

# WHITE PAPER

## CISCO CONNECTED REAL ESTATE IN EDUCATION

*Cisco Connected Real Estate in Education leverages IP infrastructures to create fully featured buildings with the facilities to deliver world-class education*

## **Next Generation Schools, Colleges and Universities**

Schools, colleges and universities throughout the UK are aiming to create the next generation of buildings with the facilities to deliver world-class education. They are aiming for buildings and campuses that provide a safer place to learn and teach. Campuses that understand their occupants and intelligently provide services to them, buildings that preserve valuable costs by providing heating, lighting, network and audiovisual services in the right place at the right time .

A prerequisite for their success will be the choice of network infrastructure to provide services within and between buildings. While many schools, colleges and universities have converged their voice, video and data communication services onto a single network, few have recognised the potential to connect their building and estate control systems to the same network.

In this next wave of convergence, which is the focus of this white paper, all the disparate building automation systems (for heating, lighting, security etc), as well as voice, video and data, will eventually be supported by a single integrated network based on open standards. The end result will be buildings that are more economical to manage, providing a safe and secure environment for students to learn and work.

## **The Framework for Connected Schools and Campuses**

To help create these intelligent buildings Cisco Systems has developed a framework aimed specifically at the education sector called Connected Real Estate (CCRE) in Education.

Cisco's framework is based on a secure intelligent information network using Internet Protocol (IP) as a communication standard. This network is the same as the Cisco networks that are already used to connect many different types of properties around the world, including small and large businesses, shopping malls, hotels and airports.

Integrating building systems with these networks has been hampered by their use of different data standards and protocols. Usually each building management function required a separate network, which was costly in terms of installation, integration and maintenance. Having multiple proprietary networks also resulted in buildings that were complex to operate and had limited opportunities for automation.

Now, change is underway as building system companies include IP in their new product developments. Ethernet-based multi-function building automation systems are emerging that combine heating, ventilation and air conditioning (HVAC) with lighting and lift controls, and fire and safety with security and access controls. Soon these multi-function

systems will converge into an IP building platform, just as voice, video and data converged into an IP communications platform.

Ultimately, a single IP environment will exist for both user systems and building systems, and it does not need to be confined to a single building. Multiple properties can be linked together into a connected campus, enabling building control systems across all buildings to be monitored, controlled and maintained from a single centralised (and/or remote) location.

Cisco uses this approach in its Europe, Middle East and Africa operations, managing access and security over its IP network for all 88 offices in the region from a single Security & Facilities Operation Centre in Bedfont Lakes in the UK. The company also monitors several facilities systems over the network such as temperature control in its communications rooms, leak detection in its laboratories and the status of its uninterruptible power supply systems.

## **The Network as a Utility**

To fully utilise Cisco's framework, the IP network must be considered early in the design phase of a major refurbishment or new building construction. Studies show that the cost of the communication infrastructure for a new building is usually between 1.5 and 2 per cent of the building costs.

Such a small investment can have major repercussions throughout the 25 to 30-year lifecycle of a building. Looking at costs again, approximately 75 per cent of a building's lifecycle costs occur in the maintenance and operating period, when the building is in use. The rest of the costs occur in the development period, during the concept, design and construction phases.

With three-quarters of the costs for building occurring during the maintain and operate period, instead of initial capital expenditure, it is clear that decisions taken in the design and construct phases can have far reaching financial and operational effects. An IP network that is included in the building design phase and installed early in the construction process, will provide immediate gains for building owners.

Laying a network as the building is under construction is easier and more cost efficient than retrofitting it. Time and capital costs are also reduced by laying a single open standards-based cabling infrastructure rather than multiple closed proprietary networks. In addition, by installing a network early, building owners can extract value from the network over a longer period of time, increasing the overall return on investment.

## **The Value of CCRE in Education**

Overall, Cisco's framework for connected schools, colleges and universities creates unprecedented opportunities:

- to reduce the lifecycle costs of a building or a campus
- to attract staff, students and partners and generate new revenue and service streams
- to improve health, safety and security.

These are the benefits that can be achieved solely by connecting building automation systems to the IP network utility. The additional educational benefits of having voice, video and data on the same network, while considerable, are not the subject of this white paper.

