



GE Digital Energy

Hard Fibre System

IEC 61850 Process Bus Solution

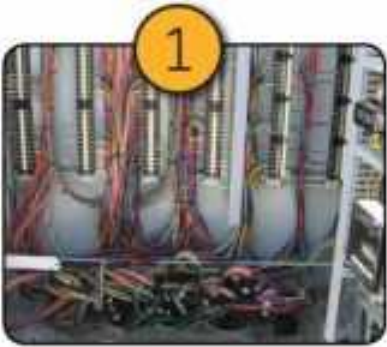
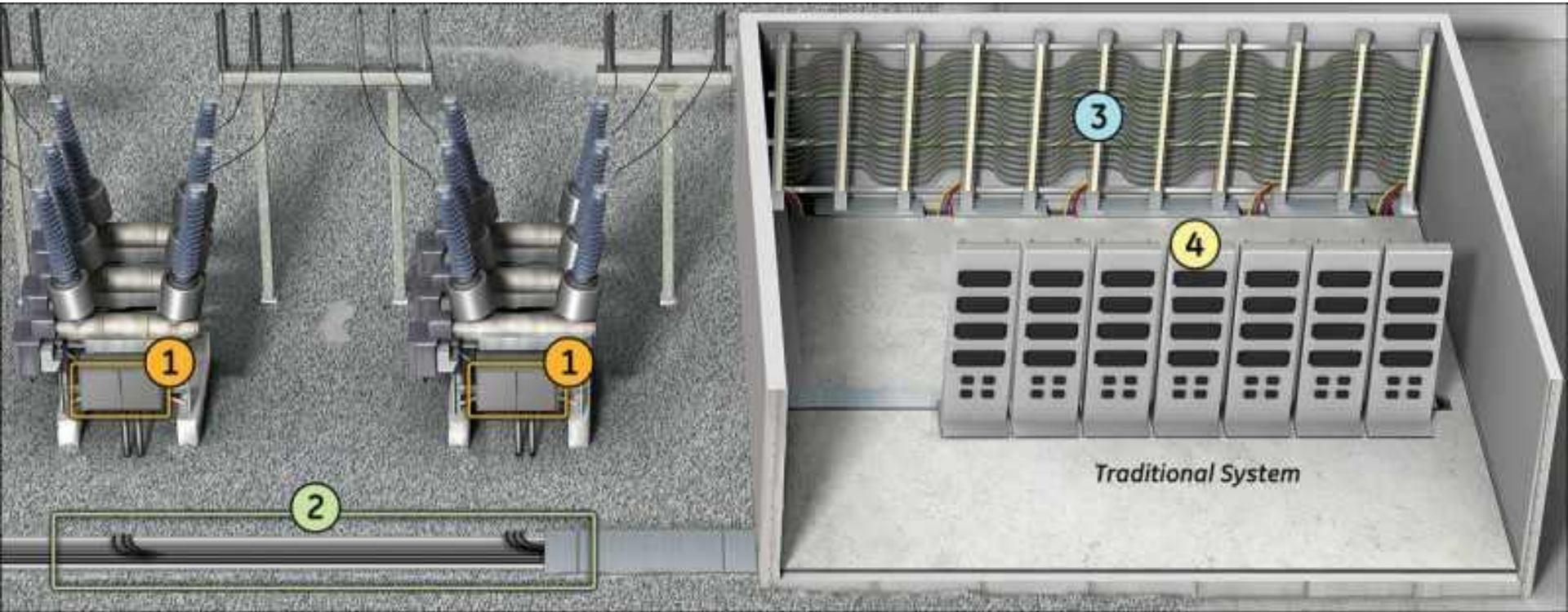
Siva Harish



Agenda

- Complexities with Current Switchyard Cabling
- Copper Saving using the Kiosk System & Challenges
- Eliminating Complexities using Hard Fibre technique
- Design Principles
- Technology Overview
- System Components
- Benefits & Advantages

