ABB’s communication networks portfolio offers outstanding multiservice technology for power utilities.

Mission-critical Communications. Let's connect.

• Utilities are embracing digital transformation solutions.
• Digitalization can't happen without communications.
• Are you ready for the challenges of tomorrow?
Challenges faced by utilities.
Utilities are embracing digital transformation solutions to address today’s and tomorrow’s energy challenges.

In addition to extremes of temperature, mission-critical communications equipment for utilities are also exposed to magnetic and electrical fields, which are particularly severe during short-circuit events. In order to maintain the high levels of availability required, especially in emergency situations, utility communications equipment must offer a robust and reliable design that has proven capabilities for providing accurate functionality under extreme conditions. In dusty and remote environments, where regular maintenance cannot be guaranteed, fan-less designs are preferable.

ABB’s wired and wireless communications portfolio offers long-lasting support for utilities-specific communications, while also delivering on the requirements of digitalized grids of the future.

Many factors to consider.
For mission-critical communications.

Challenging utility environments
- Magnetic and electrical fields and extreme temperatures
- Robust, reliable and proven capabilities needed for providing accurate functionality under extreme conditions
- Dusty and remote environments, where regular maintenance cannot be guaranteed

Applications driven
- Installed base grew during many years, is defined, multiprotocol environment - flexible solution required
- Long-term support for traditional technology/ solutions also in new platforms required

Critical applications
- Very fast signal transmission required in case of failures in the electrical grid
- Highly delay, jitter, asymmetry sensitive applications
- Highest availability for critical services
- Needs to operate as well in case of massive problems in the electrical grid

Backbone for critical infrastructure
- Running system - not easy to migrate, long active life time of system (10 to 15 years or more)
- Long active life time requires specific solution - high MTBF in order to compromise on availability
- Long supplier support required (10 to 15 years or more) - opposite to the fast changing telecom environment where life cycles get shorter and shorter

Aging infrastructure, new regulations, distributed energy resources and the growing number of information technology (IT) applications within the operational technology (OT) field driven by digitalization are just a few of the issues that are dramatically changing the utility landscape today.

These days most offices grind to a halt in the face of a failed internet connection, but no industry compares to electrical transmission and distribution in being dependent on robust, resilient, and predictable communications. Only suppliers with an intimate knowledge of the industry can supply, and maintain, equipment capable of meeting that unique set of demands.

In dusty and remote environments, where regular maintenance cannot be guaranteed, fan-less designs are preferable.

ABB’s wired and wireless communications portfolio offers long-lasting support for utilities-specific communications, while also delivering on the requirements of digitalized grids of the future.
Digitalization can't happen without communications.
Proving robust, secure and reliable communications in a rapidly changing world takes ability.

ABB has been at the forefront of mission-critical utility communications for more than 140 years. Take a look at some of the utility projects ABB has already delivered.

Oman Electricity
Transmission Company, Oman
IEC 61850 GOOSE based inter substation protection
OETC has already implemented IEC 61850 for many years inside their substations. Recent developments of the standard consider also IEC 61850 GOOSE based communications between substations, extending its usage significantly. Furthermore it helps to increase the performance of the protection system of the high voltage powerline. ABB extended the existing SDH network with FOX615 nodes for high voltage protection applications in addition to SCADA, telephony and other services. The hybrid SDH & MPLS-TP network further extends the 15 year relationship between OETC and ABB.

DTE Energy, USA
ABB wireless communications technology helps weather-proof the US against future storms
DTE Energy operates one of the largest wireless mesh network in the world powered by ABB Ability based technology. The effectiveness of the distribution automation efforts was tested when a storm with 70 mph winds left nearly 800,000 customers without power – more outages than any other time in DTE’s history. By design, the self-healing wireless mesh technology embedded in the communication network was able to work around downed lines and poles to continually read the meters and provide additional data essential in pinpointing outages, making field deployment far more efficient than in previous years.

ABB Ability™ based digital solutions help speed up response time, mitigate outages, save downtime and cut repair costs during and after big storms.

TRANS CO, Abu Dhabi
Ensuring the safe and efficient operation of the growing power and water network
Turnkey design, supply of fiber optic communication network with FOX multi-service PDH/SDH multiplexers, teleprotection, telephony and network management. More than 1000 PDH/SDH nodes were deployed in the network. The reliable and fully integrated communications solution enhanced TRANSCO’s role in the unbundled Water and Electricity Sector.

