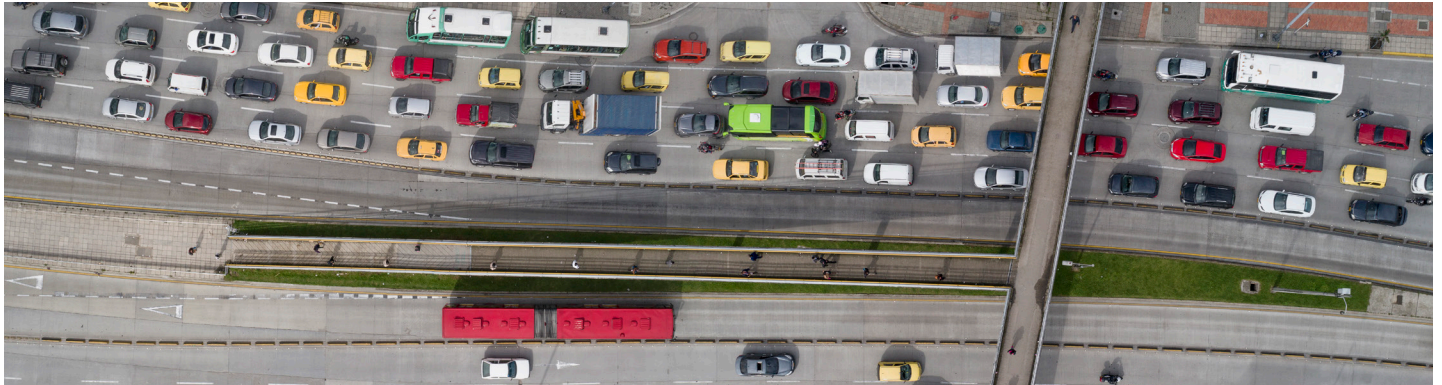# Ciena Helps Departments of Transportation Implement Intelligent Transportation Systems that Improve Motorist Experience

Challenges

For a highway traffic manager in a remote operations center, making critical decisions about road conditions without real-time data visibility resembles attempting to drive with a mud-splattered windshield. Although the driver can see through a few clear patches, seeing the entire road and making quick decisions becomes next to impossible. Without real-time access to the reams of data flowing from roadside devices, state Departments of Transportation (DOTs) cannot provide motorists the up-to-the-minute information they need to navigate their way safely to their destinations.

While the roadside sensors, video cameras, weather monitors, radar, variable message signs, and other Intelligent Transportation System (ITS) technologies do a good job of capturing data, the sheer volume of information can quickly clog the communications network. As network paths become oversubscribed, latency and jitter of the data and video images cause problems for operators attempting to interpret information and view road conditions in real time. Legacy wide-area network technologies and protocols struggle to support the requirements of today's ITS applications.

DOT network managers face difficult decisions about upgrading fiber networks to a 'carrier-grade' level necessary for modern ITS requirements. Although legacy SONET-based network infrastructures have served many states well, those networks can no longer support large numbers of data capture devices that simultaneously send data through an intelligent transportation system core network. High-resolution pan-tilt-zoom video and other data can saturate fibre channel switches because of the lack of bandwidth and result in a congested network.

When these events occur, traffic engineers in remote operations centers cannot make immediate decisions and experience crucial delays in notifying authorities and maintenance crews that an accident has occurred or that dangerous road conditions exist. In addition, operators cannot convey the most current information to motorists about traffic and roadway conditions. At the very least, motorists experience travel delays and become frustrated. At worst, accidents happen.

Impact

Network congestion interferes with a central traffic engineer's ability to operate the pan-tilt-zoom functions of remote video cameras that capture dangerous road conditions such as ice and snow accumulations on bridges. Network jitter and latency can limit a remote operator's ability to view these dangerous conditions and evaluate their impact on safety and travel times. With the loss of capabilities to immediately notify motorists through variable messaging electronic signage and text alerts, operators cannot help motorists make informed travel decisions.

Latency and jitter also limit the ability of commercial vehicles to take advantage of automatic vehicle identification programs that provide 'weigh in motion' capabilities. Lengthy commercial vehicle weigh-in times can cause delivery delays and increased shipping costs.

