

# Major Utility Taps the Power of Ciena to Build a Better Network



One of the nation's largest investor-owned utilities replaces SONET technology with modern, scalable WAN infrastructure designed to support the migration to a diversified energy grid

## **A utility company paving the way toward a distributed energy future**

The energy grid is essential to modern society, harnessed to power technology for work, transportation, shelter, entertainment, health, and more. And while both society and technology have changed remarkably over the last century, the way power is delivered is surprisingly similar to when energy infrastructure was first built, consisting of one-way transmission from energy sources to homes and businesses. Modernizing the grid holds enormous potential to reduce power outages, increase efficiency, and improve performance after outages caused by extreme weather events, fires, or other hazards.

One Ciena customer who recognized the need to modernize is a publicly traded utility in the southeast United States. With tens of thousands of megawatts of generating capacity distributed to millions of customers over a service territory greater than 100,000 square miles, this utility has diversified by investing in solar and wind to increase renewables as the percentage of total energy resources while reducing carbon footprint. It is also investing in microgrids and distributed energy as other means to diversify infrastructure and better serve the needs of its customers.

## **The challenge: Threats to the grid are real—and growing**

As the term implies, a weather incident large enough to cause a '500-year flood' should only occur once in 500 years, but more than 26 storms of this magnitude have slammed into the southeastern U.S. coastline in the last 10 years alone, including hurricanes Florence and Michael. In recent years, a major hurricane knocked out power to several million homes and businesses, resulting in several billion dollars in damages. At the time, this utility's employees worked tirelessly to rebuild

its system and restored power to 99 percent of affected customers in just over a week. Since then, the utility has been implementing a plan to continuously harden its grid, making it more resilient to storms and security threats.

The utility is also undergoing a comprehensive transformation as it restructures its internal organizations to avoid siloed, sub-optimized solutions. One key issue being addressed is that their networks have traditionally been built around two distinct organizational groups. On one side, the Operational Technology (OT) group is mandated to deliver a network with the deterministic and guaranteed performance required by mission-critical applications that enables real-time monitoring and operation of digital grid devices to keep the lights on.

On the other side, the Information Technology (IT) group is tasked with managing many of the new applications associated with a smarter grid, such as connecting to the 40 percent of their customers who have smart meters—a key technology that enables more control for their customers. Utilities can no longer justify the cost of keeping these as siloed networks, and desire convergence. Yet the requirements of the networks are contradictory.

To address both these external and internal challenges, the utility has invested in a modern packet-optical Wide Area Network (WAN). The packet-optical WAN is the bridge between control systems, analytics systems, and devices in the field (such as automated switches and controllers, sensors, smart meters, and computers in trucks), and is a key foundation for a smarter, more modern grid. The utility is using their packet-optical WAN to converge their siloed OT and IT networks to meet the diverse requirements of each organization. The packet-optical WAN will improve system resilience and create more efficient grid operations by:

- Improving the reliability, speed, and accuracy of data-to-grid operations
- Enabling faster responses to issues on the grid that could lead to service interruptions for customers
- Enhancing customer value by allowing interconnected systems to work more effectively
- Increasing data capacity to retrieve more information and data from field devices and other critical assets

## **The solution for the packet-optical WAN: The Adaptive Network™ built for the needs of today and tomorrow**

Ciena worked with the utility to obtain a complete understanding of their existing network infrastructure, its strengths and weaknesses, and their network plans and requirements in the short, medium, and long term. One of the main challenges identified was a limited amount of fiber in the network, which necessitated including DWDM in their architecture.

Based on all information gathered, Ciena proposed and delivered the Adaptive Network designed specifically for utilities and for this customer. This network goes substantively beyond autonomous networks to include:

**Programmable infrastructure**—the packet and optical networking technology designed to securely manage a dynamic pool of virtual and physical resources. These resources can be accessed using common open interfaces (APIs), are highly instrumented, and can export real-time network performance data to an analytics engine. This infrastructure can also dynamically scale and allocate resources to meet changing demands.

**Analytics and intelligence**—the ability to get the information out of the programmable infrastructure, feed it into an analytics engine, and apply machine learning to turn the data into actionable insight. This will allow utilities to make network policy decisions based on actual network data, to respond to customer demand, and effectively allocate network resources.

**Software control and automation**—the Multi-Domain Service Orchestration (MDSO) and centralized, software-defined control of individual domains to support the end-to-end management and automation of network services across multi-vendor hybrid networks.

Combined, these three factors can fundamentally change how optical networks are built and managed, dramatically lowering the cost per bit and helping utilities automate their networks so they can adapt to today's increasingly dynamic service requirements in real time.

In this specific scenario, the utility's network included:

- Ciena's 6500 DWDM Optical Transport Network (OTN), which delivers a programmable infrastructure layer with both OTN and photonic control planes to significantly improve network capacity, security, and resiliency
- A packet layer on their core network using eMOTR technology, which aggregates traffic from edge substation rings