Central Hudson Gas & Electric (Central Hudson), United States of America
ABB wireless network enables centralized monitoring and control in New York
Central Hudson has begun territory-wide deployment of an ABB wireless communications network that will provide a foundation for aggregating multiple utility applications through an integrated distribution automation program. The initiative is part of a major system reformation project to improve network efficiency and reliability.

The new wireless communications solution is enhancing power quality, system safety, and efficiency. The network is facilitating the monitoring and management of voltage levels for distribution and substation equipment. Connected devices can now send information automatically for analytics, enabling proactive maintenance, thus reducing costs.
Ready for the challenges of tomorrow.
The changing landscape of utilities is rapidly evolving just like the major cities of the world. To keep pace, ABB’s mission-critical communications solutions need to deliver on the requirements of the digital grids of the future, today.
Mission-critical communications.
For transmission utilities.

1. **Teleprotection**
Optimized solutions for superior performance

ABB’s optimized teleprotection solutions lead to superior performance, higher availability and reduced operational costs. With the latest generation of protection interfaces and devices, alongside the capability to enable the technology migration of these services. FOX615 provides integrated protection solutions for distance as well as differential protection applications over any kind of network technology (SDH or MPLS-TP). With the latest extension of IEC 61850 based protection interfaces, the FOX615 is the most advanced solution for your teleprotection system and provides you with a migration path to new technologies.

2. **Cyber Security**
Security in mission-critical systems

ABB’s layered mission-critical communication architectures ensure improved network security. Additionally, ABB has developed the first encryption card for mission-critical infrastructure with truly random numbers based on quantum physics. Improving cyber security of operational communication network by applying wire speed encryption suitable for real time applications. In addition, application specific firewalls offer controlled access to the station bus for IEC 61850 GOOSE, sample value data and static network design without extensive control plane. This ensures the defense-in-depth approach and is supported all in the FOX615 platform.

3. **Power Line Carrier**
Robustness and reliability

ABB draws on over 75 years of experience of data transmission on power lines. ABB’s power line carrier communications portfolio offers extensive functionality. It is easy to configure and to upgrade – thereby ensuring that the customer remains at the forefront of technology for years to come.

4. **IEC 61850 GOOSE**
Integrated packet based line protection

Recent development of IEC 61850 standard as well as activities in the Teleprotection industry lead towards generic packet based protection schemes. For line distance protection the IEC 61850 standard allows the use of GOOSE messages. FOX615 with the integrated TEGO1 interface provides a IEC 61850 Gateway functionality where the TEGO1 Interface card acts as an IED, connects to up to 8 different remote ends and provides selective filtering of GOOSE messages, translation capabilities in case of miss-matching configurations and controlled access to the station bus from remote ends through the WAN.

5. **Network Management**
Minimizing maintenance, enhancing performance

All ABB Communication Network solutions are fully integrated into FOXMAN-UN, including FOX615 and it’s utility specific interfaces for distance and differential protection. FOXMAN-UN provides sophisticated supervision features, such as a graphical representation of the communication network, a view of the synchronization status of FOX615 network elements and performance monitoring of links. In addition, FOXMAN-UN allows certain tasks, such as firmware distribution and activation, to be automated and scheduled.

6. **SCADA**
Operational Confidence

Today’s utilities depend on automatic systems to monitor, control, and protect their network and the investment it represents. Modern automation isn’t just about collecting, and collating, data; though that remains a central task of any automation system, the increasing intelligence of IED’s, Relays and RTUs offers scope for greater autonomy too. Mission-critical communications enable decisions to be made locally, or in concert with other local devices, while centralized SCADA systems alert human operators to decisions made by the machines.

Unlike telecom oriented vendors, who may step away from certain technologies, ABB continues to support the extension of customers operational communication networks for decades. ABB continues to support critical applications based on traditional technology and provides future-proof ABB Ability enabling communications technology that support hybrid solutions. Ensuring the best of both worlds for customers around the world.
Mission-critical communications.
For distribution grids.

1. Distribution automation
   Feeder Automation
   Distribution Automation (DA), also known as Feeder Automation (FA), encompasses a broad range of applications that help utilities make more efficient use of their distribution feeder systems. For example, utilities can confidently operate closer to the physical limits of their systems with the increase in more robust data for planning, engineering and maintenance, extending equipment useful life.