Traditional Switchyard Construction



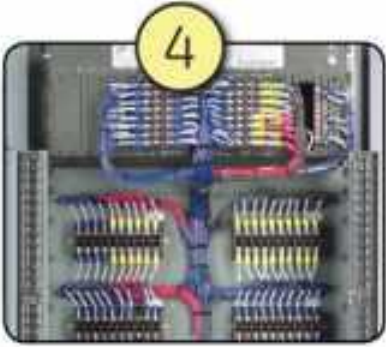
Traditional Breaker Wiring



Traditional Cable Trench

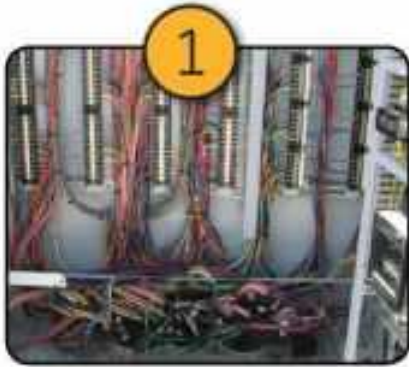


Thousands of Copper Wires from Switchyard



Labor Intensive Copper Wiring on Relay Panels

Eliminating Complexity



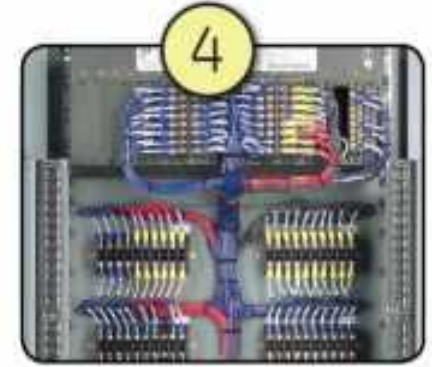
Traditional breaker wiring



Traditional cable trenches



Thousands of individual copper wires from switchyard



Labor-intensive copper wiring on relay panels



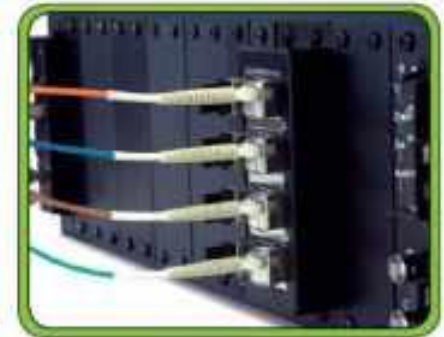
Eliminates
33% of
breaker
terminations



40% less
cabling with no
terminations
required



Eliminate 90%
of control
building
terminations



1,000's of wires
replaced with few
communication
cables

Addressing the right problem



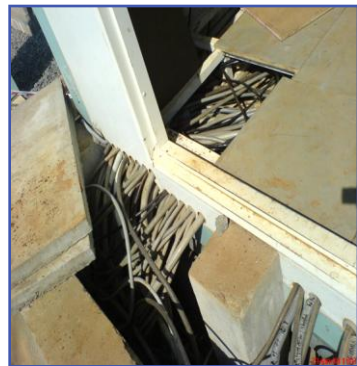
A need for a technological solution that

- Aligned with today's P&C practices
- Industry-wide acceptance – IEC 61850
- Delivers savings to the customer
- Replaces on-site labor with pre-fabricated material
- Facilitates transfer of work
- Increases key performance indices
- Complete and future-proof

Bringing industrial revolution to protection and control field

KIOSK System - Challenges

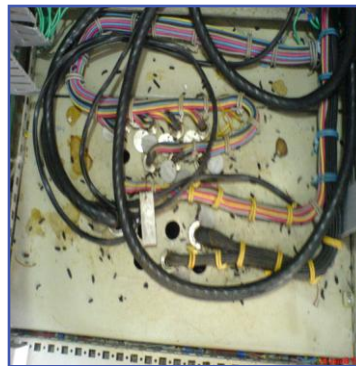
- Is Copper Eliminated ?
- BCU's – In Kiosk – Patrolling ?
- Kiosk Location – Operator Safety?
- Is the Kiosk – All weather Safe ?
- Can we prevent rodents and pests?



