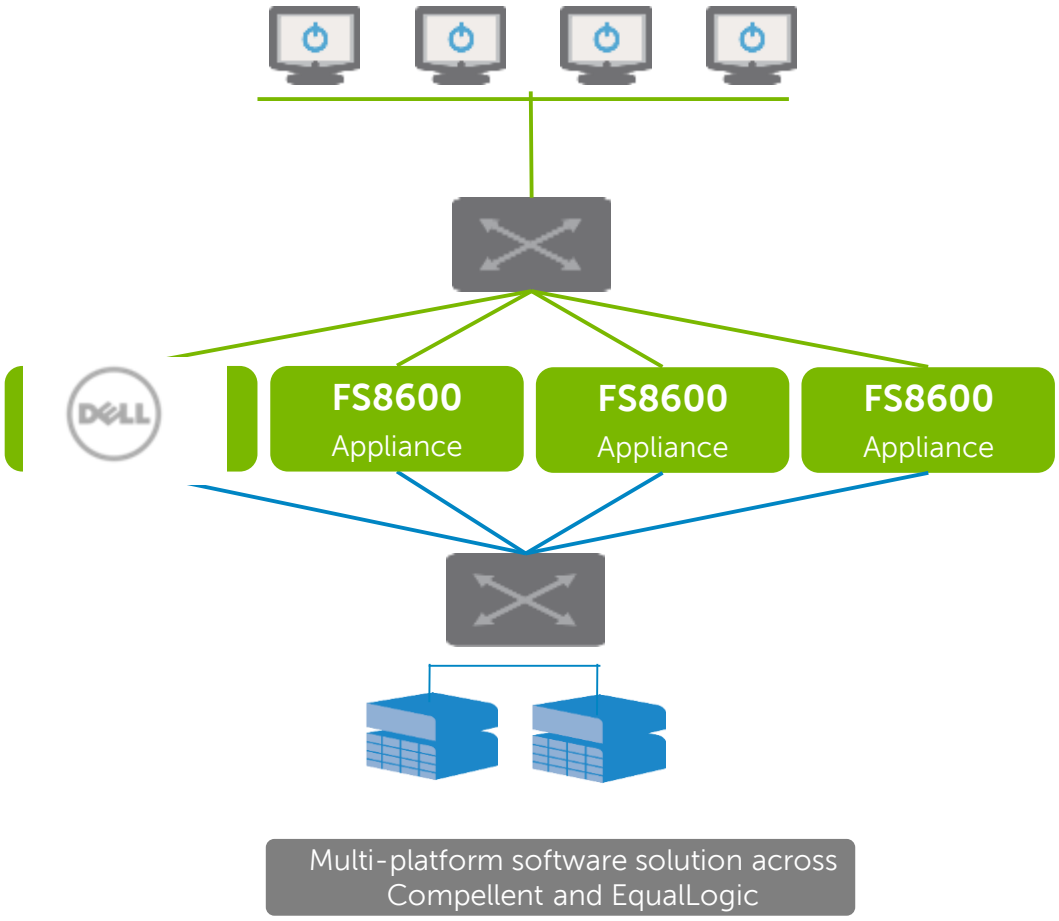
Dell FluidFS and Fluid Cache

Dell Fluid File System
Scale-out unified storage designed for future growth

- Non-disruptive capacity and performance scale-out without forklift upgrades
- Linear file OPS and throughput scalability
- No architectural limitations of traditional NAS or file servers
- Single scalable namespace up to 4PB for easy administration
- Shared infrastructure for block and file enables highest efficiencies and cost savings
- Optimized data placement on high performance SSDs and HDDs
- Policy-driven post-process dedupe and compression

