

## APPLICATION NOTE

# Building Better Networks for State and Local Governments

Economic conditions have changed the operating landscape for government and educational organizations. Networking technology offers an opportunity to provide better service with lower taxpayer cost.

The evolution of technology promises to pay rich dividends in operating efficiency and public benefit through a modernized networking infrastructure. As IT networks evolved, operators built overlays for new applications. Legacy voice networks were combined with data traffic through technologies such as ATM. Optical technologies such as SONET allowed bandwidth growth, high-grade reliability, and resiliency. As Ethernet spread into Wide Area Network (WAN) applications, techniques emerged to encapsulate packet data into circuit data, and MPLS emerged as a means to control traffic through the core network. Often, the result was a tangle of application-specific networks operated under the domain of one state or local government. Inherently inefficient, application-specific networks require expensive capital outlay each time a new application is adopted.

### Emerging Applications

Traditionally, network applications were put into two categories: voice and data. Older telephone circuit networks were adapted to accommodate data generated by computer networks. "Bursty" computer data was mapped into rigid circuit timeslots, resulting in inefficient bandwidth utilization.

Newer networking technologies such as Optical Transport Network (OTN) and switched Ethernet offer the ability to match application needs to the network's capabilities. Just one example is the Quality of Service (QoS) concept, in which specific applications are assigned a service level based on their needs, usually equating to lower latency and higher network bandwidth.

Emerging applications use the network to yield new public benefit. The challenge is to implement a unified broadband network that can support legacy applications and adapt quickly to support new ones with minimal incremental cost. Delivery of services may be through a government-owned network or through a managed network or

### Benefits

- Delivers better public service at lower taxpayer cost
- Supports emerging applications in transportation, public safety, healthcare, and education
- Enables a graceful technology migration from legacy to converged network
- Constructs an efficient, modern network infrastructure capable of long-term scale and flexibility
- Helps prepare for future, unplanned government applications

cloud service, purchased from a service provider, tailored to unique local needs. Emerging applications include:

**Intelligent Transportation Systems (ITS)** – monitor weather, congestion, and road hazards as a means to optimize flow and improve safety and convenience

**Public Safety** – protect citizens’ quality of life through fire, police, and emergency medical services. A comprehensive public safety network also provides means for unified E911 and regional coordination in times of disaster

**Public Broadband Access** – similar to the rural electrification efforts of the 1930s, these systems enhance economic development, quality of life, and agency network access in isolated or underserved areas

**Telemedicine** – specifically address the national needs of public healthcare. Through technologies such as high-definition imaging, electronic healthcare records, and remote diagnosis, improved patient care and reduced cost of delivery can be realized

**Education** – deliver better access to top-grade educational resources through distance-learning applications

## Network and Supporting Technologies

A modern, converged network utilizes advanced optical and Ethernet technologies to form a highly flexible and scalable infrastructure capable of delivering all the applications outlined above and ready to scale far into the future. Ciena’s optical transport, Ethernet switching, and software platforms form solutions to solve government and education problems, including data center interconnect or campus/metro optical networks.

### Optical Transport

Optical networking provides a highly resilient, scalable, and secure means for transport of all application data around a national, regional, or local area. The cost and prevalence of deployed fiber optics makes the technology practical. OTN G.709 is a mechanism to integrate legacy traffic gracefully with emerging packet-based data. OTN scales well with leading-edge backbone standards for 10, 40, and 100 Gb/s. OTN provides reliability and manageability equivalent to SONET, with the flexibility to support all the data-intensive applications emerging today.

