SHI International pioneering data center design for cloud services

First of its kind architecture relies on service provider networking features for secure, highly scalable connections among virtual machines

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**Objective**
Expand strategic business opportunities by building new data centers to host cloud computing services

**Approach**
Design a highly scalable, easily managed on-demand computing facility by using a simplified network design that taps technologies traditionally found in large communications networks

**IT improvements**
- Created a more scalable, high-performance data center networking architecture
- Lowered complexity of securely and reliably managing dynamic connections to thousands of virtual machines
- Simplified data center management and increased security with consistent feature support throughout network infrastructure

**Business benefits**
- Established new cloud computing business for increased revenues from fast growing market
- Lowered operational costs to provide better competitive pricing
- Increased agility and responsiveness to customer demands through cohesive, automated infrastructure

In its efforts to pioneer cloud computing services, SHI International Corporation re-imagined how data centers should be built.

SHI is a global provider of technology products and services to a wide-range of businesses and other organizations. The privately held company, headquartered in Piscataway, N.J., now records nearly $4 billion in annual sales and has achieved revenue growth and profit in virtually every quarter of its 21-year history.

Much of that success can be attributed to the company’s exemplary customer service, says David Hardy, senior director of enterprise solutions for SHI. The company has a 99 percent customer retention rate, one of the highest of any company in any industry.

A few years ago, SHI began expanding into information technology services. The company hired 100 of the “best and brightest” to set up a new business unit to assist its customers in such areas as security, data center automation and operations optimization.

As part of this push to expand beyond its traditional role as a software and hardware reseller, SHI last year decided to “very aggressively” rollout a new cloud computing service, which will allow customers to purchase “on-demand” computing capacity from SHI.

**IT as a utility**
Much in the way businesses and individuals pay for water or electricity, SHI’s cloud computing customers will be able to purchase the capacity they need, just when they need it. Such services are rapidly gaining interest from companies looking to avoid onerous capital expenses from running their own IT infrastructure.

“In a few years, as many as 50 percent of all small and medium-sized businesses will not own any information technology operations,” Hardy says. “Instead, they will buy them as a service from a third party.”
But such a radical departure from traditional data center operations—which were designed with each server and storage system dedicated to a single application—requires a re-invention of these facilities.

SHI recognized that it needed to develop a much more efficient, highly scalable, and easy to manage data center design in order to gain a competitive advantage over other companies rushing to offer cloud computing service. If it succeeded, SHI’s data centers would be more cost-effective and flexible, helping the company provide superior service at lower rates than its competitors in this rapidly growing industry.

The company is now doing full-scale testing of its new data center design and by mid-2011 it aims to offer it cloud computing services, with plans to open build more data center as business expands.

To create its innovative data centers, SHI looked closely at the offerings from all the major data center equipment vendors, including Cisco and IBM. In the end, only HP provided a family of products with a consistent set of features that could support SHI’s innovative greenfield design, Hardy says.

“HP had all the technologies we needed under one roof and was able to coordinate the necessary teams to help us achieve our vision,” he says.

Scale and security
Starting from a blank sheet, SHI designed its new type of data center with elements that have never been seen in commercial production. Uniquely, SHI’s data centers are tapping networking technologies previously only used in commercial communications networks.

SHI’s data center network connects a greatly simplified architecture that is built upon highly scalable, modular, virtualized computing and storage “service cores.” Each contains 32 blade servers and 256 terabytes (TB) of storage capacity interconnected by a pair of HP A5820 switches providing 10 Gigabit Ethernet (GbE) throughput.

To tie the service cores together and manage inbound and outbound connections to the data center, SHI is using HP A12518 routing switches, which offer high-density 10 GbE throughput and up to 13 TB switching capacity, making them capable of supporting as many as 60 of SHI’s service cores.

The management network for the data centers relies on HP A3100 EI switches at each service core and HP A5500G EI switches for the backbone of the management network.

