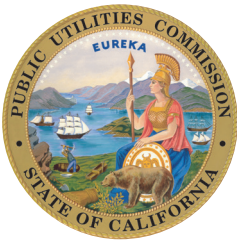# We Broke the 80% Barrier to Reach Nearly Total Virtualization

KEY HIGHLIGHTS

Industry
Government / Public Sector

The Solution
- Two four-node SF2405 clusters that support VMware® and Microsoft® SQL workloads
- Virtualize last 20% of workloads
- Reduce footprint from 21U to 4U
- Improve performance 25% to 30%
- Scale-out architecture enables granular growth

Benefits
- Scale-out
- High availability
- Deep VMware integration
- Guaranteed performance

The California Public Utilities Commission (CPUC) regulates privately owned electric, natural gas, telecommunications, water, railroad, rail transit, and passenger transportation companies in order to protect consumers and ensure safe, reliable utility services and infrastructure at reasonable rates. Since its inception in 1911, the CPUC has constantly innovated beyond the era when the most common car on the road was the Ford Model T. Today, the CPUC is a leading-edge organization that models innovation by continually striving for operational efficiencies that save energy, cut costs, and enable better customer service.

How CPUC was able to virtualize what others had not virtualized before

Under new leadership and a mandate to modernize, the CPUC had successfully virtualized approximately 80% of its IT environment on VMware. But that's where the innovation encountered an insurmountable roadblock: performance limitations and the upward-spiraling cost of legacy storage.

Turning to all-flash storage from SolidFire, CPUC virtualized that difficult last 20% of workloads — those with the highest IOPS — by winning the long-elusive trifecta of fast, reliable, and affordable storage.

What this means to CPUC customers

The CPUC is committed to environmental enhancement and a healthy California economy. "We're a regulatory agency for energy, so we need to set an example," said Albert Fuller, Infrastructure Manager for CPUC. "We reduced our physical footprint significantly through virtualization, but that remaining 20% was our pain point. Scale-up storage solutions didn't let us close that gap. SolidFire's scale-out storage is something new that enables us to do what we could not before: approach 100% virtualization."

"SolidFire is one of those upstart companies that makes a real difference because of the way the solution is architected."

Albert Fuller, Infrastructure Manager, California Public Utilities Commission

"With SolidFire, we are able to virtualize applications and databases — and thereby reach our goal of complete virtualization."

Albert Fuller
Infrastructure Manager, California Public Utilities Commission

The Whole Story

As an organization that abhors waste, the CPUC was never satisfied with the inherent compromises of storage solutions it had implemented. "In the world of storage, the general rule has been, there's cheap, there's fast, and there's reliable — and you can choose only two of those at a time," Albert said. "With most storage solutions, you hit a limit or threshold. Performance degrades, it's slow, and you need to buy another unit or upgrade to the next model. It's not just money you're investing, it's time; it takes hours to move data. Those are serious drawbacks of a scale-up design."

The Solution

The CPUC evaluated a number of solutions from a variety of leading vendors to continue to reduce its storage footprint while increasing efficiency. The agency even endured one disk chassis failure that crashed an entire SAN and caused a days-long data outage. "I was living here for three days trying to recover that," Albert said.

In contrast, SolidFire offered high availability and self healing (the ability to keep running even with multiple, concurrent node failures), as well as a scale-out architecture that addressed the pain associated with refreshing legacy storage technology. "SolidFire's ability to have high availability even if you lose one or more of their nodes — that to me is a big win," Albert said. "In addition, the fact that it can scale out really sold me. SolidFire is one of those upstart companies that makes a real difference because of the way the solution is architected."

