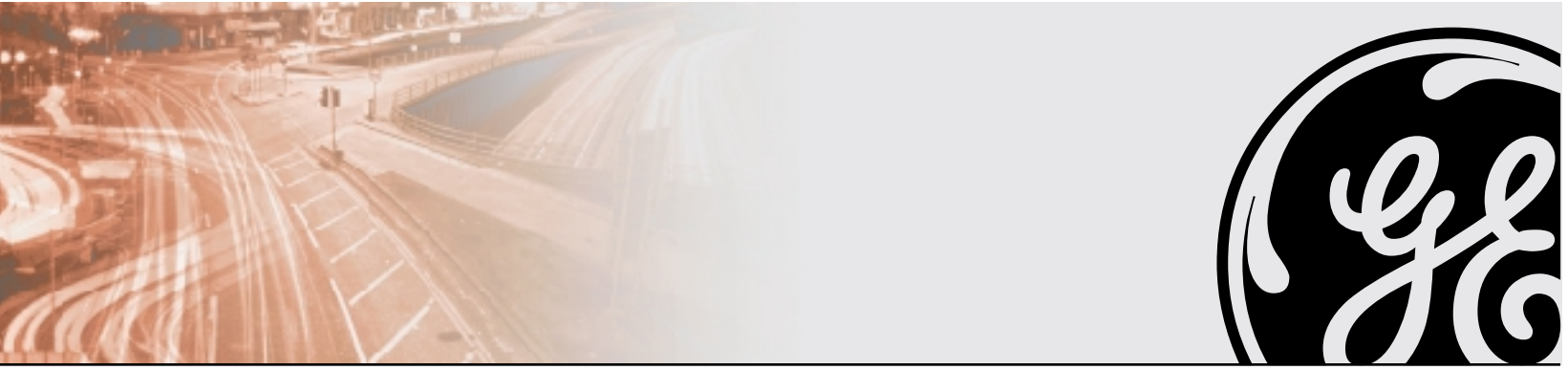


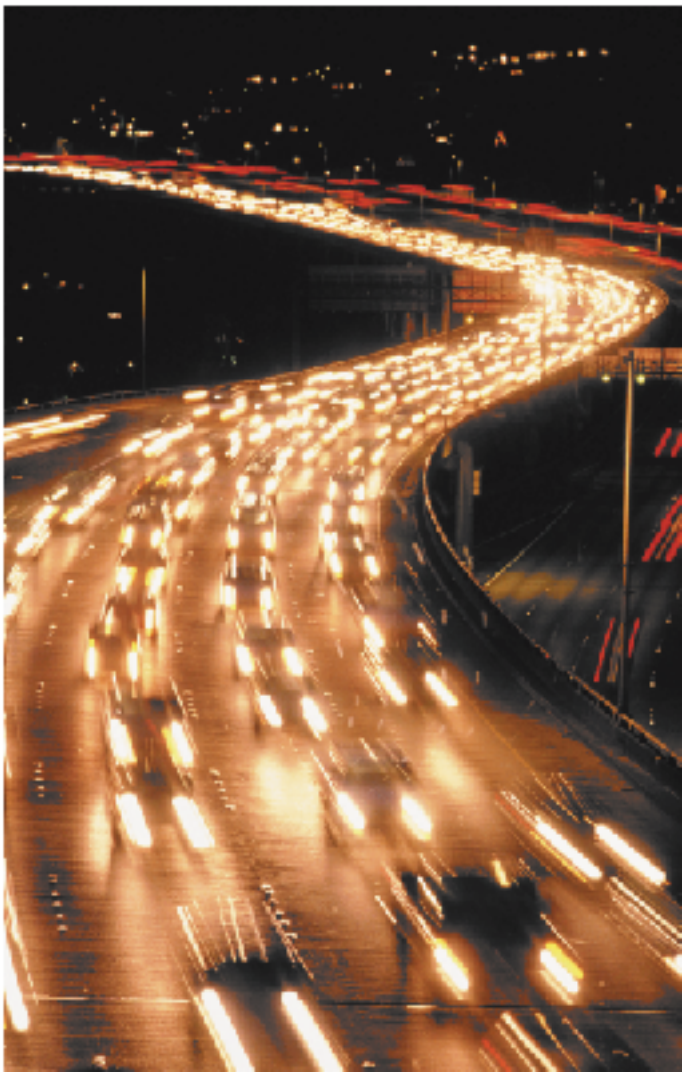
JungleMUX keeps traffic flowing for Colorado Department of Transportation

Keeping tabs on statewide, regional and municipal traffic activity is a task that requires a large and diverse telecommunications network infrastructure. A well designed network can satisfy continually evolving needs for real-time video, voice and data communications between municipal, county and state locations. This entails, among other challenges, integrating a wide variety and vintage of electronic equipment having different communication protocols from PCs, to traffic control equipment, to video cameras.

