MORE THAN AN EXERCISE: DELL COMPELLENT STORAGE CENTER AND FIVE NINES AVAILABILITY

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“Five nines” is an engineering expression of 99.999% uptime within one year, for a grand total of 5.26 minutes of downtime in a year. Five nines storage systems generate this level of availability to businesses that must be always-on, especially in highly utilized systems. Enterprise environments serving critical data are the primary customers of five nines storage systems. However, the need for five nines availability for mid-sized and large businesses is growing, although the majority of proven five nines offerings have big price tags and high operational costs due to complexity.

Outage costs vary by industry but in the case of financial services, retail, ecommerce, resources exploration, transportation and broadcasting, downtime costs can easily total millions of dollars per hour. Some of the organizations in these verticals are enterprises, but many more are mid-sized businesses with exceptionally high-growth, high-volume, and critical data stores. Many will try to save money and time by purchasing simpler and less available systems on the philosophy that the systems are good enough. They’re not. When a mid-sized business avoids five nines in the name of cost or complexity, they will fall behind. The revenue impact on a business in revenue impact can be huge.

Five nines availability is not at all restricted to the enterprise. Businesses of all sizes, from cost conscious mid-size to larger enterprises, frequently need five nines availability. At the same time they also require cost-effective CAPEX and OPEX. Dell has already stepped in to this market with the five nines Compellent Storage Center. Their test results are impressive and illustrate how seriously Dell takes the need for cost-effective yet highly available storage for businesses. This Opinion will briefly discuss what five nines means to high availability, what availability means to business success, how Dell Compellent Storage Center has achieved five nines, and what that means to IT and business users.

WHY FIVE NINES MATTERS – A LOT

Five nines refers to five literal nines expressed as an uptime percentage: 99.999%.

<table>
<thead>
<tr>
<th>Nines</th>
<th>Uptime %</th>
<th>Downtime per Year</th>
<th>Downtime per Week</th>
</tr>
</thead>
<tbody>
<tr>
<td>one nine</td>
<td>90%</td>
<td>36.5 days</td>
<td>16.8 hours</td>
</tr>
<tr>
<td>two nines</td>
<td>99%</td>
<td>3.65 days</td>
<td>1.68 hours</td>
</tr>
<tr>
<td>three nines</td>
<td>99.9%</td>
<td>8.76 hours</td>
<td>10.08 min.</td>
</tr>
<tr>
<td>four nines</td>
<td>99.99%</td>
<td>52.56 min.</td>
<td>60.48 sec.</td>
</tr>
<tr>
<td>five nines</td>
<td>99.999%</td>
<td>5.526 min.</td>
<td>6.048 sec.</td>
</tr>
</tbody>
</table>
The chart demonstrates that although the decimal difference may seem negligible, it is not. 2 9s for example means 3.65 *days* of downtime in a year, averaging out to 1.68 unavailable hours a week. For planned downtime on Tier 2 backup systems or in a slower computing environment, this might be acceptable. But for high-growth active data it is completely unacceptable.

In contrast, five nines returns an average yearly downtime of about 5 *minutes*. Let’s look at what near-permanent uptime means to the business computing environment.

**#1. High availability.** It has been a common practice to take down storage systems in order to add new components, run firmware upgrades and install applications. IT simply planned downtime late in the day or over weekends so end-users were not affected. But now that primary storage systems operate globally 24x7, planned downtime is a luxury that business cannot afford. A highly available system will allow hot hardware swapping and software upgrades, self-monitoring tools, no single point of failure and transparent failover.

**#2. Optimized performance.** Highly available systems optimize business applications with flexible systems that can accept different drive types and network interconnects. This allows IT to optimize performance to different applications and end user requirements. Additional performance factors include fast data I/O processing.

**#3. Data protection.** Five nines availability also provides fully protected and accessible data. Nowhere is this more important than primary systems serving high-value business applications. These systems need snapshot technology optimized for capacity and fast recovery, and replication that accelerates data copy and restore from remote storage targets. Another critical factor is spreading workloads across multiple drives for high performance and continuous availability.

**#4. Efficient management.** Storage systems are complex and five nines uptime requires simplified and highly automated management tools. A single interface providing clear visibility is key and includes full-time monitoring, alerts and remediation. This allows storage administrators to cost-effectively maintain system performance and uptime even in the most I/O-intensive environments.

