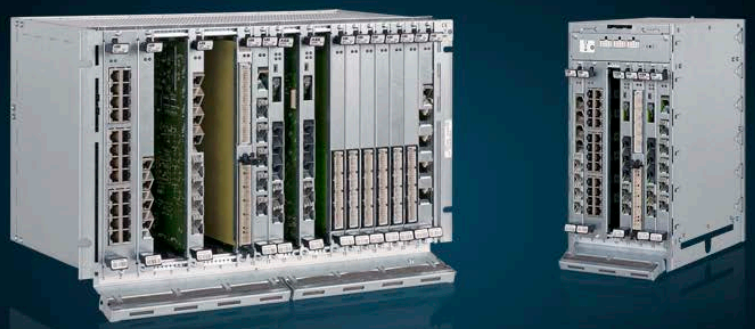
Christian Köhler, Network Management Forum, 09. October 2013

ABB Communication Networks Latest News FOX615 / References with TROPOS Mesh

Power and productivity for a better world™

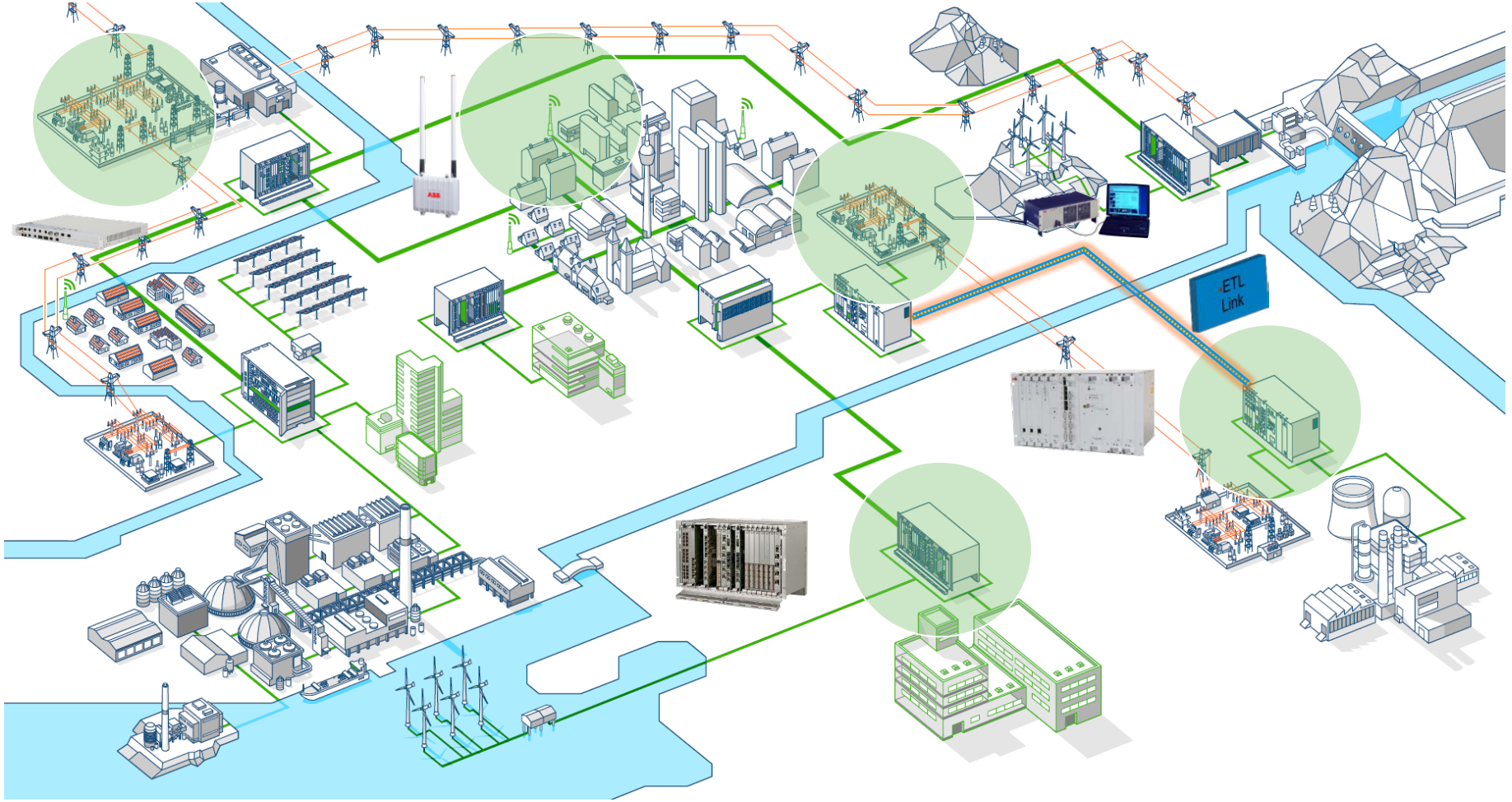
Why ABB for Utility Communication solutions
Benefit from integrated know how

