

University Stays In Front With Full-Scale Network Transformation

Customer Case Study



End-to-end Cisco architecture enables university to maintain pre-eminent position in UK higher education market.

EXECUTIVE SUMMARY

Customer Name: Loughborough University

Industry: Higher Education

Location: United Kingdom

Company size: 3000 staff, 16,000 students, and 1500 business community tenants

Challenge

- Maintain strong leadership position
- Provide IT infrastructure commensurate with top student experience status
- Improve sustainability, resilience, and disaster recovery provisions

Solution

- Ultra-high-speed Cisco-based campus network with world-first adoption of Cisco SUP 2T engine
- Twin on-campus data centers based on Cisco UCS servers, VMware virtualization, and NetApp storage
- Cisco Unified Communications with Unified Personal Communicator, Unity Connection, and Unified Communications Manager hosted on UCS servers
- Cisco VXi virtual desktop infrastructure

Results

- Optimized and flexible broadband campus infrastructure offering 1Gbps to desktops
- Agile private cloud with triangular data center architecture
- Improved productivity and efficiency from unified communications

Challenge

Loughborough University is justifiably proud of its customer satisfaction ratings, having topped the Times Higher Education Best Student Experience poll for five years in succession. It is also the premier UK university for sport and was selected to be the preparation headquarters for the 2012 British and Japanese Olympic teams.

However, UK higher education is an increasingly competitive marketplace. Introduction of student fees means universities vie with each other for students. Meanwhile, Loughborough has to work hard to attract research funding, and has made major investments in high-caliber staff and advanced facilities. It is now home to more than 40 research institutes and centers spread across 23 academic departments. Their work is internationally recognized, with 20 percent judged as world leading¹.

“Research is a highly competitive business,” says Dr. Phil Richards, Director of IT at Loughborough University. “Our people need to respond rapidly to niche areas, as opportunities arise and evaporate with equal speed. We wanted a solution that would give researchers the resources they need virtually on demand, to keep them out ahead of the rest of the world.”

A key objective of the university’s i2012 vision, therefore, was to help ensure that not only researchers, but also students and staff, have access to state-of-the-art systems and applications. This vision set out a strategic plan to address three crucial areas: an ultra-high-speed secure campus network, including fixed and wireless connections; a resilient and sustainable data center; and the wide-scale introduction of unified communications services.

Phil Richards and his team form an acclaimed networking technology center of excellence without parallel in the UK higher education sector. They launched a study to scope future computing and networking needs for prospective suppliers. Discussions involved departmental heads, which helped gain support for a centralized approach. Loughborough then took advantage of the European Union Competitive Dialogue process, which enables discussions about precise requirements to take place with shortlisted companies.



¹. 2008 Research Assessment Exercise

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Dr. Phil Richards
Director of IT
Loughborough University

The winning solution, from Cisco partner Logicalis, was the only one to propose an end-to-end Cisco environment based on the FlexPod reference architecture including NetApp storage and VMware virtualization. At its core was a hybrid private cloud model with remote connection between Loughborough University and the Logicalis data center via the Janet network, the UK backbone for education and research. Richards says: “The Logicalis Cisco-based proposal was head-and-shoulders above the other contenders, which included a roll call of the best-known names in the global IT services market.”

Having inherited a patchwork of in-building networks using diverse technologies, the upgrade was to be conducted on a large scale. It reaches 26,000 network points, including 5,500 in students’ accommodation, in 75 buildings stretching across a 437-acre site (the largest contiguous university campus in Europe). The aim was to achieve watertight standards of resilience, along with standard reference architectures, and guarantee the same high-quality user experience anywhere and at any time.

Solution

A Cisco® Borderless Network, utilizing Power over Ethernet throughout, now provides anytime, anywhere, anyplace connectivity across the campus. The core comprises 18 Cisco Catalyst® 6500 Series Switches running the Cisco Catalyst Supervisor Engine 2T (SUP 2T). In fact, Loughborough University was a world-first SUP 2T implementation.

Dave Temple, Assistant Director (Technology Strategy) of IT at Loughborough University, says: “Among other capabilities, the SUP 2T has hardware-based optimization functionality to dynamically cope with hyper-bandwidth networks like ours.”