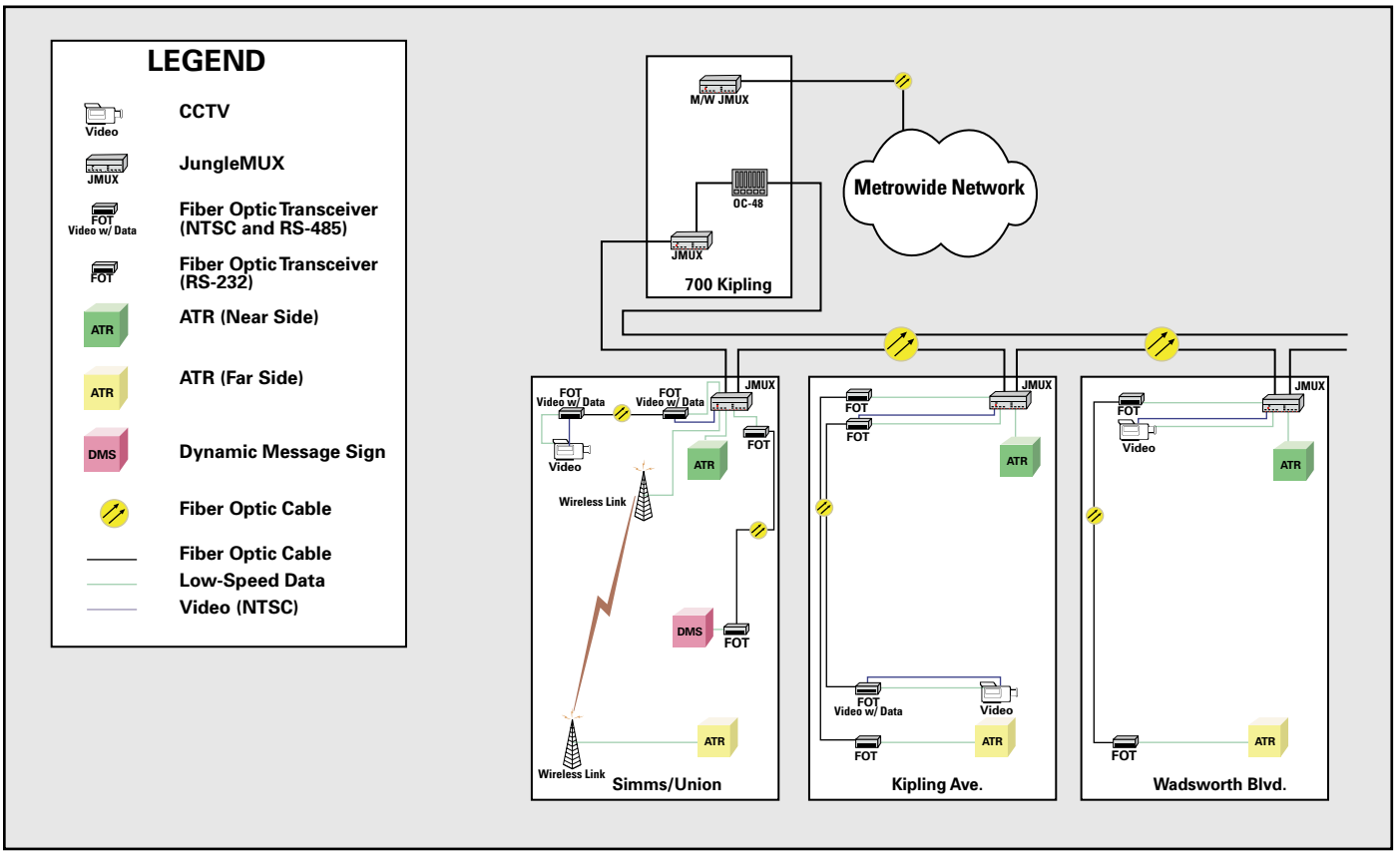
For the Colorado Department of Transportation (CDOT), that task was best managed through the installation of a multi-ring SONET fiber optic network, capitalizing on the voice, video and data capabilities of the Lentronics JungleMUX (JMUX) multiplexer from GE Multilin.

Relying on this SONET architecture for its Intelligent Transportation System (ITS) network, CDOT is in the process of putting in place the telecommunications infrastructure that will ultimately span many jurisdictions and serve many stakeholders. These include the Colorado Traffic Management Center, CDOT headquarters, various city, regional and county transportation operations centers, regional node hub sites, as well as field operations centers.

The network is also remarkably flexible. Ongoing additions now require a simple build out of the SONET fiber rings, through the addition of JMUX nodes on an as-needed basis.



GE Multilin



I-25 segment of Colorado DOT's 3-tiered network.

A 3-Tiered Solution

Tier 1 is the statewide ITS high-speed OC-48 SONET network which ties all of the CDOT Regional Residencies and other key offices together.

Tier 2 is the JungleMUX OC-3/OC-12 SONET multiplexer infrastructure that links circuits from Tier 3 devices to the Tier 1 high-speed backbone and also ties together individual regional networks, supplementing the Tier 1 network.

