VDI PERFORMANCE COMPARISON: DELL POWEREDGE FX2 AND FC430 SERVERS WITH VMWARE VIRTUAL SAN (ABRIDGED)

DELL™ POWEREDGE™ FX2 SERVER SOLUTION

POWERED BY INTEL® XEON® PROCESSORS E5-2650 v3

A cost-effective shared storage compute solution

72% more users

91% less space

versus a legacy Cisco UCS® B200 M2 blade solution using a traditional SAN

The rapid adoption of virtual desktop infrastructure (VDI) across enterprises is forcing IT admins to rethink the way they equip their datacenters. Server performance, efficient use of space, cost-effectiveness, and ease of management all come into play as companies seek to maximize their investment. The legacy servers and complex storage solutions that once adequately supported VDI are no longer the best approach. Upgrading from an older solution to a new Intel Xeon processor E5-2650 v3-powered Dell PowerEdge FX2 solution using VMware Virtual SAN can allow you to support more users, reclaim valuable rack space, and gain enormous flexibility in your storage.

In the Principled Technologies (PT) labs, we tested two VDI solutions to find the number of virtual sessions each solution could support: (1) a Dell PowerEdge FX2 with Dell PowerEdge FC430 server sleds and FD332 storage using VMware Virtual SAN and (2) a five-year-old legacy Cisco UCS B200 M2 blade solution (first released 2010) using a traditional SAN. We found that the Dell solution using FC430 servers and FD332 storage nodes supported 400 virtual desktop users, while the five-year-old legacy Cisco UCS B200 M2 solution supported only 232 virtual desktop users. That's an increase of 72 percent, achieved in 91 percent less space and with a software-defined shared storage solution that is much easier to set up, manage, and use than traditional storage arrays.

DECEMBER 2014 (Revised)

A PRINCIPLED TECHNOLOGIES TEST REPORT

Commissioned by Dell

Upgrading from an older virtual desktop infrastructure to the Dell PowerEdge FX2 with VSAN and the latest-generation Intel Xeon processors can deliver a dramatic performance boost, support more users, save space, while costing only $176.52 per user based on hardware costs.

OVERVIEW – THE DELL POWEREDGE FX2 ENCLOSURE

The shared infrastructure approach of the Dell PowerEdge FX2 enclosure is scalable and can help you make the most of your data center space while reducing rack space. The Dell PowerEdge FX2 enclosure has a standard 2U footprint and features a modular design that can hold different combinations of compute and storage nodes to meet your specific goals. The PowerEdge FX2 fits four half-width or eight quarter-width compute nodes to increase the compute density in your rack and optimize the space in your data center. You can deploy the FX2 solution like a traditional rack-mounted server while gaining the benefits and features that more expensive dense blade solutions provide. Important features of the FX2 enclosure include:

- Up to eight low-profile PCIe expansion slots
- Two pass-through or optional networking FN I/O Aggregator modules
- Embedded network adapters within the server nodes
- Offers both chassis-based management through the Chassis Management Controller and rack-based management through Integrated Dell Remote Access (iDRAC) with Lifecycle Controller on each compute node

The Dell PowerEdge FX2 enclosure fits a number of server and storage options, including the PowerEdge FM120, FC430, FC630, and FC830 servers, and PowerEdge FD332 storage node – all Intel-powered. For more information about the Intel-powered Dell PowerEdge FX2 solution, visit www.dell.com/us/business/p/poweredge-fx/pd.

THE ADVANTAGES OF THE DELL SOLUTION WITH VMWARE VIRTUAL SAN

Extreme space efficiency

The Dell PowerEdge FX2 solution we tested included four quarter-width Dell PowerEdge FC430 server sleds powered by dual Intel Xeon processors E5-2650 v3 and two half-width Dell FD332 storage units, each of which contained a mix of SSDs and HDDs (see Figure 1).

