

WORLD RENOWNED UCLA NEUROIMAGING LAB MAPS THE BRAIN'S MYSTERIES WITH HIGH-PERFORMANCE INFRASTRUCTURE

Summary

Industry: Healthcare, Higher Education, Research & Development

Challenge:

- Improve performance of neuro-imaging computing cluster, and speed access to digital brain atlases in a multi-terabit data warehouse
- Simplify network upgrades and reduce frequency of network operating system patching
- Improve productivity of research investigators with anywhere, anytime access to computing resources

Selection Criteria: UCLA's Laboratory of Neuro Imaging evaluated three routers for performance and ease of management. Once the results were in, LONI selected the Juniper Networks MX960 Ethernet Services Router. "We fell in love with the Juniper router," says Rico Magsipoc, chief technology officer at LONI.

Network Solution:

- Juniper Networks MX960 Ethernet Services Router
- Juniper Networks EX4200 Ethernet Switch
- Juniper Networks SA2000 SSL VPN Appliance

Results:

- Doubled core network performance
- Increased service uptime and service provisioning due to simplified network
- Cut network management time by half
- Researchers and IT staff can access images, applications, and other information anywhere, anytime with any standard Web browser

Understanding why the teenage brain can be so responsible and so reckless at the same time. Mapping the ravages of Alzheimer's on the brain. Shedding light on the genetic and environmental causes of schizophrenia. Neuroscientists at the Laboratory of Neuro Imaging (LONI) at the University of California, Los Angeles (UCLA) are unlocking these mysteries of the brain—and many more—in order to gain a better understanding of the brain in health and in disease that will lead to better health for everyone.

Directed by Dr. Arthur W. Toga, LONI is a leader in the development of advanced computational algorithms and scientific structures for the comprehensive and quantitative mapping of brain structure and function. The lab builds population-specific and disease-specific brain atlases that are used by neuroscientists at UCLA and at other universities, academic health centers, and research institutions around the world.

Challenges

Investigation into brain structure and function requires a wide array of tools to create, analyze, and interact with models of the brain. The scientific researchers at LONI rely on a 1300-CPU compute cluster running Sun N1 Grid Engine software. LONI is a Sun Center of Excellence for neuro-imaging. About 1,000 researchers have access to the cluster, and hundreds of individuals are active at any given time. LONI has the largest neuro-imaging database in the world; it has 25,000 unique scans and is nearly a petabyte in size. Researchers work with datasets ranging from 20 MB to several hundred gigabytes.

As usage of the high-performance computing (HPC) cluster grew, the network infrastructure was straining under the demands. "It became obvious that we were bottlenecked in the connection between the core router and the top-of-rack switch," says Rico Magsipoc, chief technology officer at LONI.

Magsipoc set out to investigate ways to improve performance while also simplifying the network. The end game was to keep researchers productive, so that they could get answers to their analyses faster and could pose more complex questions in their available research time. Reducing network complexity would also bring productivity gains to the IT department.

"Our first requirement for the new infrastructure was to simplify the way we handled upgrades and network operating system deployment," says Magsipoc. The IT team regularly tunes the network to maximize performance, but the incumbent router was requiring quarterly (or more) operating system upgrades, which was sapping the productivity of the network engineering team.

Selection Criteria

Magsipoc and his team put three vendors' high-performance routers, including the latest router from UCLA's long-standing incumbent vendor, through their paces. "We tested router performance and how to deploy patches," says Magsipoc. "We fell in love with the Juniper router. In terms of the simple elegance of the JUNOS operating system software and how it is managed, Juniper is the top of the pile."

"After the deployment of the Juniper router and switches, our researchers asked me what kind of optimizations we did because performance was much faster. It was clear to our researchers that the network was faster."

Rico Magsipoc
Chief Technology Officer, Laboratory of Neuro Imaging, UCLA

Results

LONI deployed a Juniper Networks® MX960 Ethernet Services Router in the core and Juniper Networks EX Series Ethernet Switches as the top-of-rack switches for its HPC cluster.

Juniper Networks MX Series Ethernet Services Routers with powerful switching features provides the flexibility and reliability to support advanced services and applications. The MX Series delivers the most advanced routing features, including quality of service (QoS), multicast, and MPLS, as well as the ability to scale functionality without compromising performance. This is due to Juniper's proven track record in advanced system engineering, which continues to fuel innovation in software (Juniper Networks Junos® software), hardware, silicon (ASIC), architecture (collapsed layers), and third-party innovation (Partner Solution Development Platform-PSDP) to maximize investment protection.

