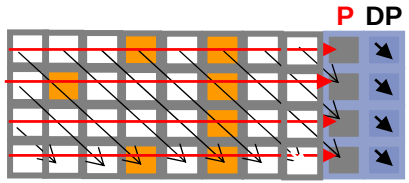
N series Software Feature / Capability

RAID-DP™

RAID 6

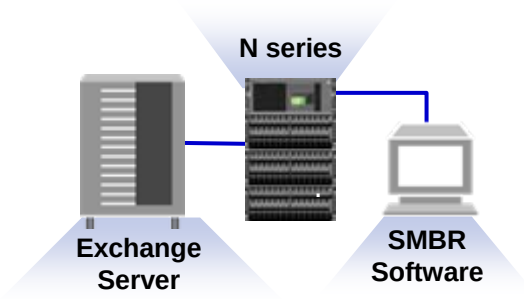


- Designed to survive all 2-disk failure scenarios
- Essential for SATA drives but also applicable to FC drives
- Breakthrough innovation: USENIX Best Paper in 2004
- Protects better than single-parity RAID or RAID0+1
- No performance penalty for industry-leading protection

- Traditional single-parity RAID technology offers protection from a single failed disk drive.
- The expectation is that no other disk fails nor uncorrectable bit errors not occur during a read operation while reconstruction of the failed disk is still in progress.
- If either event occurs during reconstruction, then some or all data contained in the RAID array or volume could be lost. With modern larger disk media, the likelihood of an uncorrectable bit error is fairly high, since disk capacities have increased but bit error rates have stayed the same.
- The ability of traditional single-parity RAID to protect data is being stretched beyond its limits.

Single Mailbox Recovery (SMBR)

- Enables the recovery of a single mailbox from a Microsoft Exchange Information Store.
- Unlike Lotus Domino where every mailbox is stored as a separate database (and therefore is implicitly recoverable as a unit by itself), Exchange clumps several mailboxes together into .edb files and .stm files.



- This makes recovery of a single user's mailbox extremely cumbersome and in most cases impossible unless there is some brick-level backup software in place.
- With SMBR, no brick-level (transaction level) backup is required.
- SMBR can extract a single mailbox or email directly and rapidly from an Exchange Information Store.

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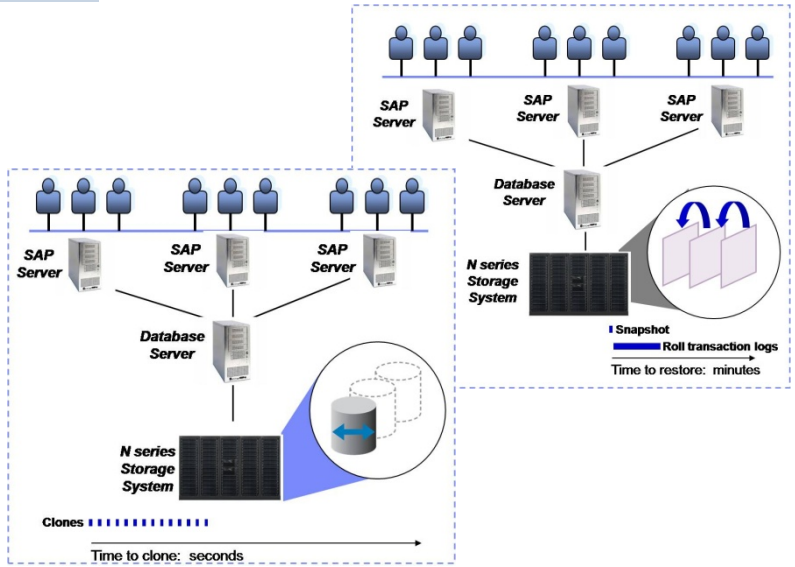
N series Software Feature / Capability

SnapManager for SAP Benefits:

- SnapManager backs up in seconds
- Snapshot copies verified for integrity and stored
- Near instantaneous restores from Snapshot
- Dramatically shortened recovery with automated log replays
- Automated recovery tasks
- Near-instant clones from Snapshot
- Automated cloning operation
- Reduce downtime from outages
- Automation eliminates manual errors