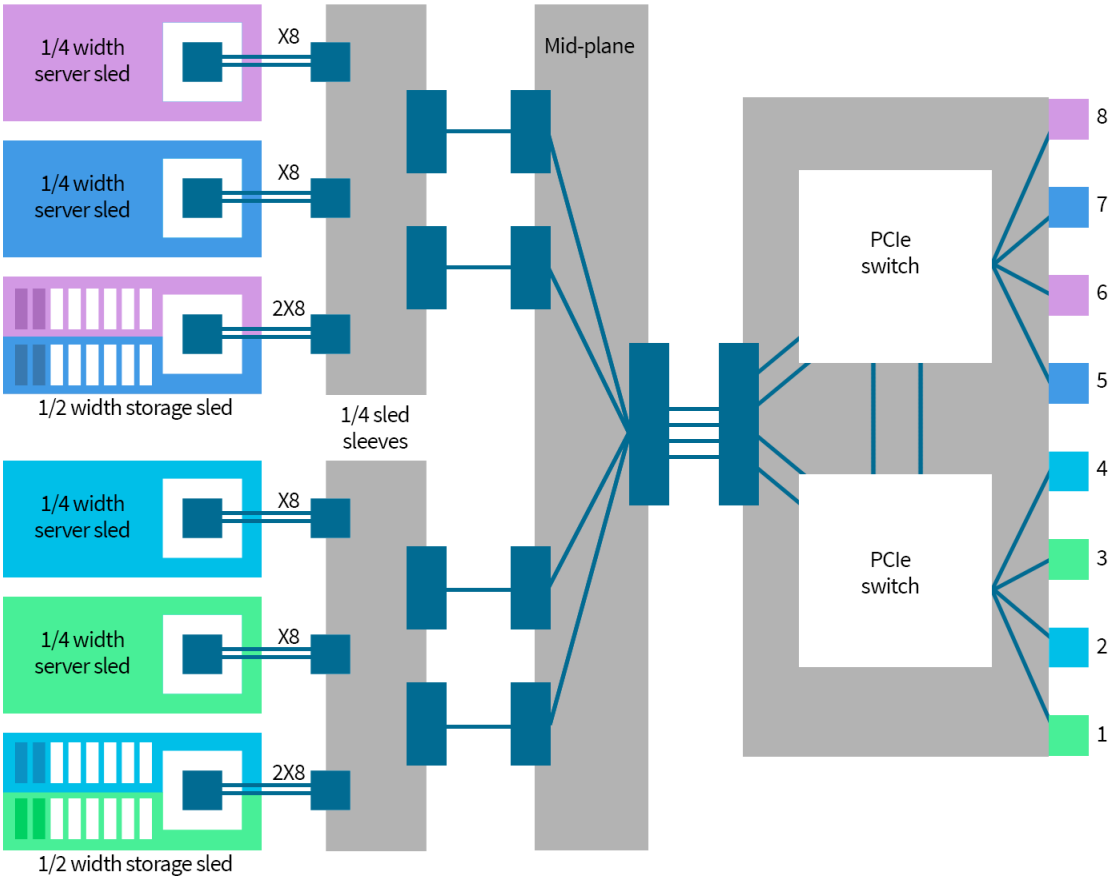

Figure 1: The components of the Dell PowerEdge FX2 solution we tested.

Each of the server sleds have access to eight drives on a corresponding storage unit, and the entire solution, which ran both the VDI workload and VMware Virtual SAN on all four servers for the 400 supported user tests, fits within a single 2U enclosure.

Figure 2 illustrates the extreme space-efficiency of the Dell PowerEdge FX2 solution we tested, which required one-tenth the space required by the legacy Cisco solution. This means you can save significant data center space as you upgrade your VDI infrastructure to meet current needs. Additionally, this has enormous cost-savings potential for your organization in having less hardware to manage, maintain, and having the ability to scale out your VDI infrastructure without having to expand your data

center. We used a mixed of 2.5” and 3.5” disks on the Cisco legacy solution so that both solutions had at least 20TB of raw capacity. The industry-leading SAN solution is close to 23TB raw capacity while the FX2 solution has approximately 30TB of raw capacity.

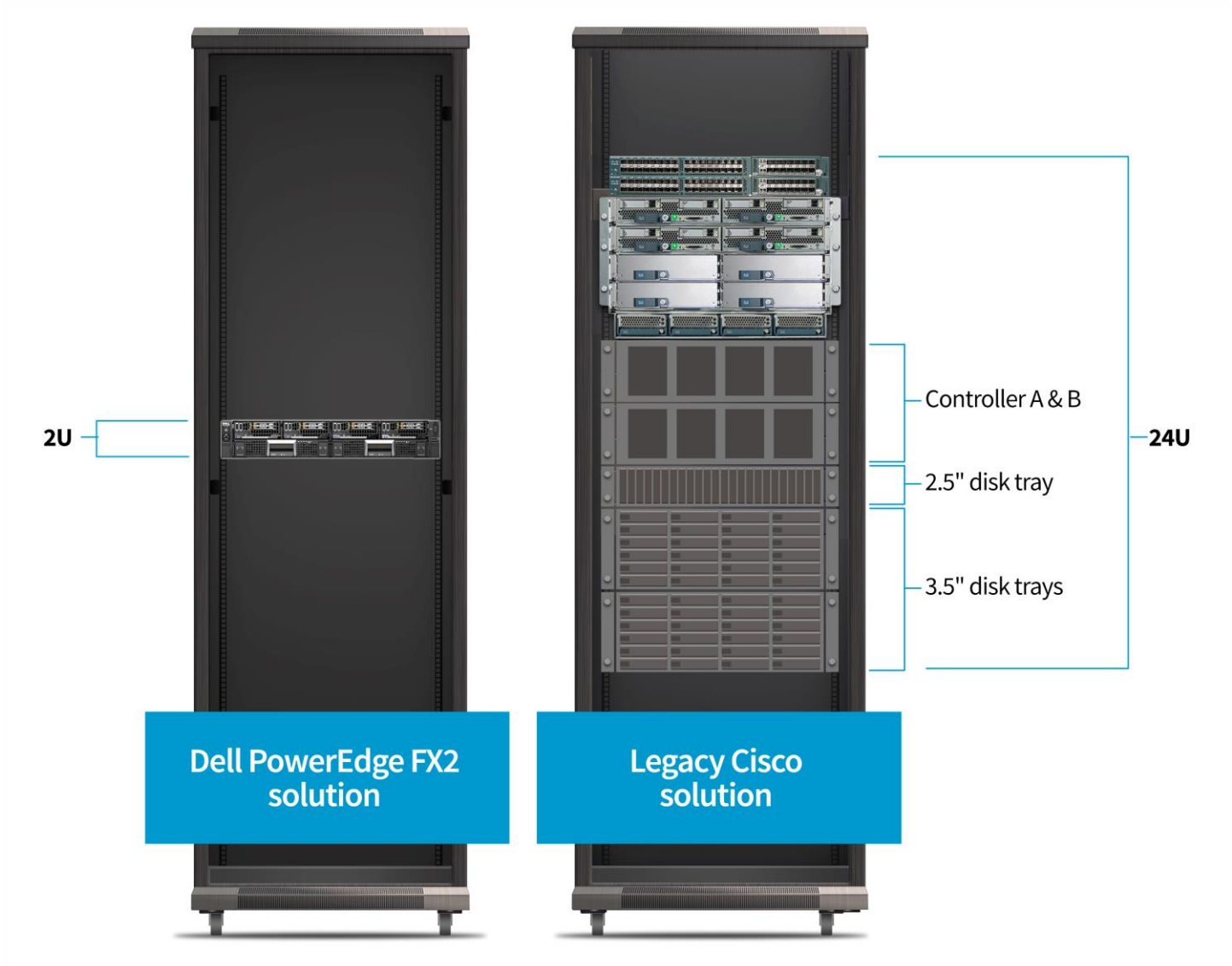

Figure 2: The space requirements of the Dell PowerEdge FX2 solution vs. the legacy Cisco solution.

