

The background of the top half of the page is a cityscape at dusk or dawn, with a mix of warm and cool tones. Overlaid on this are various digital and technical icons: a lightbulb, a line graph, a network of nodes and lines, a gear, and a data table. A prominent orange and blue light trail curves through the center of the image. The Siemens logo is in the top left corner.

# SIEMENS

*Ingenuity for life*

## Executive Summary

# Reliable protection and control for power utilities

Migrating to an integrated LAN-WAN solution leads to improved reliability

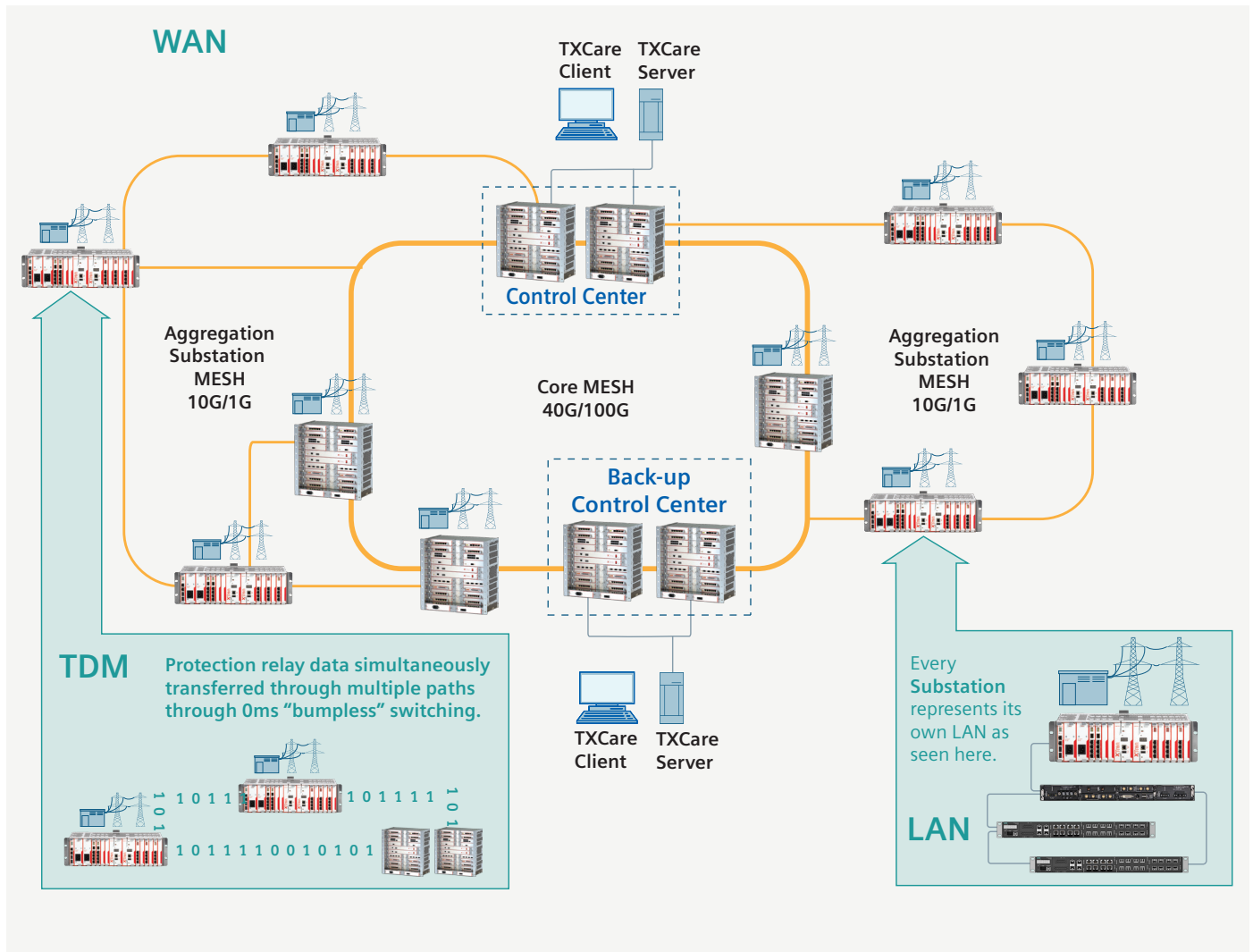
**Siemens and OTN Systems, two global leaders providing Industrial Communications Networks for electric power utilities, have aligned to provide a purpose-built solution for end-to-end Operational Telecom and Operational LAN.**

Power utility executives face numerous challenges today as an increasingly digital society depends on the provision of affordable, reliable power.

