CASE STUDY

City Utilities of Springfield (CUS)—Springfield, Missouri

SEL ICON™ Helps CUS Upgrade Its Primary Communications and Relay System

CUS Upgrades Communications System

Springfield, Missouri—In 1945, City Utilities of Springfield (CUS) in Missouri emerged as a community-owned utility after the Springfield City Council voted unanimously to purchase the assets of the privately owned Springfield Gas and Electric. Over the past 60-plus years, CUS has grown into a successful utility with 43 substations, 2 power plants, and approximately 229,000 customers.

Schweitzer Engineering Laboratories, Inc. (SEL) has provided products and services to CUS since 1989, the year the utility first started using SEL-121 Distance Relays and Fault Locators. This initial transaction led to a long-standing professional relationship between the two companies.

David Thompson, CUS's general supervisor of T&D operations, said, "We have always had good luck with SEL relays, and customer service played a big part in that success." So, in 2010, when CUS started thinking about upgrading their primary relay and communications system, they turned to SEL.

CUS had been using a T1 multiplexer, a relatively effective communications unit, for its primary communications system. The T1 had limited bandwidth, however, and could not support high-speed applications, such as Ethernet. The system consisted of eight small fiber-optic rings connected to HCB (former Westinghouse model) pilot-wire relays.

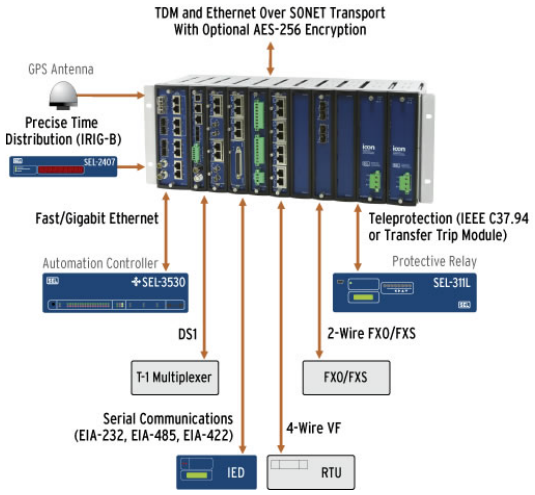
The fiber-optic rings had to be small because HCB relays could not tolerate the delay characteristics introduced by larger T1 rings. About this time, the T1 multiplexer started running out of capacity, and CUS was starting to experience some failures.

Consequently, because they knew their communications system was integral to everyday operations, and to be responsive to the frequent changes in regulations from North American Electric Reliability Corporation (NERC), CUS decided it was time to upgrade.

CUS talked with multiple vendors while looking for a replacement for its T1 multiplexer. Some vendors suggested that CUS simply upgrade their communications network and keep their antiquated pilot-wire relays. SEL, however, recommended a complete turnkey solution with a new communications network and the replacement of their outdated differential relays with digital relays.

CUS submitted a request for proposal for a complete solution. SEL offered a new and innovative package, one with numerous advantages, namely the SEL ICON Integrated Communications Optical Network, a multiplexer that combines SONET and Ethernet technologies with flexible drop interfaces for an integrated data and voice communications solution in a single platform.

The ICON offered a simple and economical approach to network design that eliminates the need for multiple network management systems. The ICON features time-division multiplexing (TDM) services and can take DS0 traffic from an end device, such as a relay, directly into its OC-48 payload.



The SEL ICON with other SEL products provides end-to-end solutions.

Typically, a T1 multiplexer is used for DS0 access, which is then transported over a SONET multiplexer, thus requiring a two-box solution. With the ICON, however, this traffic goes straight into the node via a dedicated interface module and is then placed onto the high-bandwidth SONET interface, or OC-48. All of this happens inside the ICON, eliminating the need for extra hardware.

The ICON allows operators to create various sizes of bandwidth, or "pipes," used to carry Ethernet traffic. Virtual tributary 1.5 (VT1.5), for instance, is one of the fixed TDM bandwidth selections in a SONET payload. These bandwidth pipes can also be sized in synchronous transport signal level 1 (STS-1) or VT1.5 increments and used in conjunction with virtual local-area networks (VLANs) to isolate traffic between port groups on the ICON's integrated switch.