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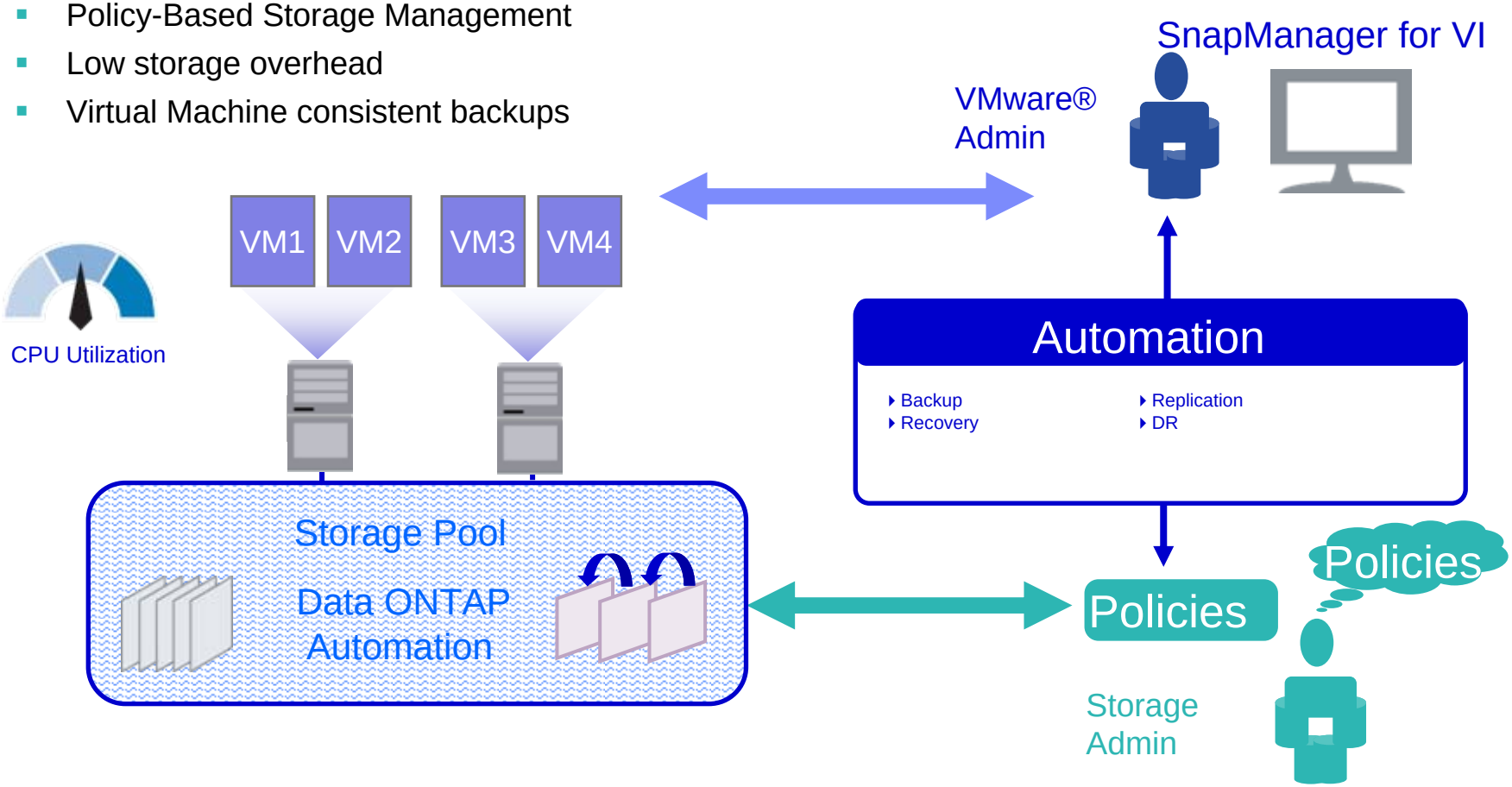
SnapManager for Virtual Infrastructure

- Server-free Instantaneous backup and recovery
- Policy-Based Storage Management
- Low storage overhead
- Virtual Machine consistent backups



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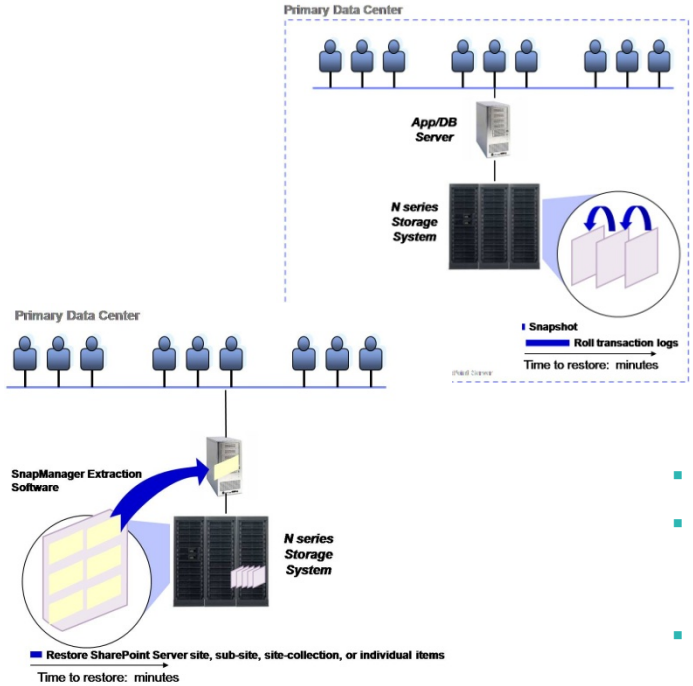
N series Software Feature / Capability