Focus standards for the Utility market
Active participation in defining future solutions



Utility Communication
An integrated network

Utility Communication
An highly Integrated Network



FOX Family
MPLS-TP on the Road-Map

FOX515H

Transport Multiplexer providing up to SDH STM-64 interfaces

FOX660

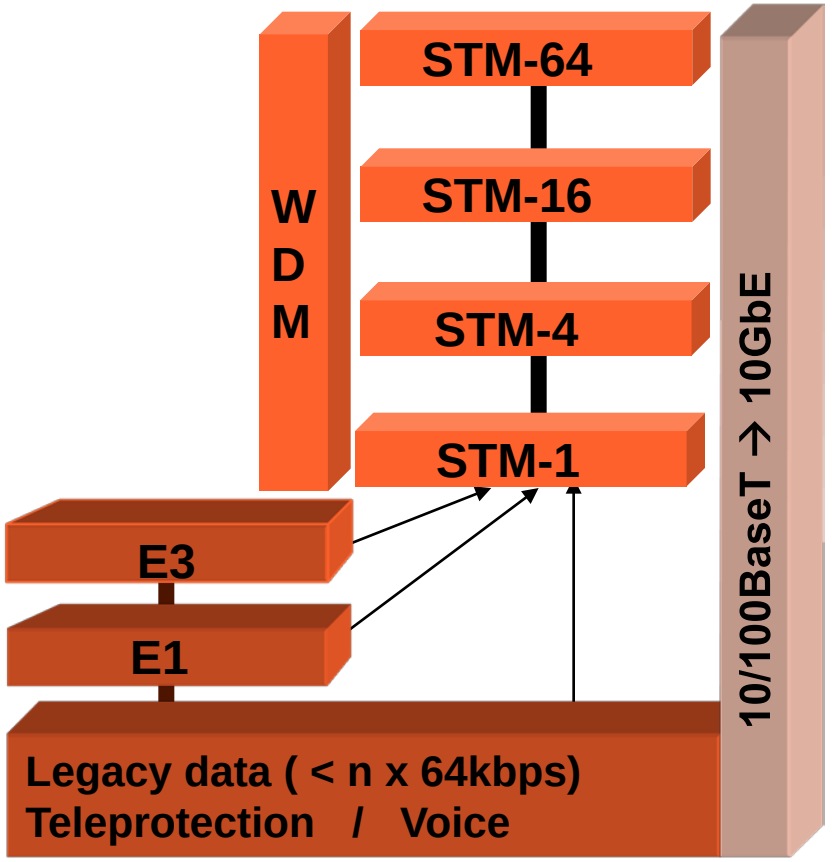
Hybrid optical transport multiplexer providing SDH interfaces up to STM-16 & 10GbE inclusive MPLS-TP in one device

