Better city services, the fibre-optic way

Fibre-optic infrastructure accommodates phased construction and planned expansion and helps in providing better city services, opines **Cathy Chatfield-Taylor**

Port St. Lucie is known for its beautiful surroundings but often faces the brunt of nature. What was once a young fishing community in the 1950s, it has grown to a metropolitan area of more than 160,000 residents. With a six-month hurricane season, lightening strikes are a common feature that wreck havoc to the place and communications often get interrupted. As the place grew, with it grew problems of outages, knock out traffic signals, utilities and other services. For the municipal government, maintaining quality of service in a rapidly growing region has been the challenging task.

In 2005, the city retained Precision Contracting Services (PCS) to design and build a US$ 17-million city-wide fibre-optic network that would withstand the forces of nature. A full-service network design and implementation firm, PCS has a successful track record in building governmental metropolitan area networks throughout the southeastern United States. PCS was tasked with designing a sustainable data and communications network that supports the highest quality of service while accommodating future growth and a phased construction implementation.

"We helped the client develop a network design that achieves physical routing diversity and redundancy to reduce network downtime," explained Bruce Boyd, PCS director of engineering. "Our use of Bentley products helped visualise a design that allows for phased construction, planned expansion, and multiple department utilisation of the infrastructure." This approach will help reduce lifecycle costs and deliver a higher return on the investment through internal cost allocation, reduced maintenance expenditures, and improved efficiency.

The Port St. Lucie Traffic and Utilities Departments led the initiative, with public/private funding provided in part by developers building new subdivisions. The Traffic Department had a mandate to coordinate signals on new road construction as well as provide traffic video for safety surveillance and incident detection. Fibre-optic communications meets the needs more reliably than the copper wire communications

deployed on existing roads. The Utilities Department has a wireless SCADA system that suffered losses when radio towers were downed in the 2004 hurricane season. Fibre strengthens the core communication infrastructure and fills the gaps in the existing wireless system.

Early in development it was apparent that a robust network design could accommodate other high-end communications needs. The emergency operations centre could tie in to traffic system data and management information systems could use the network to provide data services to city departments at all office locations – at lower cost than leased services.

The master network plan encompassed the city's outside and inside plant infrastructure. PCS used MicroStation, Bentley Map, and GPS locations to map the existing and proposed buildings, cabinets, conduit, and cable systems that would support the city-wide fibre-optic network. Once this plan was in place, PCS utilised Bentley Communications to design the network, populate the outside/inside plant models with network components, track and report on component status, and provide data for installation and implementation.

PCS's design included network rings, optical circuit names and parameters, inside plant connectivity, schematic reports for fibre splicing, engineering calculations for optical loss budgets, bill of materials for inventory, and work-order coordination of field crews. The operations teams used bill-of-material reporting to facilitate the procurement and purchasing of materials. The site-specific reports were used to generate work orders and cut sheets for locations where the crews were working.

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Plans and schematics were conveyed on paper and in PDF file format, with sets generated and exported by Bentley Map to Google Earth to coordinate installation and splicing of conduit and cable. The team used daily information from the crews to keep the communications model current. "This design/build process helped us to be more efficient in the design and execution of installing the network infrastructure," Boyd noted.

PCS kept the city up-to-date using an innovative application of Google Earth. By converting updated Bentley Communications data – such as newly installed fibre routes or sites that were recently brought online – and exporting these files as a GIS layer with attributes, all members of the project team could use the free version of Google Earth to view the updates in a nontechnical, user-friendly format. PCS also exported network plan information to Google Earth, in which it appeared as a data layer within the GPS interface.

The benefits are evident in designing, building, and

maintaining a fiber-optic network in the deliverables that PCS produced. When the network design model was complete, the team generated the site-specific bill-of-material reports for procurement, site-specific splice reports for splice technicians, and fibre route maps for field crew deployment and orientation. As the network was built out, the team tracked reel and slack placement, referenced new GPS points for network changes, and input all confirmed information into the outside plant and inside plant communications models.

"This establishes an as-built of the system that is current and reflects all changes from the original design," Boyd said. "Now the network is ready to turn over to the client to maintain. By keeping the information current in the software, we can also provide bill-of-material reports on their network components for warranty and insurance purposes. We can generate fibre route maps for their locating crews. We can generate fibre schematic reports for splice operations/maintenance. PCS also provides a service to maintain the network data via Geo Web Publisher for remote client access into the live database."

Integral to the PCS approach to documentation is a proprietary procedure called FiberTrak, which collects all network data in a common database. FiberTrak makes previously unintegrated inputs from design, construction, as-built, operation, maintenance, and asset management activities accessible as graphical renderings. The procedure processes data attributes between MicroStation, ESRI's GIS software, Google Earth, and other applications to generate layouts for such purposes as physical asset management, traffic image sensing system design, and materials purchasing.

"We have pioneered a DGN reference structure that uses base files that are updated by Bentley Communications reporting features and pushed to layouts so when changes are made in base files, they ripple throughout the layouts," added Tim Cessna, PCS engineering technician.

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"Bentley Communications provides for continuation of all documentation in electronic format, from design to construction to as-built."

Port St. Lucie's metropolitan area networks are being assembled in stages, with more than 100 traffic/utility locations over 85 miles completed to date. Even as the existing network plan is being built out, the metropolitan area networks are expanding to meet the needs of new private developments, including a public/private venture that incorporates 150-acre biosciences research park. The Port St. Lucie fibre-optic network will not only benefit the community through improved city services, but also by supporting technology-based economic development initiatives.

"It is clear that knowledge of where all the components of the network are, how they are used, and when they will become obsolete is crucial to maintaining quality of service and return on network investment," Boyd said. "Bentley provides software solutions that allow our team to see our projects through all phases of a fibre optic network design. By combining these efforts in Bentley software, we are able to be more efficient in providing services from the field to the office to the client."

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