



QUALCOMM Lowers TCO Using VMware ESX Server and VirtualCenter

VMware Virtual Infrastructure Helps QUALCOMM Save Six Figures On Hardware—while Providing Optimal Server Management to Support the Company's Rapid Expansion

RESULTS

- Increased server utilization from five percent to nearly 100 percent
- Consolidated servers by a 30:1 ratio
- Reduced data center space by a 20:1 ratio
- Reduced equipment costs by two-thirds
- Optimized server management and instant server provisioning with VirtualCenter
- Can easily perform software upgrades with no downtime using VMotion

Large-Scale Consolidation Project Weeds Out Underutilized Servers

QUALCOMM Incorporated, a leader in the digital wireless communications field, is best known for pioneering and commercially developing Code Division Multiple Access (CDMA) digital wireless technology. Over 174 million consumers worldwide rely on CDMA today for clear, reliable voice communications and leading-edge data services.

In the first half of 2003, the QUALCOMM IT department embarked on a consolidation project to lower costs in the company's data centers worldwide. IT Manager Paul Poppleton investigated alternative approaches for consolidating the company's Intel®-based servers.

VMware ESX Server™ Chosen as the Best Consolidation Approach

The QUALCOMM IT team considered several approaches to lower costs as well as reduce power and space requirements. "Blade servers were interesting," says Poppleton, "but we needed a greater reduction in power and space requirements than blade servers would provide. Server consolidation had much greater potential to lower our total costs." Poppleton assessed the feasibility of server consolidation using VMware software, which virtualizes servers so that multiple applications, each encapsulated in an independent virtual machine, can run on the same physical server.

After Initial Testing, It Was Full Speed Ahead

QUALCOMM started with just one VMware® server to evaluate the product and get comfortable with its operation. "For example, we have a number of internal administrative tools and we wanted to be sure that they worked with VMware virtual machines just like they worked with standalone servers. We migrated a couple of production servers, but everything was going so well that we decided to open up the use of that machine a little.

"We get many requests for new test servers and often, these servers must be provisioned quickly. This is an ongoing need here and VMware is a perfect way to satisfy those users. Pretty soon, we had entirely filled that first machine. We had zero problems and felt comfortable with VMware administration. Our IT team and other test users were so impressed with this initial test that we felt comfortable going full speed ahead with the consolidation of production servers."

Poppleton describes his approach: "Initially, we considered every server 'guilty until proven innocent'—meaning that every server was a prospect for consolidation. Then we realized that there was a huge potential—upwards of 1,000 servers—so we needed to set some criteria to limit the number initially and develop a methodical rollout plan that we could implement over time. We decided to start with the 30 oldest and least critical servers and then march through the others, from least critical to most critical. These included Web servers, database servers, and other application servers."

"Once we introduced VMware ESX Server, it caught on faster than I could have imagined. Even more amazing than the product's efficiency was the way it reduced our costs. VMware software probably saved us several hundred thousand dollars within a year on hardware purchases alone. As QUALCOMM grows, we anticipate even greater savings."

*Paul Poppleton
IT Manager, QUALCOMM*



VMWARE VIRTUAL INFRASTRUCTURE

- HP Proliant DL 360 G3, 2GB RAM, Single CPU with VirtualCenter
- VMware ESX Server on HP Proliant series servers
- ESX Server on HP Proliant DL 760 and DL 580 G2 four-CPU servers with 20 GB RAM, connected to a SAN
- ESX Server on HP Proliant DL 380 G3 two-CPU servers with 6 GB RAM, connected to direct attached storage
- Guest Operating systems: Microsoft Windows NT Server, Windows 2000 Server, Windows Server 2003, Linux
- Applications: Web servers, small database servers, domain controllers
- Consulting services: VMware ESX Server Jumpstart, VMware P2V Migrations

VMware ESX Server Enables QUALCOMM to Consolidate Physical Servers 30:1, Beats Everyone's Expectations

The QUALCOMM IT team added two more eight-way servers and migrated more production applications onto VMware virtual machines. The consolidation ratio was impressive. "Initially, we hoped to consolidate eight physical servers on one VMware ESX Server," says Poppleton. "Instead of an 8:1 ratio, we've achieved 30:1—a huge win for us. This was largely because we started with the most underutilized servers hosting applications with modest demands for memory and CPU resources. So the real work-horse applications will probably yield something like an 8:1 ratio, which is still absolutely fantastic. But we eliminated 30 small servers, so we were also seeing our administrative burden reduced."

