REC division manager David Brown

Cutting edge NETWORKING

CALTRANS IS IN THE PROCESS OF INSTALLING THE LARGEST WIRELESS VIDEO NETWORK IN THE WORLD, AS *JAMES FOSTER* REPORTS

The US California Department of Transportation (Caltrans) is deploying a multi-million dollar state-of-the-art electronic surveillance system network, designed to protect the San Francisco Bay Area's transportation infrastructure. This consists primarily of bridges, tunnels and key sections of highway along several important transportation corridors.

Called Bay Area Security Enhancement (BASE), the project is unmatched in the scale and scope of its use of wireless networking technology. Consider the size of the networking task that faced Caltrans in planning BASE.

The area covered amounts to nearly 5,200km^2. It encompasses nine different counties and several cities, in terrain ranging from heavily built-up urban sprawl to wetlands.

Royal Electric Company (REC), which specialises in designing, building and maintaining infrastructure projects including highways, airports, wireless telecoms systems, schools and other government facilities, was selected as a prime contractor. Its role involved overseeing the design, management and integration of BASE, as well as the construction of some of the structures.

Rosendin Electric and Steiny and Company were also selected as prime contractors. As David Brown, the division manager for REC who is overseeing the project for the company, told *ITS International*, a wireless network, to link the 250 surveillance cameras being installed at the core of the BASE project, was the only option.

On this scale of network deployment, he stresses, it was not just a cutting edge decision in terms of the technology used. The decision also had a huge impact in terms of cutting time and cutting cost.

Brown cites an example of another installation completed some time ago. This involved the installation of 12 surveillance cameras - along with some traffic monitoring equipment - on the San Mateo-Hayward bridge, which crosses the lower part of San Francisco Bay.

This project took several years to plan and almost another 18 months to build at a cost of about US$ 6.5 million for the 12 cameras, traffic monitoring equipment and fibre-optic installation. The BASE project will provide Caltrans with 250 cameras, networked over the 5,200km^2 area, for less than US$20 million.

As Brown explains, it is not just a matter of the cost of digging up roads and putting the fibre-optic structure in. There is the huge workload, and time, involved in negotiating right-of-way agreements for trenching.

In the case of the BASE project, that would have involved dozens of local administrations. "And, in fact," says Brown, "in some parts of the terrain - the wetlands, for instance - it would have been impossible to lay a conventional cable infrastructure.

"So dispensing with that saved a huge amount of time, and indeed cost. Opting for wireless networking technology meant that we were able to use a lot of existing towers; but, even if we needed to install a repeater, we only had to negotiate for a small plot of space."

An RVision camera

▼ PERFORMANCE

Caltrans District 4 has been responsible for the BASE project, since its area contains most of the large bridges in California. John Hemiup, office chief, maintenance of District 4, has led the project on behalf of Caltrans. It began with the establishment of a test site where the proposed system and hardware components could be amalgamated and rigorously tested.

As David Brown points out, the major shift in developing such a wide-area network has been made possible by the move to Ethernet and Internet Protocol (IP)-based systems, with wireless technology being a major subset. He also points out that, where there was an existing fibre-optic infrastructure, this has been incorporated into the system. However, while installations normally involve the use of two fibres per individual camera, the type of architecture deployed on the BASE project has enabled two fibres to be used for a whole bridge.

In terms of supplying hardware, after a careful selection process, Caltrans chose Open Computing Platforms (OCP) as system integrator. According to Brown, this was not only because the company had a successful track record in providing integrated wireless solutions for public agencies and private firms. It was also, he says, the only systems integrator that insisted from the outset that the entire network could be accomplished wirelessly.

The wireless hardware supplier chosen was Proxim, a manufacturer of high-performance wireless local area networking (WLAN) and wireless wide area networking (WWAN) products. The company supplied its line of high-speed Tsunami Ethernet devices.

In an industry which has several major camera suppliers, the contract for the supply of all the pan/tilt/zoom (PTZ) cameras in the network went to a local company, RVision.

