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Images



A member of Stafford General's Portering and Security Team monitors ...



Above and below, left: The main A&E reception area. Scenes ...



Case study

NHS on the network

May 2004

It's no secret that the Government is committed to spending heavily on IT infrastructures within the National Health Service. Healthcare Trusts are now discovering that, with fast networks, it makes perfect sense to transmit their surveillance images across them. Security Management Today examines one such application in Staffordshire. Photographs courtesy of Axis Communications

Stafford General Hospital, based just two miles outside Stafford town centre, is part of the Mid-Staffordshire NHS Trust in the West Midlands. The hospital boasts an extensive outpatient area, a Cancer Treatment Unit, Acute Stroke Unit, a Post-Graduate Medical centre and a 24-hour Accident & Emergency Unit. It also has a Special Care Baby Unit, three Maternity Wards and an Infirm Elderly Unit.

The hospital employs more than 2,500 regular members of staff, and holds 450 beds. Stafford Hospital's staff are ably supported by IT personnel from the local Health Informatics Service (HIS) who can readily provide desktop, networking and server support.

Network infrastructures in focus

Much like the growing number of other health and education establishments, Stafford General Hospital has taken full advantage of its share of new investment capital by installing a network infrastructure, part of which is being used for an Electronic Patient Record System. This eliminates the need for sending hard copy patient records between GP's surgeries and hospitals, and enables them to be easily updated – wherever doctors happen to be treating their patients.

This initiative is part of a centralised health service IT initiative known as the Integrated Care Records Service. An example of digitisation of patient records is the so-called Picture Archiving and Communications Systems which will replace x-ray film as well as images from CT and MRI scanners with fully digitised images, enabling the National Health Service to move another step closer to making all patient records electronic. Indeed, the investment in new network infrastructures has also created savings by way of the recent installation of a new IP-based surveillance system to replace the dated analogue system in the hospital and its environs.

One conservative estimate put together by the network

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installer involved – Plexnet – suggests that Stafford General's management team has already saved more than £42,000 by installing IP-based surveillance in the main hospital building and two other locations within the hospital grounds. Those savings are set to increase still further as IP surveillance is rolled out across the car parks of the hospital later on this year.



Prior to 1998, a batch of analogue cameras had been installed and attached to a multiplexer based in the hospital's Security Office. From here all cameras could be viewed and information stored on a digital video recorder. However, the Portering and Security Services Department began to express concern about the quality of recorded images generated by the ageing CCTV cameras.



Simultaneously, HIS staff were keen to look at the maximisation of its new network by running any surveillance system using new 1 Gb cabling and wireless Ethernet links that had now been installed.

Axis network cameras have been installed to monitor the main ...

In addition, both departments knew that a new, traditional CCTV system would involve coaxial cabling in the main hospital, but space for additional cabling was in short supply. Managers thus decided to call in the experts to tender for the installation of an IP-based surveillance solution in the Autumn of 2001.



Cisco switching systems are a vital component of Stafford General ...

Having won the tender battle, Plexnet selected Axis Communications to provide key equipment for the installation, including video servers designed to convert existing analogue-based CCTV cameras.

After a pilot was conducted in February 2002 with just four cameras, the whole system was installed and rolled out in just three months, eventually 'going live' in April 2002.

Location, location, location

Cameras inside the hospital are sited at the reception, on entrances and exits, at the Special Care Baby Unit, the Maternity Wards, in the Infirm Elderly Unit and within the Cardiology and Acute Stroke Unit.



Surveillance has been upgraded in the Accident and Emergency Department. ...

In addition to the existing analogue cameras, five Axis 2120 network cameras have been installed at the main entrances and inside the main building. A further duo of network cameras have been sited at the Technology Park, which is 1.2 km away and provides additional accommodation for approximately 100 Trust staff (all of whom have access to the Trust's IT network, to which they are linked via an 11Mb wireless link).

Three Axis 2400 and two Axis 2401 video servers are deployed to take analogue feeds generated by the 14 existing analogue cameras and digitise them, before transmitting the video across the network. Thus a total of 21 cameras are now deployed in the hospital's main building and in the Technology Park.

