

VMware

XtremIO Powers VMworld 2013



ESSENTIALS

Industry

Virtualization Solutions

Company Size

VMware has approximately 13,800 employees

Business Challenges

- VMware needed an infrastructure that could handle hundreds of thousands of low-latency IOPS to service over 2,500 concurrent active virtual machines
- Must provision & deprovision labs with no impact on active students
- Platform resiliency was key

Solutions

- Four EMC XtremIO All-Flash Arrays, each a single high-availability building block configuration with the ability to scale out

Results

- High levels of consistent and predictable IOPS performance under demanding workload conditions
- 50,000 IOPS delivered by each XtremIO array, less than one-third of its potential
- 350 microsecond latency
- 100% uptime with nearly 86,000 virtual machines delivered

OVERVIEW

VMware (www.vmware.com) is the leader in virtualization and cloud infrastructure solutions that enable businesses to thrive in the Cloud Era. Customers rely on VMware to help them transform the way they build, deliver, and consume information technology resources in a manner that is evolutionary and based on their specific needs.

Every year, VMware showcases its latest solutions at the company's VMworld conference in San Francisco and Barcelona. A popular feature of the conference, and one that clearly demonstrates the value of VMware solutions in solving critical business challenges, is the Hands on Labs (HOL) environment. HOL provides a powerful educational setting in which IT professionals and decision-makers can directly experience VMware's latest product offerings. This year the real power behind the scenes was EMC's XtremIO All-Flash Array.

Patrick Noia, Cloud Operations and Infrastructure Program Manager at VMware, led the OneCloud team that provided the backend cloud capacity for the Hands On Labs. "By nature, the HOL is a very disruptive environment," he explains. "In the lab area itself we had about 350 traditional seats, plus 200 bring your own device (BYOD) seats. Hot spots all around VMworld represented another 50 or so concurrent sessions. Some 500 vApps, each comprising about 10 virtual machines, were being provisioned and deprovisioned very, very rapidly. You need a streamlined, high-performance hardware solution to deliver those kinds of high churn without impacting the active labs."

VMware chose XtremIO for many reasons. For one thing, the platform delivers hundreds of thousands of low-latency IOPS to service a huge number of virtual machines. Another critical factor is the inline data reduction capabilities of XtremIO with no performance degradation, which allow a large VM environment to fit in a small and cost-effective flash footprint. And the in-memory metadata architecture with VAAI integration makes instantaneous VM clones a reality, while not impacting I/O to active virtual machines. These unique capabilities, coupled with XtremIO's exceptional availability, made the platform a natural choice for this year's HOL.

BUSINESS CHALLENGES

VMworld 2013 provided 30 unique lab offerings. Each lab consisted of up to 14 virtual machines (the average is 7) packaged as a vApp and delivered through VMware VCloud Director. Each vApp comprised on average 10 vCPUs, 18GB of memory, and 150GB of storage capacity. While labs were underway, these virtual machines generated substantial amounts of I/O traffic; in fact, the HOL infrastructure ran on 14,000 vCPUs and more than 60TB of RAM to support 800 concurrent labs. In addition to supporting the approximately 7,700 virtual machines running concurrently, the HOL created and destroyed up to 25% of the environment at any one time, causing yet more I/O on the storage arrays.

CUSTOMER PROFILE

The HOL supports over 400 customers at once, and more than 7,000 customers participated in a lab throughout the 36.5 hours of open lab time scheduled. Students selected their desired lab and received their own unique virtual environment to be used for the duration of the lab. When a student requested a lab, it was assigned from a pool of approximately 800 vApps, and a new clone of the lab was produced; upon completion of the course, the virtual application was destroyed. The storage demands on the HOL infrastructure were tremendous. Just do the math:

- The course catalog contained 210 unique virtual machines in 30 vApps consuming 21TB of storage capacity for a single copy of the lab course catalog.
- 800 vApps were cloned and available in a pool, ready for students to use at any given time. This pool required 380TB of high performance storage capacity.
- The 800 vApps represented a pool of over 7,700 virtual machines, with over 2,500 active VMs during typical hours while the labs were open to students.

SOLUTIONS

In years past, the VMware HOL team leveraged a conventional storage infrastructure to support the environment—around 14 racks of equipment, heavy on flash to handle the IOPS load. This year four X-Bricks (the X-Brick is the basic building block of XtremIO's scale-out clustered design) provided the primary storage backing the infrastructure, consuming just half a rack and with a power budget of 3,000 watts. The XtremIO platform was load-balanced with conventional storage in a separate data center, using an active/active configuration; each system was sized to handle the entire load. Since it was the first time XtremIO would be used at scale for the HOL, EMC was cautious in sizing the environment to ensure sufficient capacity. As it turned out, they were far too cautious.