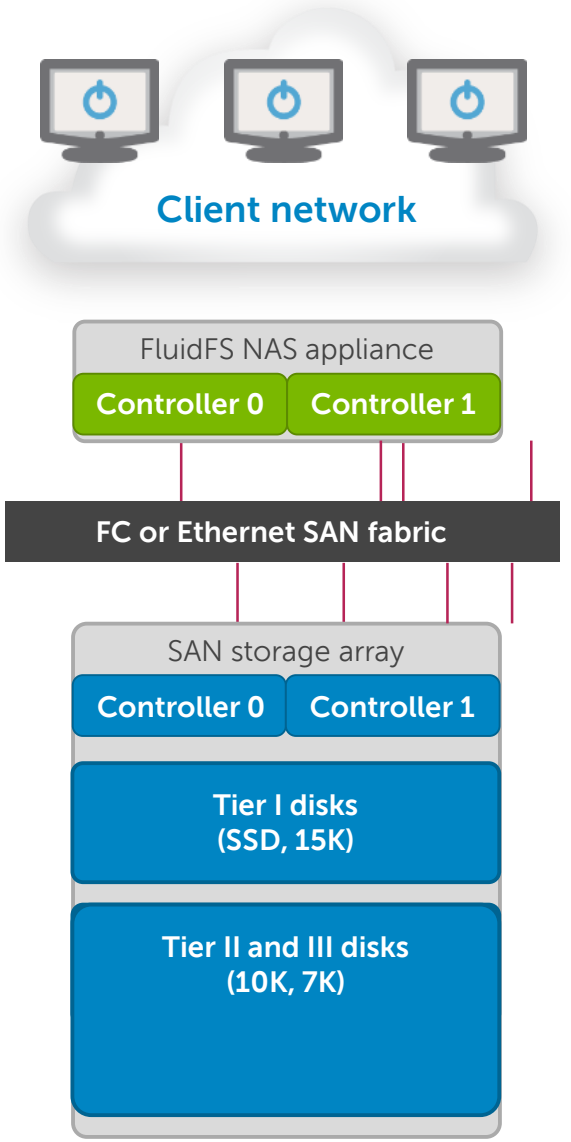


Delivers enterprise resiliency and data protection

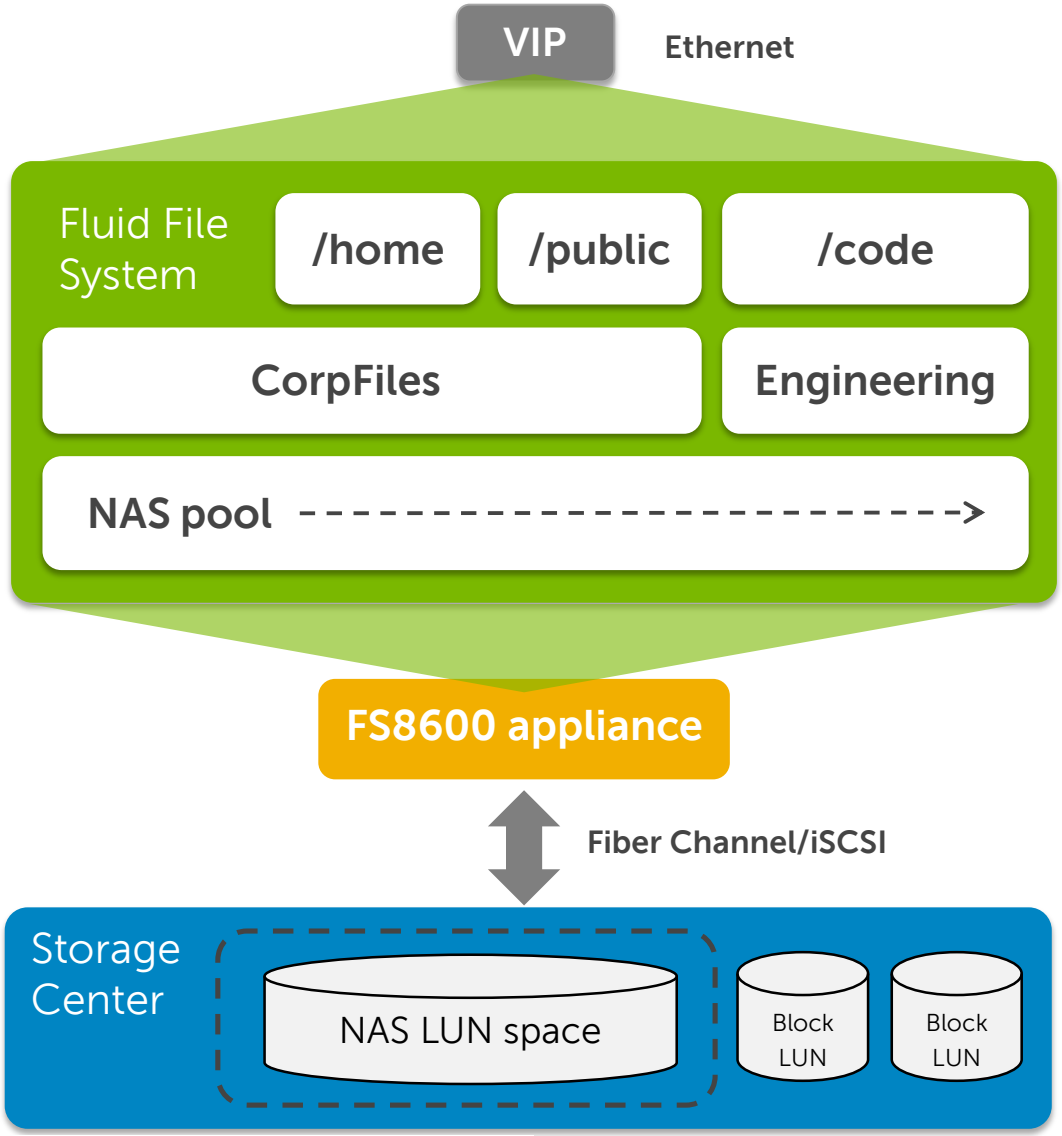
- Two active-active controllers per appliance deliver **high availability** without introducing idle resources
- Midplane between controller pairs with 40Gb bandwidth enables **cache mirroring** and write-back operations
- Battery backup and redundant copies of critical file system structures protect metadata to **maintain data integrity**
- Internal hard drive for local boot with flash for **configuration backup**
- Native support for NDMP and ICAP antivirus **protects business-critical data**

FluidFS offers best-in-class performance and scalability

- Achieve linear performance scaling with low CAPEX.
- Only purchase the performance and capacity you need today.
- Add controllers and disks non-disruptively to accommodate block and/or file growth.
- Keep your busiest data on high-performance storage; move stagnant data to dense, low-cost storage.
- Scale to 4PB in a single namespace, whether you have a single appliance or four.



FluidFS offers flexibility without sacrificing simplicity



Virtual IP space for client access to entire namespace

Directory structure for shares and exports

Logical volumes to manage files

Single pool spans FluidFS cluster

Scales from 1 to 4 appliances

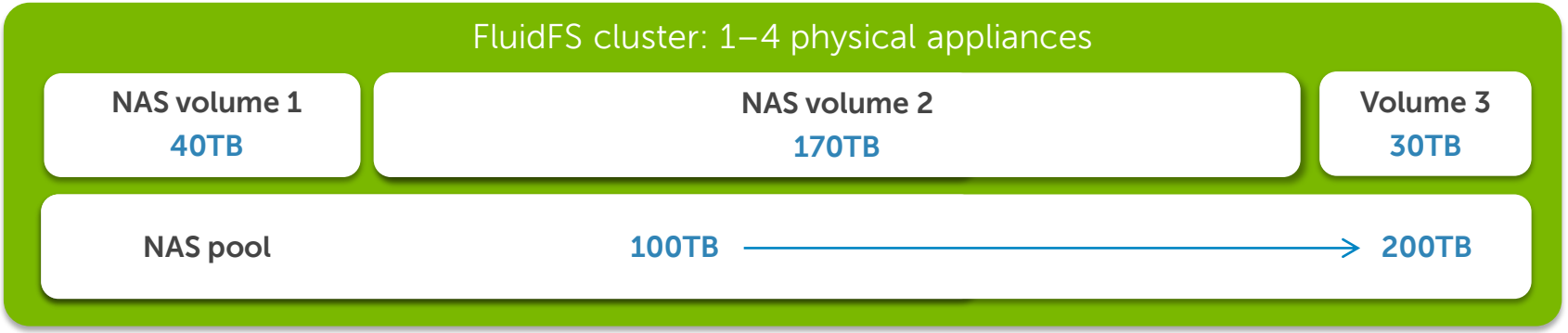
Block space carved transparently

FluidFS feature set

NAS volume thin provisioning: increases flexibility

How it works

- Administrator provisions more "advertised" space than the actual size of the NAS pool