Photo courtesy of Gregg Gargan

Colorado DOT's new Traffic Operations Center.

Tier 3 comprises the telecommunication links which connect electronic devices to the JungleMUX, such as coax links for closed circuit television (CCTV) cameras and monitors, fiber optic transceiver links for dynamic message signs (DMS), automated traffic recorders (ATR) and ramp meter systems, and copper links for emergency call boxes and PCs.

The built-in redundancy of the SONET network ensures enhanced reliability and security for mission critical ITS applications. JungleMUX provides native voice, data and video connection to the SONET network for thousands of Tier 3 traffic management devices.

The CDOT SONET network now provides for the exchange of previously unavailable information between various governing bodies over a broad geographic area. Information gathered from field sites is collected and published to the CDOT Website and any other communications medium of choice. As CDOT's ITS network manager, Bob Wycoff says, "We get that information to the public - or each other - any way we can. With each JungleMUX we put on the network, we can get more real-time data transmitted

"With each JungleMUX we put on the network, we can get more real-time data transmitted from the roadways to the centers."

Bob Wycoff, ITS network manager
Colorado Department of Transportation

from the roadways to the centers. Eventually, we plan to develop incident detection algorithms to build more intelligence into the system, to make assumptions and automate more functions."

Building up

Bringing the master plan to reality involved some trial and error at the outset. When it came to installing the first SONET backbone ring Wycoff says, "We had no clue as to how to integrate the various devices out there. Once we had decided on the Tier 1 backbone architecture, we knew we needed equipment that could collect information from all the different types of traffic management devices and tie them all into the SONET network."

CDOT opted for the JungleMUX OC-3/OC-12 add and drop multiplexer (ADM) to address this need. "The JMUX not only fit into our Tier 1 SONET architecture, it also gave us the native interfaces for all the Tier 3 devices we were going to integrate on the network."

One critical factor in developing the system was integrating video feeds efficiently and cost effectively. "Video surveillance represents the most critical component of our network," says Wycoff. The JungleMUX features a built-in camera switching and bandwidth allocation capability, managed by a software package from 360 Surveillance Inc., Victoria, BC, Canada.

360 Surveillance's Camera Cameleon provides users with distributed control of multi-vendor CCTV equipment through a single PC graphical user interface (GUI). The package has been enhanced to incorporate JMUX's unique ability to provide video transport and serve as a video switch.

The combination of the JungleMUX with the Camera Cameleon was definitely a deciding factor," says Wycoff. "With it, we knew we could utilize all the available interface types and have a complete video solution in the bargain. No other box could match the video switching capability and make it as easy for us to pick up the video cameras. We would never have gotten this far, if we did not have this combination of native interfaces and the integrated video solution."

Another selling point he adds, is that "JungleMUX is a tried and true workhorse in the power utility industry." The fact that it was specifically designed to meet the reliability and availability needs of utilities was also an important factor. "When you go to a power utility substation and see the temperature ranges and harsh electrical environments these boxes have to work in, we knew that this system was rock solid. There is no air conditioning or insulation in the traffic roadside cabinets, so we had to have a hardened chassis. Other solutions had substantial and costly requirements for heaters and cooling fans. The GE JMUX was a perfect fit, just as it was."

Photo courtesy of Gregg Gargan

Standing (Left to Right): Rod Mead, TOC operations manager, Frank Kinder, ITS program manager, Saeed Sohbi, planning research & special projects manager, Richard Stener, ITS electronics engineer.

Seated: Bob Wycoff, ITS network manager

Building out

Like any large scale networking initiative, the CDOT network is considered a continuous work in progress. Wycoff estimates it will be a five-year build out. With the deployment of a SONET fiber optic backbone and JungleMUX network elements, CDOT is currently progressing on a number of integration projects, including a major highway expansion project known as T-REX. "Now that we have an established infrastructure, we can use the fiber we have in place to connect cities and counties to bring information to the CDOT Traffic Operations Center," says Wycoff. "In addition, our T-REX road widening project is well positioned to take off from here."

He adds that the ability to build out is a critical element in staying on the front lines for federal funding. "For example, states that have hosted the Olympics already have the infrastructure build outs in place. Now we're on the road to reach that level of efficiency. Having the SONET/JMUX infrastructure, along with the cooperation of the cities and the counties, helps immeasurably in getting ITS funding for new projects and setting statewide standards for new equipment. All we need to do, is build out the fiber and place the nodes. Then we can easily share traffic and weather data with any community.

"When we didn't have the infrastructure it was a struggle. Now that we have it, the funding is attainable."

DOT

Colorado Department of Transportation

Highlights

- *CDOT leverages SONET network architecture to implement new ITS applications for its roadways.*
- *JungleMUX cost-effectively supports multiple ITS applications.*
- *JungleMUX video switching provides key to CCTV integration.*
- *CDOT lays the groundwork for "intelligent" traffic management in the future.*

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