Globally Acclaimed University Builds an Innovative New Data Center Interconnect

Summary

Company:

London School of Economics and Political Science

Industry:

Education/Research

Business Challenge:

- Interconnect a campus network securely and resiliently with data centers to support increasing demand for more applications
- Maintain support for existing L2 VLAN architecture
- Protect against the operational risks associated with building large L2 networks
- Create a flexible, future-proofed solution

Technology Solution:

- MX240 3D Universal Edge Router
- QFX5100 Switches
- SRX5400 Services Gateway
- Junos Space QuickStart

Business Results:

- A robust and secure network to support over 200 applications, enabling better research and teaching capabilities
- End-to-end 10 Gbps connectivity
- Network automation, with network configurations that can be implemented easily in response to IT system changes
- Reduced workloads and a more agile IT environment

The London School of Economics and Political Science (LSE) is one of the top universities in the world. LSE is a specialist university, researching and teaching across the social sciences, from economics, politics, and law to sociology, anthropology, accounting, and finance. Founded in 1895, the school can count 16 Nobel Prize winners amongst its staff and alumni, and 37 past or present world leaders. Its campus in central London serves 9,600 students from 140 countries, with a staff of over 3,300.

Business Challenge

LSE had to connect its campus premises to the data center that it shares with other higher education establishments. It had access to the U.K.'s shared Janet academic network, but needed to overlay additional functionality to satisfy its specific requirements for security and Layer 2 support.

LSE wanted to create multiple resilient 10 Gbps connections between its data centers and its campus; it was also important that the connections be highly secure, and would support the existing L2 virtual LAN (VLAN) architecture that was operating in its previous data center environment. Finally, it needed to provide privacy via a tunneling technology, Layer 4 firewall capabilities, and end-to-end encryption of all of its traffic.

As Matt Bernstein, senior network architect at LSE, explains: "We needed to create a Layer 2 data center interconnect and a data center fabric that could fit into the existing L2 architecture, but it was also important that we avoid the operational risks associated with building large L2 networks, such as storms of broadcast, unknown unicast and multicast traffic, which could introduce network instability."

LSE was also looking for a future-proofed solution that would provide support for automation, management, and orchestration as SDN/NFV technologies become established.

"We can't know what our academics will need from the IT infrastructure in a few years' time, so we built in a future-proof network from day one. The solution anticipates future capacity, topologies, and automation technologies like SDN, because we believe we can do more or less anything we need to on the Juniper equipment,"

Matt Bernstein, Senior network architect, London School of Economics

Technology Solution

Part of LSE's overall strategy is to be "prepared to innovate" and that's just what it did to solve its data center interconnect challenge. LSE created its data center interconnect using Juniper Networks® MX240 3D Universal Edge Router. It deployed MX240 routers on its campus in London, and in its data centers in Slough, U.K., configured to provide a resilient mesh of VPNs from each campus router to each data center router. With up to 1.92 Tbps of system capacity, the MX240 delivers high performance, reliability, and scale for a wide variety of service provider, enterprise, and data center applications. It can concurrently support 10GbE, 40GbE, and 100GbE interfaces as well as legacy SONET/SDH, ATM, and PDH.

"The Juniper routers gave us access to the full networking stack, which, combined with Juniper's Virtual Chassis Fabric (VCF) technology, allowed us to create a cutting-edge solution that we believe provides at least five years of future-proofing," Bernstein says. "With Juniper, we could solve one of the most complex networking challenges I've come across, and do it with an open standards implementation."

Juniper Networks Elite Partner Axians worked with LSE from the beginning to design possible solutions to fit the school's requirements. Once a design was established, Axians provided a Proof of Concept (PoC) in its dedicated lab facility. This put the solution through a stress testing process so that throughputs could be verified in advance. The PoC also gave the LSE team the opportunity to learn more about the technologies, which will be enhanced by Juniper Networks Junos® Space QuickStart professional services, to provide further education and training.

As Elliot Townsend, pre-sales from Axians, explains: "LSE required an innovative solution that would solve business challenges and future-proof the network. Using Juniper technology, we were able to establish a design that was a perfect fit and would benefit the institution now and in the future."