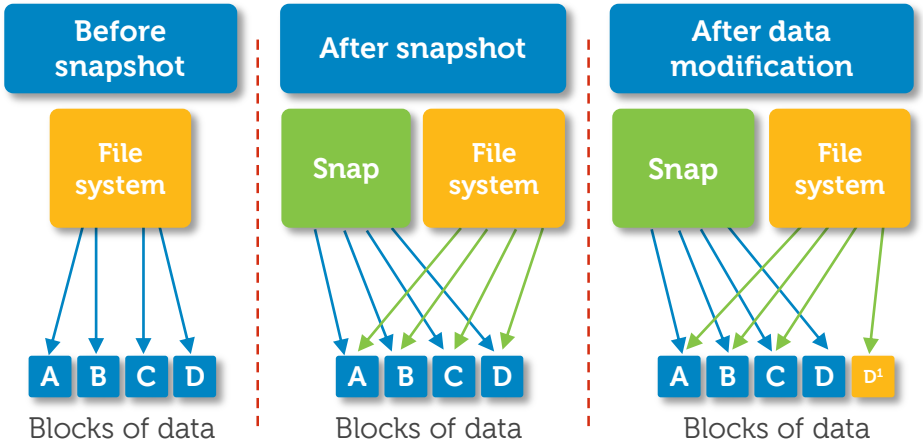


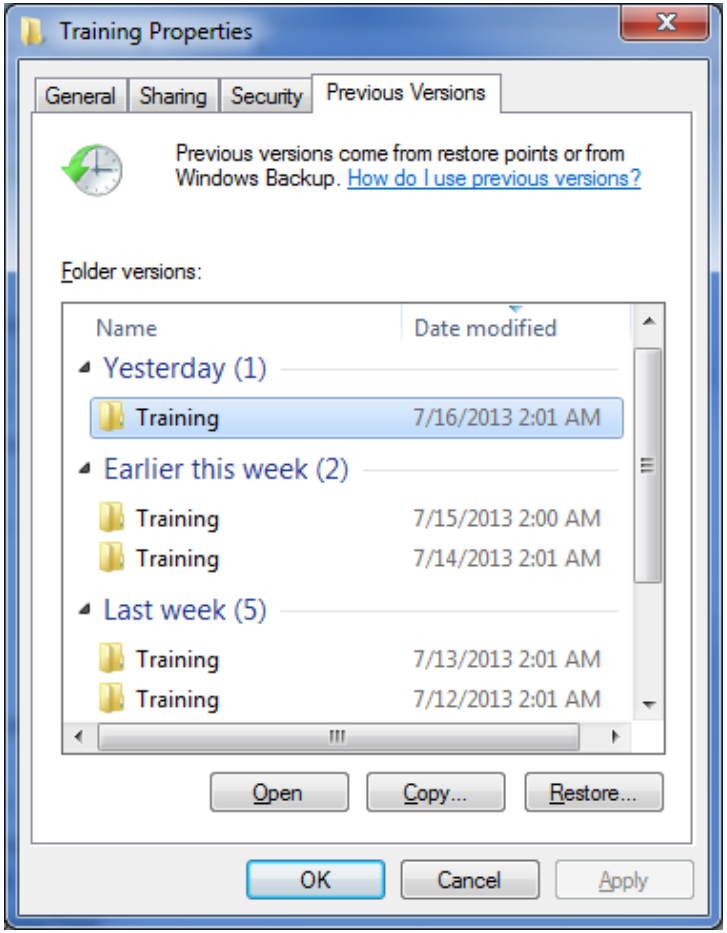
Benefits

- Gives the end user or application the flexibility grow NAS volumes unencumbered by the physical capacity of the NAS pool
- Notifies the administrator when the consumed space in the pool reaches user defined watermarks