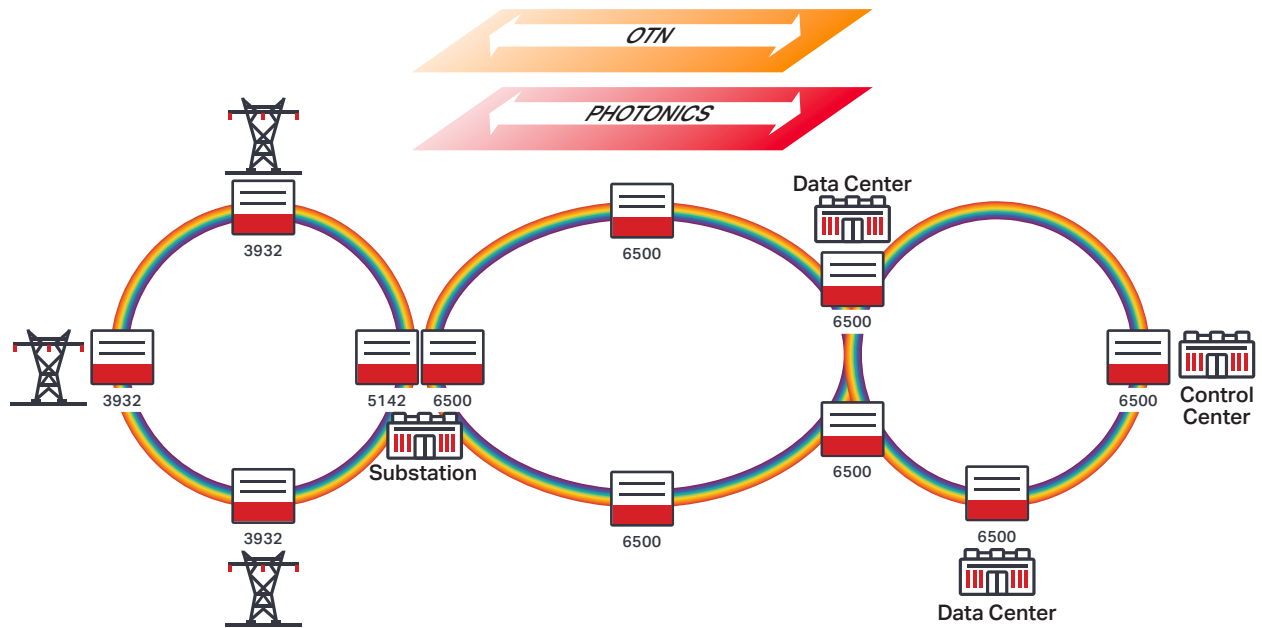


Figure 1. The utility's highly secure 100G protocol-agnostic OTN backbone network traverses several states in the southeastern U.S..

- Ciena's 3932 Service Delivery Switch to interconnect their substations. This advanced Carrier Ethernet packet switch is focused on high-bandwidth, multiservice applications requiring sophisticated Quality of Service (QoS). The 3932 also takes advantage of proven G.8032 technology, which provides protection and restoration parameters similar to SONET, without requiring the redundant fiber or networking equipment of other approaches
- Blue Planet® Manage, Control and Plan (MCP) software, for unified network management and end-to-end service provisioning and planning

**The Adaptive Network**  
Learn more ➔

## Results

Since deploying the new Adaptive Network architecture, the utility has realized the following benefits:

**Reduced costs**—The new network converges all services over a common network infrastructure, greatly simplifying operations and controlling costs.

**Reduced staffing requirements**—With automated provisioning and remote turn-up, testing, and verification, the new network can detect and isolate faults remotely, and make changes more easily. This means the network has reduced

the management and maintenance demands on the utility's network operations team.

**Improved network security and control**—Security is inherent to the new network because Carrier Ethernet is not a routable protocol, eliminating address snooping as threat. The utility is also able to use Ethernet-based data encapsulation to ensure traffic is delivered to its proper destination. The 6500 DWDM OTN also features Ciena's WaveLogic Encryption solution, which delivers integrated, always-on AES-256 wire-speed encryption, meaning the utility can protect all communications in flight, without impacting performance as the data traverses its network.

**Ability to deliver flexible, scalable bandwidth**—Unlike their legacy network, the Ciena solution has very granular scalability that allows capacity requirements to be dynamically adjusted on a per-site basis.

**Improved network visibility**—The new network supports a rich set of standards-based Operations, Administration, and Maintenance (OAM) tools that provide advanced capabilities for network monitoring and management. These tools give the utility greatly improved insight into the status and performance of their network connections.

The new network will allow the utility to deliver a flexible range of services to both internal and external customers using a resilient network that offers multiple protection options and multi-layer control plane intelligence. Combined, these capabilities minimize the risk of service disruptions, with

six-9s reliability and availability. This is achieved through the network's self-healing capabilities, which reduce downtime and the costs of human intervention in the event of a cable or equipment failure.

The upgraded network will also enable the utility to deliver modern applications—such as a smart grid and Internet of Things (IoT) services—all stemming from infrastructure that is fully FIPS-certified to ensure the highest possible level of security.

## Summary

Utilities are implementing highly intelligent energy grids to improve operating efficiency, address consumer demands, and meet government mandates. These smart grids are powered by a two-way communications network that must be highly reliable and offer low latency, yet remain affordable to install and operate.

Network requirements have continued to move rapidly since this utility's network was put in place. The bandwidth requirements have grown even faster than anticipated due to video surveillance and smart meter traffic, so the network's ability to scale to 10 Gb/s—and potentially even further, to 100 Gb/s—is already being utilized.

Ciena helps utility customers realize the full potential of a versatile, intelligent communications infrastructure through the Adaptive Network approach. The company combines deep expertise with packet-optical networking and software innovation to make integrating a communications infrastructure that readily adapts with the electric grid not only possible, but practical—offering an automated, deterministic, and resilient power-delivery system.

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