FOX515 / 615

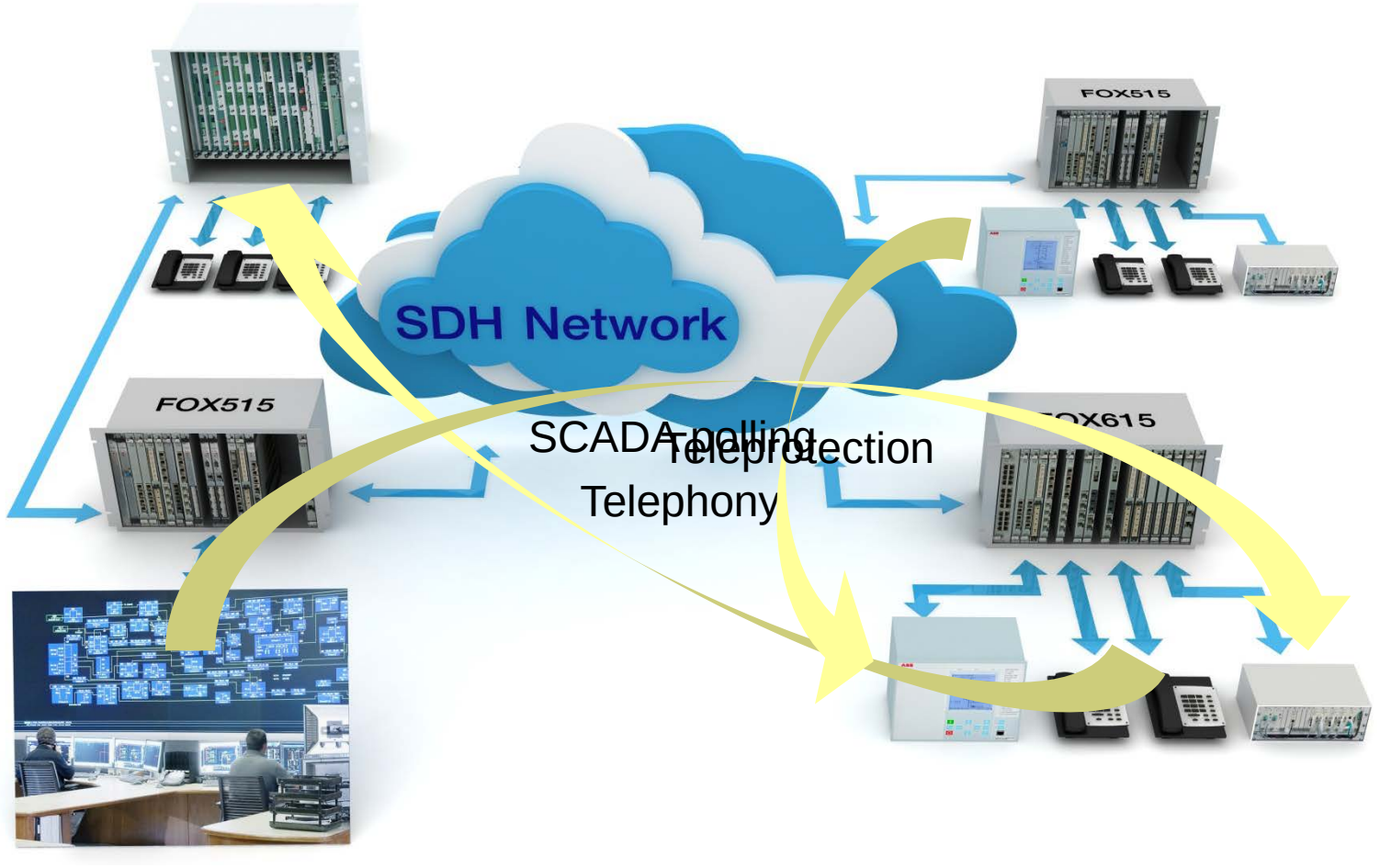
Combined access and transport multiplexer providing up to SDH STM-16 & 10GbE capacity and many legacy data access interfaces

FOX505

Access multiplexer providing legacy data access interfaces and traffic capacity up to STM-1



Interoperability with existing FOX515 networks
FOX515/ FOX615 full interoperability



Power utilities applications
Utilities mission in the focus

- Power utility need to reliably transmit and distribute electrical energy
- Various applications help the utility to ensure the reliable energy transmission and distribution
- Some of them are mission critical
  - Requiring real time communication
  - Requiring predictable and constant communication channels

- **The Utility Communication-Network helps to achieve reliable energy transmission and distribution and accordingly it needs to fulfil the requirements defined by the applications without compromise**

Power utilities applications
Teleprotection

Teleprotection functionality – safeguarding the electrical grid (distance and differential protection is a must!)