In the proverbial big picture, extreme weather – the leading cause of power outages in the United States – is increasing<sup>1</sup>; third-party development of utility-scale distributed generation (DG) is on the rise; and power systems are being networked for efficiencies and remote management, creating cybersecurity vulnerabilities. Furthermore, as the power business becomes more market-oriented, utilities are focusing on customer needs and service expectations to remain viable amid competition.

Power reliability and affordability remain among the top priorities of both commercial/industrial and residential customers, and these customers rate their utility's performance accordingly. Outages cost utility customers productivity, time and money and erode customer satisfaction.<sup>2</sup>

In operational terms, power utilities face the perennial challenge of replacing aging or obsolete infrastructure with next-generation technologies that offer an attractive business case. The need for more granular visibility into power system behavior and improved protection and control schemes is directly tied to the quest for improved reliability. Today, the data networks that enable protection schemes – arguably the linchpin of power system reliability – are migrating to faster, more secure and reliable technologies.



An integrated LAN-TDM-WAN solution that supports protection and control schemes and redundancy across the entire grid

Simply stated, legacy telecommunication techniques for protection and control schemes are reaching the end of their useful life. For example, TDM-based SONET – i.e., time division multiplexing (TDM) for synchronous optical networking (SONET) – is in wide use, but it is nearly three decades old. Research and development, as well as product and service support, for TDM-based SONET is fading.

Meanwhile, newer data network technologies are seeing increased adoption. In particular, packet-switched networks based on multiprotocol label switching – transport profile (MPLS-TP) is on the rise. This approach relies on Internet Protocol (IP), Ethernet (LAN) and multiple legacy protocols like Serial and Time-Division Multiplexing (TDM) (i.e. T1 and C37.94) within power substations to be transported over MPLS over wide area networks (WAN) across entire service territories.

The migration of data networks for protection and control schemes – and myriad other trends such as substation automation and cybersecurity measures – requires close coordination between operational technology (OT) and

information technology (IT) staff. The IT department and its telecommunications staff must participate in designing, implementing, operating and managing a utility's LANs and WANs that support OT responsibilities. And OT staff – responsible for critical systems such as protection and control schemes – must ensure that relay signals are given guaranteed bandwidth and latency performance as their highest priority. Relay engineers in OT will always insist that relay signals be deterministic – meaning that they reach the targeted circuit breaker without fail – and do so at always the same latency regardless of the telecom network load to ensure faults are isolated before damage to the power network and an outage occurs.

The decision on when and how to migrate from an outdated, legacy communications network to serve protection and control schemes to a supporting LAN-TDM-WAN data network depends on factors unique to every utility. However, failure to plan for an inevitable migration to next-generation technology risks potential damage to crucial, expensive power network components and endangers public and staff safety.

The first step in planning, designing and implementing an integrated LAN-TDM-WAN solution that supports protection and control schemes is to coordinate the IT and telecommunication staff's work with fundamental OT requirements. Those requirements include prioritizing deterministic relay signals and substation-to-substation communication with enough speed and bandwidth to ensure system reliability.

As utility decision makers approach the market for a LAN-TDM-WAN solution to support protection and control schemes they must include another OT requirement. The physical hardware that enables a LAN-TDM-WAN solution must be hardened for the harsh substation environment, which can include temperature extremes and electromagnetic interference (EMI).

In fact, meeting OT's strict requirements for deterministic relay signals is what distinguishes the market leaders for optimal LAN-TDM-WAN solutions and differentiates them from merely IT-centric LAN-WAN only offerings that may be ill-suited for power systems. When it comes to the business case, any proposed solution – particularly for substation-to-substation communications – must also provide the flexibility to integrate legacy equipment to minimize stranded assets.

