

Particle Physics Research Institute Builds Virtualized Core Network

Summary

Customer:

Nikhef

Industry:

Scientific Research

Business Challenge:

Nikhef, the Dutch National Institute for Subatomic Physics, needed to:

- Increase the performance of its core from 10GbE to 100GbE
- Create a highly virtualized environment capable of segmenting traffic and control between multiple stakeholders
- Use an open systems approach

Technology Solution:

Nikhef has deployed its new network using:

- EX Series Ethernet Switches
- SRX Series Services Gateways
- Juniper Care 4-hour hardware support

Business Results:

- A high-performance core network with capacity to grow as future research programs generate even greater volumes of data
- A virtualized network that can be used by multiple institutes
- A simpler operational environment, reducing the management of 40 switches down to seven

Nikhef is the Dutch National Institute for Subatomic Physics, located in Amsterdam. Nikhef's mission is to study the interactions and structure of elementary particles and fields at the smallest scale and the highest attainable energy levels. Nikhef's research programs involve the collision of minuscule particles, which are studied using large particle accelerators, such as those at CERN near Geneva.

The institute was created as a collaboration between several universities, enabling them to pool their resources and research high energy and particle physics as a single institute. Its staff includes both scientists and technicians. The scientists design new experiments and the technical department supports them by developing and building new data-centric systems, which may include writing new software, building sophisticated hardware, or doing grid and cloud computing for large-scale data analysis.

Business Challenge

Nikhef has a depth of technical in-house resources, even having the capability to design its own field-programmable gate array (FPGA) silicon and network systems, and it had a clear understanding of what would be required to meet the extended organization's challenges.

Nikhef required a high-performance platform that could support its continual traffic growth, but also one that could be highly virtualized, supporting several virtual routers within a single device to ensure complete separation of traffic and policy management among its constituent users. Nikhef also valued an open systems approach, so that it would be able to integrate the new network platforms into third-party maintenance and monitoring systems and maintain maximum flexibility for the future.

The technical team at a local university had been using Juniper Networks equipment for many years and recommended that Nikhef look at the capabilities of Juniper's solutions.

"Initially we thought the Juniper solutions might be beyond our budget range, but we were pleasantly surprised. Unlike many other vendors, we found that Juniper supplies very high-end features even in its smaller platforms. We found we could have features in a small Juniper system that other vendors could only offer in their top-of-range switches."

Tristan Suerink, IT Architect, Nikhef

Technology Solution

Nikhef has deployed its new network using Juniper Networks® EX Series Ethernet Switches. This includes the first ever European deployment of 100GbE cards in the EX9214 Ethernet Switch platform. The network is underpinned by 4-hour hardware support from Juniper to ensure business continuity for Nikhef's mission-critical projects.

As Tristan Suerink, IT architect, explains, "Initially we thought the Juniper solutions might be beyond our budget range, but we were pleasantly surprised. Unlike many other vendors, we found that Juniper supplies very high-end features even in its smaller platforms. We found we could have features in a small Juniper system that other vendors could only offer in their top-of-range switches."

Nikhef was able to fully test and evaluate the systems in-house, using units lent from Juniper's dedicated pool of proof-of-concept equipment. "The demo equipment was shipped in purpose-built crates ready for us to use and was in perfect condition. We were also very impressed with the way we could always get hold of the right person to ask any detailed technical questions as we formulated our design," Suerink says.

The core of the network is completely virtualized, using an EX9214 split into virtual logical systems and linked to Nikhef's collaborative institutes such as Institute for Atomic and Molecular Physics (AMOLF) and Centre for Mathematics and Information Sciences (CWI). All of the institutes share the same physical network but have separate virtual routed networks guaranteeing their own quality of performance and allowing them to implement their own policies while keeping sensitive data fully protected and compliant. The EX9214 core switch is also connected via 100GbE to Surfned, the national educational and science network. Forty-six EX3300 Ethernet Switches, which provide the network access layer, have been deployed using Juniper's Virtual Chassis configuration, and have been grouped into seven virtual switches.

"The virtualization is very flexible," Suerink says. "For example, on our network, a specific VLAN can be used for a completely different purpose than the same VLAN that might be designated by another institute. It's just one example of how a research institute like this is different from a conventional enterprise or service provider environment. Some vendors just try and force us to adopt their standard solution, but Juniper listened to us and we worked together to solve the problems the way we needed to. This was a big difference in its approach."

Business Results

Nikhef now has a high-performance core network operating at speeds of 100GbE, and sufficient system capacity to grow in the future. It has also been able to implement the separation and network virtualization that it had specified in its original brief.

"Juniper's virtualization capabilities have saved each institute buying the same device over and over again. These advanced features are usually only available at very high price points, rather than across the full product range, and when the Juniper documentation says something will work, we know it really will work in practice. Juniper's open interfaces are also very well supported, which has saved us writing our own scripts," Suerink says.

Nikhef is also benefiting from a simpler operational environment. Using Virtual Chassis features has meant that instead of managing 46 switches, now Nikhef only has to manage seven. It has also been able to swap out individual physical switches without rebooting any of the attached systems, increasing availability and business continuity.

As Tristan Suerink explains, "The Juniper CLI is far better than the one we were used to. After less than an hour, I realized there were a lot of features that weren't available before, such as the 'commit feature.' We can roll out new maintenance features and simply go back to the previous version if we need to, or we can have different users configuring different aspects of the system, so we can limit access and protect our BGP configuration from day-to-day operational changes."

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Tristan Suerink, IT Architect, Nikhef

Next Steps

Nikhef is migrating more and more to Juniper but will remain committed to a "best-in-class" approach, so interworking and open standards are very important.

As Suerink says, "Juniper is very keen on open standards and implements them as they should be. Its vision of networking matches our own. Now, we are exploring ways of using SDN to create storage, compute, and networking clouds for different experimental teams. With Juniper we know we can do this without an explosion of physical units or compromised data."

Nikhef is also looking at using [Juniper Networks QFX10000 Ethernet Switches](#) and [Contrail](#) Networking platform for SDN and automation to further enhance its network. The QFX10000 switches scale from 3 to 96 Tbps of throughput, ensuring that Nikhef will have all the performance it needs to continue its cutting-edge research, and the software-defined flexibility to meet its users' requirements.

For More Information

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

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Juniper Networks is in the business of network innovation. From devices to data centers, from consumers to cloud providers, Juniper Networks delivers the software, silicon and systems that transform the experience and economics of networking. The company serves customers and partners worldwide. Additional information can be found at www.juniper.net.

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