2. Advanced metering infrastructure (AMI)
   Smart metering
   A communications network is a foundational part of a utility Advanced Metering Infrastructure (AMI) architecture, delivering bidirectional connectivity between smart meters and head-end utility systems.

3. Utility Mobile
   Workforce Management
   Management, asset tracking and information access.
   Real-time wireless communication enables linemen and other mobile utility workers to bring a virtual office anywhere in their service territory, improving productivity and safety.

4. Outage management
   Fault detection isolation recovery (FDIR/FLISR)
   Minimizes the duration of an outages by automatically detecting and isolating distribution feeder faults and rerouting around them if possible, with little or no manual intervention.

5. Volt/VAr optimization
   Reducing line losses
   Used to improve efficiency of the distribution feeder system through automated control of capacitor banks and voltage regulators.

6. Physical security
   And video surveillance
   Adding network communications to existing substations to extend reach to the various security devices around the yard is often physically or financially prohibitive. As wireless networks require no trenching, they are typically the most cost-effective solution for existing substations. Some of the physical security applications commonly used are video surveillance cameras; access control using biometrics, keypads, etc.; perimeter sensors that detect thermal/motion; and gunshot detection, alerting and location identification.

ABB Distribution Automation improves grid reliability and efficiency, and give you control of the grid, anywhere, any time. We help you see inside your grid, with mission-critical communications technology backed by more than a century of experience in substation automation, communication and protection.
Mission-critical communications.
For substation automation.

Seamless redundancy based on HSR and PRP

HSR (High Availability Seamless Redundancy) offers redundancy by sending messages through both directions in the same network and detecting broken communication links and alarming the user accordingly. With PRP (Parallel Redundancy Protocol), a message from an IED is sent through two identical independent networks thus removing the risk of communication breakdown in case there is a fault in one of the networks.

Security of protected network Defense in depth

Depending on the application requirements, different measures need to be taken, starting from denial of service protection, protection against data modification using authentication, up to encryption of confidential data and centralized user account management. This ensures a ‘defense in depth’ approach.

Switches, routers and firewalls

The increase of Ethernet based communication protocols, such as IEC 61870-5-104, paved the way for switches in local area networks of utilities. Critical applications such as IEC 61850 signals or SCADA data can be transmitted via fast and reliable Ethernet networks in the substation environment.

Integration of Ethernet/IP and legacy services into a common platform

FOX615 addresses the needs of existing legacy networks, while at the same time providing future-proof equipment capable of evolving towards packet-based transport networks. This reduces the operational costs for our customers’ networks and enhances the reliability and the availability of services through reduced network complexity.

IEC 61850 enabled platform

The TEGO1 interface module now further extends the capabilities of the FOX615/612 multiplexing platform to enable IEC 61850 GOOSE based line protection. With the ongoing digitalization of electrical substations, the GOOSE based line distance protection application brings significant advantages to our customers and further strengthens our digital substation offering.

Redundant power supply and alarm contacts

Enabling the stepwise introduction of Smart Grid applications, such as integration of renewable energy sources, advanced distribution automation solutions and similar.

Substation automation is a key smart grid application. ABB’s mission-critical communications solutions enables remote monitoring and control of intelligent electronic devices (IEDs) through the substation to achieve improved power grid reliability and visibility as well as lowered operational costs.
The majority of existing communication networks of power utilities are based on SDH which allocates dedicated circuits to specific communications and thus guaranteeing the required communication performance parameters such as bandwidth, latency and symmetry. New standards today are based on packet switched technologies (e.g. IEC 60870-5-104 or IEC 61850) and therefore integrate natively into a packet-switched MPLS backbone network.

Today operators of communication networks in electrical utility environment are quite often confronted with the fact that established suppliers of SDH technology do not support the device anymore and replacement of the communication infrastructure has to be considered. Considering the fact that often a significant amount of applications still communicate on SDH, especially also protection applications, the migration needs to be planned carefully. Changing the network with a new device and at the same time changing the technology of the network bears significant risks for ending up in situations where not all applications can be migrated to the new network infrastructure in a reasonable time frame or extensive refurbishment projects need to be done additionally.

To smooth that process FOX615 supports the widely-deployed synchronous Digital Hierarchy (SDH) standard as well as MPLS-TP at the same time, and can bridge between the two to create a hybrid infrastructure that permits a managed and risk minimized migration towards a packet based infrastructure. Devices can be moved between the two networks as they are replaced during the normal lifecycle management. That, in turn, reduces the complexity of updating components, and provides access to an increasing range of applications which are being made available to packet-based networks.