All images are viewed and managed by a DV Networks 'discover e' system, to which the network cameras and video servers are connected. The system takes images generated by the cameras and displays them in quad or single view on PC monitors, while saving them to a hard disk drive of a PC in

the hospital's main Security Office.

The DV Networks system also allows operators to vary picture size, resolution and the number of cameras being viewed on-screen, and enables rapid retrieval of images from the hard disk for review purposes.

Images can also be exported as AVI video files or bitmap 'still' images for distribution to other authorised users.

Ultimately, the new software enables Giles Perry – Trust security manager, and the person in charge of managing Stafford Hospital's security services – to control the variable frame rate for viewing and recording to the server.

This is important because in some areas where there's high volumes of 'traffic' (such as entrances), a high frame rate is crucial to ensure all people entering are captured and identifiable on recorded video. Frame rates can be lowered in areas where there are fewer people in order to restrict bandwidth usage.

Perry can also use the system to determine the number of days of recordings to be stored. All footage from the previous 15 days is stored on a 960 Gb RAID (Random Array of Independent Disks) device where six 160 Gb disks operate inside a Pentium 4 server.

"In all the years I've been in surveillance I have never been asked to provide evidence of an event that was more than two weeks old," states Perry. "Most incidents are reported within minutes, and the rest are generally brought up the next day. The Data Protection Act demands that surveillance images aren't kept for more than 31 days unless they're likely to lead to prosecution. Really, this stipulation is more a legacy of analogue recording days when tape management systems insisted on a new tape for each day of the week, and that after one month all VHS tapes were reused in rotation in a system. This was known as 'son, father, grandson' and was designed to prevent the misplacement of recordings to tape."

Two workstations support the system.

One provides the recording to hard disk and viewing, the other back-up storage (particularly for those images which may be used as evidence of a crime at some future date).

"All information is kept on one hard drive for two weeks and key evidence is then transferred as AVI files onto a dedicated computer," continues Perry. "Events which require police involvement are then captured on CD and sent to the police. A great deal of recorded evidence has led to successful prosecutions. In the wake of incidents such as a break-in and attack on the vending machine we burnt images to CD and sent them to the police. We also printed copies of some key images and distributed them around the hospital to warn staff to be on the look out for these youths [whom] we knew had keys to vending machines on hospital premises."

On the audit trail

The system is used purely retrospectively, partly because of a lack of resources and partly due to the fact that the level of crime is such that it doesn't make economic sense to have

staff monitoring the cameras or responding to alarms around the clock. The Security Team therefore relies on duty supervisors who have a security remit (or other hospital staff or patients) to spot and report incidents.

The advantage of digital recording is that if witnesses can provide a rough time of when an incident occurred, security staff can then locate the relevant images very swiftly. Specifically, the 'discover e' system has a user interface which includes a graphical display of a monthly calendar and time clock. In this way, recorded images of a reported incident can be quickly selected and retrieved.

Due to the fact that all images may be recorded at between one and 25 frames per second, it's extremely rare for members of the Security Team to miss any incident (whether it's a suspect entering the hospital or an assault taking place in Accident & Emergency).

In addition to the surveillance system, a stand-alone access control system (now three years old) is housed in the Security Office. Staff use it to print identity badges and create or alter access privileges for hospital staff, contractors and regular visitors through specific entrances relevant to their hours and places of work.

The system also means that security officers can track the use of an identity card through specific doors. By pinpointing the time of entry, staff can then refer to surveillance pictures and compare them to a database of access card images to ensure that the user of that card is the person authorised to use it.

"We have had some incidents of theft of identification badges and we can now pick these up very quickly, because we can spot a change in usage through analysis of entry and exit times," adds Giles Perry with obvious enthusiasm for the new security set-up.

Expanding the system

"A cost saving of over £40,000 is significant even for the largest of security installations," comments Peter Brimble, managing director of Plexnet, "and as we extend the surveillance system beyond the walls of the hospital, the cost benefits will start to multiply."