The ICON supports both Ethernet and TDM, providing users with the best transport solution for each application. Additionally, Ethernet and TDM traffic can be isolated into segregated "pipes." This prevents high-bandwidth Ethernet applications from consuming all the available resources and reducing throughput for other services. This enables deterministic Ethernet services to be provisioned and allows critical data traffic to be isolated.

Another of the ICON's innovative features includes the ability to distribute IRIG-B time over the wide-area network (WAN). In the event of a single antenna failure or complete loss of global positioning satellite (GPS) timing, the ICON maintains relative timing to all intelligent electronic devices (IEDs) to within 1 microsecond. Each ICON node has a built-in GPS receiver that provides Stratum 1 network synchronization, IRIG-B time distribution, and real-time latency monitors for DS0 traffic.

Initially, CUS had requested that SEL build an HCB interface to connect their original pilot-wire relays to the ICON. SEL engineers explained that this solution would be costly and inefficient, and it would be best to upgrade from the pilot-wire relays to SEL-387L Line Current Differential Relays. In addition, since the SEL-387L Relays would be included in the complete solution, the entire package would provide a more cost-effective solution with improved performance.

Changing out the old relays also meant that SEL could offer CUS a much simpler network that consisted of three rings with dual ring interconnect ties, which provided greater reliability. CUS agreed. They upgraded to an IEEE C37.94 interface, eliminating the outdated copper connectivity between the HCB relays and T1 multiplexer.

David Thompson and CUS representatives met with Ken Fodero, SEL R&D project manager, at the SEL Solution Delivery Center in Pullman, Washington, to see their new system assembled and working before installation and commissioning at their utility.

The SEL Solution Deliver Center is a one-of-a-kind facility where engineers assemble and test networks in their entirety prior to shipping them for installation. This process allows SEL to demonstrate complete, network-wide system operation right in front of the customer. It also greatly reduces the time it takes to commission a network upon installation as well as reinforcing the SEL commitment to high quality and exceptional customer service.

Thompson mentioned how impressed he was not only with SEL's ability to set up CUS's entire system, but that they invited him to test its performance. "It was a good primer," he said, "to see it all set up."

Once CUS tested all of its equipment and received their SEL complete solution in Missouri, SEL's Tom Dahlin, senior communications application engineer, visited the utility to help commission the ICON network.

CUS replaced over 100 HCB and KC4 relays with 100 SEL-387L Relays and 50 communications nodes. Once the equipment was replaced, engineers from both companies ran a complete end-to-end check. SEL personnel stayed until they knew everything worked exactly as CUS expected. They also trained CUS on the new equipment. Thompson said everything "performed flawlessly."

Changing out the old T1 system and switching from eight small rings to three large rings dropped the number of nodes CUS had to maintain from 61 to 50. At about $16,000 per node, including the relay cost, the upgrade provided a savings of approximately $192,000.

Thompson said, "It was great to get rid of the older relays all at once. Now we have access to the SEL-387L Relays and can see our entire system better than before. The relays work very well and very fast. And they have fault location. We are pleased with SEL's support."

Thompson added that he really appreciated being part of the development process right alongside SEL. "The ICON team seems to have taken another step," he said. "You're dealing directly with the people who design, develop, and work on the product. That's hard to beat."

CUS was the first customer to order the SEL ICON. "After talking with Tom and Ken," Thompson said, "and seeing the commitment SEL had to this, we had no doubts. SEL has been great. The ICON interfaces with our product. And it's a sturdy unit."

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About CUS

City Utilities of Springfield (CUS) is a progressive, community-owned utility that serves southwest Missouri with electricity, natural gas, water, broadband, and transit services. CUS has 229,000 customers who benefit from having electricity prices that are among the lowest in the United States, one bill for all utilities, and dependable services delivered with a personal touch. CUS's mission is to responsibly serve their customers and community.

About SEL

Schweitzer Engineering Laboratories, Inc. (SEL) designs, manufactures, and supports a complete line of products and services for the protection, monitoring, control, automation, and metering of electric power systems for utility and industrial customers. SEL's mission is to make electric power safer, more reliable, and more economical.

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