File-level snapshots: improves the data protection process

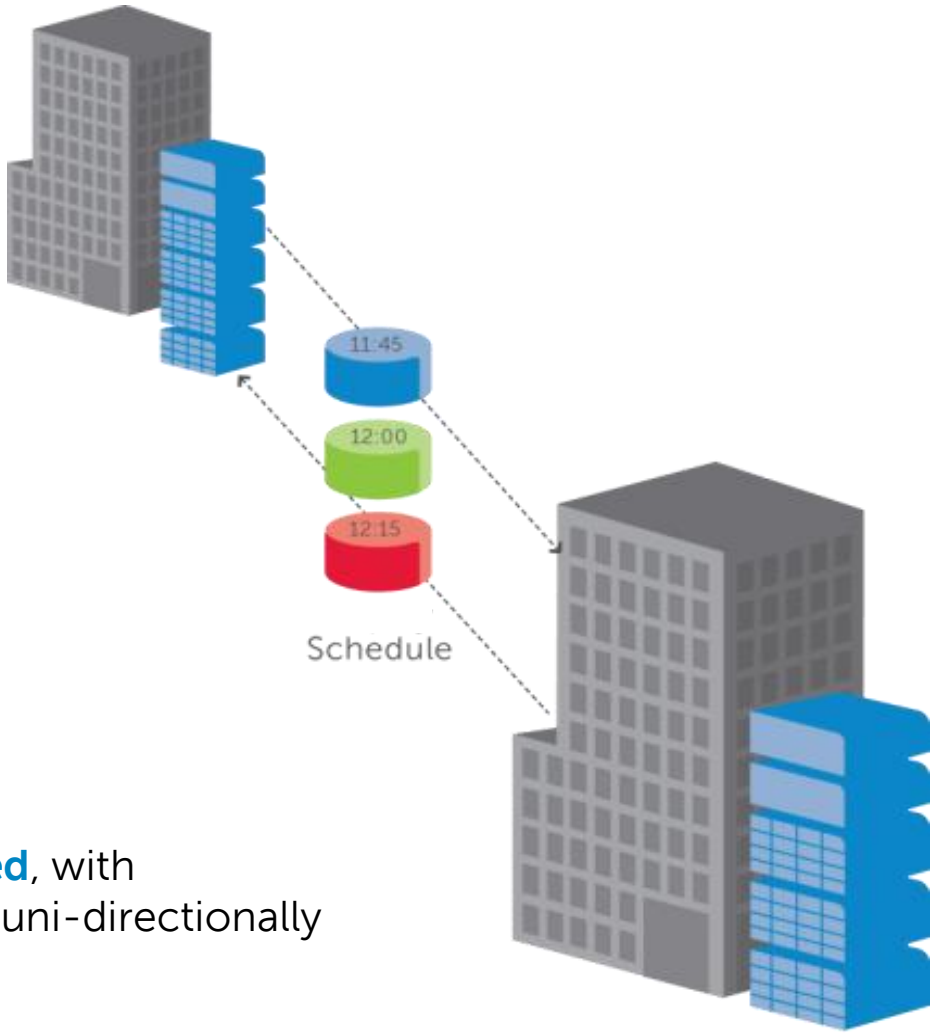
- Pointer-based file data protection applied per NAS volume; **no snap reserve**
- **Redirect-on-write** snapshots prevents performance degradation; one I/O per write
- Provides **user-level access to snap history**; lets users recover their own files





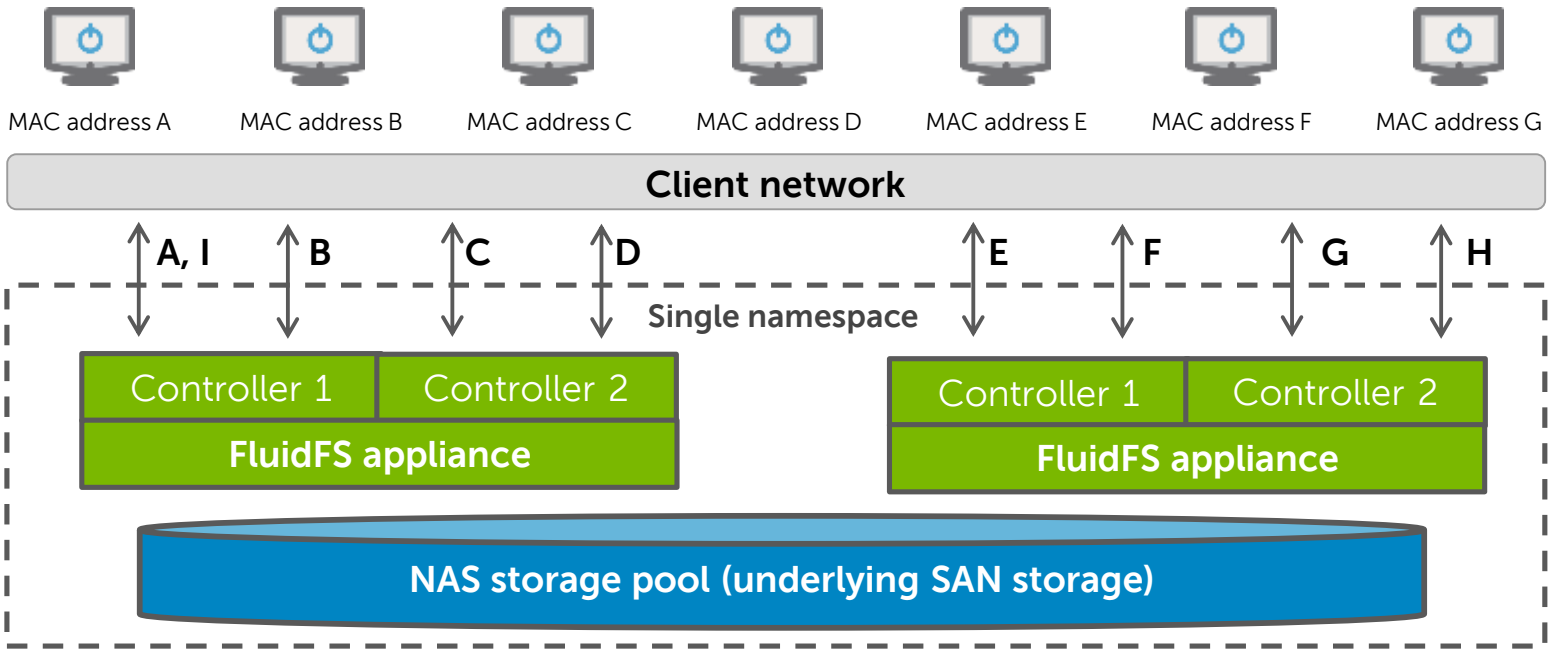
File-level replication: shares snapshots between peer sites

- **Snapshots replicated** to FS8600 systems with the same number of controllers
- Replication is **policy-driven** and can be scheduled per NAS volume
- Only incremental changes are replicated, **saving bandwidth**
- **Bidirectional replication supported**, with individual NAS volumes replicated uni-directionally