The HOL's virtualized cloud infrastructure offered a perfect opportunity to demonstrate the power of XtremIO. Large-scale cloud data centers drive many small, highly random I/O operations to shared storage, and this is exactly the workload for which XtremIO was built. The platform has tremendous IOPS performance with sub-millisecond latency; each X-Brick the HOL ran was capable of sustaining 150,000 fully random 4K IOPS measured with a 50% read/50% write workload.

Says Noia, "One of the things that we were most surprised by was that, even when we were at full tilt, the XtremIO X-Bricks weren't stressed at all. We were just taking them for a walk. Even though we were throwing a lot of workload at them, they performed wonderfully." Noia adds that, compared to conventional storage, HOL was able to achieve much greater performance and efficiency with less infrastructure using XtremIO. "The performance of the EMC XtremIO platform allowed us the flexibility to do more with less while also providing exceptional performance," he continues. "In addition, it was extremely easy to use—almost plug and play."

XtremIO delivers this performance with true inline data reduction technology. Because virtual machines contain a great deal of common information, many more VMs can be packed onto an XtremIO system than the underlying physical amount of flash would otherwise allow. The HOL got an overall boost in effective flash capacity of greater than 6:1 from this technology. As a side note, the HOL used linked clones; the space savings with full clone VMs would have been much higher. In summary, the four X-Bricks with a usable capacity of 30TB supported 180TB worth of virtual machines, with room to spare.

Finally, XtremIO's sophisticated in-memory metadata management system allowed VMware vCenter cloning activity to be carried out at extraordinary rates of speed, without affecting ongoing host I/O to active virtual machines. This unique capability of the XtremIO arrays meant the HOL could create new vApps while the labs were active with students—something they could never do in the past.

BLAZING PERFORMANCE

Metrics collected by VMware's HOL team tell the story best:

- Total labs taken: 9,587.
- Total number of virtual machines delivered: 85,873.
- Maximum IOPS seen by any of the XtremIO X-Bricks: 50,000, less than one-third of the platform's overall performance potential.
- Uptime: 100%. Note: The workload is so strenuous that in years past the HOL has experienced outages. Nothing of the sort happened with XtremIO.
- Latency: 350 microseconds. XtremIO specifications are for sub-millisecond latency at rated load; in this case, with the arrays running at far less than their peak capabilities, the latency was astronomically low.

Setting up the XtremIO platform was straightforward. "From basically removing the shrink wrap to rack stack to actually provisioning LUNs to VCD (vCloud Director) took us a day and a half," says Noia. "Most of that time was just the logistical onboarding, to get the arrays into the data center. Once they were racked, stacked, and cabled, from bare metal deployment to realizing VCD workload took us only a couple of hours."

EMC XtremIO is also easy to use. "What's really attractive about the XtremIO solution is that it comes natively with a very detailed GUI that gives you real-time numbers and insight into what the X-Brick is doing," Noia continues. "So at any given point in time, you know exactly the latency you're achieving in that X-Brick, how much physical space you're taking up, and how much virtual volume you have—and, you can load balance across all the X-Bricks simultaneously. The level of information that's presented to you as a storage administrator is staggering compared to other solutions out there."

HAPPY CAMPERS

XtremIO helped make this year's VMworld HOL a smash hit. As one attendee wrote: "Awesome job on the labs this year. I have been to VMworld five times, and these labs are the best by far. Great job!" Another comment echoed that positive sentiment: "I have been to VMworld four times, and in the past I felt the HOL was hit or miss—mostly miss. This has to be one of the best HOL experiences I have had. Excellent work everyone, I would say that this year you knocked HOL out of the park."

Noia himself is now a big fan of XtremIO. "We are exceedingly happy with the XtremIO platform and what it can deliver from an operations perspective," he says. "One thing in this environment is constant: You are always under the gun in terms of resource constraints and how many people you can bring to bear in a short amount of time. With XtremIO, the time to market was a day and a half, tops. Compared with standard storage platforms, that is amazing. You can't ask for more."

In fact, one of the benefits of XtremIO that VMware couldn't exploit for 2013's HOL is the ability to build the environment using full clone virtual machines, rather than linked clones. Time was too short in preparation for this year's event to make such an infrastructure change, but moving forward, the HOL team views full clone virtual

machines as much simpler to implement and manage. With XtremIO's inline data reduction technology, the shift to full clones is finally feasible and will make 2014's HOL even better.

"The EMC XtremIO arrays not only delivered exceptional performance, they weren't even breathing hard. XtremIO is much more than fast storage—we're only now learning how to leverage it fully to simplify our future HOL infrastructure."

Patrick Noia
Cloud Operations and Infrastructure Program Manager, VMware

Noia is already looking forward to next year's VMworld HOL. "I think we can do a lot more with less," he predicts. "In fact, as the technology evolves, we will probably be able to support the whole show with one or two X-Bricks. If you want to run a large-scale virtualized data center, XtremIO is clearly the way to go."

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