SnapManager for Microsoft Office SharePoint Server

- Fast and storage efficient backups
- More frequent backups due to speed and efficiency
- No performance degradation from online backups
- Instantaneous access to backup data
- Automation eliminates manual errors
- Extremely fast and accurate data recovery
- Reduce downtime from outages
- Automation saves administrative time



- Recovery using Snapshots is very fast
- Extraction capability recovers individual Sites, Sub-sites, Libraries, Lists, Files and Versions in minutes
- Recovery is non-disruptive

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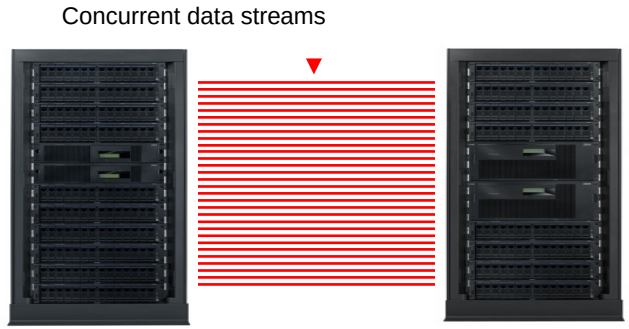
N series Software Feature / Capability

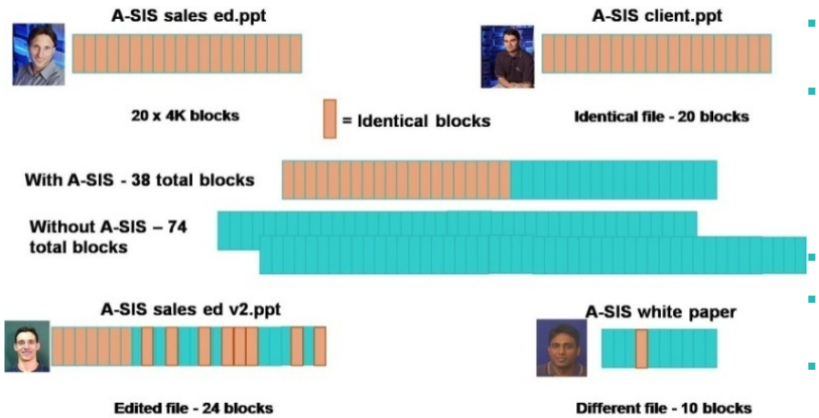
NearStore

- Data ONTAP maintains a fixed upper limit for concurrent SnapMirror and SnapVault transfers based on the type of disks the system has attached.
- Concurrent operations allow multiple data streams between two N series devices for the purpose of backup, data protection, disaster preparedness
- The NearStore (near-line) feature increases the maximum number of concurrent data streams (per storage controller) to the following limits:
  - N5200 w/FC & SATA drives = 32 concurrent data streams
  - N5300, 5500 & N7600/N7700 w/FC & SATA drives = 64 concurrent data streams
  - N5600 & N7800/N7900 w/FC & SATA drives = 128 concurrent data streams

Notes: *Concurrent data streams = a combination of SnapMirror and SnapVault and Open Systems SnapVault sessions*



A-SIS Deduplication



Benefits of A-SIS

- Reduces storage use by sharing identical data blocks
- Ideal for Business Processes / Applications
  - Archiving
  - Enterprise Content Management
  - Information Lifecycle Management
- Eliminates redundancy within and across files
- Between multiple backups of same source data set
- Between multiple backups of different source sets
- Within one backup (duplicate files and blocks)