Simplified network integration

As part of the PowerEdge FX architecture, Dell Networking FN IO Aggregators are designed to simplify FX2 connectivity with Internet Group Management Protocol (IGMP) snooping capabilities and support for multicast traffic, lowering latency and improving VSAN cluster performance. The FN IO Aggregators can manage east-west traffic flows within the IO module for up to four VSAN nodes. This capability allows network administrators to reduce the number of top-of-rack (ToR) switches, 10GbE ports, and cables needed to run server clusters while reducing overall networking cost. For example, a Principled Technologies study found that adding redundant FN IO Aggregators to a Dell PowerEdge FX2 configuration with four Dell PowerEdge FC630 servers saved $24,416 or 28.5 percent on networking costs when compared to HP ProLiant DL360 Gen9 rack servers.

For more details about this networking cost savings study, visit www.principledtechnologies.com/Dell/PowerEdge_FX2_networking_costs_0115.pdf

Easier to configure and manage storage with VMware VSAN

Our solution also used VMware Virtual SAN, a software-defined shared storage solution that allows policy-based provisioning of direct-attached storage on server nodes. It automates many manual storage tasks and offers flexibility that lets companies grow their storage environments as they need to. It uses a flash pool as a read/write storage cache, improving the performance of direct-attached disks. This software-defined shared storage solution automates many manual storage tasks such as disk management, storage optimization, and failure tolerance and offers flexibility that lets companies increase storage capacity by adding more HDDs to new or existing hosts on the fly.

With VSAN, you can maximize VDI density using the existing direct-attached storage without having to invest in external storage solutions. Virtual SAN's simple, easy-to-use design has the potential to increase operational efficiency, saving you both time and money. For more information about VMware Virtual SAN, visit www.vmware.com/products/virtual-san

Superior performance

We compared the VDI performance of the Dell PowerEdge FX2 with Dell PowerEdge FC430 server sleds and VSAN to that of a legacy environment with the five-year-old Cisco UCS B200 M2 blades and a traditional SAN approach to storage. (For more details on the configuration of the two solutions, see the complete version of this report at www.principledtechnologies.com/Dell/PowerEdge_FX2_FC430_VMware_VSAN_VDI_0215_v4.pdf.)

Enterprises looking to upgrade to the latest generation hardware will benefit from moving their VDI workloads from older hardware to the Intel Xeon processor-powered Dell PowerEdge FX2. The comparison in this paper demonstrates the performance benefits of upgrading to the Dell PowerEdge FX2 solution while simplifying storage configuration and saving valuable datacenter floor space. To perform this comparison, we configured the servers—the Dell PowerEdge FX2 using VMware Virtual SAN and the legacy Cisco server using a traditional SAN—with VMware vSphere 5.5, and then we set up a VMware Horizon 6 (with View) virtual desktop pool. Next, we executed VDI testing using the knowledge-worker workload from the Login VSI 4.1 benchmark to determine the VSImax, or total number of users performing a heavy, graphics-intensive workload each solution could support before reaching a failing point. (For the specifics of our testing, see the complete version of this report at www.principledtechnologies.com/Dell/PowerEdge_FX2_FC430_VMware_VSAN_VDI_0215_v4.pdf.)

More sessions supported

We found that the Dell PowerEdge FX2 running a VDI workload on one FC430 servers and using VMware Virtual SAN on all four FC430 servers could host 100 concurrent sessions while retaining a satisfactory user experience. This is 72 percent more than a single legacy Cisco server using a traditional SAN, which could host only 58 sessions before experiencing slow end-user response time due to CPU saturation (see Figure 3).

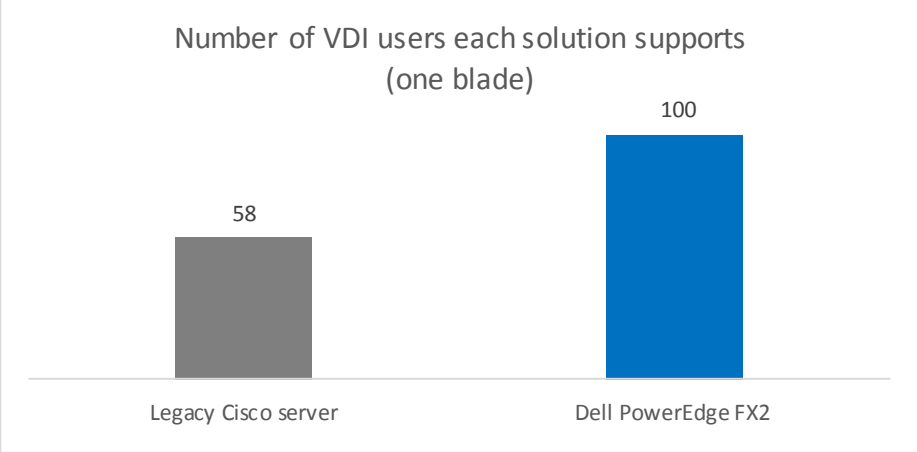

Figure 3: The Dell PowerEdge FX2 running the VDI workload on one FC430 server supported 72 percent more VDI users than a single legacy Cisco server.

