Technology Considerations for the Next-Generation Data Center

Introduction

What does a typical data center look like today?

If your company is like most, infrastructure sprawl is rampant. Virtualization has helped break the one-application-one-server paradigm, but the I/O requirements of virtual servers have led to a proliferation of network cards and storage connections. Managing the bandwidth allocation for each virtual machine and the Fibre Channel or iSCSI connection to the storage network is an increasingly painful headache for IT administrators. Cables are strewn everywhere. The number of virtual machines capable of being hosted on individual servers is lower than originally expected because of these bottlenecks.

The result is a chaotic deployment that remains inefficient and expensive to run, both in terms of IT management overhead and energy costs.

Next-Gen Equipment Changes the Game

How can today’s servers make a dent in this chaos?

“Smaller, faster, cheaper” is one of the most common refrains around technology advancements. As components mature and manufacturing processes improve, IT equipment does tend to pack higher performance into smaller, less-expensive, and more-efficient packages. Nowhere is that more apparent than in next-generation servers and networking equipment from HP.

Based on cutting-edge, multi-core processors, today’s x86 ProLiant server and blade systems are delivering mainframe-like computing power, and the latest advances in memory and network connectivity ensure that I/O does not impede performance. If the equipment in your data center is three to five years old, the difference is not incremental; it’s exponential.

For example, HP’s new four-socket servers running on the latest AMD 6100-series processors can host four times as many virtual machines (VMs) as older systems, and deliver up to 27x greater performance per watt than older systems.¹

As previously mentioned, memory and I/O bandwidth have to keep pace with the processing speed in order to enable companies to leverage the full potential of today’s virtualization technologies.

DDR3 memory is the new gold standard, running at speeds up to 1333MHz—double the speed of the previous generation. Similarly, the new servers feature PCI-Express 2.0 I/O connections, with X16 slots capable of delivering up to 8GB per second of throughput—once again doubling the bandwidth over previous generations. 1-gigabit or 10-gigabit Ethernet is the standard LAN technology that links the servers to the company-wide network, but some platforms now feature “Converged Network Adapters” (CNA) which combine dual 10-gig Ethernet

¹ HP internal testing comparing hardware on HP ProLiant DL380 G4 to HP ProLiant DL385 G7 with AMD Opteron 6100 Series processor.

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with iSCSI/FCoE storage connectivity. Taken together, these enhancements deliver a ‘fat pipe’ of connectivity that enables HP’s next-generation servers to host dozens or even hundreds of VMs concurrently. Each can be allocated the exact amount of processing resources and bandwidth it needs, and these can be rebalanced dynamically as needs change.

The management software driving this multifaceted operation is also significantly more advanced than previous generations. With dozens, or perhaps hundreds of VMs and hundreds of connections, sharing resources on numerous hardware and storage devices, maintaining centralized control and visibility from a single console is more important than ever. Today’s data center management software delivers comprehensive automation to keep everyday operations running smoothly without human intervention, and granular control to enable precision management at the level of each VM.

As a whole, these technology advancements promote and enable next-generation virtualization, which cuts down dramatically in energy costs. In fact, next-generation equipment can cut power costs per server in the range of 90 percent. Just by consolidating your current workload onto these newer servers, you can save up to 40 percent in capital expenses and reduce total cost of ownership by around 56 percent.2

In addition to the dollars saved, you’ve built an infrastructure that supports unprecedented growth and flexibility.

Converged Fabric = More Savings

As mentioned earlier, VMs still require physical connections to the data and storage networks. In the last 18 months or so, IT vendors began promoting a new strategy, with numerous virtual connections sharing physical ports. Some versions of this technology involve connecting blade servers to a specialized chassis, or using special ‘converged’ devices that mimic network adapters and enable a number of virtual connections to share each physical adapter.

The problem with these approaches is that they require additional purchases and a lock-in to the vendor’s proprietary technology.

A more efficient approach involves building industry-standard converged network adapters directly into new servers, which eliminates an entire layer of networking hardware while maintaining standards-based connections with the rest of the data center.

This simplified fabric integrates Fibre Channel, Ethernet, and iSCSI directly onto the motherboard of the server, which eliminates so-called network sprawl, eases I/O bottlenecks, and enables more and more-powerful VMs. If a mission-critical application was too demanding to trust to a first-generation VM, for example, a converged network fabric combined with the latest high-performance processors creates a more powerful VM that can handle the workload comfortably.

This convergence leads to even greater savings. Network switches, host-bus adapters, Fibre Channel switches, and network interface cards are all eliminated from the architecture, which cuts the ‘network sprawl’ at the edge of the server rack or chassis by an estimated 95 percent. This also saves an estimated 65 percent in equipment costs, or $1 million for every 15 server enclosures.3 Energy costs are also slashed another 45 percent by incorporating these connection technologies into the server motherboard.4

When considered along with the enhanced high-performance processors, memory, and interconnect technologies of next-generation servers, converged fabric provides that last step to creating private cloud infrastructures, where every asset and connection type is available, addressable, and able to be provisioned dynamically from a single console.

How to Plan a Refresh

When you’re ready to phase next-generation ProLiant servers—either rack-mount or blade—into your data center, it’s important to follow best practices in evaluating your current needs and planning for the future.