**#5. Cost efficiency.** A number of businesses avoid five nines availability storage products because of the perceived high cost. However, storage vendors usually achieve five nines performance by building in high performance features that operate with fewer drives and at a lower energy cost. Storage virtualization that creates an efficient central pool, thin provisioning for disk savings, and tiered storage for long-term storage on low-cost drives: all of these capabilities save money throughout the storage system’s lifetime.

**Dell Compellent Storage Center Tests Five Nines Performance**

Dell has stated from the beginning that Storage Center was designed to meet five nines. This completed study demonstrates that Compellent has met that criterion and more. Dell Compellent ran detailed tests on Storage Center, its highly automated and virtualized disk pool for block data. Note that these are not theoretically calculated or extrapolated availability numbers. They are based on real, measured, field data; the only numbers that matter. We find that the sample size was large enough to warrant statistical validity, and upon carefully reviewing the numbers we can corroborate that the data is accurate.

Another very important consideration is that many vendors actually exclude scheduled maintenance downtime from their five nines claims. Frankly we find that unacceptable. Downtime is downtime, scheduled or not. Dell included its scheduled maintenance time on its detailed reports. The maintenance time did not affect their five nines results, since Dell’s unique hardware approach
can perform traditional tasks online that would normally have required downtime. This includes component upgrades.

Dell also recorded actual failures using its proactive monitoring and support application Copilot. Copilot Incident Data collected all failure and remediation reports from tested systems throughout the run-time period. Dell calculated actual Mean Time between Failures (MTBF) using a run time total of more than 26 million hours accumulated across thousands of systems, over a 6-month period. Dell did not merely put together their largest storage model using top of the line equipment. Instead they tested using a variety of Storage Center configurations, including combinations of dual controllers, disk enclosures, disk types, switches and HBAs. The data was drawn from Compellent dual controller systems comprised of Series 20, 30, and 40 controllers.

Dell also calculated an estimated weighted average of Mean Time to Repair (MTTR) when Dell parts and/or support services are required. The MTTR represents the time to return a system back to an available state. MTTR times varied according to the individual customer service level agreements (SLA): 7.2 hours for a 12-hour part dispatch + 1.5-hour-to-reboot SLA, and 4.5 hours for a 4-hour part dispatch + 1.5-hour-to-reboot SLA.

**BENEFITS OF DELL COMPELLENT STORAGE CENTER AND FIVE NINES**

Five nines availability matters because of the benefits it brings to critical data storage. Storage Center matters because it brings those benefits to mid-sized business, which has been under-served by high availability storage systems.

- **Ensure system availability.** Storage Center scales block without disrupting system operations. Sharing capabilities also cuts down on complexity and overhead, which minimizes human error. Its robust hardware architecture and redundant systems ensure against equipment failure. Should a primary system go offline, immediate failover to secondary systems maintains availability without interruption.

- **Optimize application performance.** Storage Center continually optimizes application and data performance as the system grows. Flexible memory and connectivity choices suit differing application requirements, while virtualizing workloads across spindles preserves performance and availability and protects hardware.

- **Protect data.** Disasters happen even to robust hardware, which is why five nines must include built-in redundancy and resilience. Storage Center ensures business continuity with features like Data Instant Replay’s space-efficient snapshots for instantaneous and fully consistent restore. Remote Instant Replay’s snapshots synchronize and restore data from multiple locations. Dell has optimized Storage Center’s data management and protection capabilities for available bandwidth.

- **Manage efficiently.** Five nines availability should not be predicated on intensive and continuous IT overhead. A common, intuitive user interface replaces heavy IT management overhead with automated tools, reporting and remediation. Ongoing energy costs are also an issue with highly available systems, and energy costs for storage are very high. Storage Center is purpose-built for energy efficiency. For example, energy-saving power supplies and efficient drive technology generate far less heat than competing systems.

- **Automated tiering.** Dell’s Data Progression technology tracks data usage patterns so it can automate data tiering accordingly. Active blocks remain on high-performance drives while less active data migrates to lower cost, high capacity SAS drives. This allows Dell to deliver five nines availability, optimize performance, and decrease management overhead at a very low cost.
TANEJA GROUP OPINION

Dell Compellent’s five nines testing will help to convince IT of Storage Center’s exceptional availability. Instead of trusting theoretical data or excluding scheduled maintenance, IT can take the test results and make the business case for a five nines storage system that business users can understand: high capacity and performance, deep scalability, manageability, application performance, and robust data protection.

Since Storage Center was previously positioned as a mid-size array, there was some question if Compellent could truly deliver five nines in such an array. That mystery is over. Customers can confidently implement their mission critical applications with the Storage Center at the heart of it, knowing that their storage availability is rock solid.

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