We then increased the number of FC430 server sleds running the VDI workload in the Dell PowerEdge FX2 and the number of blades on the legacy Cisco solution running the same workload to four, and found that performance scaled evenly, supporting 400 and 232 sessions respectively (see Figure 4).

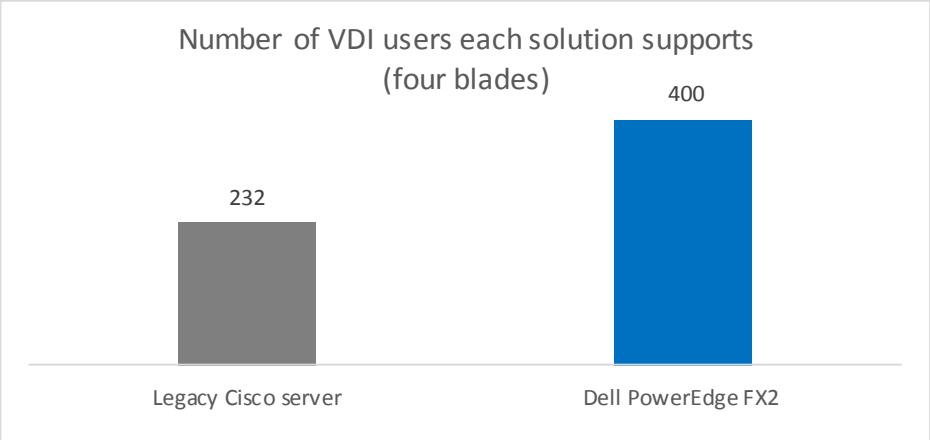

Figure 4: With four FC430 sleds, the FX2 supported four times as many users as with one blade, as did the legacy server.

Faster Login VSI response times

Figures 5 and 6 show the Login VSI response times, in milliseconds, for the two solutions with one sled or blade each. The Dell PowerEdge FX2 solution using VMware Virtual SAN was able to run 100 sessions, which was limited by the maximum number of virtual machines supported by one VSAN 5.5 host, without reaching VSImax. VSImax represents the maximum user capacity at which performance will degrade; therefore, not reaching VSImax is a positive indicator that response time remained satisfactory. Due to CPU constrains, the legacy Cisco server using traditional SAN was able to run only 58 sessions without reaching VSImax. Adding additional sessions caused the server blade to reach VSImax due to CPU saturation, which degraded end-user response times to unacceptable levels. An explanation of the metrics Login VSI reports appears in the complete version of this report at www.principledtechnologies.com/Dell/PowerEdge_FX2_FC430_VMware_VSAN_VDI_0215_v4.pdf.)

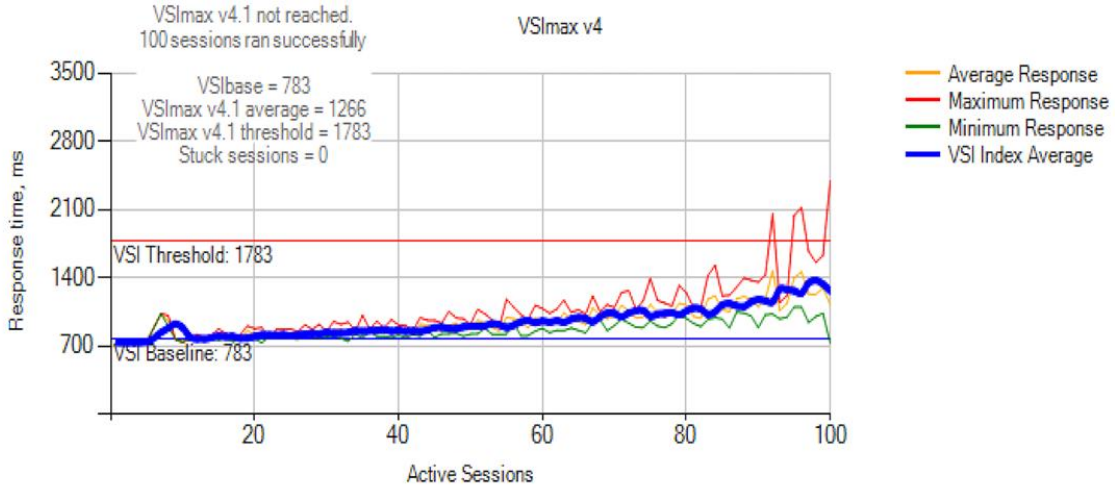

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Figure 5: The Dell PowerEdge FX2 using VMware Virtual SAN with a single FC430 sled ran 100 sessions, with room to grow. VMware Virtual SAN 5.5 limits allowed only 100 sessions per server.