Gaps in Trenches



I can do enough Damage

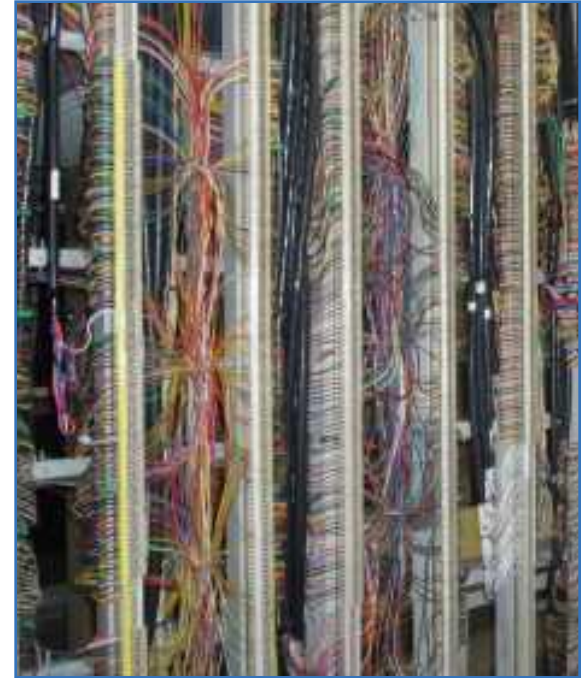


Not Me

Design principles

Designing-out copper wiring

- Maximum pre-connectorization
- Early and comprehensive acquisition of signals
- Fiber-based signaling
- Ruggedness and security paramount
