

DELL STORAGE CENTER ACHIEVES GREATER THAN FIVE NINES AVAILABILITY AT MID-RANGE COST

OCTOBER 2015



Dell Storage SC Series achieved a five nines (5 9s) availability rating years ago. Now the SC Series is displaying 5 9s and greater with technologies that are moving availability even farther up the scale. This is a big achievement based on real, measurable field data: the only numbers that really count.

Not every piece of data requires 5 9s capability. However, critical Tier 1 applications do need it. Outage costs vary by industry but easily total millions of dollars per hour in highly regulated and data-intensive industries. Some of the organizations in these verticals are enterprises, but many more are mid-sized businesses with exceptionally mission-critical data stores.

Consider such applications as e-commerce systems. Online customers are notorious for abandoning shopping carts even when the application is running smoothly. Downing an e-commerce system can easily cost millions of dollars in lost sales over a few days or hours, not to mention a loss of reputation. Other mission-critical applications that must be available include OLTP, CRM or even email systems.

Web applications present another HA mission. SaaS providers with sales support or finance software can hardly afford downtime. Streaming sites with subscribers also lose large amounts of future revenue if they go down. Many customers will ask for refunds or cancel their subscriptions and never return.

However, most highly available 5 9s systems have large purchase prices and high ongoing expenses. Many small enterprise and mid-sized business cannot afford these high-priced systems or the staff that goes with them. They know they need availability and try to save money and time by buying cheaper systems with 4 9s availability or lower. Their philosophy is that these systems are good enough. And they are good enough for general storage, but not for data whose unavailability quickly spirals up into the millions of dollars. Buying less than 5 9s in this type of environment is a false economy.

Still, even the risk of sub-par availability doesn't raise the money that a business needs for high-end availability systems. This is where the story gets very interesting. Dell Storage SC Series offers 5 9s and higher availability – and it does it at a mid-range cost. Dell does not sacrifice high availability architecture for a lower CAPEX and OPEX but also provides dynamic scalability, management simplicity, redundant storage, space-saving snapshots and automatic tiering. Thanks to the architecture behind Dell Storage SC Series, Dell has achieved a unique position in the high availability stakes.

Taneja Group Findings

Two years ago, Taneja Group audited Dell's findings of the SC Series' high availability numbers. In developing availability statements, most storage vendors use theoretical calculations based on statistics. Dell has always used a more robust approach. They leverage field data using their Copilot Support Phone Home database and information from the QA teams. Using field data supports a more valid claim for availability, and we verified that Dell Storage SC Series does achieve 5 9s availability.

This year Dell asked us to audit their new field test findings. Dell's tracking numbers came straight from customer data. We took Dell's numbers and analyzed them to find proof of Dell Storage SC's 5 9s availability. Our findings? That the analysis proved once again, with even more confidence, that Dell Storage SC achieves 5 9s availability.

Over a six-month time period from August 2014 to January 2015, Dell ran a series of availability tests on dual-controller Dell Storage SC Series SANs. They did not cherry pick only the newest models but included series 20, 30, 40 and SC8000. These systems include four generations of controllers. All systems included dual controllers, single or multiple disk enclosures, disks and HBAs. Dell tested availability a run time total of 67.3 million hours. Actual run hours were based on active systems running 24/7.

Dell calculated its Weighted Failure Rate Analysis on Mean Time to Repair (MTTR). They included two repair types: non-hardware that did not need a part, and hardware that did. The percentage of non-hardware and hardware failures was similar: 48% for non-hardware and 52% for hardware. Unsurprisingly, non-hardware repair was faster at a weighted average of 1.92 hours. Hardware failures, which by definition required parts, averaged a weighted 6.24 hours. Dell totaled a weighted MTTR average of 8.16 hours to return a system back to an available state.

Dell used its Copilot CRM Incident data to run its Availability Analysis, expressing results as mean time between failures (MTBF). Across the entire test environment, Dell recorded 69 availability failures occurring within 67,368,840(67.3 million) runtime hours. Dell recorded 1.02 failures per hour during 67,368,840 actual run hours. This means that Dell Storage SC Series averages 976,346 hours between failures, for a year-long failure rate of 0.008. Adjusting for an MTTR of 8.16 hours of downtime, Dell achieves 99.999% availability.

Note that Dell included its scheduled downtime time on its detailed reports, not simply unplanned downtime. This matters because Dell's unique approach can perform storage tasks even during system downtime.

How Dell Does It

How did Dell achieve these high availability ratings, and how does it do it at a reasonable cost? First, Dell Storage SC Series virtualizes its storage and storage management features across entire SANs. Features do not depend on particular SANs, specific drives or RAID types. And its modular architecture flexibly supports scaling and technology refreshes.

The SAN tracks information about every data block on the system. Metadata includes dates and times, access frequency, volume identities, flash or disk, and RAID levels. Performance and capacity are easily scalable: simply add new I/O cards or drives.

Tiering works on the sub-LUN level. Default block sizes are 2MB but blocks can also be 512 KB or 4 MB. In any case, the blocks are deliberately very small for fast and highly flexible tiering. Admins can build tiering policies governing single or grouped LUNs, including multiple LUNs within a

group. Data migration is built-in and posits a 3-tier structure with different available RAID settings on each tier. Application requests receive priority so migration will not impact performance.