> "In storage, there's fast, cheap, and reliable — before SolidFire, you could only have two of those at a time."
> Albert Fuller, Infrastructure Manager, California Public Utilities Commission

SolidFire delivers linear scalability of both capacity and performance without ever requiring data migration or full-scale generational upgrades. Initial implemen-tations begin with a simple four-node / 4RU cluster configuration and scale out via 1U node increments to add performance and capacity resources as business needs dictate. New nodes are simply added to the established cluster without disrupting service, while data is automatically redistributed in the background across all nodes in the cluster with no rebalancing, restriping, or volume re-allocation required. Volume-level Quality of Service (QoS) settings remain enforced because within a SolidFire storage array, performance and capacity are presented as independent unified pools, both of which can be changed on-the-fly without migrating data or impacting performance. SolidFire's QoS settings thus eliminate resource contention and variable application performance.

"The biggest benefits we get from SolidFire are guaranteed IOPS and the ability to scale out," Albert said. "All I need to do is add another node, which is significantly cheaper than upgrading to a newer model. SolidFire gives me the performance and capacity I need without breaking the bank and without the need to move data."

SolidFire integrates with VMware's Storage I/O Control (SIOC), ensuring system-wide, end-to-end, guaranteed performance. After successful proof-of-concept testing, CPUC implemented SolidFire to virtualize its most demanding workloads: Microsoft SQL and the agency's VMware Horizon virtual desktop infrastructure (VDI).

Virtualizing Microsoft SQL Servers

Running SQL servers on legacy storage created significant latency and did not provide the speed and performance CPUC required. SolidFire solved the latency problem and also helped reduce licensing costs. CPUC began virtualizing its SQL servers when Microsoft started requiring that all cores be licensed. "For every SQL server that an application needed, we would end up buying more

"SolidFire enabled us to tackle our pain point: virtualizing that last 20% of high-IOPS applications."

Albert Fuller
Infrastructure Manager, California Public Utilities Commission

licenses," Albert said. "SolidFire helped because we create a virtual cluster for SQL servers. It saves us licensing costs, and performance-wise, it works very well."

Retiring a half rack from its legacy storage solution, CPUC reduced its footprint from 21U to 4U.

Eliminating VDI boot storm

SolidFire also enabled VDI to become a reality at CPUC. The agency runs offices in San Francisco and Sacramento that employ remote workers and consultants. A pre-SolidFire attempt at implementing VDI had failed miserably, unable to deliver the required performance and rendering its virtual desktop environment unusable. Storage performance was just too slow. Now CPUC has virtualized 60 desktops in San Francisco and plans to scale to 150 desktops there, as well as expand to a second site in Sacramento. Even with 150 desktops, CPUC will not be exhausting the capacity of its San Francisco cluster. SolidFire's scale-out architecture natively supports in-line data reduction without performance impact. Block-level

de-duplication, compression, and thin provisioning reduce data footprints to provide more usable capacity while eliminating hot-spots and performance vs. capacity trade-offs. While creating a new tracking application, CPUC created a datastore in SolidFire with outstanding results. "We're seeing performance improvements of 25 to 30%," Albert said.

Delivering capacity for additional workloads

While for licensing reasons the SolidFire clusters supporting SQL remain dedicated, other clusters support mixed workloads and thereby increase utilization. "We're going to push this, see how far it can go," Albert said. "If you're a regulatory agency for California, you have to practice what you preach: reduce your data center footprint and conserve energy."

For example, CPUC has placed its SolarWinds monitoring software on SolidFire. The previous disk storage solution required weekly reboots. To date, SolidFire has gone four weeks without a reboot. Additional workloads migrating

to SolidFire include a new inhouse application for content management — something the previous solution could not handle. "This is going to be a big test for SolidFire, because one of the components of the system is a physical server to do the indexing of millions of documents. We tried it before using our legacy storage solution, and it failed."

With SolidFire, CPUC gained a fast, reliable, and cost-effective storage solution that eliminates latency, performance degradation, and the need for resource-intensive scale-ups. Having overcome barriers to full virtualization, the agency runs its existing applications more efficiently, with better access and visibility, and deploys new ones that improve service to both internal and external customers.

SolidFire also delivered a surprise advantage: true ease of use. "I was amazed at how easy it is," Albert said. "I did not even have to read a manual to create a datastore. I was able to do what I need based on the user interface. I really love that interface!"

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