The core switches run at 40Gbps with full TrustSEC support. New line cards connect to 150 Cisco Catalyst 3750-E Series Switches, which enable 10Gbps optical fiber links to individual university buildings. The network edge is composed of approximately 700 Cisco Catalyst 2960S Series Switches, providing 1Gbps to individual desktops. Class-leading Cisco ASA 5585-X firewalls, with 10Gbps interfaces, deliver best-in-class security and VPN capabilities. Configured to meet the new dual-homed data center architecture, this installation was the first such Cisco ASA 5585-X deployment in the UK.

Cisco Wireless Services Module 2 controllers in the Catalyst 6500 switches are at the center of a campus-wide wireless network, delivering high-speed 802.11n performance via 1500 Cisco Aironet® 1142 Wireless Access Points. Aggregate bandwidth is 300Mbps per access point shared between users within range of that device. In addition, some 150 Cisco Aironet 3500 Series Access Points, with Cisco Clean Air® functionality, avoid any potential interference from other devices (particularly in laboratories) by intelligently switching radio frequencies when such problems are detected.

Remote access is provided by a Cisco Any Connect VPN. This technology helps ensure the same high-quality user experience irrespective of whether the user is 1000 metres away or 1000 miles away. End-to-end protection is provided by the Cisco Any Connect Secure Mobility Solution. A further campus wide security measure uses 802.1x network authentication. Active Directory-driven, this feature alters switch configurations to match users’ security profiles, automatically excluding people from areas where they are not supposed to be.

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Matthew Cook, Head of Infrastructure and Telephony at Loughborough University, says: “In such situations security is crucial. Networks are being opened up more and more, for example, by the trend towards bring-your-own-device. In fact, higher education has been exposed to that for some time, but it’s relatively new in the corporate world. We’ve been able to help guide the Cisco Borderless Network architecture to take account of that, as well as the impact of developments such as IPv6.”

The new Loughborough data center architecture is a world away from its old legacy facility. It is housed in two mini-pods located at either end of the 437-acre site. Each mini-pod comprises about eight racks within an enclosed cooling system, with one pod set in a roof void that would otherwise have remained unused. Construction costs were just £20,000. Each mini-pod has 10Gbps resilient and diverse links to the Janet network and to the Logicalis cloud. That arrangement not only helps ensure high-speed, guaranteed quality-of-service connections are always available, but its triangular nature offers industry-leading disaster recovery assurance.

The mini-pods, which use VMware virtualization technology, replace 50 to 60 conventional racks. They are far kinder to the environment, with a Power Usage Effectiveness (PUE) rating of 1.3 to 1.5 as opposed to the old data center’s 2.4. Within each pod, Cisco Unified Computing System™ (UCS™) B-Series Blade Servers, with NetApp storage and software-based Cisco Nexus® 1000V Series Switches, provide computing resources able to meet day-to-day computing needs for the next four to five years.

In terms of unified communications, the university has replaced its multiple legacy private branch exchanges (PBXs) with a Cisco Unified Communications Manager platform running on the UCS servers in the data center (that application is another first for the higher education sector in the UK). The deployment of IP telephony and collaboration services will include approximately three thousand IP phones provided for staff, complemented by Cisco Unified Personal Communicator. These desktop soft phones will help enable staff for the first time to enjoy integrated voice messaging via Cisco Unity® Connection along with instant messaging (IM) and presence.

In addition, Cisco Unified Workspace Licensing (CUWL) provides a flexible package covering various collaboration options on a per-user basis. This service will help the team deploy new services at a pace that suits them. “For example, this architecture gives us the potential to easily introduce desktop video conferencing to effectively communicate and collaborate from anywhere,” says Temple.

Results

The new Loughborough standardized architecture is largely IPv6-enabled. Whether user devices are wireless or fixed, the university is able to offer them the bandwidth they need to run today’s media-rich applications. It also offers the facilities to manipulate, prioritize, and control different traffic flows from students, researchers, and staff securely and smoothly, irrespective of access technology.

The network’s inherent resilience means that the campus is a much more flexible and better managed environment. For example, IP-enabled facilities management applications use the Cisco infrastructure rather than separate cabling. These applications include building management systems, networked multifunction printers, emergency lighting controllers, and fire alarms.