Communications, even over a hybrid network, must be low-latency, but most importantly it must be deterministic. New technologies, as well as equipment not designed for teleprotection, can lead to non-deterministic behavior (jitter, wander and asymmetrical delay times) which causes virtual fault currents in differential protection relays, misinterpreted as an infrastructure fault leading to false tripping. ABB’s FOX615 is designed to provide that stability, preventing variations and turning latency into a known quantity which can be mitigated against.

### Comparison of SDH and MPLS-TP Applications

<table>
<thead>
<tr>
<th>Functionality</th>
<th>SDH</th>
<th>IP-MPLS</th>
<th>MPLS-TP</th>
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</thead>
<tbody>
<tr>
<td>Static channel routing</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
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<tr>
<td>End to end channel supervision</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Bidirectional channels</td>
<td>✔</td>
<td>✘</td>
<td>✔</td>
</tr>
<tr>
<td>Switchover &lt; 50ms</td>
<td>✔</td>
<td>✘</td>
<td>✔</td>
</tr>
<tr>
<td>DAMM based switchover</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Sophisticated GUI for channel configuration</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Easy configuration</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Network Management System</td>
<td>✔</td>
<td>✔</td>
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</tbody>
</table>

* Supported with additional protocols

<table>
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<tr>
<td>Non-critical applications on PSN</td>
<td></td>
<td>IEC 61850 over PSN</td>
</tr>
<tr>
<td>Critical applications remain on TDM</td>
<td></td>
<td>Traditional serial data over PSN</td>
</tr>
</tbody>
</table>

**SDH**
- **Supported network.**
- Circuit-switched Technologies
- Switching Matrix
- Interworking Function
- TDM Cross Connect

**Hybrid**
- **Combined networks.**
- Hybrid Platforms SDH/ MPLS-TP
- Ethernet over SDH
- • IEC 104 RTU
- • Voice over IP (VoIP)
- • Critical applications remain on TDM

**MPLS-TP**
- **Future network.**
- Ethernet Switching Matrix
- I/10 GbE & MPLS-TP
- TDM from E1 to STM-16
Teleprotection.

High performance demands on teleprotection equipment.

Teleprotection equipment, operating in conjunction with line protection, must be capable of reliably transmitting a signal to the remote end of the line, in the shortest possible time and under extreme interference conditions that might be caused by a fault in the power system.

ABB has been protecting critical infrastructure for more than a century, but our history is one of constant innovation – taking the best new technologies and developing them for challenges unique to the industry, and unique to you.

Communication networks have always been important to the operation of electrical grids, but in recent years it has become the enabler that makes the truly intelligent grids possible. That intelligence requires a network which can deliver outstanding performance, with the resilience expected from a system critical to the uninterrupted delivery of power. The communication system you use is essential in maintaining that delivery, while ensuring the safety of your staff, and the protection of your assets.

Critical to grid operations is the protection of power lines, through teleprotection. Teleprotection systems were developed alongside the electrical grids themselves, and the communication networks used were created with those applications in mind. In 1940, the average telephone user was just getting to grips with the rotary-dial telephone, while ABB was deploying power line carrier communications: utilizing the electrical transmission infrastructure to carry teleprotection data and avoiding the need for a separate Pilot Line.

Back then it was obvious that consumer communications and teleprotection systems had little in common. The users had different priorities, used different applications, and were thus best served with different technologies and techniques. Commonality might be found in some components, but the resilience required of electrical systems, compared to the cost-sensitive consumer market, reduced that overlap.

With the introduction of the use of fiber within the operational communication networks of electrical utilities, similarities between the technologies being used in consumer communications and operational communication networks of electrical utilities have appeared. The application requirements have been somehow comparable; private, highly available communication links with low jitter, wander and high level of symmetry as well as frequency synchronization. This is why Synchronous Digital Hierarchy (SDH) and Synchronous Optical Network (SONET) transport technologies have been successfully deployed in both network types.

Consumer systems have evolved with alarming speed due to the changing needs of consumers. This has seen a move away from voice communications and teleprotection systems had to rapid deployment of the latest technologies and cost-saving ideas. This was often to their detriment, as quality of service reduced for real time applications (e.g. voice calls) but bandwidth for data networks increased tremendously.

