COMMUNICATION NETWORKS

We are securing the past in a fast moving future.
FOX605 multiservice platform.
Designing and operating a communication network in a secure and reliable way is a major task for utilities. Electrical, oil & gas as well as transport enterprises are facing an increasing number of decentralized assets as well as emerging smart applications (e.g. SCADA, automated meter reading, video surveillance, cyber border control) which have to be integrated into the existing network. Therefore cost efficient management including rapid intervention and deployment of new services are a must.

Furthermore, the trend from the telecom industry to migrate from traditional TDM oriented systems to packet-switched networks is also noticeable in utility communications. Ethernet technology brings a flexibility in communication networks that allows latest applications to be deployed. As PSN technology is increasing the level of cyber security threats, protecting mission-critical communication and sensitive industry applications from unauthorized access and manipulation becomes essential and challenging. Mission-critical applications require a distinct performance, so hybrid TDM/PSN networks will dominate the network landscape of utilities for many years to come. Millions of peripheral devices like RTUs, relays, PABXs or process control systems for railways and pipelines with traditional TDM interfaces cannot be replaced by packet-devices overnight. This huge installed base requires a seamless and stepwise migration that typically starts in the backbone. This calls for solutions that allow connecting the installed TDM-infrastructure including LAN/WAN services to the packet-switched core in a secure way.

Planning, implementation, migration and extension of network infrastructure therefore remains a complex task for utilities. Service continuity, strict performance and security requirements are demanding.

With its hybrid architecture and encryption capabilities, ABB’s FOX605 addresses exactly these challenges for harsh utility environments.

FOX605 is a one unit high, fan-less multiplexer designed and tested for harsh environments of utilities. It combines TDM and packet-based technology in a single platform for the aggregation of traditional data (RS-232, 64kbit/s, E1) as well as voice and LAN traffic that needs to be transported across the packet-switched backbone. Higher TDM capacities (e.g. STM-1) as well as ANSI-oriented Interfaces like T1 or OC-3 are provided using Smart SFPs. This allows a stepwise migration and extension into a secure and robust network infrastructure.

The comprehensive set of data interfaces including utility-specific features makes FOX605 the ideal solution for access and aggregation network layers of the communication network in a utility environment. FOX605 offers complete interoperability with ABB’s FOX family for cost-optimized network approaches and smooth extension of existing communication infrastructures. Network management activities can be easily handled with ABB’s modular NMS suite.

On the trunk side, the multiplexer offers strong network security functionalities based on enhanced MACSec. This approach allows significant improvements of data security with service-aware encryption capabilities. Hardware and traffic protection schemes guarantee reliable and resilient communication under adverse conditions so that applications are not affected in case of network anomalies.

The end to end L2 and MPLS service-based encryption including authentication enables data to be transported securely across the communication network. Compared to traditional, hop-oriented MACSec according 802.1ae FOX605 supports much more flexible encryption modes. LAN and emulated TDM flows run secured end to end even through non-encryption aware core networks. Increased performance and synchronization of the network infrastructure is gained by using Synchronous Ethernet and IEEE 1588v2.

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We are here for the lifetime of your network. Future-proof, long-term support of proven technologies.

ABB’s communication solutions do not only fulfill the requirements of today, but also protect the investment of tomorrow. We have been leading the field for utility communications for more than 75 years with state-of-the-art and traditional technologies. Our communication equipment is robustly tested and certified for demanding environments. Seamless migration and extension of existing communication infrastructures are ensured by support of both proven and modern technologies in one single operational network.

The whole range of fiber-optical communication devices provide a scalability which ensures that utilities have the appropriate and required migration and extension possibilities, which reduce OPEX and maximize availability.

Secure, long-term investment
With a far-ranging experience in utility communications, ABB provides utilities with support of proven technologies for a long time, matching the long equipment life cycles of communication devices in the utility environment. The support of both traditional TDM and packet-switched technology enables stepwise migration or extensions of existing communication infrastructures, so that utilities can evolve to future communication networks securely and with the expertise of a long-term partner. New applications can be easily and securely added to the existing operational network.

ABB continues to support traditional TDM technologies such as SDH/SONET/PDH for highly secure and reliable operational communication networks. When the time for the utility has come to migrate its communication network to the packet-switched world, the comprehensive feature set of FOX605 offers the required functionalities. As all other FOX products, FOX605 can be easily managed from one network management system.

Made for utilities
ABB’s FOX605 comes with a comprehensive feature set in one single device, making it the ideal solution for access and aggregation network layers. The support of traditional interfaces combined with state-of-the-art Ethernet and upcoming MPLS-TP based services and latest synchronization / timing features are essential for time-sensitive applications. Powerful features in combination with Sync-E allow time distribution for mission-critical applications, e.g. tele-protection, and make them widely independent from the availability of a reliable GPS signal.

The utility-grade hardware design with support of an extended temperature range allows physical installation in harsh environments that are common for utilities.