Beyond 5 9's: Availability and Reliability

Highly available storage arrays rely on a wide variety of technologies to deliver five nines or greater availability. These include:

1. Selecting and using the highest quality components for both mechanical and electrical parts for controllers, memory, flash drives, hard disk drives, and other components.
2. Using redundancy and sparing such that a component failure has no impact on the running of the systems.
3. Using hot swap-out technologies that allow a component to be swapped out without bringing the system down.
4. Using replication technologies so that data is available in multiple locations
5. Failover technologies that allow for applications to access data from another location when the primary data is unavailable, for whatever reason.
6. Workload balancing software to minimize any portion of the system from getting over extended (and prone to failure).
7. Other innovative measures that are typically the secret sauce from each vendor.

Our audit indicates that Dell Storage SC Series uses all of the above techniques to achieve availability in excess of 5 9s. At the risk of repetition, these technologies are not simply designed for unplanned downtime but even come into play during planned downtimes, such as that typically experienced during software or hardware upgrades or maintenance.

LIVE VOLUME – KEY TO APPLICATION ACCESS

5 9s is an important measure for predicting uninterrupted storage access. But it does not answer the crucial business continuity question: when storage access is interrupted, do users lose access to applications? In most environments, users will lose access until failover occurs or until the downtime event resolves.

In contrast, Dell Live Volume bridges the gap 5 9s availability and near-continuous application access. Live Volume creates a fault tolerant environment that automatically protects the SC Series from IO interruption and data loss due to downtime – planned or unplanned.

Live Volume creates a virtualized layer between paired Dell Storage SC Series across a metro or campus. Applications never lose host storage access even when one of the storage arrays is offline: the systems automatically failover to one other with no IO loss. The movement is entirely transparent to the end-user. IT will know, of course – they either plan downtime and simply switch control to the secondary system, or they are alerted that Live Volume has done it for them in case of unplanned downtime. Once the failover event is over, IT promotes the secondary back to the primary. The downtime event has no impact on end-users.

Reliability adds another dimension to availability. Live Volume ensures reliability by automatically distributing workload IOs across clusters and aggregated arrays, and by working with the Dell Storage Center OS to replicate data between Live Volumes. SC Series Volume Advisor proactively

monitors data placement and storage optimization throughout all arrays, and recommends actionable intelligence to administrators. And Storage Center's modular architecture ensures reliability with hot hardware swapping and software upgrades, self-monitoring tools and no single point of failure.

In addition to Live Volume's availability and reliability, the SC Series also simplifies, streamlines and secures systems.

- **Simplified management keeps administration consistent and streamlined.** Traditional 5 9s availability systems are prone to management complexity. Even though the systems stay highly accessible, companies must devote full-time staff to running them. Going beyond 5 9's does not have to mean great complexity – it can mean a great deal less. Dell Storage SC Series provides a single management interface for simplified full-time monitoring, alerts and remediation.
- **Storage efficiencies save money on storage purchases.** Dell Storage SC Series also automates the intensive data tiering process across storage pools. The Data Progression tool automatically tiers data across multiple SANs, tiers and RAID levels; and automatically places all write transactions and frequently accessed data on high-performance media. Space-efficient snapshots consist of the original data write and subsequent changes-only, which saves significant space while providing near-continuous protection. This maintains very high write performance even on older blocks stored on slower tiers, and even your oldest data stored on Dell Storage SC Series remains highly available and writeable.
- **High security protects data against loss.** Securing data against loss is another component of availability. Dell's self-encrypting drives (SEDs) freely mix with non-SEDs in the same disk, enclosure or array. Dell engineers the SEDs with FIPS 140-2 security level 2 standards to meet the highest governmental encryption requirements for resting data. IT flexibly assigns encryption levels by regulatory requirements and data priority, and an external key manager protects data against loss.

Taneja Group Opinion

Even 5 9s storage can fail because storage components fail. With Dell Storage SC, applications remain highly available even if a SAN fails. Essentially storage becomes a non-issue, which is exactly what you want from a well-designed storage array. This is a game-changer in the market for near-continuous storage systems.

This changes the traditional measure of availability, particularly in a mid-sized affordable system. Because even with its extended availability, Dell's pricing is considerably lower than most other 5 9s vendors. Dell is priced for the mid-range without compromising system and application availability, not to mention security and performance.

Businesses need high availability to protect these mission-critical applications but not all of them can afford high-priced HA systems. It is this segment of mid-range customers who are Dell's sweet spot. Dell provides low cost, simplified management; 5 9s system availability; and near-continuous application access with innovative technologies like Live Volume and Data Progression. The Taneja Group validated this for the second time, this time with systems aggregating more than 6 million hour run times.

This combination of high availability/reliability and mid-range price is a rare thing and a big achievement. We are confident the numbers speak for themselves.

NOTICE: The information and product recommendations made by Taneja Group are based upon public information and sources and may also include personal opinions both of Taneja Group and others, all of which we believe to be accurate and reliable. However, as market conditions change and not within our control, the information and recommendations are made without warranty of any kind. All product names used and mentioned herein are the trademarks of their respective owners. Taneja Group, Inc. assumes no responsibility or liability for any damages whatsoever (including incidental, consequential or otherwise), caused by your use of, or reliance upon, the information and recommendations presented herein, nor for any inadvertent errors that may appear in this document.