SAN DIEGO SUPERCOMPUTER CENTER OFFERS DATA CENTER SERVICES WITH JUNIPER NETWORKS SOLUTIONS

Summary

Company: San Diego Supercomputer Center (SDSC)

Industry: Education

Challenge(s): Provide cost-effective and scalable data center colocation to support data-intensive research for the University of California system

Selection Criteria: High-performance, highly reliable routers and switches to support supercomputing applications

Network Solution:

- EX Series Ethernet Switches
- MX Series 3D Universal Edge Routers
- SRX Series Services Gateways

Results:

- Support data-intensive, advanced research projects
- Provide cost-effective, scalable, multi-gigabit network services for data center
- Support the supercomputing needs of multiple departments in the UC system

The San Diego Supercomputer Center (SDSC) was founded in 1985 to advance science and engineering through computational science and data-intensive, high-performance computing (HPC), and that leadership continues today. A broad community of scientists, engineers, students, commercial partners, and museums work with SDSC to develop cyberinfrastructure-enabled applications to manage their extreme data needs. Projects include astrophysics visualization, the Protein Data Bank, large-scale earthquake simulations, predictive analytics and data management, mining, and integration.

SDSC is a pioneer of flash-based supercomputing. The Triton Resource, a data-intensive compute system designed to support UC San Diego and UC researchers, was launched in 2009, along with Dash, the first HPC system to leverage super-sized flash memory to investigate a wide range of data-intensive science problems.

In 2012, SDSC deployed Gordon, a larger scale, flash memory-based supercomputer, which is used to accurately predict severe storms, analyze seismic activity, and perform many other data analysis tasks. Gordon has a multi-terabyte shared memory system, which makes it able to process data-intensive problems about ten times faster than other supercomputers.

Challenges

The University of California system wanted to provide high-performance data center services to its campuses. The Office of the President, which is the group responsible for the business operations of the university system, turned to SDSC to create a data center colocation facility that could handle the UC campuses' needs for HPC. SDSC's two data centers comprise 19,000 square feet and are climate-controlled, secure facilities that are equipped with 13 megawatts of power.

Selection Criteria

The SDSC data center runs a multivendor network, but its incumbent provider was unable to satisfy the growth and scale of growing computing needs. SDSC conducted a thorough evaluation of high-performance routers and switches for its data center, including an extensive proof-of-concept test to experience the products' differentiators in the real world.

SDSC chose Juniper Networks® MX Series 3D Universal Edge Routers and Juniper Networks EX Series Ethernet Switches for the network core and switch aggregation. With Juniper Networks, SDSC found that it could adapt easily to its customers' requirements for high-performance and cost-effective data center services.

Solution

"We needed to provide cost-effective colo offerings to allow the departments in the UC system to save money and time by plugging into SDSC for network and compute services," says Lyle Carlson, Enterprise Network Services manager at SDSC, as he describes designing a multi-tenant data center to meet the needs of many different supercomputing projects. "Using Juniper MX960 routers and EX4200 switches allowed us to scale the data center services that our customers need."

As the data center network core, the Juniper Networks MX960 3D Universal Edge Router runs a broad variety of network services for the supercomputer center, including MPLS as well as IS-IS, OSPF, and BGP routing (SDSC is migrating to IS-IS from OSPF). The network runs both IPv4 and IPv6. SDSC also uses link aggregation to bundle multiple 10GbE connections to deliver multi-gigabit performance to supercomputing applications and ISPs.

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>   Manager, San Diego Supercomputer Center

SDSC uses a pair of MX960s as the border routers to UC San Diego and the rest of the world, including CENIC, the California research and education network, as well as NLR, the National Rail, the ultra high-performance national network, and many other high-performance research institutions. SDSC and UCSD were able to consolidate several border routers to two MX960s by using the logical routing capability of Juniper Networks Junos® operating system. "Using multiple logical systems on the MX960s has allowed us to speed up information sharing and peering," says Carlson.

SDSC also makes advanced use of the MX960's firewall filtering and rate limiting capabilities to protect researchers from malicious traffic.

SDSC uses EX Series switches for server aggregation. EX Series Ethernet Switches are designed to deliver carrier-class reliability and meet the challenges of data center networking. Juniper's unique Virtual Chassis technology allows multiple interconnected switches to operate and be managed as a single logical device, reducing operational expenses and eliminating the need for protocols such as Spanning Tree.

"With the EX Series, we can connect entire rows in our colocation with a single Virtual Chassis," says Carlson. "Virtual Chassis is very valuable for colocation, because we can get customers up right away."

Gordon, SDSC's newest flash supercomputer, also uses the Juniper Networks EX4500 Ethernet Switch and EX4200 Ethernet Switch for top-of-rack and management connectivity. And the supercomputing center uses Juniper Networks SRX3600 SRX Series Services Gateways, including SRX100, SRX650 and SRX3600, to provide firewall and security services for a variety of departments and medical applications. The SRX Series Services Gateways deliver market-leading performance, scalability, and integrated advanced security features for data center and cloud.

Results

Data center colocation at SDSC is cost-effective for the University of California system because individual schools can leverage historical UC investments as well as benefit from the vast economies of scale.

The SDSC data center team can set up new customers quickly, even those with outsized server requirements. Junos OS, which runs across Juniper's routing, switching, and security platforms, helps SDSC reduce the time needed to deploy new services and decreases network operations costs. "With Junos scripts, we can push out policies quickly, which greatly speeds up deployment time," says Carlson.

Running Junos OS in a network improves the reliability, performance, and security of existing operations. "Junos has helped our uptime," says Carlson. The previous vendor's switches experienced issues with the recovery time for the Spanning Tree Protocol. But network outages have become a thing of the past with the ability to quickly isolate and repair this issue.

Next Steps and Lessons Learned

With "big data" going mainstream, SDSC will have more demand than ever from academic and commercial enterprises for its unique services. Carlson and the team at SDSC are continuing to expand their use of Juniper Networks. They are exploring the use of the MX Series' Multichassis Link Aggregation Group (LAG) capability to improve node-level redundancy and ultimately to remove Spanning Tree Protocol from the network.

For More Information

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

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3520424-001-EN   June 2012   Printed on recycled paper