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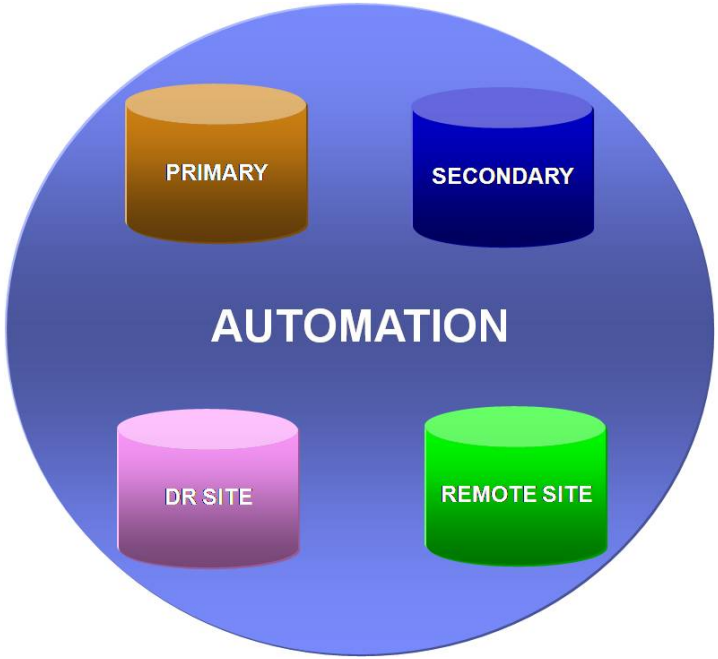
N series Software Feature / Capability

Protection Manager



- **Overview:**
  - **Automated backup and replication management for N series disk-to-disk environment.**
- **Customer Benefits:**
  - **Assured data protection through policy based management**
  - **Eliminates time consuming manual set-up and mapping**
  - **Effective use of secondary and tertiary storage resources reduces cost**

Automation of Backup and Replication

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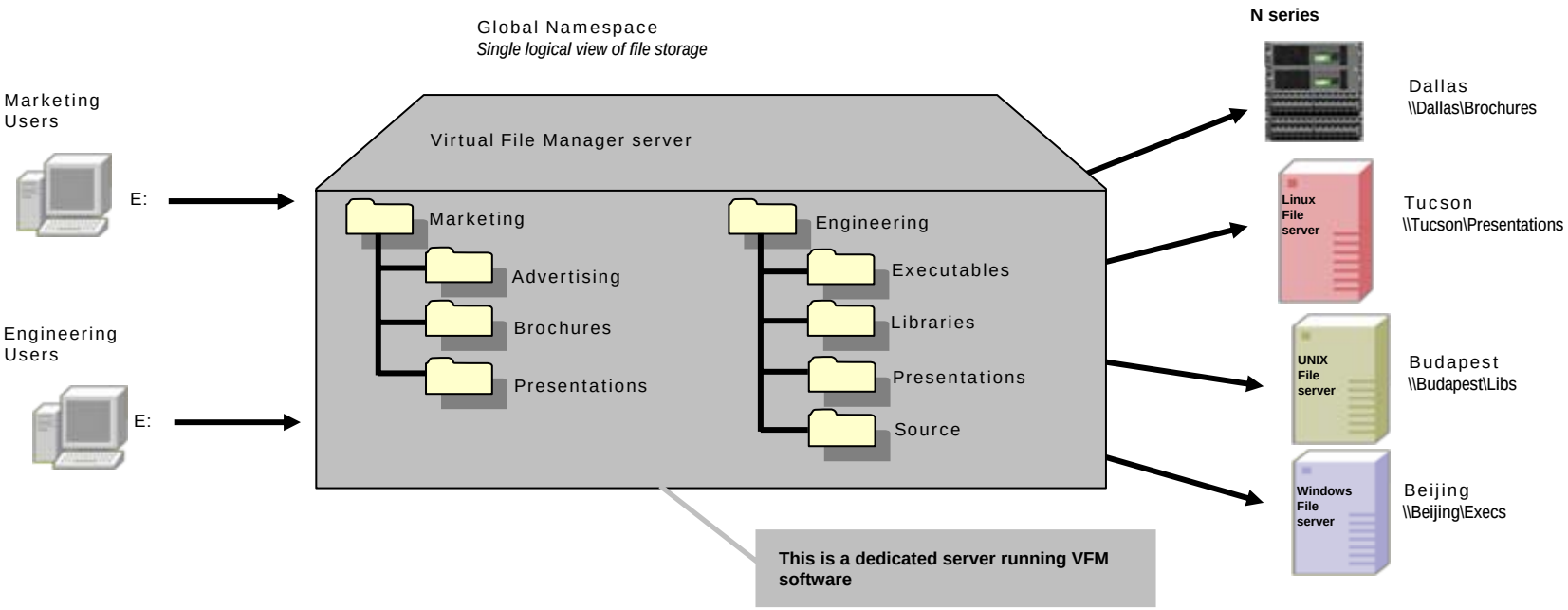
Virtual File Manager™ (VFM®)