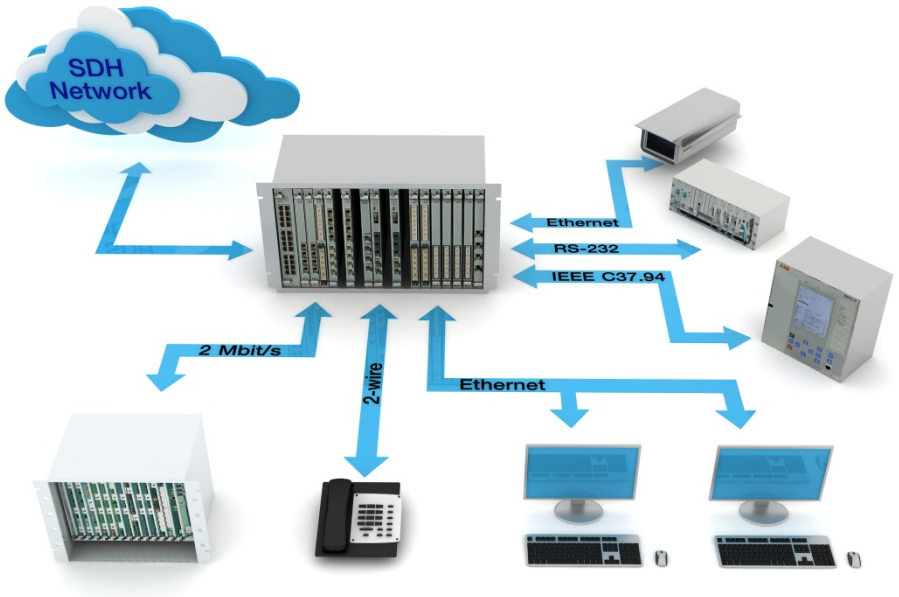
- In case of malfunction the potential implications are tremendous
  - Blackouts
  - Destroyed primary equipment such as transformers or switchgears
- Requirements on communication performance are very high
  - Hard real-time communication
  - Very deterministic data channels
  - Very high network availability
  - Very high dependability and security

Application requirements
Overview about various applications

Service	Data rate	Acceptable latency [ms]
Voice	2.4 – 100 kbit/s per channel	< 100
Telecontrol		
SCADA	0.05 – 64 kbit/s	< 1000
ICCP	2 Mbit/s – 100 Mbit/s	< 1000
Distance Protection		
Blocking	< 64 kbit/s	< 4 - 8
Permissive	< 64 kbit/s	< 5 - 10
Intertrip	< 64 kbit/s	< 8 - 16
Line Differential Protection[1)]		
EHV (Extreme High Voltage)	64 kbit/s – 2 Mbit/s	< 5
HV (High Voltage)	64 kbit/s – 2 Mbit/s	< 10
MV (Medium Voltage)	64 kbit/s – 2 Mbit/s	< 40
Video Surveillance	256 kbit/s – 10 Mbit/s	< 1000
Other operational data	64 kbit/s – 100 Mbit/s	< 1000

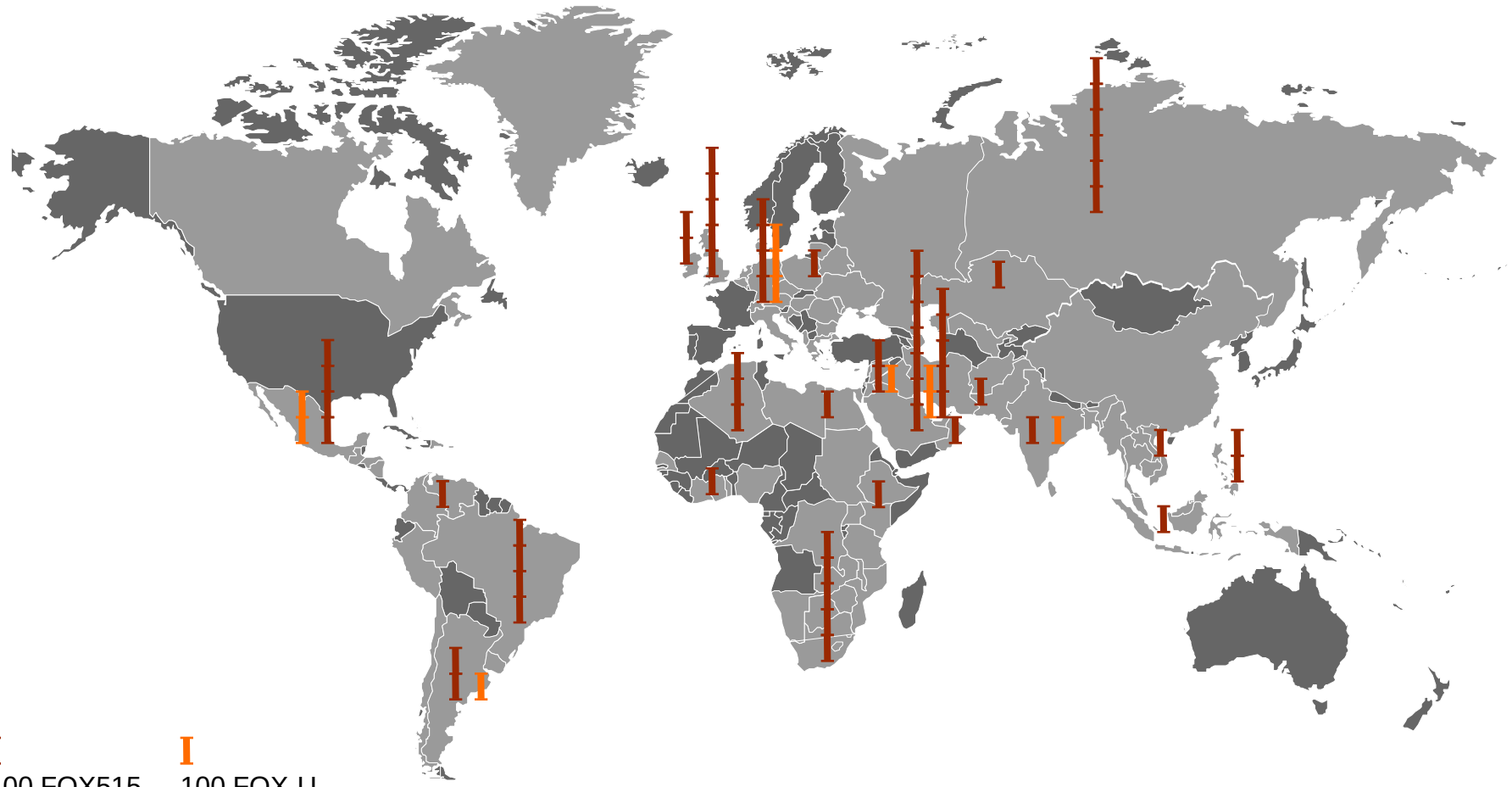
1) Line Differential Protection is very sensitive to Jitter/ Wander and asymmetrical delay (movie)