Teleprotection systems, in contrast, have always operated under the pressure of protecting critical infrastructures. Reliability is paramount, resilience required, while new technologies and techniques must prove themselves robust enough to match, or exceed, the existing equipment before they can safely be used in the electrical network. That’s why migration to new technologies for such systems is more complex and takes significantly longer compared to consumer networks.

Protection applications have very specific requirements. If the same are not met maloperation or even worse no operation of the protection system will lead to large blackouts, destroyed primary equipment and dissatisfied customers. Differential protection is very sensitive to latency, jitter, wander and asymmetries, if those performance parameters are not met the application is severely compromised. Distance protection on the other side is sensitive to latency, maloperation due to false or missing commands. That’s why Teleprotection systems, in contrast, have always operated under the pressure of protecting critical infrastructures. Reliability is paramount, resilience required, while new technologies and techniques must prove themselves robust enough to match, or exceed, the existing equipment before they can safely be used in the electrical network. That’s why migration to new technologies for such systems is more complex and takes significantly longer compared to consumer networks.
ABB has a long lasting experience in providing optimized teleprotection solutions leading to superior performance, higher availability and reduced operational costs. With the latest generation of protection interfaces, ABB also enables the technology migration of those services.

FOX615 provides integrated protection solutions for distance as well as differential protection applications over any kind of network technology (SDH or MPLS-TP). Migration of teleprotection applications from TDM networks to packet switched networks provides specific challenges which are address with the FOX615 integrated solution.

TEPI2 Integrated teleprotection interface cards, TEP2 and OPIC2, which provide integrated distance protection and differential protection respectively. TEP2 provides IEC 60834-1 compliant teleprotection, over packet-switched networks, while OPIC2 guarantees symmetrical real time communication channels using wide area communication networks, based on packet-switched technology, for differential protection.

Migrating distance protection form TDM to PSN networks requires a detailed analysis of performance requirements as well as implications leading out of such changes. For example dependability, security and latency values of distance protection trip signals will be different before and after the migration. Especially in the case of applying circuit emulation technologies teleprotection standards such as IEC 60834-1 might not be fulfilled anymore. With TEP2, FOX615 fulfills the requirements of IEC 60834-1 in all aspects also using packet switched networks, as well as substation relevant standards such as IEEE 1613, EN61000-6-3 and EN61000-6-2.

OPIC2 Integrated differential protection interface OPIC2 adds IEEE C37.94 to the range of standards supported fulfilling the application specific quality parameters entirely. With OPIC2 there can’t be a wrong trip of your differential protection application due to asymmetry, excessive Jitter & Wander. OPIC2 eliminates network asymmetries as well as jitter and wander and provides enhanced alarming functionality in case of degrading performance. OPIC2 takes the gateway functionality deciding if quality of service for a traditional differential protection relay can be met or not and blocks the communication in case of unmatched performance. Using the TDM backplane allows the integration of other TDM traffic (e.g. differential protection relay using G.703 64kbit/s or X.21). TEGO1 Integrated packet based line protection Recent development of IEC 61850 standard as well as activities in the Teleprotection industry lead towards generic packet based protection schemes. For line distance protection the IEC 61850 standard allows the use of GOOSE messages. FOX615 with the integrated TEGO1 Interface provides a IEC 61850 Gateway functionality where the TEGO1 interface card acts as an IED, connects to up to 8 different remote ends and provides selective filtering of GOOSE messages, translation capabilities in case of miss-matching configurations and controlled access to the station bus from remote ends through the WAN. With TEGO1 ABB closes the gap between substation automation and protection and wide area communication. Networking concepts are brought to the protection application which allows optimized solutions with better performance at lower costs.

Supervision and Data security / authenticity All teleprotection cards provide continuous supervision and collection of performance statistics, hitless traffic protection in case of link failure, and authentication of trip signals to guarantee data integrity. Additionally the high performance encryption unit SENC1 of FOX615 allows encryption of teleprotection signals. All interface cards are integrated into ABBs FOXMAN-UN control software. Integrated management is a vital component in managing protection hardware, and securing it from the next-generation threats of cyber-attack. Packet-based networks use publicly-documented protocols, and utilities are potential targets, so a comprehensive (and coordinated) security policy is essential across the entire network.
Fiber Optic.
Ready for the challenges of tomorrow.