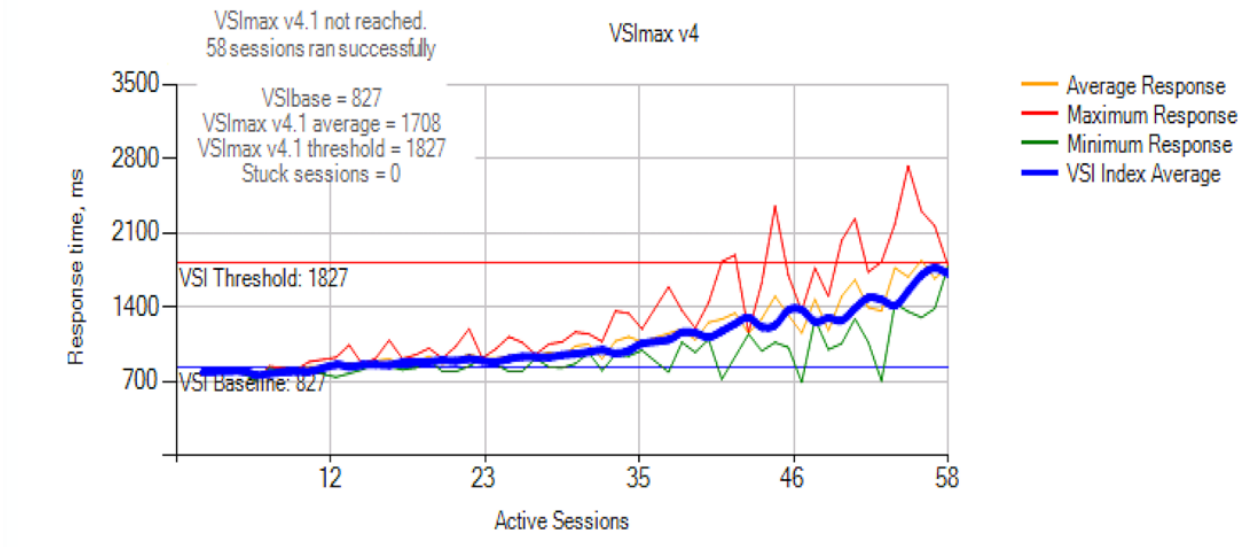

Figure 6: The legacy Cisco server using a traditional SAN with a single B200 M2 blade ran 58 sessions and did not reach VSImax; Adding additional sessions caused the server to reach VSImax due to CPU saturation and unacceptable end-user response times.

Figures 7 and 8 show the Login VSI response times, in milliseconds, for the two solutions with four sleds or blades each. The Dell PowerEdge FX2 solution using VMware Virtual SAN was able to run 400 sessions (the maximum number of virtual machines supported by four VSAN 5.5 hosts) without reaching VSImax. As we note above, VSImax represents the maximum user capacity at which performance will degrade; therefore, not reaching VSImax is a positive indicator that response time remained satisfactory. Due to CPU constraints, the legacy Cisco server using traditional SAN was able to run only 232 sessions without reaching VSImax. Adding additional sessions caused the server to reach VSImax due to CPU saturation, which degraded end-user response times to unacceptable levels.

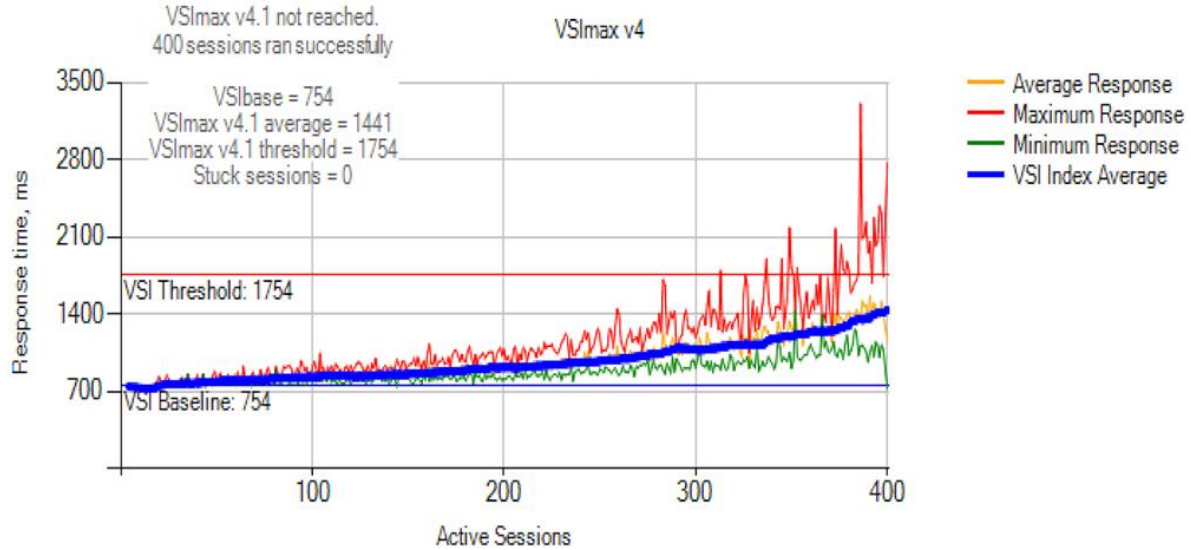

Figure 7: The Dell PowerEdge FX2 using VMware Virtual SAN with four FC430 sleds ran 400 sessions (100 per server), with room to grow. VMware Virtual SAN 5.5 limits allowed only 100 sessions per server.

