

The Oklahoma Turnpike Authority (OTA) Converts to Cashless Tolling Fueled by Ciena's Network Technology Solution



Ciena provides a high-speed, low-latency network solution with the performance and resilience required to make cashless tolling a reality

The customer

The Oklahoma Turnpike Authority (OTA) constructs, operates, and maintains the turnpike system in Oklahoma, which presently consists of 11 turnpikes covering approximately 624 miles. The OTA enhances the state's transportation network by providing safe, effective, and efficient travel routes. The OTA's operations are funded entirely through toll revenues, which are used to develop and maintain high-quality roadways.



Figure 1. OTA turnpikes

Summary

Challenges

- Safety concerns for staff and drivers due to congestion for cash tolling
- Modernizing tolling and network infrastructure without a costly and disruptive overhaul
- Challenging weather conditions causing outages
- Poor network performance
- Additional network capacity needed to support DOT systems

Solution

- Carrier-grade Ethernet switching technology with Ciena's 5171 and 3926 platforms
- High-speed, scalable, low-latency back-office connectivity
- MCP software to monitor and control the MPLS network
- Resilient backup solution using Ciena's 6500 platform

Benefits

- Cashless toll plazas with accurate vehicle recording
- Fewer delays and safer toll plaza traffic flows
- Lower-risk, lower-cost solution for the avoidance of missed revenue
- Cost reduction from reduced toll
- Resilience to deal with extreme weather conditions

Oklahoma serves as a transportation crossroads for three of the nation's most important transportation corridors, with U.S. Interstates 35, 40, and 44 all intersecting within the state. This central geographic location means roughly 40 percent of toll revenues are collected from out-of-state travelers.

In the past, the OTA had captured tolls in two ways. The first was PIKEPASS, an electronic system where regular users could register and pay for tolls in advance. The second was traditional cash collection at both tollbooths and coin machines, mainly used by out-of-state travelers. However, these traditional toll plazas represent several safety concerns, both for employees and drivers.

A new approach

To create a much safer travel environment and help reduce costs, OTA decided to convert its turnpikes to a cashless tolling system.

Cashless tolling allows enhanced access and ease of travel to customers, while offering the convenience of open-road tolling for non-PIKEPASS customers. It also reduces future spending on infrastructure such as tollbooths and associated staff facilities such as bathrooms, offices, and breakrooms.

The OTA decided to upgrade to an electronic license-plate recognition and billing system, where cameras and axle sensors are connected to a central office for automated plate recognition and vehicle-type verification. This allowed the OTA to accurately identify and charge every vehicle traveling through the toll. Yet this also exposed the limitations of the existing network infrastructure, which was not sufficient to serve the new capabilities.

Key network challenges

To ensure full toll capture, the new system needed high-speed, low-latency connectivity to back-office applications used for vehicle identification and billing. The original network could not support this traffic; it simply lacked the reliability, consistency, and sub-10 ms transmission latency necessary to meet performance requirements.

Additionally, the OTA network supports the highway monitoring systems used by the Department of Transportation (DOT), such as CCTV and weather monitoring. The DOT needs to be able to see what is taking place on the roads in real time, meaning that all the data has to be captured and fed back to data centers

without interruption. This extra capacity demand needs to be managed and aggregated with toll data traffic while maintaining appropriate quality of service for both applications.

Local weather conditions also presented challenges. In Oklahoma, frequent tornadoes and severe storms can often result in physical damage and power failures, as well as increased traffic incidents related to the conditions. These potential hazards could all cause loss of network connectivity, which would impact the toll collection systems.



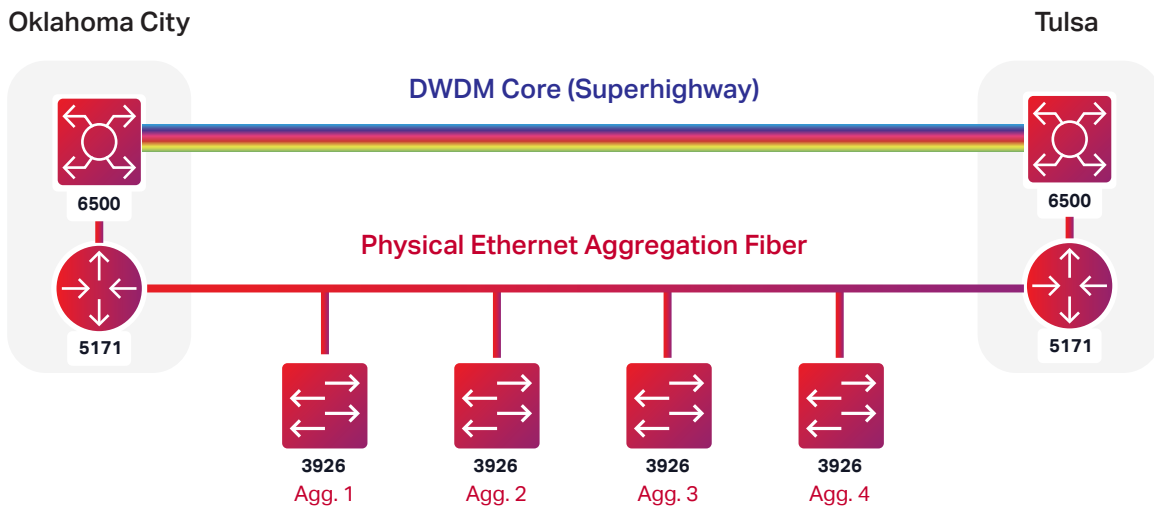


Figure 2. The Ciena Solution

Ciena's solution

Ciena played a key role in enabling the OTA to realize its vision by upgrading the network infrastructure to support these new capabilities. To work effectively, the OTA's system needed a consistent, reliable connection—including resiliency to protect network connectivity in the event of an outage due to severe weather.

Ciena implemented high-end, carrier-grade Ethernet switching technology through its 5171 and 3926 platforms. This technology underpins a Multi-Protocol Label Switching (MPLS) network to provide a highly reliable, managed connectivity for the new systems, and give the OTA more control over its network.

In addition, by installing its Manage, Control and Plan (MCP) domain controller software, Ciena enabled the OTA to monitor and control their MPLS network to quickly identify any problems and reconfigure the network to resolve them.

It was essential to be able to reroute network traffic in the event of a tornado or severe storm taking out the main connection. Ciena's solution allows the OTA to leverage backup through a long-haul Call Management Server (CMS) network solution based on Ciena's 6500 Packet-Optical Platform. This solution utilizes fiber cable underground, thereby minimizing exposure to adverse conditions. Thus, in the event of an outage to the main network connection, the OTA systems are able to reroute through an alternative, pre-existing network that is completely separate from the primary route. This reliability was the key to the success of the system.

Results

The OTA now has a system that allows it to identify its toll users quickly and accurately, and collect the charges owed. It has allowed for the redesign of toll plazas for faster and safer traffic flow while reducing expenses for tollbooths and staff facilities.

The OTA will monitor revenue collections from license-plate tolling as it continues to convert each turnpike to cashless tolling over the next 4-5 years. This system has been a boon to OTA customers, making them safer and giving them a much more convenient experience as they travel the turnpike system.



Gain more insights



Was this content useful?

Yes

No