ABB’s mission-critical communication solutions for optical networks offer a broad range of world leading products for local and wide area communication networks.

FOX615
FOX615, is an outstanding multi-service multiplexer which enables the extension of existing communication infrastructure, as well as the smooth migration to future technology. FOX615 integrates teleprotection interfaces for distance as well as for differential protection simultaneously within state-of-the-art SDH networks and MPLS-TP networks; ensuring an easy and flexible way to migrate technology in a utility network. With its latest IEC 61850 interface the FOX615 also acts as an substation IED and enables GOOSE based protection applications of digital substations. Built on ABB’s huge domain expertise, the utility-grade design of FOX615 is deployed in thousands of installations across the globe with guaranteed performance including those with electromagnetically polluted environments and across a broad range of temperatures.

FOX605
FOX605 offers a cost-efficient communication solution for electrical utilities of all sectors and markets (ETSI, ANSI). Designed and tested for the utility environment, FOX605 combines circuit- and packet-switched technologies, including MPLS-TP, in one single device for the transmission of traditional signals, protection signals and local LAN-traffic via packet switched backbone networks. On the network side the multiplexer offers sophisticated WAN functionality whilst the user side supports LAN and common traditional interfaces, enabling a stepwise upgrade into the packet-switched world. Reliable data transport is guaranteed under any network circumstance.

NSD570
Protection equipment in conjunction with communication links provide the best possible means of selectively isolating faults on high voltage transmission lines, transformers, reactors and other important items of electrical plants. To prevent the power system from failure and damage, the NSD570 teleprotection system selectively disconnects the faulty part by transferring command signals within the shortest possible time.

AFS Family
ABB’s AFS family includes a broad range of Ethernet switches, routers and firewalls which are designed for utilities environment. All products of the AFS family are compliant with IEEE standards and offer many features, such as fast protection schemes, redundant power supply and alarm contacts, which enable the stepwise introduction of smart grid applications.

EDS500
EDS500 is a product family of ruggedized Ethernet/SHDSL switches and FSK modems especially designed to support critical infrastructure companies by enhanced robust communication technology offering minimal downtime, predictive failure notification and encrypted management.
ABBB Wireless delivers products and services to build interoperable wireless communication networks for utilities. We optimally blend technologies such as broadband mesh, broadband point-to-multipoint (PTMP), sub-1 GHz unlicensed PTMP/point-to-point (PTP), and sub-1 GHz licensed PTMP/PTP to provide turnkey private wireless communication networks that meet customers’ reliability, security, performance, and economic requirements. Our networks enable customers to own and operate a modern wireless communications infrastructure that can deliver five 9s system availability, is based on IP, provides enterprise class security from the core to the edge of the network, offers broadband speed, and can support multiple applications now and into the future.

The ABB Wireless product line includes TropOS broadband wireless mesh routers, MicrOS broadband mesh client nodes, TeleOS sub-1 GHz unlicensed PTMP/PTP radios, and the SuprOS network management system. Our professional services staff can assist customers in all phases of planning, deployment, optimization, and commissioning communication and automation solutions. As required, they can manage and facilitate integration with third party products that will connect to the communications network.

TropOS mesh routers and MicrOS client nodes build highly resilient wireless networks with high capacities for aggregating multiple, mission-critical applications covering broad geographic areas that are often remote locations with rugged terrain and extreme weather. All TropOS mesh routers and MicrOS client nodes run Mesh OS. Mesh OS leverages each router’s and client node’s on-board intelligence to minimize network congestion and adapt on a real-time, packet-by-packet basis. This distributed approach optimizes performance and throughput by minimizing control traffic, delivers a highly scalable solution, and provides the connection quality demanded by industrial endpoints.

Mesh OS is the key to delivering high throughput and scalability. It is the industry’s only mesh routing software that dynamically selects end-to-end paths through the mesh based on maximizing client-server throughput and minimizing latency. The TropOS wireless mesh router product line installs outdoor, mobile, and indoor devices. MicrOS client nodes are optimized for wired IoT client connectivity. The TropOS 6430-T integrates a TropOS broadband mesh router with a TeleOS narrowband PTMP base station in a single enclosure, simplifying installation time, and reducing cost. It is the ideal solution to connect remote devices using long-range narrowband to a TropOS mesh network.