Cyber protection for mission-critical information
In traditional TDM networks deployed in the utility environment, communication channels between stations and control-centers were regarded as secure, whereas the packet oriented networks have to be considered as insecure. Many applications in the utility environment do not support IP-layer security mechanisms for technical reasons and timing constraints. FOX605 ensures secure data transmission across the packet-switched network. In operational networks of utilities the protection of sensitive, mission-critical data is essential.

Any intrusion could heavily impact the performance of the complete communication network and the depending infrastructure for power, transport or pipeline. The end to end security of FOX605 guarantees that mission-critical information is protected without compromising the performance.
Benefits and key features.

The increasing usage of Ethernet and IP services in operational networks imposes new challenges for communication.

Secure, long term investment
Future-proof, long-term support of proven technologies
• Stepwise migration and extension of existing ETSI / ANSI communication infrastructure
• Support of traditional interfaces
• User-friendly, intuitive configuration via NMS
• Interoperability with the installed base

Performance and predictability
Constant connection and information
• Reliable data transmission and traffic protection schemes including ERP5
• Accessible time and phase distribution for network and application synchronization
• OAM controlled performance

Protection of mission-critical information
Secured data communication in packet-switched networks
• Built in cyber security with service aware encryption
• Verified cyber robustness and distribution of FOX605 firmware

Made for utilities
Robust communication solutions for utility-specific applications
• One single platform offering a comprehensive feature set
• Integrated cyber security
• Combination of TDM and packet technologies in one single platform
• Tested and certified for utility environments
• Fan less design

Performance and predictability
Constant connection and information
• Reliable data transmission and traffic protection schemes including ERP5
• Accessible time and phase distribution for network and application synchronization
• OAM controlled performance

In the traditional TDM world dedicated, pre-setup communication channels ensured that required information was sent and received directly and dependably. A packet-switched technology suitable for the requirements of utilities has to guarantee the performance of real-time applications, e.g. teleprotection, under any network circumstance.

ABB’s FOX605 feature set provides mPLS-tP, a PSN technology with a behavior similar to TDM. As the majority of PSN technologies, it offers fast data transmission and great bandwidth flexibility, enabling the combination of traditional and latest applications into one multi-service network. The distinct difference of mPLS-tP, compared to other packet-based technologies are the pre-defined paths: bidirectional LSPs are centrally defined in the management system, determining the way a packet must take through the cloud without significant asymmetrical delay. Automatic protection switching guarantees reconfiguration times as quick as in TDM. Fault location is enabled by a comprehensive set of OAM fault management and performance monitoring features for a minimum of network downtime. Standard forwarding mechanisms guarantee interoperability with existing communication equipment and technologies, thus reducing the complexity of the network.

In comparison with other PSN technologies, mPLS-tP is a perfect fit for utility operational networks as it offers all required functionalities for reliable, TDM-like data transmission, without adding more complexity to the network.

Technical features
Fits ETSI & ANSI markets
L2/MPLS GE LAN/WAN with SyncE
Service-aware traffic encryption for secured End2End transmission based on public algorithms
(enhanced version MACSec acc. 802.1AX)
Embedded traffic generation / analysis acc. RFC2544 & Y.1564
Fan-less operating temperature up to +55°C
8x GbE ports (E 4 el. + 4 SFP)
Power over Ethernet on 4 electrical GbE ports
Up to 4 ports with encrypted traffic streams
Comprehensive set of timing-interfaces (TsO, BITS,1 PPS, IRIG-B, 10MHz)
4x E1 ports (G.703 / G.704 / 120 Ohm)
4x 64 kbit/s interfaces
4x 8x RS-232 / RS485 / V.11 (configurable)
Smart SFP support for e.g. T1, OC-3, STM-1
Alarm – Interfaces (on R145 2x In / 1x Out)
Management LAN & Terminal (on 2x R145)
Redundant 48 VDC power supply (hot swappable)
Managed by ABB’s NMS suite

MPLS-TP technology.
Robust communication solutions for utility-specific applications.

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Glossary
CESoP Circuit emulation service over packet switched networks
NMS Network Management System
E1 2048 Kbit/s
PABX Private Automated Branch Exchange
EoS Ethernet over SDH/SONET
PDH Plesioschronous Digital Hierarchy
FOX Fiber Optic Multiplexer from ABB
PPS Pulse per second
Goe Gigabit Ethernet
PSN Packet-switched network
IEEE Institute of Electrical and Electronics Engineers
PTP Precision Time Protocol
IP Internet Protocol
RTU Remote Terminal Unit
L2 Layer 2
SAToP Structure-Agnostic Time Division Multiplexing over Packet
LAN Local Area Network
SCADA Supervisory Control and Data Acquisition
Legacy
Local Area Network
T1 1.544 Mbit/s
LSP Label-switched path
MPLS-TP Multi Protocol Label Switching – Transport Profile
MTBF Mean Time Between Failures
TDM Time Division Multiplexing
WAN Wide Area Network