Network outages

Legacy networks require the use of complex management tools and practices. Whenever a legacy network element requires repair or replacement, downtime increases costs. Although legacy networks have given good service, those networks cannot maximize the capacity of the fiber network. As a result, network engineers encounter difficulty when attempting to factor in future growth needs. Legacy networks also depend on older technology switches that often consume fiber capacity unnecessarily and prevent DOTs from achieving the greatest potential financial return on fiber investment.

Background

State DOTs have challenges and responsibilities that stretch across complex highway systems and bridges. An average year for one state transportation system may involve handling billions of vehicle miles of travel. With the number of traffic signals in a typical transportation system, traffic operators require networks that grant them the ability to make real-time adjustments to stop times based on traffic flow and time of day. The latency and jitter seen with legacy networks detract from the ability to make those adjustments in real time.

Some state DOTs operate state-of-the-art traffic management and traveler information systems that deliver road condition and weather-related information to the public 24 hours a day, 365 days a year. Those systems utilize thousands of devices connected to the internet or cellular networks to capture data and provide information. The systems also connect to variable message signs and advisory radio networks. Because those systems collect and distribute enhanced traveler information, states can implement incident management response teams that consist of local police agencies, county and local fire departments, and emergency management agencies.

Summary

Challenges
- Connecting large numbers of devices over immense fiber networks to allow traffic managers to monitor road, weather, and traffic conditions

- Providing enough bandwidth to support the deluge of data and enable real-time decision-making and motorist notification

- Reduce network management complexity and factor in future growth needs

Solution
- Carrier-grade digital IP network based on Ciena's 6500 Packet-Optical Platform, along with Ciena's 5000 and 3000 Packet Networking platforms

- Connects up to 20 devices per fibre channel, with complete network diversity and resiliency

- Ciena's Manage, Control and Plan (MCP) domain controller provides complete visibility and control of the network that connects the roadside sensors and displays

Benefits
- Plenty of bandwidth to support current network needs for state DOTs and enable advanced traffic management applications that improve the motorist experience

- Flexible, scalable network that ensures bandwidth will be available to support future transportation innovations

- State DOTs can achieve their missions and provide the best multi-modal transportation system for effectively and safely moving people, goods, and information

Solution

Ciena can bring state DOT networks to a 'carrier-grade' level to provide the bandwidth required to support the growing number of sensors, video cameras, and other roadside devices. Open architecture solutions allow network support teams to scale the network without any disruption to operations. Ciena's platforms and switches ensure that capacity for future needs will exist without the need to spend the money for deploying additional fiber.

Ciena's 6500 Packet-Optical Platform allows state DOTs to support a wide range of devices that sense and optimize vehicular traffic flows, monitor weather and road conditions, and warn operators of impending delays or dangers. Ciena's 5000 and 3000 packet platforms give network managers a scalable and highly resilient network that can quickly add new intelligent devices to the network.

Learn more about the
industry-leading 6500 ⊙→

Ciena's solutions enable the management, monitoring, and control of ITS network performance. Ciena's Manage, Control and Plan (MCP) network element management software provides complete visibility and control of the network that connects the roadside sensors and displays while establishing a more scalable, intelligent, and programmable communications platform. Ciena understands the vision of network managers who wish to bring networks to a carrier-grade level, can assist with selecting the solution that best enables that vision, and continues to support the vision after the sale.

Network management as it should be
Download brochure ⊙→

Benefits

State DOTs implementing network upgrades with Ciena's MCP gain the bandwidth needed to support all operations. Eliminating jitter and latency throughout the network enables a number of advanced applications that further enhance the motorist experience:

- Advanced infrared video cameras that capture vehicle heat signatures, regardless of weather conditions

- Multi-cast, high-resolution video with real-time remote pan/zoom capabilities for even the most remote video cameras

- Advance notice about highway obstructions, traffic accidents, and other dangers, allowing motorists to select alternate routes

- Improved ability for operators to make real-time decisions and communicate immediately with motorists, commercial vehicles, repair crews, and public safety personnel

- Enhanced predictability of traffic flows in the intersections managed by the state, based on usage patterns and day/time

- Smooth functioning of vehicle identification systems allows commercial vehicle operators to fulfill their obligations without needing to stop

Traffic managers can provide instantaneous notification of road conditions and traffic flows to help motorists make informed decisions about their planned routes. In turn, motorists can access real-time video and other critical information on their mobile devices and smart phones through state DOT websites and apps.

(?) Was this content useful?   Yes   No

ciena.