TeleOS sub-1 GHz unlicensed PTMP radios

TeleOS selects the optimal radio technology for each scenario, including TropOS wireless mesh routers, MicrOS client nodes, TeleOS unlicensed band PTP/PTMP radios and TeleOS licensed band point-to-multipoint (PTMP) and point-to-point (PTP) radios. TeleOS selectively switches modulation schemes to ensure optimal throughput given available channel sizes and environmental noise.

ArcheOS sub-1 GHz licensed PTMP radios

ArcheOS delivers a reliable, around-the-clock wireless communications solution for mission critical applications. Every ArcheOS radio can serve as a central master, a repeater, a remote terminal or all of these simultaneously. The ArcheOS anti-collision protocol supports all types of traffic – master, multi-master-slave polling and report by exception – from remote units concurrently.

ArcheOS radios operate in a number of licensed, sub-1 GHz radio frequency (RF) bands including 200 MHz, 400 MHz and 700 MHz.

SuprOS network management system

SuprOS is a comprehensive wired and wireless network management system that provides the functionality required to manage ABB communication networks as a single system including TropOS wireless mesh routers, MicrOS client nodes, TeleOS unlicensed band PTP/PTMP radios and ArcheOS licensed band PTP/PTMP radios, plus AFS/APR Ethernet switches and routers, and Cambium and Redline broadband PTP/PTMP radios. SuprOS streamlines and minimizes costs of deployment, optimization, operation, and maintenance of ABB communication networks.

SuprOS features an intuitive web-based interface. A powerful, standards-compliant network management system, SuprOS optimizes the efficiency of IT personnel by simplifying complex tasks such as mesh wireless network performance analysis and system optimization. Network-wide software updates and provisioning can be achieved via a single command from the management station, streamlining a potentially time-consuming task and preventing service disruptions.

A key advantage of SuprOS is the ease with which initial network deployments, expansions, and reconfigurations take place. Through use of advanced auto-discovery, networks devices such as mesh routers are able to automatically find one another, reducing the need for extensive pre-planning, and streamlining network deployment. During network roll-out, SuprOS continuously analyzes the network, automatically determines strategies for optimizing performance and provides the tools needed to implement these strategies. SuprOS offers an innovative and intuitive approach to performance monitoring, optimization and control. IT management is presented with a comprehensive summary view, and can drill down for more detailed performance data to plan optimization strategies.

To integrate with higher level managers, SuprOS can forward traps it receives from devices it manages to enterprise management servers (e.g., OpenView, Tivoli) using SNMP. SuprOS also offers a northbound interface, which is a web service that presents information to third-party devices using XML.
ABB draws on over 75 years of experience of data transmission on power lines. ABB’s power line carrier communications portfolio offers extensive functionality. It is easy to configure and to upgrade – thereby ensuring that the customer remains at the forefront of technology for years to come.

The safe and reliable transmission of power depends on continuous coordination between different points in the network. From a simple telephone conversation between operators to the automated control and monitoring of remote equipment, a robust and dependable communications infrastructure is a prerequisite for efficient operation.

Power Line Carrier Systems have long been used by electric power utilities for the transmission of vital information for the operation and protection of the electric power grid, ie, voice, protection commands and control signals. Thus, power lines are used not only to carry electrical power (at 50 Hz or 60 Hz), but also to transmit communication signals (typically at frequencies between 40 kHz and 500 kHz). Special coupling devices are used to connect the communication terminals to high-voltage power lines.

The use of existing power lines for communications is a meaningful choice, because these provide the most direct link for teleprotection (where speed is crucial), they are reliable and they are completely under the control of the power utility, which is important, especially in countries with deregulated telecommunication markets. Furthermore, power lines are an excellent communication medium that can bridge very long distances (several hundred kilometers) without a repeater.

ABB offers a complete range of products, such as PLC equipment, coupling devices, line traps, transfer tripping devices (teleprotection equipment), data modems and telephone exchange equipment.

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### Power Line Carrier Network.

Robustness and reliability for mission-critical communication networks.

1. ABB has installed thousands of PLC link in more than 120 countries, at voltage levels of up to 1000 kV AC and 500 kV DC, covering a total length of more than one million kilometers.

14. ABB has installed thousands of PLC link in more than 120 countries, at voltage levels of up to 1000 kV AC and 500 kV DC, covering a total length of more than one million kilometers.

15. Power Line Carrier Network overview.

### Equal to

25 times around the Earth

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1 million kilometers of PLC links
Network Management Systems. Unlock the value of network data.

