EMC VSPEX End-user Computing Proven Infrastructure with XtremIO and Brocade

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Abstract: The EMC VSPEX End-user Computing Proven Infrastructure is a reference architecture designed to reduce the complexity of design and configuration for all aspects of a virtual desktop environment, while providing scalability and consistent performance to support thousands of virtual desktops. This report summarizes ESG Lab’s audit and testing of a real virtual desktop environment built on the EMC VSPEX End-user Computing Proven Infrastructure, including XtremIO all-flash storage and EMC Connectrix B-Series networking.

EMC VSPEX End-user Computing Proven Infrastructure

Fast, predictable performance and scalability are critical concerns in virtual desktop environments, where thousands of simultaneous users can hammer an infrastructure and random, shifting I/O, and bottlenecks in the storage domain can have an impact on performance.

EMC has partnered with numerous major providers of IT infrastructure to create a virtualization solution designed to accelerate the deployment of the private cloud and VMware Horizon View virtual desktops. EMC VSPEX reference architectures aim to accelerate the transformation of IT and mitigate the challenges and complexity of building an IT infrastructure with faster, simpler deployment and management, higher efficiency, and reduced risk.

VSPEX End-user Computing Proven Infrastructures, as shown in Figure 1, are modular, virtualized infrastructures validated by EMC and delivered by EMC VSPEX partners. Virtualization, server, network, storage, and backup layers are all included. Partners can select the compute, connectivity, and virtualization technologies that best fit a customer’s environment, while EMC XtremIO all-flash and VNX storage systems and EMC Powered Backup technologies provide the storage and backup layers.

The XtremIO Storage Array is an all-flash system built on a scale-out architecture. The system consists of self-contained X-Brick building blocks which can be clustered to scale performance and capacity as needed. The XtremIO all-flash array’s architecture is designed to deliver the full performance potential of flash, while scaling resources such as CPU, RAM, solid-state disks, and host ports in a linear and balanced manner. The goal is to enable an organization to scale to any required performance level while maintaining consistently low response times that are critical to predictable application behavior.

For this virtual desktop implementation on a VSPEX End-user Computing Proven Infrastructure, the Brocade Gen 5 6510 Fibre Channel SAN switches, sold and serviced by EMC under the EMC Connectrix B-Series brand, provided a high-bandwidth foundation for storage connectivity, while Brocade VDX Ethernet switches, powered by VCS Fabric technology, provided connectivity to the hosts and virtual desktops. Gen 5 Fibre Channel has the desired attributes of the ideal network infrastructure for XtremIO storage in a virtual desktop environment, delivering low latency, and high IOPS and throughput, with the rock solid reliability essential for VDI deployments at scale. Brocade VCS Ethernet fabric technology is designed to specifically address the requirements imposed on the network by modern data centers; requirements that legacy Ethernet networks are not equipped to meet. Multiple interconnected VCS-enabled switches automatically form a single fabric, flattening the network architecture, reducing the number of tiers, and simplifying network design.

The goal of ESG Lab reports is to educate IT professionals about data center technology products for companies of all types and sizes. ESG Lab reports are not meant to replace the evaluation process that should be conducted before making purchasing decisions, but rather to provide insight into these emerging technologies. Our objective is to go over some of the more valuable feature/functions of products, show how they can be used to solve real customer problems and identify any areas needing improvement. ESG Lab’s expert third-party perspective is based on our own hands-on testing as well as on interviews with customers who use these products in production environments. This ESG Lab report was sponsored by Brocade and EMC.
ESG Lab Spotlight: EMC VSPEX End-user Computing Proven Infrastructure with XtremIO and Brocade

Brocade Fabric Vision technology provides policy-based management to simplify monitoring and automate management of storage network resources. Predictable performance and high availability of the storage network are key to ensuring the service levels required for an uncompromised desktop experience.

ESG Lab examined the VSPEX End-user Proven Infrastructure with a goal of validating efficient desktop virtualization for varied customer use cases of up to 2,500 full-clone or 3,500 linked-clone virtual desktops for a single XtremIO X-Brick node. The following is a summary of the results observed:

- ESG Lab worked with EMC and Brocade to grow the test environment from 300 to more than 2,000 desktops, using the entire available server infrastructure. Storage characterization based on observed I/O was used to determine how many virtual desktops a single XtremIO X-Brick node should be able to support.
- Using the LoginVSI test harness and the LoginVSI “storage” workload, the VSPEX reference architecture with just two Horizon View servers was able to support 300 virtual desktops with outstanding end-user performance, less than half the VSImax v4 Average threshold.
- With 16 servers, the same single XtremIO X-Brick node supported 2,000 desktops with end-user performance still well below the VSImax v4 Average threshold.
- Using the Iometer workload generation tool, ESG Lab was able to drive more than 120,000 8KB IOPS with a 0.77 ms average response time in approximately the same read/write mix as was generated by the LoginVSI testing. Based on the 25 IOPS per active desktop observed in the previous tests, ESG Lab projects that a VSPEX reference architecture with Brocade networking and a single XtremIO X-Brick node should be able to easily support the 3,500 desktops specified in the reference architecture with plenty of headroom for additional desktops or other applications.
- ESG Lab also looked at the time to power up 2,000 linked-clone desktops. Power-up time was measured as the time required to get all desktops from the “Power Off” state to “Available” in the View Management client. All Desktops were available in just eight minutes, 30 seconds. Throughout the boot test, the average response time of the XtremIO array was 350 µsec, or just 0.35 milliseconds.
Figure 2. Maximum Number of Desktops Using VSImax with Average Application Response Time

It is important to note that the response time plotted in Figure 2, VSImax average, does not directly correlate to application response times that users would experience. LoginVSI response time is a cumulative response of all LoginVSI operations, so VSImax average will always be higher than any single application response time, but it provides context, illustrating the stability of average response times as the number of desktops increase.