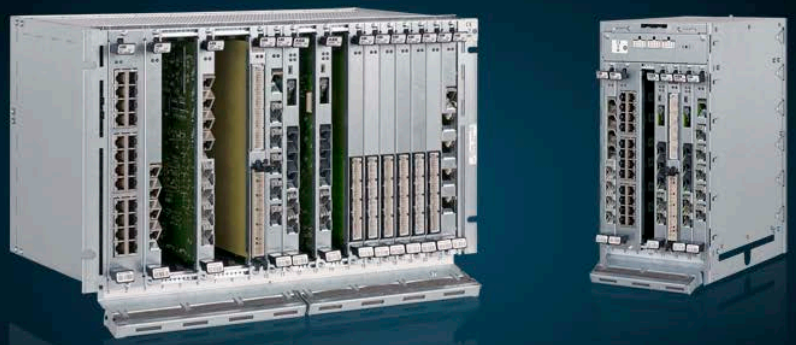
Operational excellence
The need for multiservice networks



- Requirement for huge variety of different interfaces
- Requirement for utility specific interfaces such as Teleprotection
- Requirement for real time data channels for mission critical applications
- Requirement for channel supervision for mission critical services (e.g. Teleprotection)
- Requirement for support of various protocols and topologies
- Requirement for highest communication channel availability

References FOX networks world wide





Technology trends
FOX615

Technology trends
Packet switched backbone networks

- Presently the public telecom sector is strongly going for IP/MPLS solutions
  - Driven by high data volume traffic in their networks (smartphones, tablets, etc.)
  - Good and cost effective solution for low to medium performance demanding applications such as data or voice
  - Bandwidth optimization (overbooking) is key for increased revenues
- Utility's operational networks require to transmit real time data
  - Control and availability of utilities assets is core business and depends on communication network reliability and performance
  - Selected utility applications (e.g. differential protection) require high performance data channels
    - Very low and deterministic delay times
    - Symmetrical delay times for send and receive directions
    - Highest availability figures of the communication channels

Technology trends
Why not IP/MPLS for utilities?

- IP/MPLS is a technology designed for public telecom applications
  - Problems with applications requiring deterministic communication
  - Problems with symmetry requirements of utilities applications
  - Problems with predefined (fixed) channel routing
  - Lack of channel supervision and fast protection schemes
  - Very complex in terms of configuration & maintenance (based on experience of pilot installations and first projects)
- Cost advantage for power utility presently seen in IP/MPLS solutions/ equipment's might not be materialized due to:
  - Significantly increased complexity and effort on configuration and maintenance side (high OPEX)
  - Requirement for highly specialized (expensive) staff for operation and maintenance of the communication network
- **IP/MPLS might not be the best technology for a utility**