ABB’s Network Management Suite answers the strong need for integrated software solutions capable of managing complex Mission-critical communication networks.

Network Management Systems (NMS)
Former ‘point to point’ communication based architectures could be easily managed with simple tools such as equipment craft-terminals and element managers. However, today’s networks form complex meshed structures comprising a wide range of technologies. These are based on various communication media, including fiber optics, wireless or Power Line Carrier. Moreover, mission-critical communications need to ensure network performance and high-availability of service based on well known traffic protection schemes existing for PDH/SDH networks, as well as for MPLS-TP.

ABB NMS enable reduced operational costs for utility networks by reducing the complexity in network operations and planning, as well as enhancing the reliability and the availability of services. FOXMAN provides a comprehensive range of tools, technologies and enable the integration of FOX equipments through its corresponding network management systems. In addition they also allow real-time monitoring of the performance of the network, alarms surveillance, and configuration management. The Network management system is also supporting advanced configurations including protection mechanisms that allow full redundancy of the network.

FOXOLM provides an additional service management layer for mission critical networks thanks to the integration of the underlying ABB network management system. This integration brings maximum synergy through managing different services & technologies in a unique offering.

SuprOS is a comprehensive wired and wireless network management system that provides the functionality and tools required to manage ABB communication networks as a single system— including TropOS broadband wireless mesh routers, MicrOS broadband wireless client nodes, TeleOS unlicensed narrowband PTP/PTMP access points and ends points, and ArcheOS licensed narrowband PTP/PTMP with access points and end-points plus selected broadband PTP/PTMP access points and end-points from Cambium and Redline. SuprOS also includes management tools for AFS Ethernet switches and AFR Ethernet routers from ABB. SuprOS streamlines and minimizes costs of deployment, optimization, operation, troubleshooting of network problems and maintenance of ABB communication networks.

SuprOS
• Network-wide visibility
• Simple, powerful network-wide search
• Seamless integration with Google maps
• Auto-discovery
• Network analytics

FOXOLM
• Configuration management
• Graphical network management
• Fault management
• Security management
• Management of teleprotection system

FOXMAN
• Network discovery and documentation
• Network capacity analysis
• Route protection analysis
• Incident simulation
• Network planning

SuprOS
• Network-wide visibility
• Simple, powerful network-wide search
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Power Grids Generation, Transmission and Distribution
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Segment Specific Focus

Network Equipment

Service Management

REST / SOAP / EXCEL
The future is agile and collaborative.
Assessing your needs, implementing and sustaining for impact.

ABB’s four service agreements (“Rapid Response”, “Operational Excellence”, “Lifecycle Management” and “Performance Improvement”) address various needs of assistance. From planning to maintaining a renewables project, we assess your needs and implement and sustain solutions from cyber security care packages through to training and spare parts delivery.

Rapid Response
When something goes wrong, you need it fixed fast! Whether it’s spare parts, replacement equipment, or repairs, our care agreements are tailored to your needs. Our remote services and 24/7 call center also provides quick troubleshooting and root cause analysis services so you can identify the most effective course of action and address problems before they grow.

Operational Efficiency
Need to modernize or address a sticky issue? Our consultants can help you assess the challenge and design cost-effective, fit-for-future solutions. In addition, we offer a wide range of commercial and proprietary enterprise-level applications to help you improve operational efficiency.

Performance Improvement
Hitting key performance targets can be tough to do when you’re trying to keep renewables’ costs under control. Our team can devise solutions that help you hit your targets as well as provide software applications that deliver actionable insights for future performance improvements.

Lifecycle Management
Cradle to grave, Grid Automation Service is there to help you take care of your assets by providing installation and commissioning services, maintenance, replacements, spare parts and consumables, and training. We can also help you extend the life of your assets with extensions, upgrades, and retrofits. When it’s time to retire an asset, we offer end-of-life services that help you do so cost-effectively and responsibly.

We are with you around the world
ABB Grid Automation Service has more than 150 customer care centers strategically located around the globe. These one-stop shops are staffed by 6,000 professionals with extensive industry and service experience on a wide array of power equipment and systems. Our team of power experts and analysts can help you address today’s toughest power challenges and prepare you to meet the challenges of future.
Mission-critical communications systems from ABB are ready for the challenges of tomorrow. Providing robust, secure and reliable communications in a rapidly changing world that are with you for the lifetime of your network.

Let's connect.