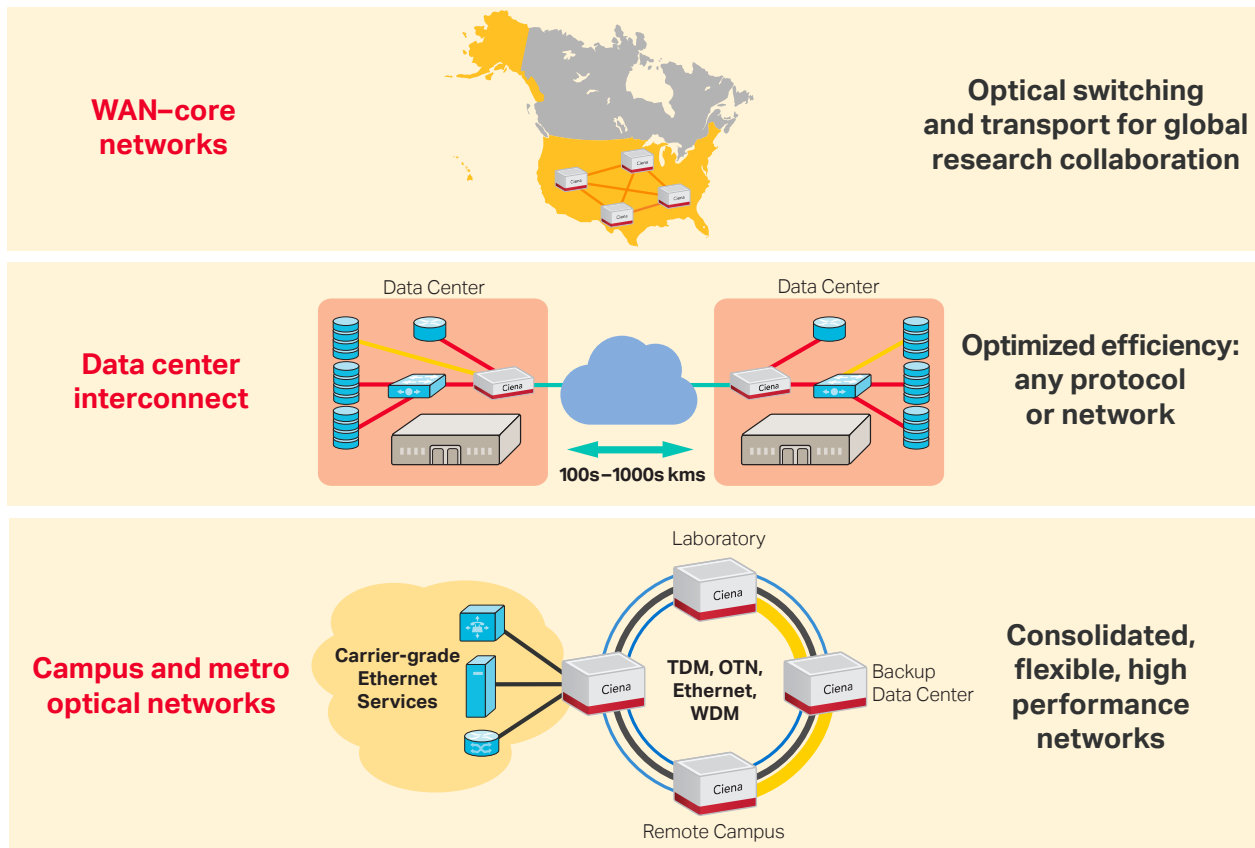


Figure 1. Where Ciena fits in government networks

## Ethernet Switching

Ethernet as a data networking technology has been in wide use for many years, keeping pace with the network speeds demanded by applications, but has evolved from a purely Local Area Network (LAN) technology to serve the WAN as well. Because of its maturity and ubiquity, Ethernet technology is inexpensive and familiar. Ethernet is also an elegant means to deliver traffic generated from any application currently in use or imagined.

## Layer 2+ Ethernet Switching: Delivering Efficiency and Optimizing the MPLS Network

Agencies can realize great efficiencies by looking deeper into traditional network hierarchical functions. In some cases, switching and transport functions are difficult to merge. However, Ethernet switches typically cost approximately 40 percent less than IP/MPLS routers. Advanced capabilities in Layer 2 switches may optimize use of expensive routers, implying a cost advantage through use of Layer 2 or “2.5” switching. These switches utilize technologies such as Provider Backbone Bridging-Traffic Engineering (PBB-TE) or MPLS-TP.