Load balancing: optimizes performance

- Incoming connections are **automatically balanced** across client ports and across all FS8600 controllers in the cluster
- **Single namespace** means file data does not need to be sharded or siloed into individual file sets as additional FS8600 appliances are added



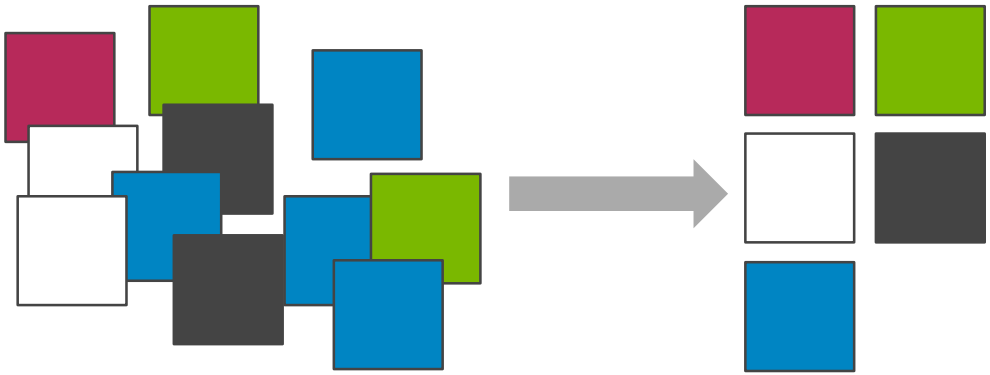
Fluid Data Reduction

FluidFS Data Reduction is composed of:

- Data DeDuplication
- Data Compression

- Data Reduction is applied per NAS Volume and once Dedup is enabled the administrator can enable/disable the compression component.

- Minimum file size to be considered for data reduction is 64KB



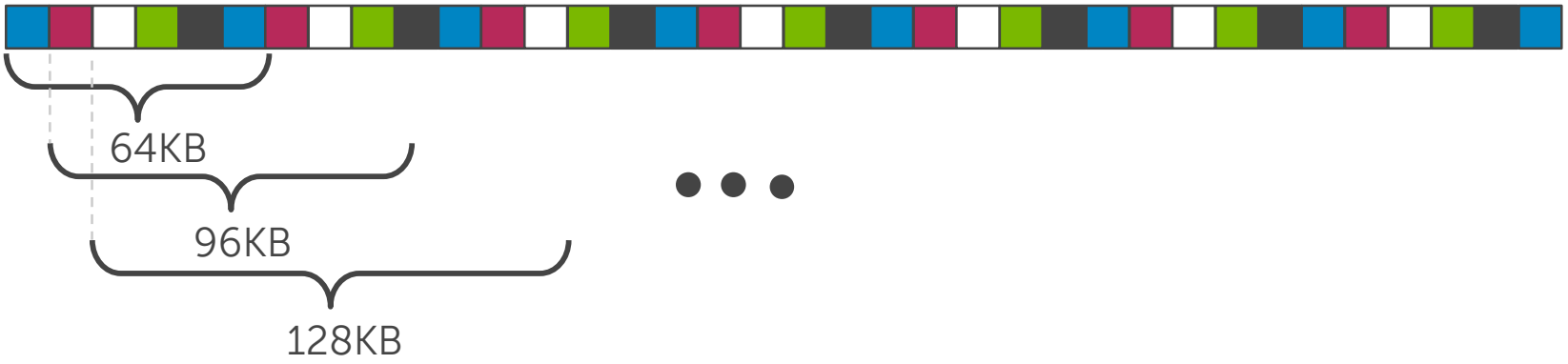
OBJECTIVE

Maximize capacity usage while increasing return on investment.

FluidFS uses differentiated approach to dedupe

Sliding window, variable block dedupe

- Advanced algorithms to determine chunk size based on data patterns
- Dedupe engine crawls file, looks for 128KB +/- 64KB chunks

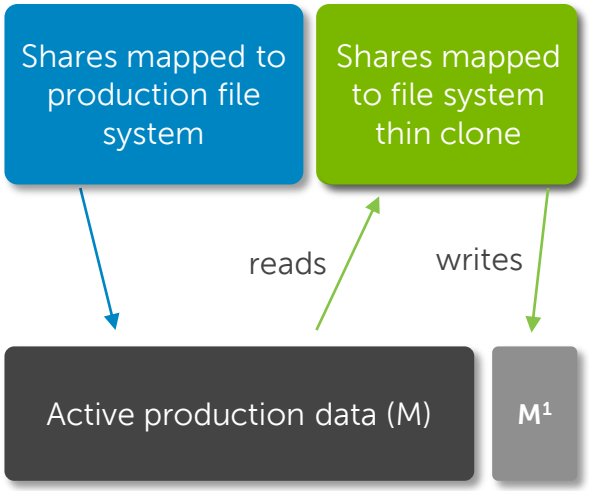


- Results in better deduplication ratios than SIS or fixed-block dedupe
- Good for unstructured data environments

Thin volume cloning: efficient application and DR testing

How it works

- Take a snapshot of a volume or file system
- Create a separate file system metadata structure, presenting a virtual copy of the file system to users by mapping new shares/exports
- Write to the clone via the new shares/exports captured separately