Giles Perry hopes that, over time, he'll be able to integrate the existing access control system with the IP surveillance set-up. "As we can have cameras that provide visual images of unauthorised personnel using someone else's badge to enter a restricted section of the main car park, an alarm can trigger cameras to begin recording and tracking the individual into the hospital."

As hospitals begin to install more comprehensive networks and links via larger bandwidth lines onto Wide Area Networks, it will become possible for groups of them to share a single central monitoring station. With hospital managers continuing to look for financial savings, and exploring ways of maximising the use of existing resources, the emergence of such central stations could well be the logical next step.

Security: the human factor

Security at Stafford Hospital isn't just about sophisticated electronics: the human factor is very much in evidence too.

The Portering and Security Services Department employs three groups of porters, some of whom have differing security responsibilities.

Group 1 consists of four security porters working eight-hour shifts around the clock. Group 1's porters operate alongside one of four duty supervisors, and provide dedicated security assistance to the relevant duty supervisor.

Group 2 is made up of 11 more porters who also work in eight-hour shifts around the clock, providing some additional security assistance such as patrolling and incident response (but predominantly portering services).

There are a further six staff in Group 3 who work Monday to Friday day shifts and have similar duties and responsibilities to Group 2 staff. Group 4 consists of four staff who provide portering services only.

Technical specifications at Stafford General Hospital

- DV Networks 'discover e' bespoke monitoring solution
- 3 Axis 2400 video servers with four analogue cameras on each
- 2 Axis 2401 video servers with one analogue camera on each
- 14 analogue cameras
- 3 Axis 2100 network cameras: one recording an entrance and exit to a ward in the hospital and two more providing images in the Technology Park. These cameras are designed specifically for indoor use, offering light sensitivities of up to 10,000 lux and image rates of up to ten frames per second.
- 4 Axis 2120 network cameras . These cameras offer 2.3 x manual zoom and built-in motion detection, and are deployable inside and outside because of DC-iris lenses and their capability to handle anything from one to 200,000 lux, a range of resolutions up to 704 x 576 and up to 30 frames per second.

The widely-used standard for video use and transmission (ie the MJPEG compression algorithm) is deployed for high quality images and frame-by-frame recording in compliance with Police Scientific Development Branch (PSDB) rules on admissible evidence.

The network infrastructure

Stafford General Hospital operates a 1 GB backbone containing two core switches which are Cisco 6500s with a 2 GB connection running between them. These core switches link to 20 Cisco 5500 edge switches.

The entire network is configured as a number of virtual Local Area Networks routed via on-board multi-switch feature cards operating inside the core switches on the supervisor board. All cabling within the hospital is 1 GB, manufactured by Avaya and supplied complete with a 25-year warranty.

Stafford currently uses Omnetica for the supply, installation, integration, testing and upgrading of all Cisco equipment. Installer Plexnet currently supplies and fits all types of

cabling system.

56% cost savings realised by IP system installation

Cost control was one of the key factors in deciding to go down the IP route at Stafford General Hospital.

To illustrate this, system installer Plexnet has estimated the costs of installing an upgraded analogue CCTV system and compared them with the actual costs of the installed IP-based system. The estimate assumes the linking-up of seven new cameras (four in the hospital itself and three in the Technology Park).

For internal coaxial cabling in the hospital building and Technology Park:

- New ducting, retainer trays, installation work (based on five man days at £240 per man day plus £500 for installation materials) = £1,250
- Internal coaxial cable (costing 20p per metre times 350 metres) = £70

For the external coaxial cabling to the Technology Park:

- External coaxial cable (at 86p per metre times 1,200 metres) = £1,032
- Installation of the cable itself = £500
- Contractor work (diggers, retarmacing, laying of new turf and drilling etc at £60 per metre) = £72,000

Total cost for analogue cabling (before security equipment costs) = £75,302.

Actual cost of IP option (before security equipment costs) = £33,000.

That equates to a 56.18% saving based on this particular IP installation.