MX Series routers are ideal for high-volume data center internetworking and are purpose-built for the most demanding large enterprise and carrier applications. The MX960 is one of the industry's largest capacity carrier Ethernet platforms with up to 960 Gbps of switching and routing capacity. QoS at the interface and per VLAN ensures that services will receive the appropriate level of quality regardless of traffic conditions.

The EX Series Ethernet Switches are carrier-class networking solutions that leverage a common version of Junos software, ensuring consistency and accelerating the learning curve. The EX Series switches feature Juniper Networks virtual chassis technology, which allows up to 10 of the switches to be interconnected and operate as a single, logical system. With virtual chassis technology, users get the reliability, manageability, and high-port densities of traditional chassis-based systems in a cost-effective, compact form factor. Optional front-panel 10-Gigabit Ethernet uplink modules provide high-speed connectivity to upstream devices such as routers.

"Juniper's professional services engineer pointed out that configuring the EX4200 switches in a virtual chassis would save us on expensive 10-Gigabit Ethernet on the MX960 router," says Magsipoc. "That way, we could have a redundant 10-Gigabit Ethernet connection between the logical virtual chassis and the MX rather than simple point-to-point 10-Gigabit Ethernet connections to each of the EX4200 switches at the top of the rack. We really appreciated that advice." In essence, virtual chassis technology reduces the number of 10-Gigabit Ethernet connections required.

In addition to the productivity gains introduced by the high-performance network, researchers and IT staff at the lab can now access the corporate network and applications from anywhere using a standard Web browser. LONI uses the Juniper Networks SA2000 SSL VPN Appliance, which is ideal for small and medium-sized businesses that want cost-effective remote access. "Our users can now reliably VPN into the network and submit a job for processing, do email or access their SharePoint portals," says Magsipoc.

Results

"After the deployment of the Juniper router and switches, our researchers asked what kind of optimizations we did because performance was much faster," says Magsipoc. "It was clear to our researchers that the network was much faster."

Indeed, the performance improvement is quite evident: Capacity in the core network doubled, and the uplinks from the core to the top-of-rack links went from 4 to 10 Gbps, alleviating the bottleneck. Magsipoc also notes that the addition of OSPF routing between the MX960 router and the EX4200 Series switches added additional efficiencies, as it eliminated overhead that was present on the previous Layer 2 connection.

LONI's network is now more reliable and easier to manage. "Management is much easier, and management directly relates to reliability," says Magsipoc. "If systems are poorly managed or unnecessarily complex, an outage may occur. We have several hundred researchers relying on the HPC cluster, so an outage is catastrophic."

Easier management also frees up IT staff for more strategic projects than patching routers and troubleshooting temperamental network equipment. Magsipoc notes that the network manager can now manage the network in half the time.

Even though the IT team at LONI was new to Junos, deployment went smoothly. "The MX960 deployment was surprisingly easy. It was pain-free," Magsipoc says. LONI engaged with Juniper Networks Professional Services and, after the initial planning, the configuration and deployment took a couple of days.

"Junos wasn't difficult to learn. I like that Juniper uses a single-source operating system to cover all network hardware," says Magsipoc. "Other network manufacturers have multiple flavors of their operating systems, so you need to be an expert in each flavor to be effective. Juniper uses the same code base for its hardware, so the learning curve is mitigated."

Next Steps and Lessons Learned

Magsipoc and his team continue to optimize the performance of the HPC cluster to support the neuroscientists' mission to better understand the brain and its functions. Next, he plans to turn on QoS on the MX960 router as part of his ongoing efforts to optimize network performance. Looking forward, the IT team is investigating a 10-Gigabit Ethernet upgrade to the network backbone and security infrastructure and improved fault tolerance. Looking back on the deployment of his new Juniper high-performance network infrastructure, Magsipoc admits he was pleasantly surprised. "I was not expecting the upgrade to be as smooth as it was," he says. "I'm happy with our move away from the traditional network vendor at UCLA."

For More Information

To find out more about Juniper Networks products and solutions, visit www.juniper.net.

About Juniper Networks

Juniper Networks, Inc. is the leader in high-performance networking. Juniper offers a high-performance network infrastructure that creates a responsive and trusted environment for accelerating the deployment of services and applications over a single network. This fuels high-performance businesses. Additional information can be found at www.juniper.net.

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