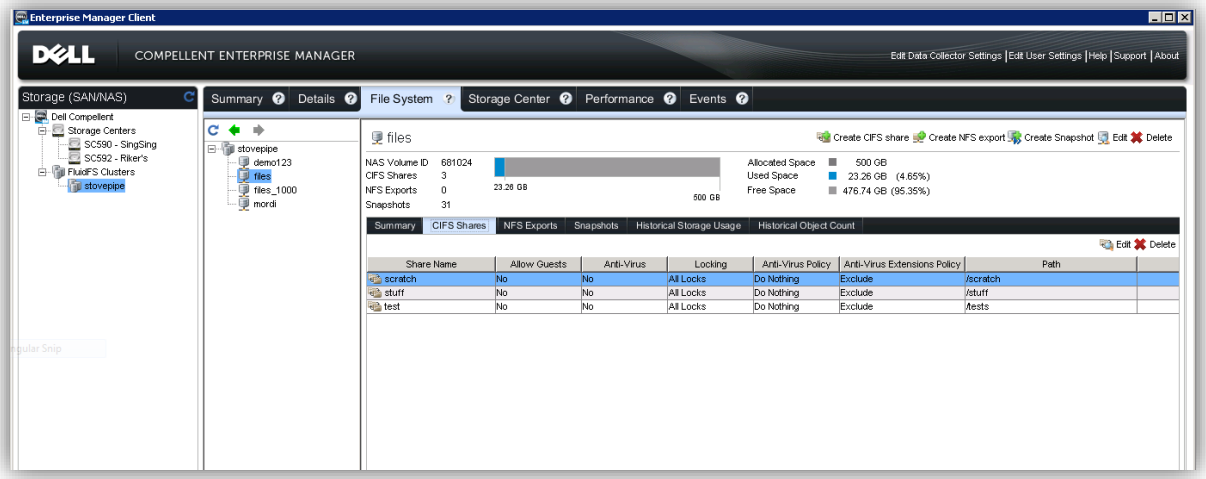


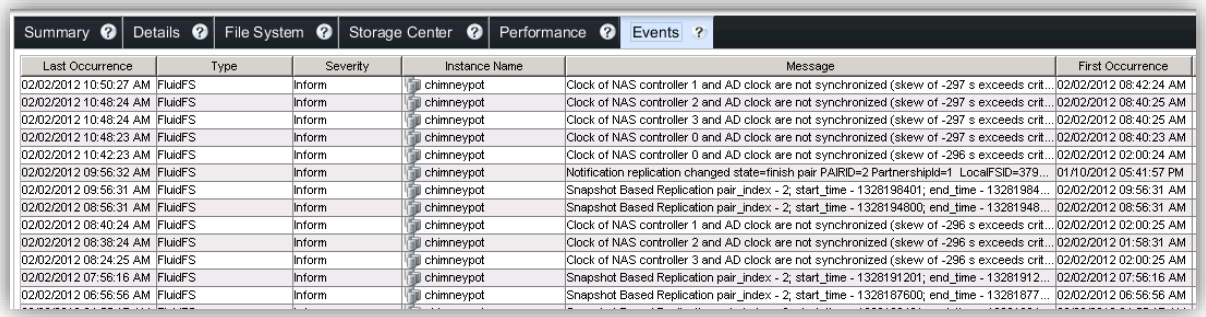
Benefits

- No space is consumed until data is modified (aka "thin clone")
- Enables code and workflow testing against non-production data sets for applications and DR procedures

Manage entire platform through a single interface

- Configure, deploy and manage from a single interface
- Phone Home proactively monitors entire storage ecosystem
- More robust reporting for file activities





FS8600 current tested/validated values

Max values	Single appliance (2 controllers)	4 appliances (8 controllers)
Max system size	4PB	4PB
Max file size	10TB	10TB
Max number of files	64 billion	128 billion
Max file name length	255 bytes	255 bytes
Max number of directories	34 billion	68 billion
Max directory depth	512	512
Max NAS volumes	256	1,024
Max snapshots per volume	512	512
Max snapshots per cluster	10,000	10,000
Max replication policies	100	100
Max NFS exports	1,024	1,024
Max CIFS shares	1,024	1,024
Max quota rules (user quotas)	100,000	100,000
Max quota rules per volume	512	512

Growing list of third-party certifications

ICAP Antivirus

- Symantec ScanEngine 5.2
- Symantec Protection Engine for Cloud
- McAfee Virus Scan Enterprise and Enterprise for Storage
- Sophos Endpoint Security and Control
- Trend Micro InterScan Web Security Suite

Other certifications

- Mezeo – secure file sharing solution
- Ippany – cloud storage solution
- Merge, Agfa, McKesson – medical