The answer, for many utilities, is to turn to a trusted advisor with a long track record of expertise and proven solutions in industrial communications. On the LAN side, Siemens is a consistent market leader with its RUGGEDCOM portfolio that is designed for power utilities, while its Networking Professional Services offers industry-leading consultation in the planning, design and implementation of critical data networks. When combined, the premier products and expert guidance achieve a level of robustness and reliability that has set the standard for communications networks deployed in harsh environments.

All RUGGEDCOM products pass the EMI-related tests required by IEC 61850-3 without any communications loss or delays. These products qualify as IEEE 1613 error-free devices. The modular, multi-port devices in the portfolio enable the integration of legacy and new equipment, whether that's serial, Ethernet, fiber, wireless and/or cellular connectivity. RUGGEDCOM products also have advanced cybersecurity features baked in.

Today, Siemens is proud to announce that it has partnered with OTN Systems (OTN), an established global leader in WAN technology, to create an integrated LAN-TDM-WAN solution. OTN operates in more than 70 countries with purpose-built solutions for the power industry. The two companies have tested their solutions together for functionality and interoperability and this proven, integrated network solution is now being deployed in the market.

OTN's XTran (eXcellence in Transport) product for power utilities is based on the latest MPLS-TP technology and supports network designs tailored to each utility's specific needs. That includes the emerging need for packet-based transport networks that provide deterministic signal paths for protection and control schemes that can replace legacy TDM-SONET networks.

In fact, OTN's use of MPLS-TP technology enables packet transport services with the degree of predictability and reliability found in SONET. Moreover, OTN's XTran solution doesn't simply replace SONET, it provides improved visibility and management of the data network, self-healing, increased capacity, and an intuitive, point-and-click user interface.

OTN's XTran technology provides end-to-end signal paths that guarantee 0 millisecond (Hitless) switching speed for all TDM related protection relay signals that optimize power network reliability. MPLS-TP's multiple signal paths enable self-healing and no interruptions to communications when fiber is cut. The company's TXCare (TakesCare) software for network management orchestrates the operation of XTran nodes and aids in the planning, deployment and monitoring phases. Unlike SONET, TXCare provides automated hardware reporting tools to monitor all services and circuits provisioned across an XTran Network.

The key differentiators offered by this Siemens and OTN LAN-TDM-WAN collaboration is several-fold.

- OTN's MPLS-TP solution is purpose-built for the power industry, with every application assigned to reserved bandwidth. Deterministic signals, such as those for relay signaling, can be assigned the top priority and cannot be interfered with by any other application.
- Both the RUGGEDCOM portfolio and OTN's XTran nodes are hardened for harsh substation conditions.
- Other specialized vendors of high-capacity networks require additional technology to divide bandwidth among all the different devices within a substation, while the XTran and RUGGEDCOM products perform that function.
- The Siemens/OTN LAN-WAN integrated solution provides a utility with a single entity to deal with throughout the entire process of planning, design, implementation and operation.

The speed, capacity, flexibility and reliability of the Siemens/OTN LAN-TDM-WAN solution prepares a power utility for a future that includes Digitalization, the Internet of Energy (IoE), "big data," and other automation trends on the horizon.

Let's talk about your utility's plans for a post-SONET, future-proofed approach to critical substation-to-substation and substations-to-control-center communications.

1 U.S. Department of Energy, see page 8  
[https://www.energy.gov/sites/prod/files/2013/08/f2/Grid%20Resiliency%20Report\\_FINAL.pdf](https://www.energy.gov/sites/prod/files/2013/08/f2/Grid%20Resiliency%20Report_FINAL.pdf)

2 J.D. Power Business Customer Satisfaction Survey, 2019  
<https://www.jdpower.com/business/press-releases/2019-electric-utility-business-customer-satisfaction-study>

J.D. Power Residential Customer Satisfaction Survey, 2019  
<https://www.jdpower.com/business/press-releases/2019-electric-utility-residential-customer-satisfaction-study>

Published by  
Siemens Industry, Inc. 2020.

Siemens Industry, Inc.  
5300 Triangle Parkway  
Norcross, GA 30092

For more information, please contact  
our Customer Support Center  
Phone: 1-800-241-4453  
E-mail: [info.us@siemens.com](mailto:info.us@siemens.com)

**[usa.siemens.com/ruggedcom](http://usa.siemens.com/ruggedcom)**

Order No: RCEX-OTNPT-0620  
Printed in U.S.A.

© 2020 Siemens Industry, Inc.