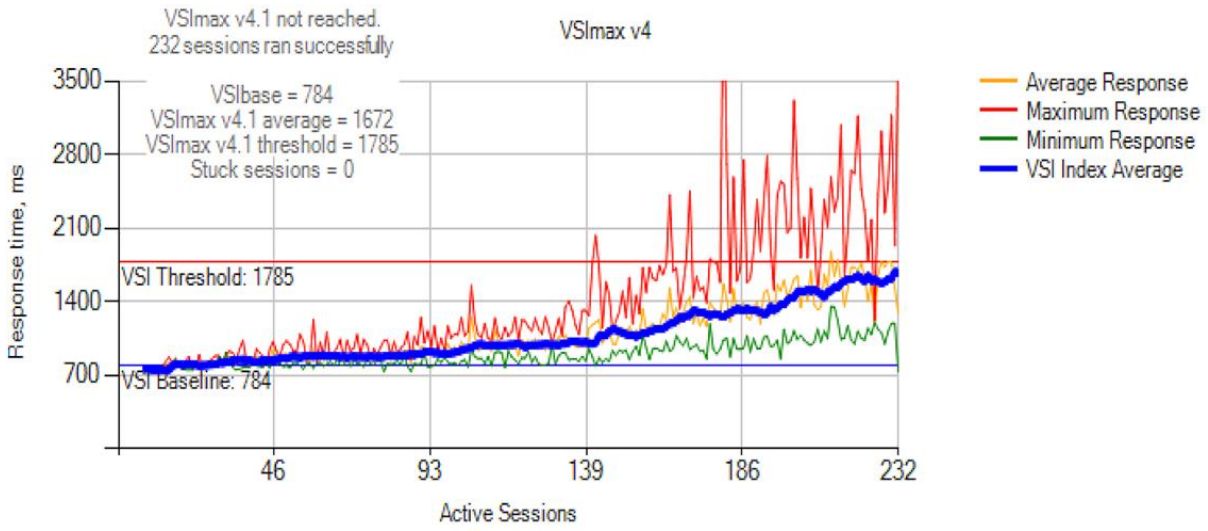

Figure 8: The legacy Cisco server using a traditional SAN with four B200 M2 blades ran 232 sessions and did not reach VSImax; Adding additional sessions caused the server to reach VSImax due to CPU saturation and unacceptable end-user response times.

Lower CPU utilization

Figures 9 and 10 show vSphere 5.5 server counters for CPU utilization throughout the test for the two solutions with one sled or blade each. CPU utilization increases as more users log in. In our tests, processing power further limited the number of users the Cisco UCS B200 M2 blade was able to support compared to the Dell PowerEdge FX2 solution.

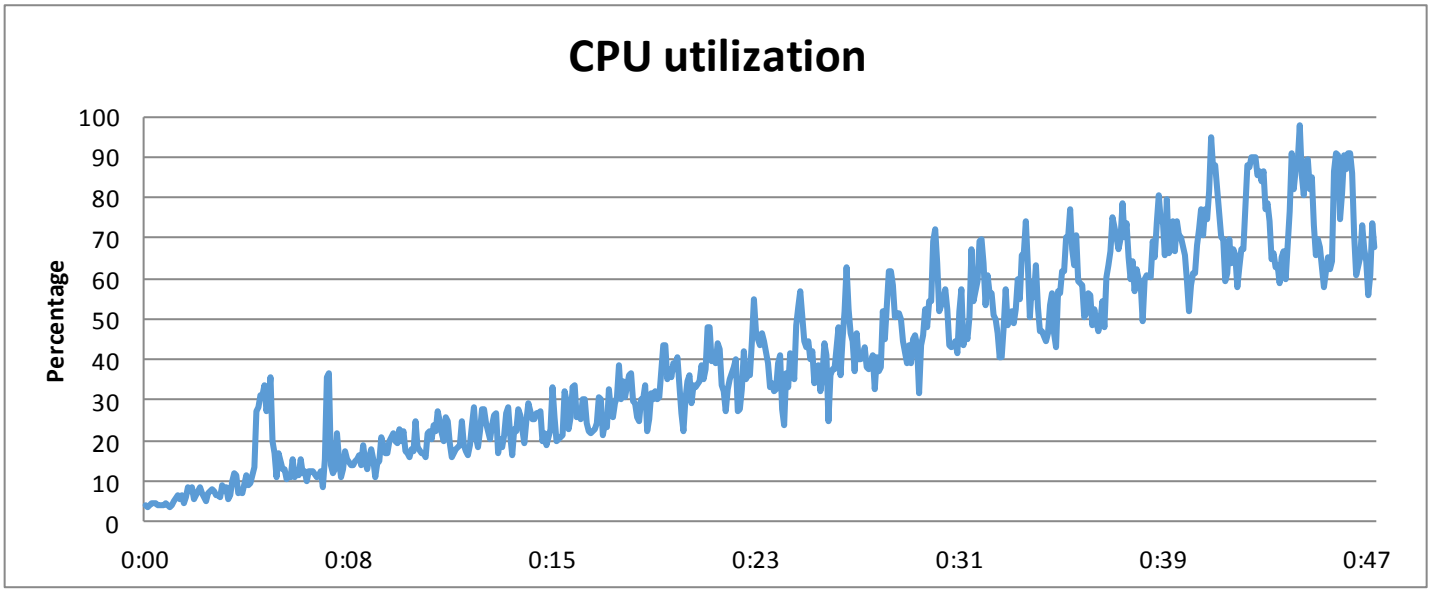

Figure 9: CPU utilization throughout our test period for the Dell PowerEdge FX2 using VMware Virtual SAN with one FC430 sled.