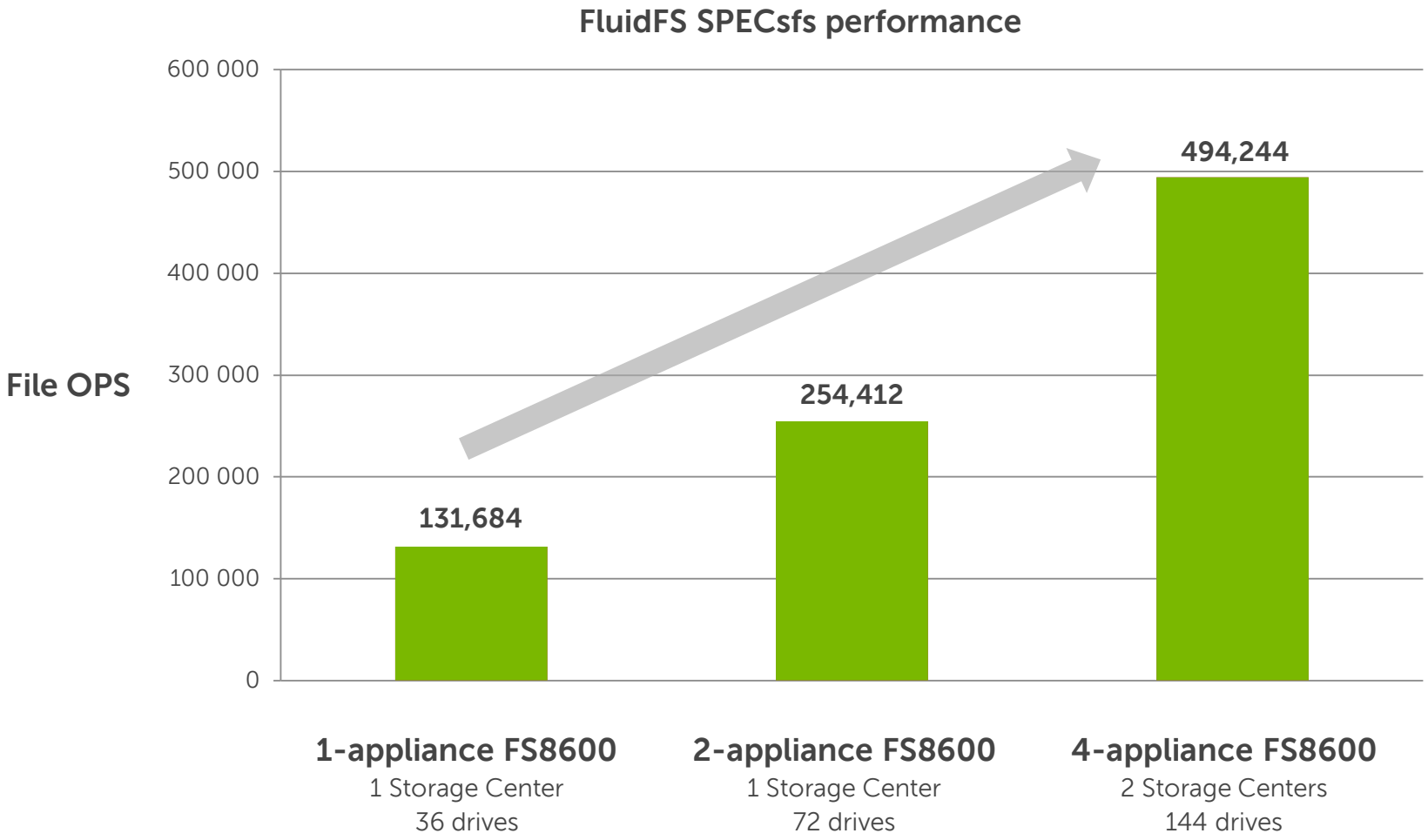
NDMP Backup

- Quest NetVault Backup 9
- CommVault Simpana 9.x
- Symantec NetBackup 7.x
- Symantec Backup Exec 2010R3 & 2012
- Tivoli Storage Manager 6.3
- CommVault Simpana 10.x
- EMC Networker
- HP Data Protector
- ARCserve

Dell - Internal Use - Confidential

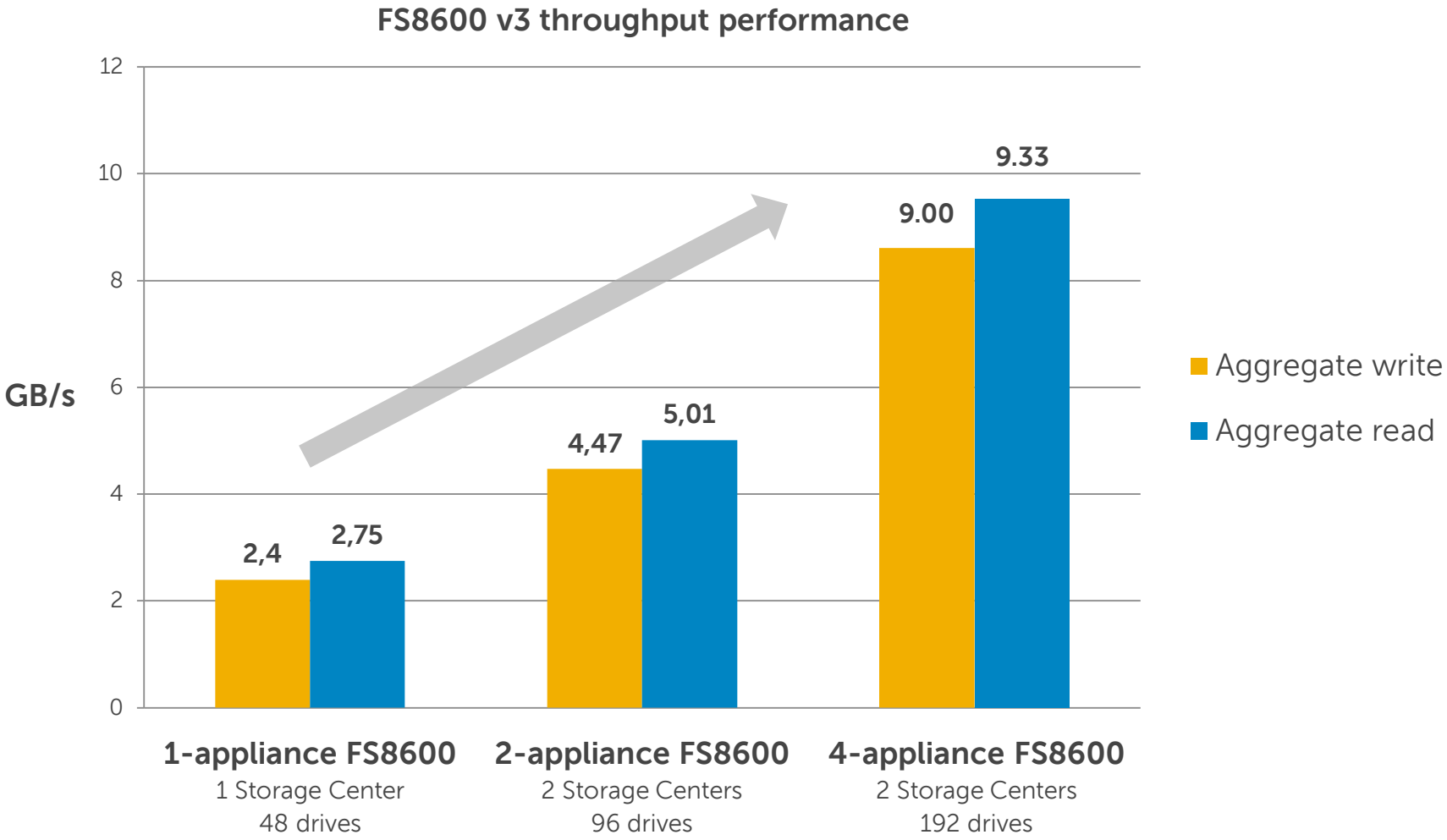
FS8600 performance observations

FS8600 demonstrates linear file OPS scalability



Read an analysis of our SPECsfs submission here.