## **Reducing the Lifecycle Costs of a Building or Campus**

As indicated above, Connected Real Estate in Education reduces capital investment during a building's construction by integrating network infrastructure requirements. In many cases, a single network is sufficient, eliminating the need (as well as the associated costs and time) to install multiple networks to support multiple building systems.

When Falmouth College of Arts (FCA) was planning its new £80 million campus at Tremough a few years ago, it saw an opportunity to avoid the costs of laying many separate cable networks and the difficulties of dealing with many different vendors. It chose to integrate all of its networking requirements – building management systems and communications – across a single IP network **from Cisco.**

Not only has the network reduced FCA's capital spending but also its ongoing operating expenditure by enabling a centralised (and sometimes remote) approach to monitoring, maintenance and control of the building environment.

“One of the huge benefits of the network is that we can manage it with a small team from anywhere at any time. I have staff who can access the network and perform any kind of maintenance or development work from home and that makes the network so easy to manage,” explains Nathan Prisk, FCA's Head of IT Services.

An open standards-based network also reduces the costs of installing and setting up the building systems or adding new ones by enabling a plug-and-play approach to new solutions. When Newport City Council in Wales wanted to improve security for schools in the region, it was relatively easy to add IP CCTV surveillance to its existing Cisco IP infrastructure. “Our success with this project goes back to the creation of the underpinning, enabling infrastructure,” says Phil Cox, principal consultant on the project. “Without the right infrastructure, you cannot move forward.” The return on investment was.....lots of info here on case study.

Another advantage of connecting building systems to a single network is the ability to control, monitor and gather real-time data from any location, and ultimately to automate building operations, resulting in optimal efficiency, lower operating costs and a more comfortable working environment.

“Nottingham Trent University has migrated all of its heating, hot water and air conditioning systems at each site and each building to run on a Cisco network, so, for example, an engineer at our city site can carry out routine maintenance operations without having to physically visit each building. That’s a much more efficient and effective way to work and a significant financial and resource saving for the university,” says John Cheesbrough, Network Manager at the university.

At another educational campus, Crossways Academy, a new purpose-built sixth form college in Lewisham, south London the next generation intelligent building technologies are being used to open and close windows automatically to accommodate varying temperature and weather conditions, helping to save on energy costs.

Cisco’s IP framework also features embedded technologies that guarantee quality of service and high levels of security and resilience, further reducing network maintenance and repair costs. In addition, all components of the network are built entirely on open standards. Hardware, software and services are designed using roadmaps that anticipate and support constantly changing business requirements.

## **Attracting Staff, Students and Partners and Generating New Revenue and Service Streams**

Efficient buildings that have the latest communications facilities, comfortable and secure spaces in which to work or relax with environmentally friendly practices are an attractive proposition in today’s competitive education environment.! Owners can be confident that they are providing an optimised service if they can offer intelligent heating, lighting and cooling, energy efficiency, 24-hour video surveillance and access control features, all of which are enabled by Cisco’s connected real estate solution.

Within the education sector, these buildings and campuses are appealing to teachers, lecturers, administrators, and maintenance personnel, and help to recruit and retain them. They are equally appealing to students, helping schools, colleges and universities to meet their targets for student intake and for course attendance, both of which attract government funding.

Crossways Academy opened in September 2004 with the aim of encouraging more students to stay on at school after the age of sixteen. It has already exceeded its initial target for enrolment in the first year by 20 per cent. Its success can partly be attributed to the building’s technological sophistication, in particular its innovative building

infrastructure that supports intelligent building applications and IP security, as well as converged voice, video and data, and remote working.

By planning ahead and insisting on open standards and future proofed solutions, Crossways has achieved state-of-the-art facilities. “One of my first and key objectives was to put information and communications technology at the very heart of the Academy in order to provide students and staff alike with the most flexible, mobile and up-to-date learning and support systems,” says Anthony Bravo, Crossways’ Principal. “Our building infrastructure is proving pivotal in realising our vision of an inner city centre of excellence.” (NOTE: these are almost exact quotes taken from Guardian article, Redstone press release and case study. We’ve changed ‘Redstone’s network will be pivotal...’ to ‘Our building infrastructure is proving pivotal...’)

School, college and university buildings that offer innovative amenities, applications and features are also attractive locations for extra curricular events such as workshops and conferences. They can also be adapted for community use, helping the owners to generate new sources of revenue.