## Network Consolidation

Construction of a consolidated network must allow for graceful migration from embedded elements to an architecture that delivers new services and scales capacity with ease. Ciena offers platforms to easily accomplish this consolidation. First, the Converged Packet Optical Portfolio combines optical transport and switching functions with Ethernet and OTN capabilities. These features open up enormous deployment capabilities that can be matched to current agency demands and scaled as needed. Second, Ciena offers its Packet

Networking Portfolio, including Ethernet aggregation and delivery switches that may be deployed to form a network scalable to hundreds of thousands of end-users while assuring highly resilient operation.

One example of an application within local government is using a consolidated network to deliver Ethernet LAN service to a municipality’s public safety system. MEF-compliant packet networking services connected to an optical middle-mile network provide advanced Internet service and coordinated communications among fire, police, and EMS departments. When mobile backhaul for a dedicated 4G wireless system is added, the network becomes an advanced public safety system capable of meeting the needs of national FirstNet objectives.

Many other scenarios are possible, ranging from private build networks supporting sensitive citizen data to consolidated state agency networks, transportation monitoring systems, healthcare dedicated services, and educational or library networks. Many applications will be delivered to the government through a carrier managed service made possible by the powerful capabilities of Ciena’s solutions composed of the company’s converged packet-optical, packet networking, and software portfolios.

## Converged Packet Optical Portfolio

This application-optimized packet-optical portfolio allows acceleration and automation of service delivery while reaching new levels of network survivability and operational efficiency. Included is the 6500 Packet-Optical Platform, which converges comprehensive Ethernet, TDM, and WDM capabilities in one platform for cost-effective delivery of emerging and existing services, from the access edge to the backbone core.

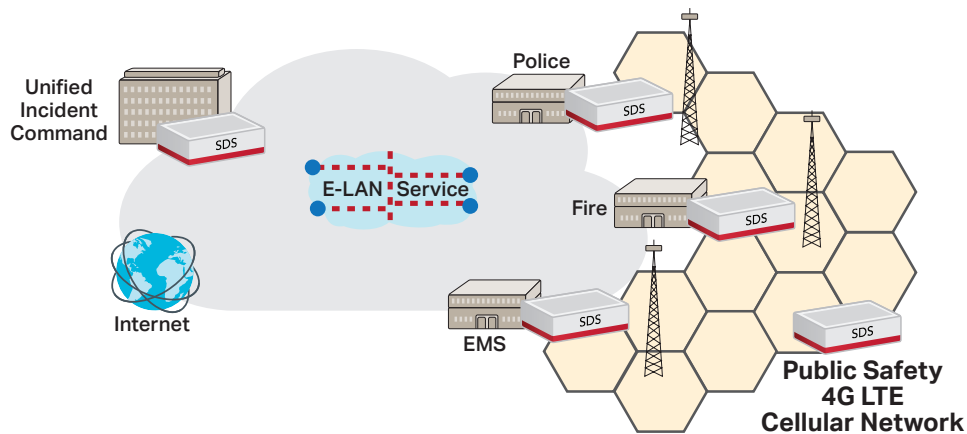


Figure 2. Municipal public safety network

## Packet Networking Portfolio

These carrier-class Ethernet switch platforms allow rapid delivery of data services with low-touch provisioning. The platforms range in port density and features to match application needs. Ciena is an industry leader in the development and implementation of PBB-TE, and this solution supports both MPLS and PBB-TE-based solutions. These platforms deliver reliability and QoS capabilities far exceeding those of traditional LAN implementations.

## Software and Applications Portfolio

Ciena's software portfolio is an integrated solution composed of both a common service-aware operating system running on network elements and unified network and service management. Ciena software provides agencies with significant advantages to managing all aspects of the network services lifecycle, including service creation, delivery, management, and assurance. The software has a consistent look, feel, and ease of operation, which results in reduced training and operation costs.

## Ciena Specialist Services

Ciena's network specialists offer services ranging from network analysis and design to deployment project management. Ciena's services are wide-ranging—from basic planning, design, installation, and support to education and Network Operations Center (NOC) activities. Ciena's U.S.-based team of dedicated engineers is available to aid in the design and implementation of any modernization effort.

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