**Why This Matters**

Delivering the optimal user experience is an essential IT task, but it is complex and difficult to design and build an environment that can deliver the predictable performance required of virtual desktop infrastructure. Having a proven reference architecture designed to both support specific workload requirements and simplify management helps to ensure IT can focus on desktop delivery, user productivity, and enhanced security with less operational burden of maintenance, tuning, and troubleshooting the virtual desktop environment. Virtual desktop environments can hammer storage and network infrastructure since I/O is high bandwidth, generally random, constantly shifting, and often write-intensive. These characteristics are exacerbated as the environment scales and activity spikes. Many “do-it-yourself” virtualization platforms suffer from being simply unprepared for the type of I/O generated in this environment. A poorly designed virtual desktop infrastructure can fail to deliver on the promise of improvements to both IT management and end-user experience.

ESG Lab validated that the VSPEX End-user Computing Proven Infrastructure with XtremIO all-flash storage and Brocade networking was easy to configure and manage. The reference architecture guidelines ensured that the prebuilt configuration easily met the requirements for the workload. The VSPEX End-user Computing Proven Infrastructure, with XtremIO storage and Brocade networking, delivered a solid, highly scalable virtual desktop platform. With more than 2,000 virtual desktops generating a realistic user workload, LoginVSI reported excellent application-level response times well below the threshold calculated for this test bed and sub-millisecond response time from the XtremIO X-Brick node.

ESG Lab validated that the Connectrix B-Series SAN and Brocade VCS Fabric infrastructure provided a highly available and resilient foundation for a 3,500 virtual desktop deployment. Redundant switches and ports and active/active server connectivity ensured full functionality for all users at all times, and intelligence built into the Brocade fabric enabled automation of tasks that might otherwise interrupt productivity.
The Bigger Truth

A great benefit of desktop virtualization is the ability to increase application uptime, enabling end-users to remain productive regardless of their location or device. Desktop virtualization also enables IT to centrally deploy and maintain applications, including upgrades, patches, and security updates, then roll them out to end-users across a network. The challenge has been how to extend these at scale to the richer user requirements for persistent, full clone desktops. This deployment ensures proper application control on the part of IT, and lets users enjoy the look and feel to which they are accustomed from any location (e.g., home, corporate, or remote office) or device (e.g., desktop, laptop, or tablet).

But the sheer complexity and scale of virtual desktop implementations makes doing it yourself a huge challenge, a challenge that multiplies as the environment grows beyond the initial proof of concept into production with thousands of virtual desktops. Between the intricacies of the infrastructure and the complexity of managing each component to ensure adequate workload support, it is no easy task.

So how can you simplify virtual desktop implementation? A great way to start is with a proven reference architecture, designed for your particular workload by giants of the technology industry, delivered and installed by certified channel partners. The VSPEX End-user Computing Proven Infrastructure with XtremIO all-flash storage and Brocade networking eliminates planning and configuration burdens, virtually guarantees a successful deployment, and delivers on both IT and end-user requirements.

ESG Lab testing validated that the VSPEX End-user Computing Proven Infrastructure was easy to set up and manage and provided a robust and highly available platform. With 2,000 real virtual desktops hammering the infrastructure, activities such as logging in, and creating and editing files functioned properly with good response times; administrative tasks such as provisioning, cloning, and vMotion experienced the same solid performance. It should be noted that ESG Lab had to stop at 2,000 desktops because we maxed out every server in the test environment. Using a low-level workload generation tool, ESG Lab was able to push enough I/O to simulate more than the 3,500 linked clone virtual desktops in the specification for the reference architecture.

Finally, the highly reliable and available Connectrix B-Series switches and Brocade VCS fabric provided virtualization-focused benefits and network reliability, creating a solid foundation between storage, servers, and clients. Advanced features and intelligence-enabled automation of tasks, such as automatically configuring ports for vMotion, forming ISLs and trunks between switches, and using striping to maximize both availability and performance, have been tested and validated multiple times by ESG Lab.

Virtualization creates a dynamic and unpredictable I/O profile. The EMC VSPEX End-user Computing Proven Infrastructure, leveraging XtremIO all-flash storage and Brocade fabrics, proved its ability to handle a very large VDI environment with headroom to spare. Organizations seeking to optimize time-to-value for desktop virtualization and needing to deploy hundreds to thousands of desktops would be well served by looking very closely at the VSPEX End-user Computing Proven Infrastructure.