Consolidation Leads to Reduced Costs

The most obvious benefit of server consolidation is a reduced total cost of ownership. First, capital equipment costs are reduced because hardware utilization goes up dramatically. QUALCOMM had many servers with utilization as low as five percent of CPU resources before consolidation. On the VMware ESX Server-based machines, CPU utilization rate is now close to 100 percent. In addition, many other costs are reduced: data center space, administration labor, cost for the network drop, cost for power, and so on. Says Poppleton, "We probably saved several hundred thousand dollars within a year just on hardware purchases alone, as a result of using VMWare software."

According to Poppleton, deploying a new 1U physical server can cost a company approximately \$6,000 for the equipment and labor to install it. The consolidated approach costs \$2,000 per server, a \$4,000 savings. "The bottom line is that we're saving a lot of money, on the order of several thousand dollars per server," says Poppleton.

Adding VirtualCenter and VMotion™ – the Ultimate in Server Management

In January 2004, Poppleton and his team evaluated VMware VirtualCenter to control its data center computing resources from a centralized point. "When we saw VirtualCenter in action, we could see that it was a powerful tool that would bring us even greater capabilities," says Poppleton. So in February 2004, they implemented VirtualCenter along with VMotion – which allows Paul and his team to move live virtual resources from one physical machine to another with no service interruption.

With VirtualCenter and VMotion, Poppleton can effectively manage QUALCOMM's virtual machine resources. For example, Poppleton and his team can view the usage and availability of virtual machines across the enterprise, and make any necessary adjustments to optimize resource use and performance.

"While we were happy with ESX Server, VirtualCenter allowed us to do more," he says. "It gives us complete control of our virtual computing resources so we have the flexibility to quickly react to business demands. VMotion has also given us the agility to perform hardware upgrades with no downtime to the systems running in virtual machines."

IT Can Now Respond Faster to Business Needs

Poppleton's team can fulfill most requests for new servers quickly because new hardware does not have to be procured. As a result, IT can be much more responsive to QUALCOMM's business needs. "It used to take a minimum of two weeks to get hardware approved and ordered," says Poppleton. "Now we can instantly provision new servers. That enables QUALCOMM employees to be more productive and do a better job for our customers."



QUALCOMM Anticipates High Availability and Disaster Recovery for Business-Critical Applications

As the IT team looks to consolidate business-critical applications, VMware's high availability features provide important benefits. In clustered server configurations with redundant components, the failover features of VMware ESX Server enable QUALCOMM to improve the availability of business-critical applications. ESX Server supports network interface card (NIC) teaming and redundant storage area network (SAN) configurations. Redundant NICs preserve network connections even if a NIC fails and ESX Server SAN support enables continuous operations if a host bus adapter (HBA), switch, or controller fails. Also, with VMotion, QUALCOMM will be able to migrate virtual machines between datacenters with no downtime.

"Our virtual IT infrastructure will help us provide greater availability than ever before for our most critical applications," says Poppleton. "We plan to move forward with additional projects enabled by VMware software."

VMware Professional Services Helps Shorten Time-to-Value

As QUALCOMM started its VMware deployment, Poppleton engaged with two VMware consulting services to make sure that QUALCOMM was following VMware best practices. VMware consultants in the ESX Server Jumpstart program assisted with ESX Server installation, configuration, and training. The P2V (physical-to-virtual) Migrations service provided tools that enabled QUALCOMM's team to move

an intact image of one physical server to a virtual machine image on another physical server, mounting the image and making any necessary operating system changes so the image runs flawlessly on the new hardware.

Future Plans Call for Continued Consolidation

Virtual machines are now supporting applications used by thousands of QUALCOMM employees. Says Poppleton, "A wonderful surprise is that some stand-alone servers that were problematic have actually become more reliable since we've migrated them to ESX Server, indicating that there were hardware problems with the old machines. We are now moving as quickly as possible to consolidate as many servers onto ESX Server as is practical".

Asked to give advice to other potential VMware software users, Poppleton says, "Once we saw how effective and easy to administer VMware ESX Server is, the economics drove us to accelerate our consolidation efforts. So the best advice I can give is, plan for quick growth!"

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