Benefits of VFM

For Administrators

- Aggregate storage monitoring and distributed storage optimization tools
- Simplified storage administration without client reconfiguration
- Reduces recovery time associated with disaster or reconfiguration
- Storage consolidation without any client reconfiguration and downtime
- Simplifies network storage scalability

For Users

- Single directory namespace to browse
- Increased productivity through more efficient file retrieval
  - Links to the data are always maintained
- Increased data availability through transparent storage management

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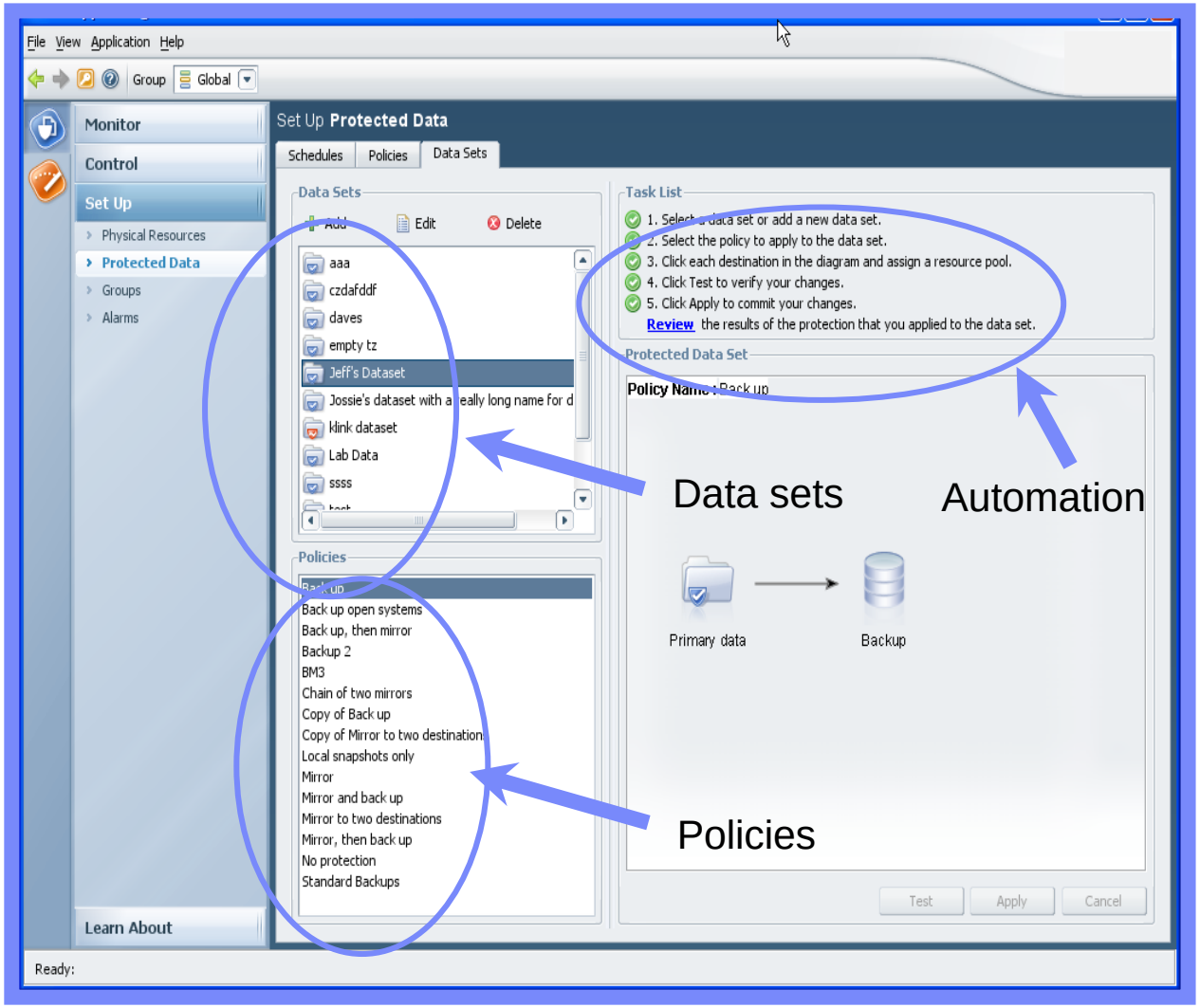
Provisioning Manager



- **Data set and policy-based management eliminates manual configuration errors and provides higher assurance of a consistent provisioning processes.**
- **Automation eliminates manual tasks and improves the productivity of administrators.**

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