The deployment phase of the BASE project began with the establishment of a Caltrans test site on one of the Bay Area toll bridges where the various elements of the system could be integrated, developed and tested fully. As part of the process of deciding which camera supplier to use, Caltrans tested a range of products at its laboratory in Sacramento for image fidelity, temperature and vibration.

Caltrans shortlisted three makes for field testing. As David Brown told *ITS International*: "We needed a really rugged camera that could be used on the bridges down close to the water, where they would have to contend with salt spray. Of the three we field-tested, two broke down but the RVision unit performed well.

"So we selected that equipment for its toughness, its comparatively small size and its 'quick-connect' system which provided installation and maintenance benefits." Another key factor in the choice of the camera was that it has near infra-red capabilities, enabling it to operate in the dark.

Despite the fact that the BASE network is already beginning to attract attention for its cutting-edge use of wireless networking technology, the development phase at the test site took less than six months to integrate all the components into the final working solution that is now being deployed. As Brown explains, the test facility highlighted areas where there was a need for customisation of both software and hardware by the chosen manufacturers.

The Rvision video cameras that are currently being deployed incorporate encoders that convert images into IP packets. These are then transmitted via Proxim's Tsunami point-to-multipoint subscriber units to Tsunami multipoint base stations.

From there, the digital images are sent through a wireless backbone of Proxim point-to-point bridges to a Caltrans control centre. The high-resolution video is then downloaded to a large off-site viewing screen in a control centre, although the images can also be viewed locally at each facility.

A major benefit of the shift to Ethernet and IP based networking systems is that there is no need to configure each component using proprietary software. As Brown explains: "You just go into a web browser and start configuring."

The ability easily to share the video feed is also a key feature of the system. So, while the BASE system is primarily intended as a homeland security system, designed to protect the Bay Area's transportation infrastructure, the cameras deployed double as traffic management cameras in many locations.

Indeed, in the event of a motoring accident on one of the Bay Area bridges, tow truck controllers can, for example, use the BASE system to see and assess, in real-time, the extent of the incident. Sharing the system with a wider range of agencies, eg public transit operators, would simply be a matter of providing secure access to the system on a web browser.

As *Jonathan Zakin*, chairman and CEO of Proxim states: "Caltrans is amply demonstrating that wireless networking technology has an important role to play in homeland security and surveillance. Wireless technology ensures enhanced security that can be deployed rapidly, reliably, flexibly and affordably."

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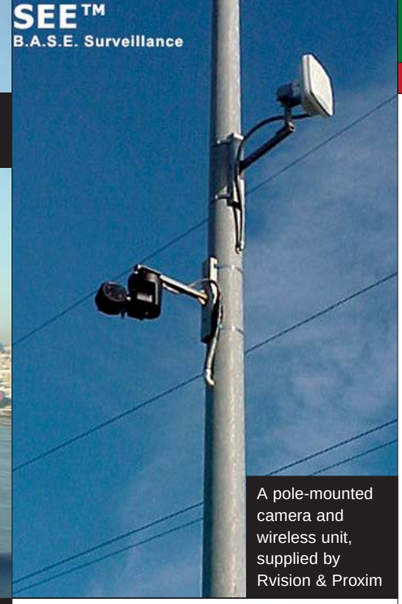
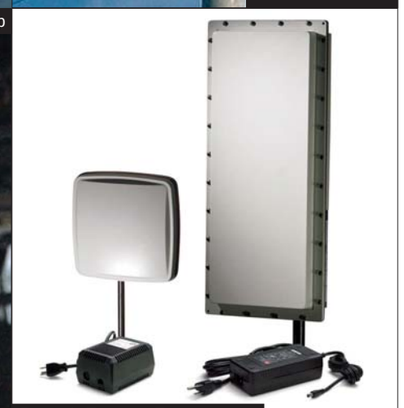


A pole-mounted camera and wireless unit, supplied by Rvision & Proxim

Caltrans' John Hemiup



Proxim's Tsunami Ethernet units