

Cisco Services for High-Performance Utility Wide Area Networks



Today's electric utility increasingly requires the ability to connect thousands of geographically dispersed communications networks, including field area networks (FANs), transmission and distribution (T&D), and control and data centers. This level of connectivity is achieved by relying on multiservice wide area networks (WANs) to unite these disparate resources into a single extended environment. Based on the WAN architecture, utilities gain holistic situational awareness of the entire grid, giving them visibility into issues and enabling prompt remedial measures as required.

Cisco's architectural designs for the smart grid WAN to enable optimum availability, safety, and performance for large-scale networks by automating the entire energy chain. By establishing a technology foundation to support rapidly expanding power systems, utilities are assured of long-term reliability, increased responsiveness, and lowered operations costs.

Communications Challenges in the Utility Environment

Over the past century, the grid has extended from large cities to the most remote rural areas. Such piecemeal growth has inevitably led to aging infrastructures that even within the same territory can encompass a large number of different network systems. Today, utilities face demands that are resulting in an industry transformation and modernization of the grid. Challenges include:

- Exponentially increased demand for reliable and stable power supply
- Managing load across the distributed grid and multiple remote systems
- Lack of visibility into aging infrastructure equipment
- Utilizing existing infrastructure to comply with new security regulations and industry standards
- The addition of intermittent renewable energy resources to the grid

Cisco Services for WAN Architectures

Cisco GridBlocks™ architecture provides a reference design for new levels of access to information, as well as improved security and monitoring, to support both daily operations and future expansion. Cisco's IP-based architectures enable a proven communications WAN that connects the entire utility network environment and supports services for a wide range of applications. Cisco Services work closely with utility operations teams to create an architecture and roadmap to meet the needs of the utility for decades to come:



- Transmission and distribution substation: operational and nonoperational SCADA, synchrophasors, teleprotection, and physical security
- Field area network (FAN): fault location and restoration, optimization, asset management, and workforce access
- Advanced metering infrastructure (AMI) backhaul: connects smart meter infrastructures to the core network for transfer of control and usage information, supporting meter reads and consumer connects/disconnects
- Corporate network business services such as business video, wireless, and IP telephony

Business Priorities Assessment and Use Case Development

Working with utility leadership and management, Cisco experts conduct a detailed analysis of business priorities and objectives and examine the development and assessment of options to address these needs. Objectives are then mapped to current and future use cases, and these use cases are further developed. The team identifies business architectural options that can implement the use cases and establishes an operational and management framework. Finally, the team provides a qualitative financial and ROI analysis to determine the architecture that best helps to cut costs and promote new sources of revenue.



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Current Network Architecture Assessment and Gap Analysis

With a focus on delivering greater security control, efficiency, and savings, Cisco assesses the readiness of the utility to transition to a smart grid WAN network. The Cisco Services team evaluates the functional strengths of existing networks to accelerate architectural planning and design. It also examines critical readiness factors such as infrastructure design, environmental issues, and security, making recommendations to proactively resolve gaps.

Architecture and Design

Our Assessment and Architecture Services teams review the current state of each network and areas for improvement to align the utility to the needs of its business, unify network-based services, and ascertain the most effective architecture for the organization. Networks being transitioned to the smart grid WAN can be assessed based on a number of models, including:

- Multiservice IP core
- Multiservice with Multiprotocol Label Switching (MPLS)
- MPLS networks with regionalized model
- WAN core (IP) nodes options for all three models

The characteristics of each model are assessed to meet the needs of the operator, including:

- Network stability
- Required level of availability
- Capital and operating expenses
- Design and configuration simplicity
- Determinism

- Operational simplicity
- Unicast/multicast failover convergence
- Agility for new services

Implementation

For the WAN network architecture to work effectively, it needs to be implemented without compromising availability or performance. Cisco works with utilities directly to transparently transition systems to the WAN, assuring little disruption to the business or to customers. When the entire energy chain is automated, grid reliability and responsiveness improve, and operating costs are lowered.

Optimization

Cisco Services support the utility over time to evolve the WAN to help the company expand, meet new security challenges, and evolve to meet new demands such as the addition of renewable resources to the grid. Cisco works with the utility to initiate and maintain operational documentation, engage in ongoing knowledge transfer, and conduct design reviews to make sure that the architecture keeps pace with changing requirements.

Benefits

Cisco Connected Grid Services deliver clear and immediate benefits to the utility, enabling better visibility across the grid, greater reliability, and significant cost savings. Our open standards-based infrastructure designs enable a more scalable and secure substation network design. Benefits include:

- Reliable communications via interoperable devices on a common network

- Remote monitoring of station equipment and sensors for better transparency in the station
- Improved load balancing based on more accurate information on grid assets
- Reduced service disruption due to proactive equipment maintenance
- Lower operational costs, reduced lease line charges, and improved worker productivity
- Demonstrated compliance with NERC CIP and other regulatory requirements
- Improved incident response, better worker safety, and stronger loss prevention

Why Cisco?

Cisco brings more than 30 years of industry networking experience to each utility project. The Cisco Connected Grid Services team has the experience, expertise, and portfolio of technology solutions to improve how the energy industry serves its customers and manages daily operations. By uniting disparate networks through the WAN, Cisco enables utilities to manage assets more efficiently and secure information across the grid, optimizing business functions, and simplifying grid operations for the future.