“Since each service core is an identical clone, the computing environment is completely homogeneous, which greatly simplifies troubleshooting, maintenance, and deployment of new computing and storage capacity as customer demand increases,” Hardy says.

While the service cores are the foundation to SHI’s data centers, Andrew Rosser, SHI’s principal architect, says the network is particularly critical to his company’s innovative design.

Thanks to virtualization, data center operators can now divide a single server into many virtual machines, making it possible to run multiple applications at once and fully use a server’s capacity. But virtualization creates many more connections, and cloud services must be able to dynamically coordinate ever-changing links between these virtual machines and multiple customers, who are often running several applications among different virtual machines, Rosser explains.

For taking advantage of virtualization’s benefits while managing its much more challenging network connections, Rosser says HP networking products eclipsed offerings from other vendors in two key aspects: scalability and security. In particular, HP’s networking products had a unique consistency of crucial features throughout its switches.

“Other vendors supported key features in some of their switches and not others, which would have greatly limited our ability to scale data center capacity on-demand,” he says. “Overall, we were given a lot more architectural options with the HP Networking product line.”

Also, while all the HP switches offer 10 GbE throughput and plenty of capacity, Rosser says the HP Intelligent Resilient Framework (IRF) provides the critical technology for scaling such high-performance virtualized data centers. IRF makes it possible to group hundreds or even thousands of switch ports together into one virtual switch. In this way, all of those switches can be managed like they were one switch, greatly reducing network complexity.

“HP IRF was superior to similar technologies from other vendors,” Rosser says.
Service provider technologies

In conjunction with scalability, security was another essential aspect of SHI’s data center design, Rosser says. “While the service cores and the HP switches provided the extensive throughput necessary for cloud services, the network must keep all of this constantly changing traffic separated as the customer’s network extends to virtual machines.”

To most effectively address this issue, SHI looked to technologies common in large scale communications networks. Until now, however, such technologies have not been used in data centers, Rosser says. “We could not find any examples of usage in commercial data centers, and they are only now being researched at some corporate and academic labs.”

Most importantly, the HP A-Series switch family consistently supported two key service provider technologies, Multiprotocol Label Switching (MPLS) and IEEE 802.11QinQ.

MPLS is widely used to help IP-based networks run major telecommunications systems by creating virtual links to separate the millions of traffic streams typical on such networks. QinQ is an industry standard designed for metropolitan-sized Ethernet-based networks that increases the number of VLANs that can be effectively run over one physical Ethernet connection.

Rosser says SHI is using these technologies because of the dynamically changing, high performance, multi-tenant nature of a cloud services data center. Like a communications network for telephone, cell phone or data links, many different customers might be using the data center network at any time, with usage patterns and traffic volumes varying constantly.

“If we didn’t have these features supported throughout all layers of the network, we would have been greatly limited in how much we could securely scale our data centers,” Rosser says. “The HP A-Series switches makes it possible to achieve our design goals, which means we will be able to much more efficiently run our cloud services and pass those savings onto our customers.”

The HP A-Series switches offered additional efficiencies, Rosser says. Unlike other vendors, all the switches used throughout the SHI data centers have the same operating system, significantly reducing costs and complexity because network engineers do not have to learn multiple operating languages, making it far easier to manage the network.

“Having a single OS throughout the data center network also greatly facilitates automation,” he adds.

Such automation is aided by the HP Intelligent Management Center (IMC), which provides SHI with a single-pane-of-glass view into all parts of the network, helping further simplify operations and streamline troubleshooting.

All of these capabilities combine to support a data center design that is much more automated and flexible, which will allow SHI to reduce costs while making it easier for the company to respond to customer demands.

In January, SHI started running prototypes of its groundbreaking service core modules, with plans to bring online the first of its cloud data centers by July. Thanks to HP Networking, this new era for the company will be just as it envisioned.

“We needed an architectural approach that could allow us to go beyond the limits of data centers of the past,” Hardy says. “Thanks to HP, we’ve been able to do just that.”

Company Profile

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