The university is already taking advantage of public cloud services such as Google Apps and the Service Now service desk. The hybrid private cloud provides the ability to choose which cloud option to take and when. Furthermore, the groundbreaking Loughborough/Logicalis model opens up the exciting prospect of cloud-based industrial-scale data centers offering server and storage facilities via the Janet network at a fraction of current costs.

An innovative ANPR (automatic number plate recognition) application, teamed with door access control, proximity sensors, and closed-circuit television (CCTV) offers enhanced physical security. The ANPR application is able to identify cars and charge them for parking according to the amount of gas they use. The university was the first UK implementation of the Cisco CCTV Video Operations Manager.

The strategic and operational flexibility offered by the Cisco-based hybrid private cloud solution means that virtual machines can be just as easily provided in the Logicalis data center as in the university's own. Virtual servers, storage, and even a Loughborough-owned IP address range can be spun up in the cloud in just 10 minutes and, if required, reassigned back to the university across the Janet backbone just as quickly.

Cook says: "So, while our local data center meets day-to-day needs, unexpected demands or short-term traffic spikes such as during admissions week can be easily met using Logicalis resources in a cloudburst mode."

Better still, whereas in the past a research team's request for additional computing power typically required a couple of months, with the hybrid private cloud solution such requests can now be achieved in a couple of hours. And soon a self-service portal will allow research teams to specify and allocate their own server space in the Logicalis data center.

"We've saved over £2 million in building costs alone, and around 640 tonnes of CO2 a year, with associated six-figure power reductions," says Richards. "Looking forward, the savings could be much more as we decide, on a case-by-case basis, where it makes sense for us to run applications in-house or use third-party services."

In the meantime, the university is able to provide unified communications services, such as IP telephony, from the data center to the entire campus. This service will improve the productivity and efficiency of university staff, while addressing growth areas such as collaborative research models with external partners in the United Kingdom and abroad.

Richards concludes: "We now have a unified architecture on which to provide a growing range of media-rich services, with the flexibility to choose between local delivery and cloud-based options. Furthermore, our time-to-market for spinning up research resources is now measured in hours rather than months. Each new such application adds further value and leverages our investment in the underlying platform."

Next Steps

The university is already looking to further explore the power of virtualization. A pilot of Cisco Virtual Experience Infrastructure (VXI) running VMware virtual desktop has been a great success. In the pilot, some 20 VXI devices were hosted on the UCS servers in the data center. Cisco VXI was found to run seamlessly across the triangular data center architecture alongside the virtual servers and the unified communication platform.



However, VXi does not rigidly lock the enterprise into the data center. For example, it offers local voice breakout at the desktop, not only enhancing call quality, but also making possible faster and more flexible unified communications facilities.

Offering the prospect of replacing corporate desktops with virtual workspaces, and even providing a virtual learning environment for students, the initial phase of the full VXi rollout will see the deployment of 400 Cisco virtual desktop client devices. Located in all sporting facilities, including the official preparation camp for Team GB, Loughborough sees this as a powerful advertisement for its technological leadership.

For More Information

To find out more about Cisco Unified Data Center, please go to: www.cisco.com/go/unifieddatacenter

To find out more about Cisco Collaboration Architecture, please go to: www.cisco.com/go/collaboration

To find out more about Cisco Products and Services, please go to: www.cisco.com/cisco/web/UK/products/products_home.html

PRODUCT LIST

Unified Computing

- Cisco Unified Computing System B-Series Blade Servers

Switching

- Cisco Catalyst 6500 Series Switches, with Cisco Catalyst Supervisor Engine 2T
- Cisco Catalyst 3750-E Series Switches
- Cisco Catalyst 2960S Series Switches
- Cisco Nexus 1000V Series Switches
- Cisco Nexus 1010 Series Appliance

Security

- Cisco ASA 5585-X firewalls
- Cisco Any Connect Remote Access Solution
- Cisco Any Connect Secure Mobility Solution

Unified Communications

- Cisco Unified Communications Manager
- Cisco Unified Personal Communicator
- Cisco Unity Connection
- Cisco Unified Workspace Licensing

Wireless

- Cisco Wireless Services Module 2 (WiSM2) controllers
- Cisco Aironet 1142 Wireless Access Points
- Cisco Aironet 3500 Series Access Points



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