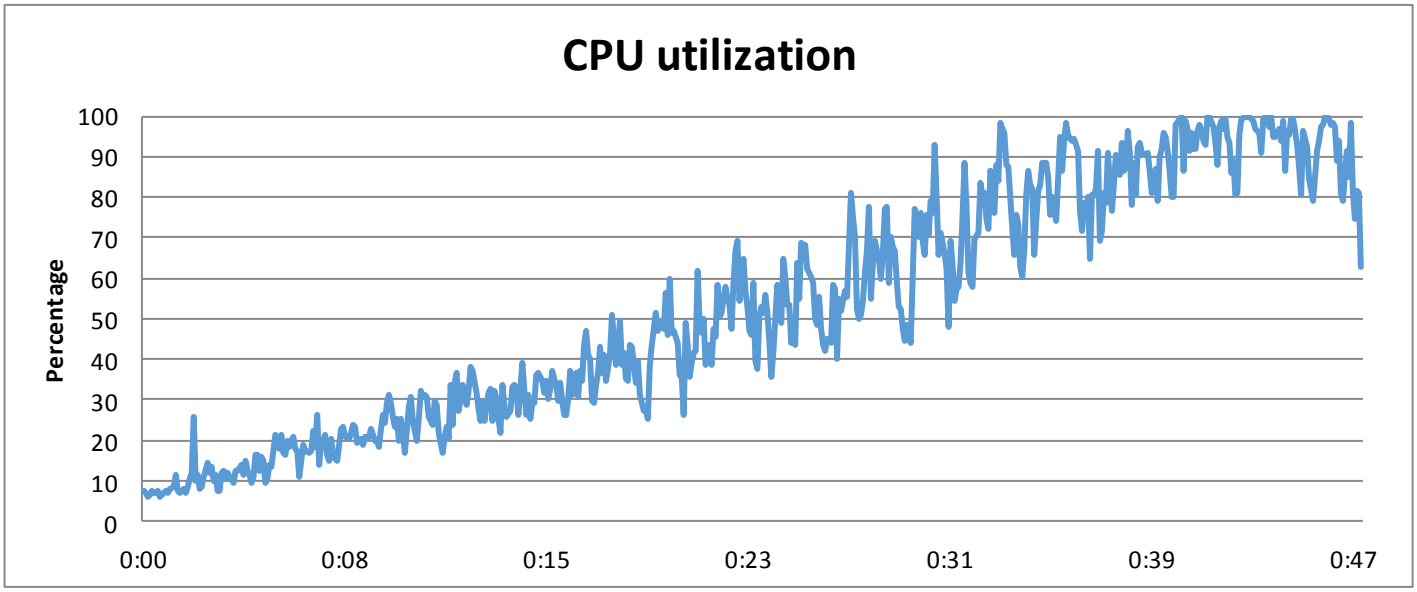

Figure 10: CPU utilization throughout our test period for the legacy Cisco server using a traditional SAN with one B200 M2 blade.

Figures 11 and 12 show vSphere 5.5 server counters for CPU utilization throughout the test for the two solutions with four sleds or blades each. CPU utilization increases as more users log in. CPU limited the number of users the Cisco UCS B200 M2 blades were able to support to 232 sessions, significantly lower than the 400 sessions supported by the Dell PowerEdge FX2 solution.

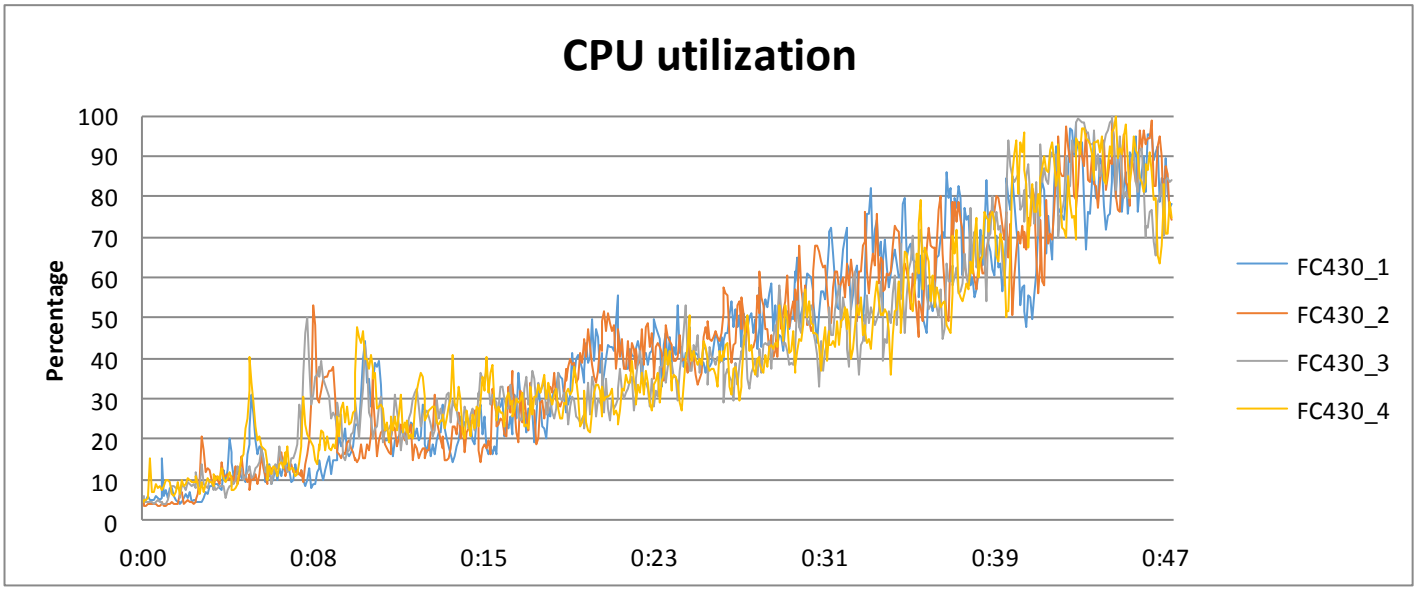

Figure 11: CPU utilization throughout our test period for the Dell PowerEdge FX2 using VMware Virtual SAN with four FC430 sleds.