Technology trends
ABB's outlook with FOX615

- ABB is carefully investigating in possible solutions for future packet switched backbone networks considering:
  - The application and availability requirements of utilities
  - The configuration effort required for such solutions
  - The supervision and management possibilities
  - The right point of time for PDH/ SDH - packet switched technology migration
- ABB product family however already supports sophisticated packet switched functionality
- ABB continues introducing solutions designed for utility applications via packet switched networks
  - FOX615 e.g. is fully prepared for future migration from SDH to packet switched networks
  - ABB sees MPLS-TP as the most promising technology for future utilities operational networks

Technology trends
SDH & Ethernet are complementary

- Understand SDH & Ethernet as complementary technologies
  - SDH provides QoS for real-time applications
  - Ethernet access interfaces allow efficient integration of data applications
  - Next Generation SDH (GFP, VCAT, LCAS) enables standardized transport of Ethernet applications in SDH WAN networks
  - Enhanced Ethernet functionality makes the equipment future prove
    - Strong Ethernet switching matrix must be available
    - High performance access interfaces must be available
    - Future migration Packet Switched Technologies with traffic engineering and QoS must be possible

Future communication networks for power utilities
Optimized approach – hybrid solution

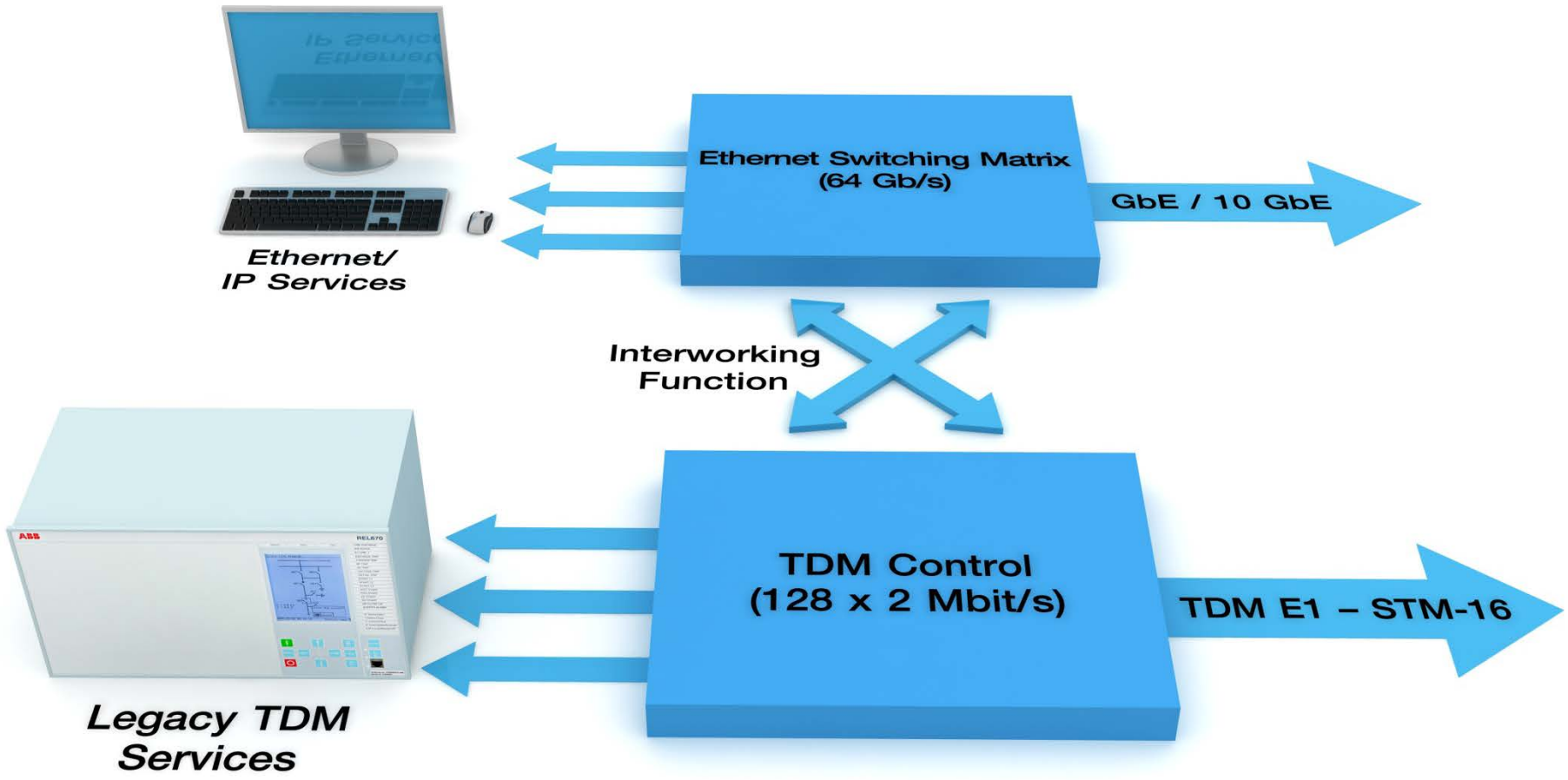
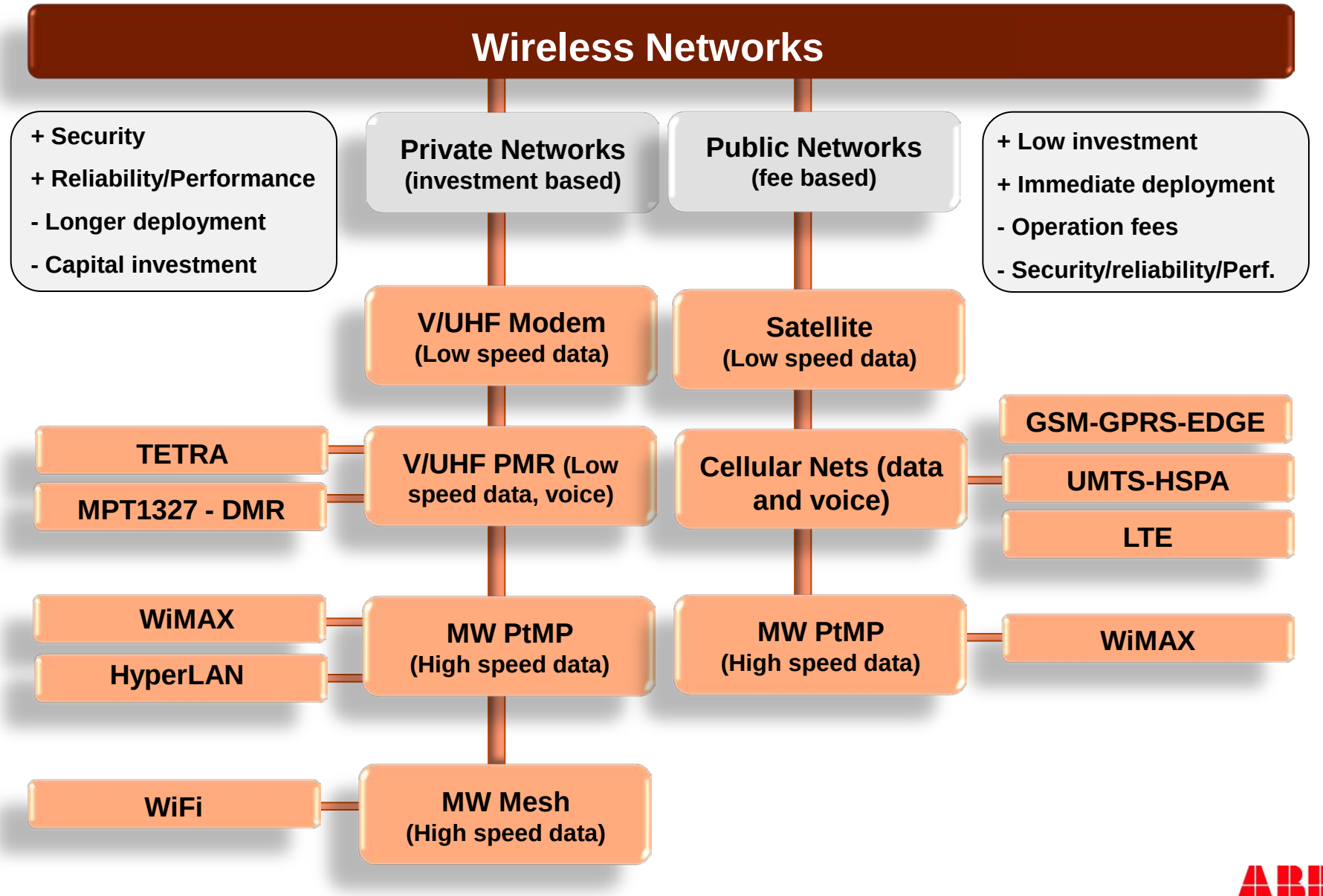