When you have a sense of your day-to-day requirements, you can use Web-based ROI tools and calculators to determine exactly how much ‘new’ equipment you’ll need to support them. If your existing data center comprises 100 servers, for example, you may find that you’ll need only 20 next-generation servers to handle the same workload. With virtualization software, the number may be much smaller.

Savings also come from reduced IT management time and resources. ROI calculators help with that as well. You may find that you need fewer personnel, or that they can be reassigned to more innovative and business-oriented projects.

Refreshing the data center is also a prime opportunity to plan for the future. If you know that a given number of new servers will support your current needs, adding to that number ensures that your business can scale and grow comfortably.

Let’s look at a sample scenario using an ROI calculator5 configured for a public-sector organization with 250 servers, of which 50...

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3 Based on HP list prices of traditional switch solutions vs. Virtual Connect FlexFabric solution

4 Based on results from HP Power Advisor at http://h18000.www1.hp.com/products/solutions/power/index.html, traditional switch solution vs. Virtual Connect FlexFabric solution

5 http://roianalyst.hp.com/bladesystemmatricetco/launch.html
are virtualized. Moving from a generic, 2U rack server to one of HP’s next-generation blade servers yields a 37 percent reduction in capital costs, a 25 percent reduction in energy consumption, a 60 percent reduction in administration time, and an astounding 98 percent reduction in deployment costs.

Moving to a converged-fabric server reduces capital expenses an additional 25 percent and virtually eliminates the cost of reconfiguring storage area network (SAN) / local area network (LAN) equipment, leading to an overall 20 percent reduction in operating costs.

**HP as Your Technology Partner**

As we’ve mentioned, next-generation HP BladeSystem servers with built-in, converged network fabric deliver the kind of performance and flexibility that today’s businesses need to compete effectively and plan for future growth.

HP ProLiant G7 servers, equipped with AMD Opteron 6100-series processors, are the building blocks of this next-generation data center.

The ProLiant DL585 G7 can support up to 48 processor cores, and it offers four-socket performance at two-socket pricing. Combining massively improved compute power with new levels of electrical power efficiency, the DL585 G7 can pay for itself in as little as 30 days.

On the blade side, the ProLiant BL465c and BL685c are the first ever to include Flex-Fabric converged networking. These can support up to four eight- or 12-core Opteron processors and up to 512GB of DDR3 memory.

The converged network adapters in these blades deliver two, or even four 10Gb ports, supporting Ethernet, iSCSI, and Fibre Channel connections. Each port can be subdivided into additional virtual connections, enabling each blade to support three times as many VMs as competing server models.

HP’s management tools enable you to fine-tune the network and storage bandwidth needed for each application. Integrated Lights-Out 3 (iLO 3), which is included in HP’s renowned Insight Control suite, delivers powerful remote management capabilities for tight control of power consumption, rapid server deployment, and comprehensive health monitoring.

In fact, iLO 3 sets a new standard for management ease and flexibility, offering a faster remote control experience overall, an improved Windows Integrated Remote Console, a Linux Integrated Remote Console, and AES encryption for solid security and data protection.

On the power management side, HP introduced several new features in its ProLiant G7 line.

Each HP ProLiant G7 server includes 32 temperature sensors that detect thermal anomalies and apply independent fan cooling only to the affected area, and only for as long as it’s needed. This creates a quieter and more responsive cooling system and cuts power consumption as well because only one fan is spinning, as opposed to all the fans in the unit. HP reports that this feature makes cooling 2.5 times more efficient than that of G5-era servers.

Insight Control also includes tools for Dynamic Power Capping, which enables long-term power management and savings. The tools enable you to draw caps for each application. Applying a power cap ensures that the HP ProLiant server or HP BladeSystem enclosure does not use more than the specified number of watts of power and cooling capacity assigned, so you don’t have to allocate extra capacity to handle peak loads. Workloads can be allotted exactly the right amount of power they need, which helps with budget planning and energy reduction initiatives. As the integrated management software monitors power usage over time, the caps can be adjusted to better reflect your operational needs. With Dynamic Power Capping, power consumption is dialed back to exactly what is needed, and no more, frequently enabling data center administrators to reclaim space within their racks and potentially postpone costly data center expansion.

When you’re ready to reap the benefits of HP ProLiant G7 computing, HP’s expert consultants are ready to guide your company through the process of assessing the current infrastructure, creating an optimal solution that’s poised for growth, and implementing that solution smoothly. HP Factory Express services can pre-configure new ProLiant servers to your exact specifications, and HP experts are available to train your staff on the new equipment as well.
**Conclusion**

There’s no way to compare next-generation computing resources to servers that are three or more years old. Between new multi-core high-performance processors, faster DDR3 memory, faster PCI I/O connectivity, 10Gb Ethernet, and converged networking, new systems are delivering an average 23:1 virtualization ratio and up to a 96 percent reduction in energy costs.

HP ProLiant G7 servers are the right choice for your next-generation server refresh. With powerful AMD Opteron processors, built-in innovations like thermal sensors, and HP’s comprehensive Insight Control management suite, you’ll enjoy the operational benefits of next-generation computing and the bottom-line benefits of reduced energy consumption and capital expenses.

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Find out how your own organization can benefit from HP thin client solutions.

To learn more about HP ProLiant servers, visit [www.hp.com](http://www.hp.com)