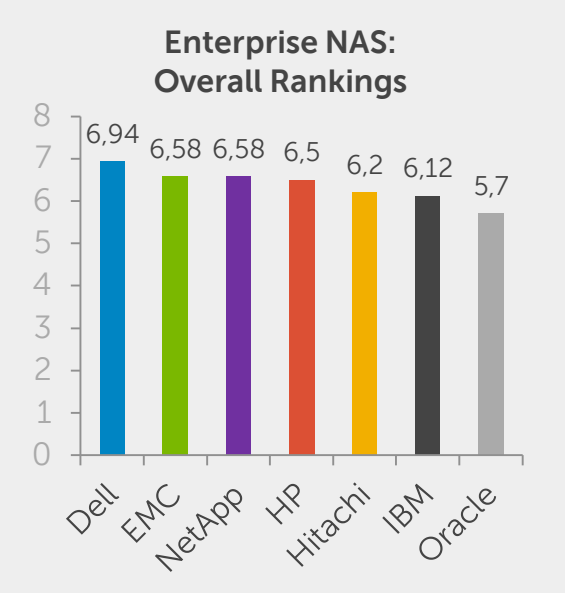
FS8600 demonstrates linear throughput scalability



2014 Storage Magazine NAS Quality Awards

Dell rated #1 enterprise NAS: Users give FluidFS top honors in all five categories.

- **#1** initial product quality
- **#1** product features
- **#1** product reliability
- **#1** tech support
- **91%** of customers would buy again



2nd highest overall enterprise NAS rating ever.

"Dell cruised through the enterprise group."

SC Series
System Center 6.5 Overview

Fluid Cache for SAN

- Extend industry leading auto-tiering to servers
- Dramatic reduction in latency though high speed PCI cache in server

Compression

- Ocarina compression algorithms reduces system impact
- Post processing of Tier 3 data provides deep data archives
- Enables more snapshots

Synch Live Volume with Failover

- Support for synchronous, as well as asynchronous Live Volume
- Sub 5 minute RTO & zero RPO
- Supports manual failover

Encryption

- Data at rest encryption using Self-Encrypting FIPS Drives
- Secure erase capabilities by array or drive
- Meets FIPS 140-2 certification

100% Greater Capacity

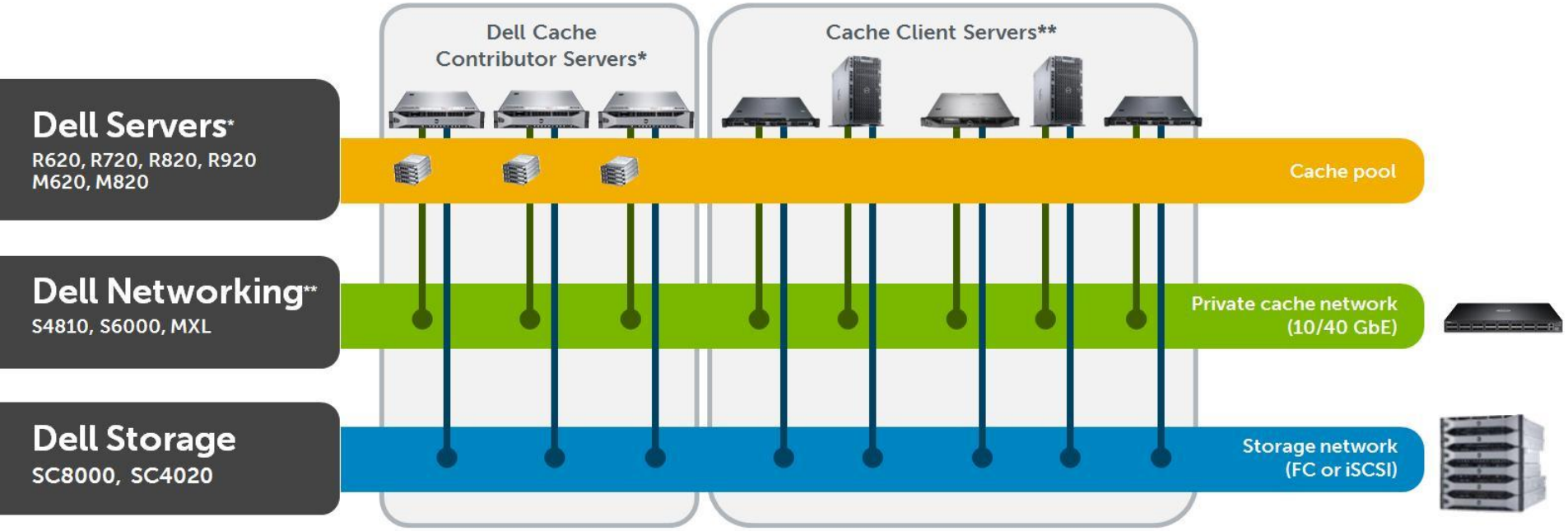
- Up to 3.1PB raw, 2PB Addressable

VLAN Multi-Tagging

- Offers data & security separation between network traffic
- More flexibility via individualized quality of service across VLANs

SC Series

Fluid Cache for SAN Bring data closer to compute…



71% Less cost per user

99% database response time improvement

Over **5 million** IOPS!

*works with non Dell servers

** Includes support for Nexus 5548UP

num of 3 validated Dell servers are required to establish the cache pool.
e client servers can be a mix of Dell and other servers that run a supported
have an available PCIe slot.

The power to do more