## **Improving Health, Safety and Security**

Safety and security in all educational establishments is a major issue and has to cover a range of situations, from children being bullied, to staff and students being attacked, buildings being vandalised and records being stolen. While it is essential to protect people and assets, it also needs to be effective without being intrusive, restrictive or overly expensive.

Cisco’s framework provides a solution that allows critical real-time data to be acted on. Video surveillance, access control and asset management over the IP network can all be used to drive more sophisticated and comprehensive physical security strategies.

If there is an emergency in a building, for example a fire has been detected or an intruder identified, information and instructions for dealing with it can be communicated to the building’s occupants in multiple formats (voice, video and data) to multiple devices, including PCs, IP telephones, information displays and public address systems. The communication is rapid and can be directed to where it is needed.

CCRE in Education also enables state-of-the-art access control to buildings, rooms within buildings, and car parks, using a variety of recognition technologies. This allows close control of expensive and limited resources – such as car parking – and enables building owners to regulate entry to buildings.

At FCA’s new campus, security cameras are linked via an IP network so that security staff can monitor the whole campus remotely from their PCs. These cameras are also integrated with door security, including swipe cards and IP lock controllers, so that staff

can remotely open and close doors, monitor incidents and, importantly, manage access in the event of fire.

What about adding in the “virtual guard” option as a result of IP CCTV?

In addition, FCA’s integrated security system helps pinpoint and identify intruders. If someone forces a door open, an alert automatically turns the nearest closed-circuit television (CCTV) camera towards the door. “We have one of the most sophisticated IP networks in the academic community,” claims Nathan Prisk.

At Crossways, its intelligent IP network is being used to improve security in a number of areas. Entrance barriers are linked to the network and are only released by staff and students with appropriate smart cards. In the library, staff and students who want to borrow books use both swipe cards and biometric identification. This prevents books being borrowed on lost cards and fines accumulating.

Security is further improved in schools, colleges and universities by using an IP video surveillance system that allows security cameras to be placed throughout a campus and monitored centrally via an IP network, helping to protect students and staff as well as records and property at a fraction of the cost of analogue CCTV systems. An added benefit of these systems is that they not only help to identify potential security problems but also act as a deterrent.

Newport City Council, having already installed a Cisco IP network infrastructure, opted to use CCTV over IP to help prevent vandalism at some of the 60 schools in the area. With little new investment, the Council’s network infrastructure has provided extra value by managing and transmitting vital data that has transformed the security of many schools.

“Schools that signed up for the monitoring and response service saved 41 per cent on the cost of repairs associated with vandalism in the first year of the scheme and a further 28 per cent in the second, when nearly £46,000 was saved on broken window replacement alone,” says Phil Cox. (NOTE: the figures are in an approved case study although they were not reported as a Phil Cox quote). At the same time, money spent on cleaning graffiti and litter collection was reduced by about £75,000.

As well as enhancing security and safety in schools, colleges and universities, CCRE in Education can also improve students’ health. At the Venerable Bede Church of England (Aided) Secondary School in Sunderland, opened in September 2003, its IP network extends to the canteen where it is connected to a cashless payment system.

Every student has a smart card that can be passed over a card reader to identify the individual, the amount of money available on their account, any food allergies or food restrictions, and whether they are eligible for free meals. Originally, iris scanning rather

than swipe cards was trialled as the recognition technology. Its use is still being explored for the future.

At meal times, pupils choose their food in the canteen, swipe their card at the checkout where an operator enters their purchases. If all the purchases are allowed, the price is automatically deducted from their account. If, however, any of the food or drink is not allowed, this information is flagged to the operator and the pupils are asked to choose different items.

“With this system there is no cash and no vouchers. As a result meal queues move quickly,” explains Ed Yeates, Venerable Bede Secondary School Head Teacher. (NOTE: this quote is taken from what he said when the school opened in 2003 when it was using iris scanning. But it’s also applicable to smart cards). More importantly, having eliminated the need for vouchers, the system has effectively removed the stigma and bullying that these pupils may have faced. HAS it also reduced pocket money/ school money theft?