- Risk mitigation with built-in redundancy



Design principles

Labor & Work transfer

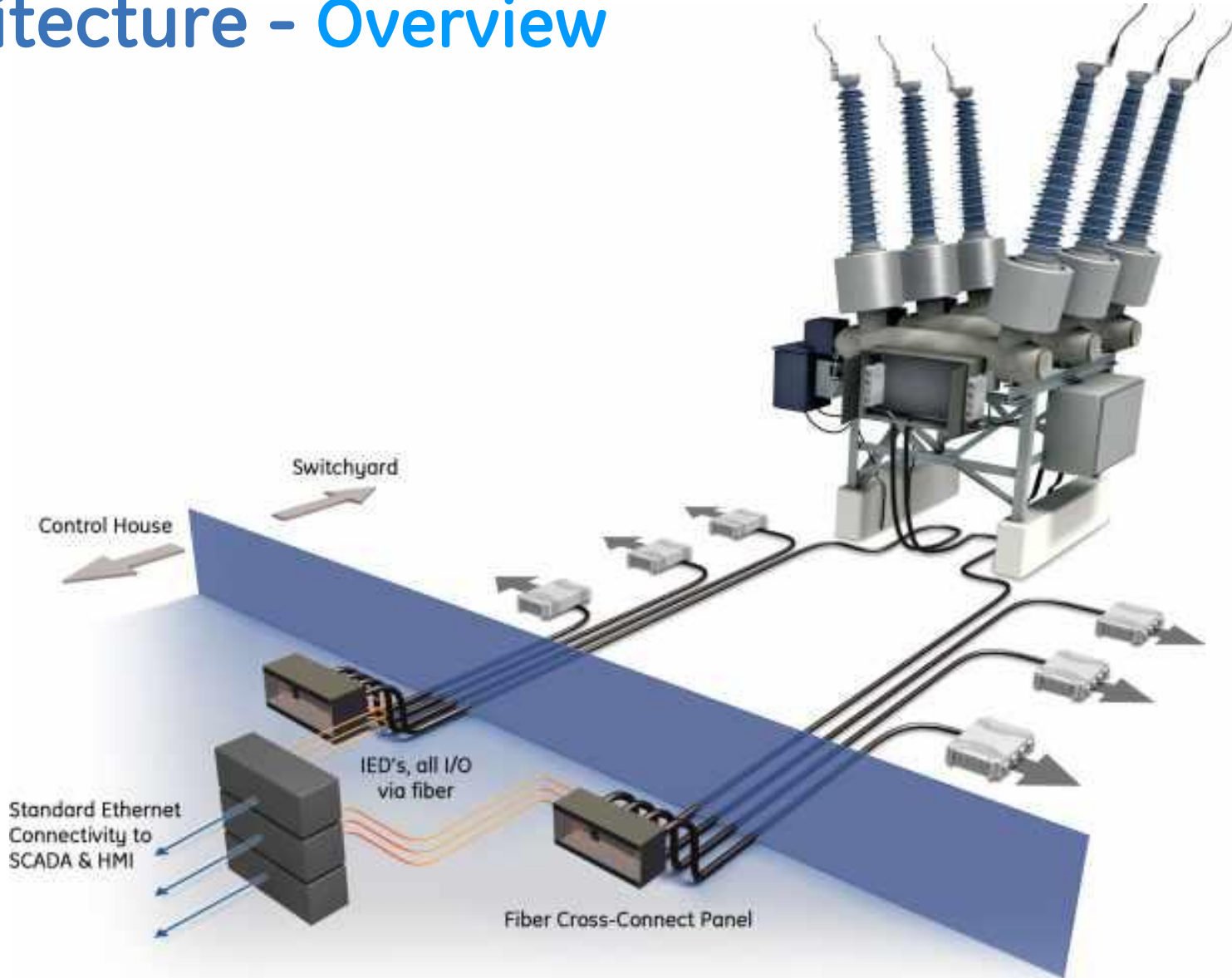
- Optimum partitioning for multiple suppliers
- Standardization of components and physical interfaces
- Minimum variability of material
- Minimum on-site labor and maximum quality control