ABB FOX515/ FOX615 solutions
Summary

- FOX615 provides…
  - full interoperability to FOX515
  - similar TDM access interfaces as FOX515 including utility specific interfaces such as Teleprotection
  - support of SDH technology until 2020 and beyond
  - significantly enhanced Ethernet/ IP interfaces & services
- FOX615 is a utility grade equipment (enhanced temperature range, EMC/ EMI) based on well proven FOX515 experience
- FOX615 provides investment protection because of:
  - Full interoperability with huge installed FOX515 base
  - Future upgradability to Packet Switched Networks
  - Full integration into the FOXMAN-UN NMS

Tropos WLAN-Mesh

Wireless Technologies Overview



eMobility Germany
Wolfsburg AG, Wolfsburg

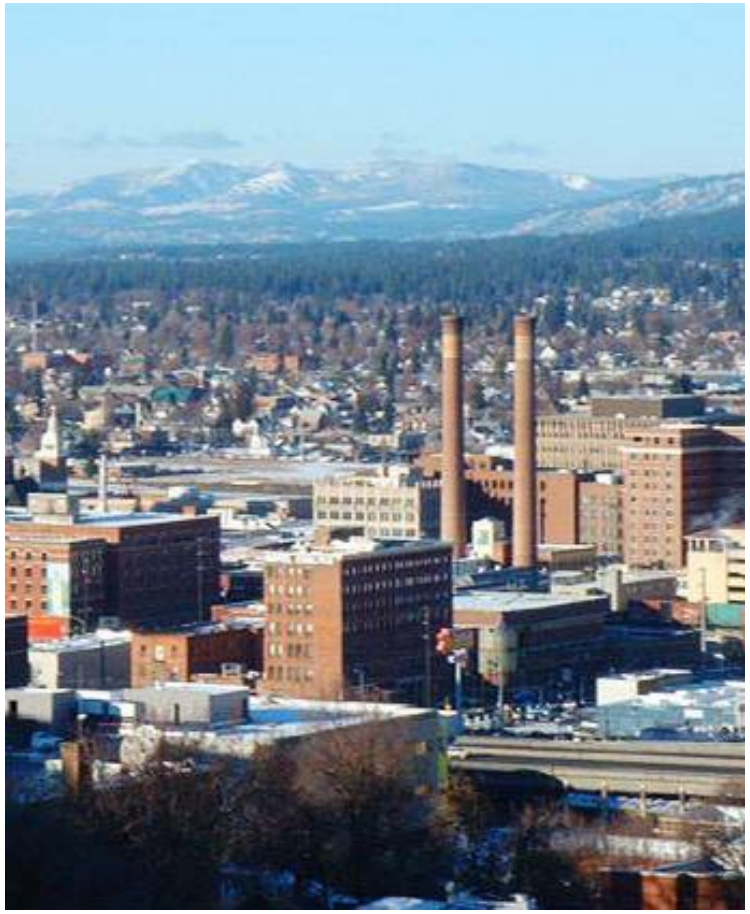
- Tropos WLAN-Mesh running since 2008
- Over 70 Dual-Band 6320 Routers installed
- Next extension +70 Dual-Band Routers
- Tropos-Network covers over 20 km^2
- Applications in use over the network:
  - SCADA
  - Free parking space
  - eCharging Stations
  - Public WLAN

Abu Dhabi Electric & Water Authority (ADWEA)
Efficient resource management, emirate-wide

- Over 1 million smart power and water meters in urban, suburban and rural areas connected by Tropos network
- Tropos network spans >3,000 square miles
- Built to support multiple Smart Grid applications simultaneously
  - Advanced Metering Infrastructure (AMI)
  - Real-time SCADA substation control
  - Distribution automation (DA)
  - Mobile workforce connectivity
  - Substation video security
  - Street light control

Avista, USA
Two smart grid projects – both using Tropos GridCom

- Spokane Smart Circuits Project
  - Goal: reduce outage times through faster detection and isolation of faults
  - 14 substations and 59 distribution feeders serving >110,000 customers
  - Network connects >200 DA devices



- Pullman Smart Grid Demonstration Project
  - AMI: 13,000 power and 5,000 gas meters
  - DA: 13 feeders and >60 DA devices (reclosers, cap banks, transformers)
  - Part of the Pacific Northwest smart grid demonstration project
  - Opportunity to extend use of networks for additional applications

Power and productivity
for a better world™