## **Vision of the Future**

CCRE in Education promotes the convergence of building systems onto a single Cisco multi-service IP platform. It is a vision of the future and of the next generation of schools, colleges and universities. But from the examples cited above, it is evident that tomorrow’s educational institutions are taking shape today.

Quantifiable benefits are already being realised. Converging building systems and user systems on a single network is proving less costly to manage, monitor and maintain. It is opening up new business opportunities, and improving health, safety and security.

When buildings and campuses are connected with a high-speed, intelligent network that can support a multitude of different systems and services, new IP applications can be examined and deployed quickly and easily. The applications can be added according to needs and available budgets.

In the first wave of deployment, which is already underway, access control and video surveillance are the applications most likely to be given serious consideration. Both represent relatively quick wins. (I think this is negative even if true – I would change this around to say the the security applications are moving to pure IP now and while it may take a little time before we see Ethernet enabled HVAC systems etc, these can be connected to the IP network through gateway products & software that convert serial fieldbus to IP) HVAC, energy management and asset tracking will follow these in the next few years. Finally, lighting and fire, life and safety systems are expected to be added.

As the concept of CCRE in Education is better understood and the benefits measured and documented, more schools, colleges and universities will decide to adopt it, especially as

more funding becomes available to refurbish buildings and build new schools and colleges.

## **Appendix: Technology Overview**

Some of the most important building systems that can be connected to an IP infrastructure are outlined below. The list is not comprehensive; new applications are continually being added.

### **Access Control**

Integrating access control devices into building networks enables security personnel to control entry, track visitors and detect intrusions into entryways, car parks, lifts, hallways and offices more quickly. The devices can range from building card systems to biometrics.

### **Fire Alarms and Safety Alerts**

IP-based building networks can be used to support a range of safety functionality providing unified, real-time, security information. This allows enhanced monitoring of properties and improved co-ordination with emergency services.

IP network enabled fire alarms and safety alerts can reduce emergency services' response time in the event of fire, terrorist threat or other emergency. Networked security systems can – for example – automatically release emergency exit locks, broadcast pre-recorded status messages and enable ventilation systems for smoke extraction.

However, it is important to note that some European countries have legislation in place that prevents fire alarm systems from sharing a common infrastructure with other building systems. In addition, phones in lifts and emergency lighting may be required to have hardwired connections.

### **Video Surveillance**

IP-based video surveillance offers significant advantages compared with analogue CCTV. It is less expensive, offers superior video quality and video portability, and allows instant retrieval of security information. Network-based digital storage also eliminates the need for VHS tapes and their management. In addition, IP-based video surveillance deployed across multiple properties can be managed and monitored more efficiently and effectively via a centralised security operations model.

### **HVAC**

Automated and networked HVAC systems can efficiently control a building's temperature, humidity and airflow. This allows authorised occupants to adjust the environment in their working spaces, thus conserving energy and controlling costs. In addition, furnaces, chillers and even compressors can be equipped with sensors that continually monitor the equipment for indication that preventative maintenance is needed.

### **Lighting Control**

Lighting systems can be accessed and computer-controlled by a building's owner or by an occupant via web-based control systems. Lights can be dimmed and turned on or off depending on whether or not the room is occupied. Lighting systems can also be linked to a centralised information system that shows point-in-time usage or usage patterns for either a single building or an entire campus.

### **Lift Control**

Network-enabled lift systems allow their operation to be monitored and optimised. Access control cards allow occupants programmable, selective access to certain floors. Interactive in-lift terminals can stream content, ranging from news feeds to emergency instructions. In addition, lifts can be continually monitored for performance and breakdowns to drive proactive maintenance.

### **Energy Management**

Energy management systems such as thermostats, environmental control systems, lighting, machinery and onsite generators can all be network enabled. This allows building owners to limit electricity and gas usage to the times when they are needed and reduce total energy costs.

### **Parking Control**

Entry to parking areas can be controlled via access cards or other electronic identification methods. Parking systems can also be integrated with security, lighting, lift and HVAC systems, and these systems programmed to turn on and off for the individual when they enter the parking structure. Visitors' parking costs can be monitored and accounted for electronically, reducing administrative overheads.

### **Digital Signage**

By using computer controlled plasma or LCD screens, building owners can integrate digital signage with their building automation systems to drive real-time control of messaging. Building visitors can videoconference with occupants from the lobby.