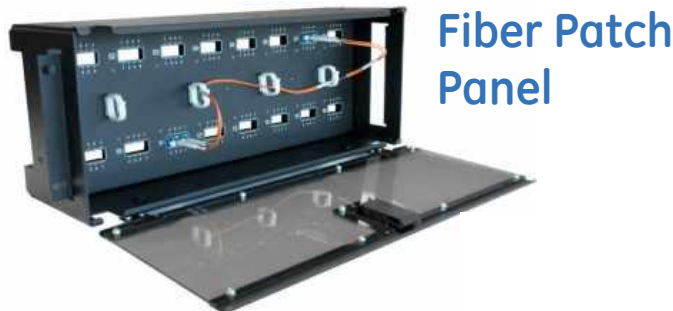
Technology

- Architecture overview
- System components
- Examples

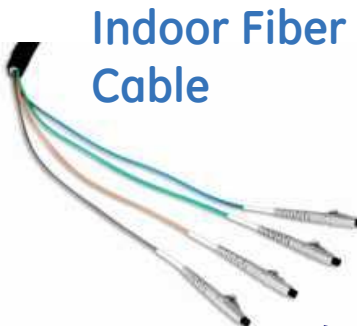
Architecture - Overview



System components



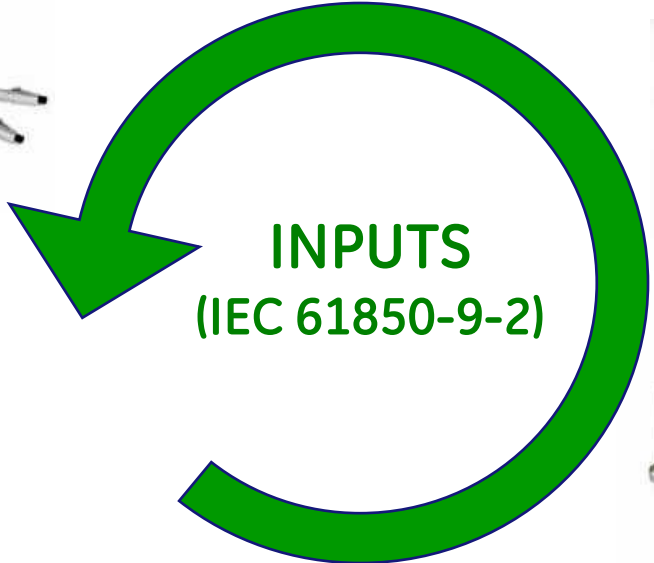
Fiber Patch Panel



Indoor Fiber Cable



Outdoor Fiber Cable



INPUTS
(IEC 61850-9-2)



Brick

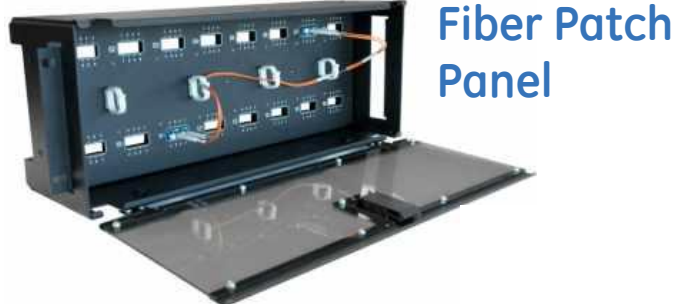


UR Process Card

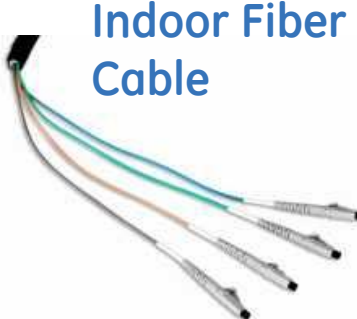


Pre-terminated copper cable

System components



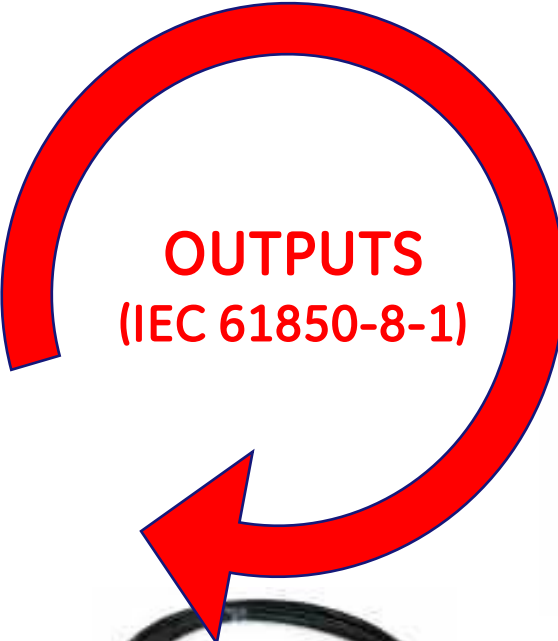
Fiber Patch Panel



Indoor Fiber Cable



Outdoor Fiber Cable



OUTPUTS
(IEC 61850-8-1)



Brick



UR Process Card



Pre-terminated copper cable

The Brick

- The I/O interface to “copper world”
- Rugged hardware to meet demanding environmental conditions
- Suitable for mounting on outdoor gear (IP67)
- All interfaces connectorized
- Self-powered via copper pair embedded in the fiber cable
- I/O device with no settings, firmware or maintenance port
- No sophisticated processing
- Removes variability from the process by standardizing the interface