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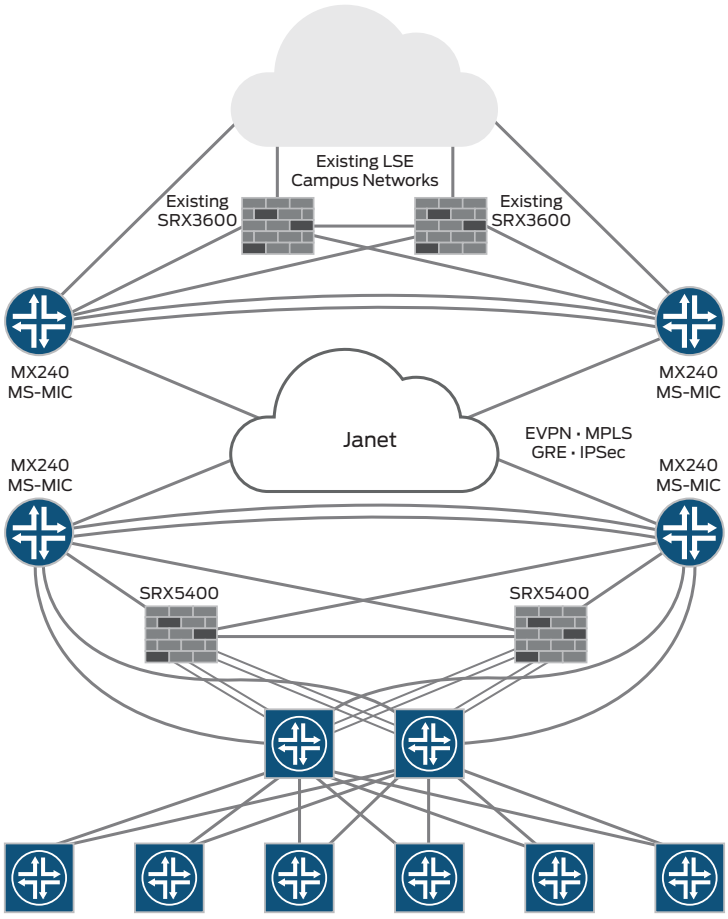

Figure 1: LSE's Juniper network infrastructure

The solution that LSE adopted was to deliver Ethernet VPN (EVPN) services over generic routing encapsulation (GRE) over IPsec tunnels. This allowed its systems department to retain the current Layer 2 VLAN design while mitigating against the risks of large L2 networks. "We felt that virtual private LAN service (VPLS) wasn't robust enough, whereas EVPN gave us both resilience and robustness, and is an open standards-based approach, which ensures longevity," Bernstein says.

LSE used the U.K.'s Janet academic network to provide the base level of its interconnect, traffic tunneled over IPv6 to ensure clean service separation from its existing IPv4 services, which share the same physical connection. On top of that, the MX240 routers provide encryption using IPsec. "Encrypting all of our traffic is essential, because the Janet network is essentially a public cloud, and we have no assurance that applications transmit confidential data securely," Bernstein says. "Encryption gives us long-term confidence that our solution will meet our future security needs and compliance demands."

The solution also uses multiple routing protocols, including BGP and OSPF to route MPLS, and RSVP for fast failover, so that if a label-switched path (LSP) becomes unavailable, a backup LSP is already available. Finally, it uses EVPN to build a hugely scalable routing table of media access control (MAC) addresses.

"Each protocol is performing a locally significant function, and we know we can grow right up to Internet scale because we're using a carrier-grade border gateway protocol (BGP) implementation," Bernstein says.

In addition to the MX240 routers, Juniper Networks® SRX5400 Services Gateway acts as a data center firewall. Juniper Networks® QFX5100 Ethernet Switches are deployed behind the SRX5400 gateways to provide the data center fabric, using Juniper's Virtual Chassis Fabric technology. Juniper's VCF technology can be used to connect multiple switches as a single, logical device, delivering a scalable solution perfect for data center installations.

Business Results

LSE now has a robust network to support its estate of over 200 applications, which range from timetable scheduling to student services to financial systems, all with secure and resilient links into its data centers. "Now we are running bigger, better, and faster," Bernstein says. "We have 10 Gbps wherever we need it, end-to-end. We can support more applications and the whole system is far more robust."

Juniper's focus on open standards will enable network automation, allowing IT systems to make changes without the network team having to get involved. As Bernstein explains: "We've been able to give the systems team direct access to the switching fabric, but at the same time this is protected from changes to the ports we use to build the actual network. This is a great operational win, which allows us to support a highly agile research and enterprise environment."

Next Steps

LSE will be looking at how the solution might benefit from SDN, as the blurring of networks and systems becomes more important. "We can't know what our academics will need from the IT infrastructure in a few years' time, so we built in a future-proof network from day one. The solution anticipates future capacity, topologies, and automation technologies like SDN, because we believe we can do more or less anything we need to on the Juniper equipment," Bernstein says.

For More Information

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

About Juniper Networks

Juniper Networks challenges the status quo with products, solutions and services that transform the economics of networking. Our team co-innovates with customers and partners to deliver automated, scalable and secure networks with agility, performance and value. Additional information can be found at Juniper Networks or connect with Juniper on Twitter and Facebook.

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