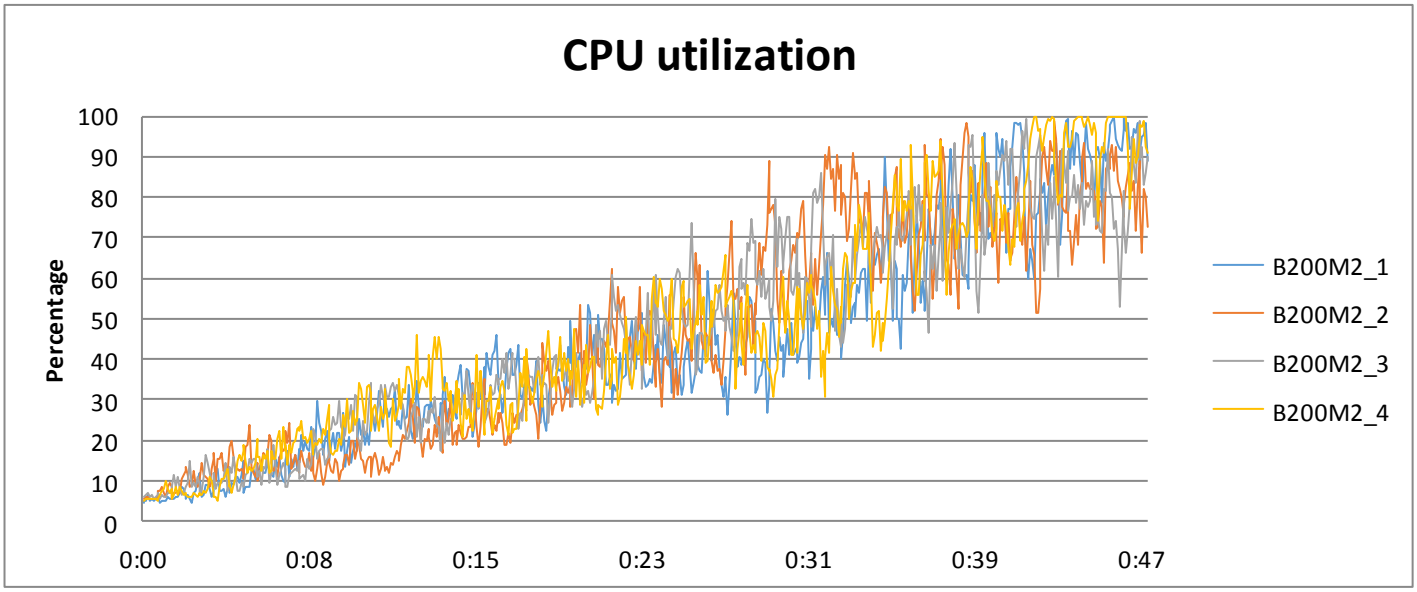

Figure 12: CPU utilization throughout our test period for the legacy Cisco server using a traditional SAN with four B200 M2 blades.

Great affordability

The space savings and added performance of the latest generation Intel Xeon processor-powered Dell PowerEdge FX2 solution with FC430 servers and VMware Virtual SAN already offers potential savings from having to maintain and manage less hardware for a greater number of VDI users when compared to the legacy Cisco solution and traditional SAN. In addition to this, the Dell PowerEdge FX2 solution cost provides an efficient solution that comes in at a low cost per VDI user. The Dell solution we tested delivered up to 400 VDI user session and cost $70,609.00.[1] That's only $176.52 per user. Figure 13 shows the hardware cost of the Dell PowerEdge FX2 solution.

Solution Component	Quantity	Total cost
PowerEdge FX2 chassis for two half-width and up to four quarter-width nodes	1	$4,585.00
PowerEdge FC430 server node with Intel Xeon processors E5-2650 v3 and 128 GB of memory	4	$36,856.00
PowerEdge FD332 storage node with dual controllers and (4) 200GB SSD and (12) 1.2TB 10k HDD	2	$29,168.00
Total cost		**$70,609.00**

Figure 13: Detailed hardware pricing.

[1] Pricing is for hardware only and does not include any software or licenses. Pricing provided by Dell.

IN CONCLUSION

Replacing your legacy VDI servers with a new Intel Xeon processor E5-2650 v3-powered Dell PowerEdge FX2 solution using VMware Virtual SAN can be a great boon for your enterprise.

In the Principled Technologies (PT) labs, this space-efficient, affordable solution outperformed a five-year-old legacy server and traditional SAN by offering 72 percent greater VDI users. Additionally, it achieved greater performance while using 91 percent less space and at a cost of only $176.52 per user in hardware costs.

By supporting more users, saving space, and its affordability, an upgrade to the Intel-powered Dell PowerEdge FX2 solution using VMware Virtual SAN can be a wise move when replacing your aging, older infrastructure.

ABOUT PRINCIPLED TECHNOLOGIES

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We provide industry-leading technology assessment and fact-based marketing services. We bring to every assignment extensive experience with and expertise in all aspects of technology testing and analysis, from researching new technologies, to developing new methodologies, to testing with existing and new tools.

When the assessment is complete, we know how to present the results to a broad range of target audiences. We provide our clients with the materials they need, from market-focused data to use in their own collateral to custom sales aids, such as test reports, performance assessments, and white papers. Every document reflects the results of our trusted independent analysis.

We provide customized services that focus on our clients' individual requirements. Whether the technology involves hardware, software, Web sites, or services, we offer the experience, expertise, and tools to help our clients assess how it will fare against its competition, its performance, its market readiness, and its quality and reliability.

Our founders, Mark L. Van Name and Bill Catchings, have worked together in technology assessment for over 20 years. As journalists, they published over a thousand articles on a wide array of technology subjects. They created and led the Ziff-Davis Benchmark Operation, which developed such industry-standard benchmarks as Ziff Davis Media's Winstone and WebBench. They founded and led eTesting Labs, and after the acquisition of that company by Lionbridge Technologies were the head and CTO of VeriTest.