Brick mounting scenarios

External, on a Circuit Breaker



Internal, old oil-type Circuit Breaker



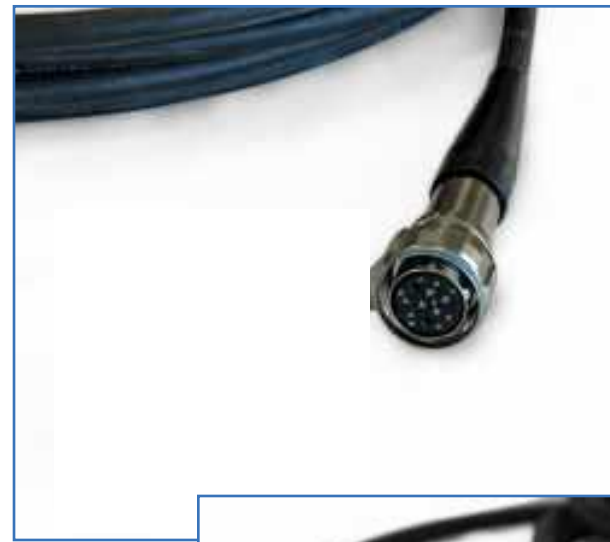
External, on a structure



External, below VT marshalling box

Cables

- All copper wires “connectorized” with MIL spec 38999 connectors (IP67)
- Single rugged connector for communications & power
- Outdoor fiber cables ordered to length and terminated at both ends
- Outdoor fiber cables protected with fuses



Patch panel

- Lands, labels and organizes outdoor brick and indoor IED fiber cables
- A 19" 4U shelf for modular applications
- Cross-connects bricks and relays per station topology (point-to-point "hard-fibering")
- Provides dc power to the bricks
- Cable slack management

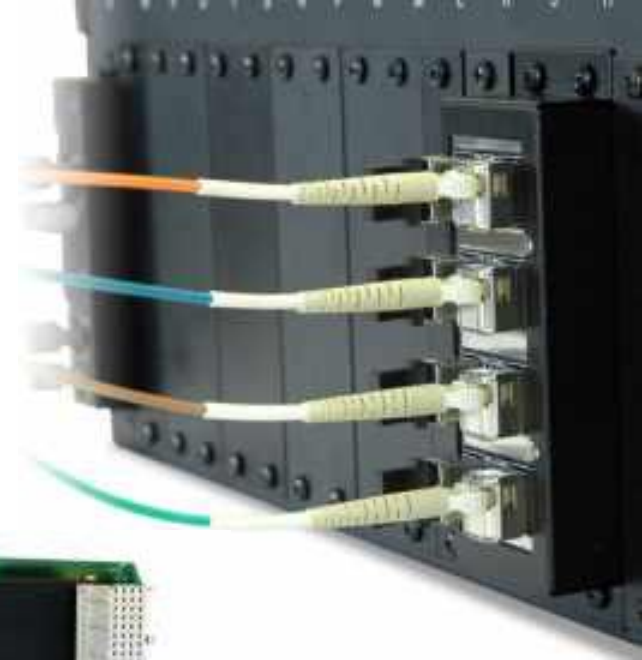


Relay

- UR family, all existing and new functions
- New communication card interfacing up to 8 bricks
- Up to 6 sources for configuration (equivalent to a hardwired UR)
- No new software required to set-up

Optional

- Conventional I/O card
- Communication card for teleprotection



Benefits & Advantages

- Head Office
- On-site
- Long-term

Benefits – Head Office

Engineering

- Intuitive architecture
- Simplified design and drafting
- Seamless integration
- Proven Universal Relay family

Project Management

- Reduced cycle time
- Easier procurement
- Shorter outage windows
- Comprehensive FAT for turn-key projects



Benefits – On-site

Construction

- Reduced on-site labor
- Higher quality, repeatability
- Optimum partitioning of work
- Relaxed skill sets

Commissioning

- Reduced time
- Fewer mistakes
- Improved safety
- Consistent testing practice



Benefits – Long-term

Maintenance

- Simplified testing
- Minimized replacement time
- Fewer spares
- “Run-to-fail” operation

Operations

- Improved security, reliability
- Easy additions/modifications
- Reduced outage times



Benefits Summary

- First IEC 61850 Process Bus solution
- Intuitive
- Practical
- Modular
- Proven family of applications
- Reduces cost
- Improves quality, reliability

Thank You