Bridging the Gap Between Legacy and Modern Substation Communications

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Bridging The Gap Between Legacy and Modern Substation Communications

Presentation Outline

- Introduction
- The Traditional Substation Communications
- An Emerging Trend Toward Ethernet/IP
- Bridging the Gap
- Conclusion
- Question and answer
What is one of the major challenges that utility companies face when it comes to their communications infrastructure?
At the heart of every successful substation automation system is an effective communications system that links the various elements of the control and monitoring system.
Increase of IP-based IEDs in Substation Automation Applications

Ethernet networks more common in substations

Ethernet networks are less costly and handle data transfer more efficiently.

Utilities are forced to maintain both the legacy substation telecommunications network and the Ethernet data network.
The Traditional Substation Communications

How did Intelligent Electronic Devices (IEDs) communicate with each other in the past?
Traditional Substation Communications

Communications Model

Control Room

Remote Terminal Unit (RTU)

Rigid Wiring
Or
Low Speed Serial Communications

IED

Switchyard

HV Wiring

Power System

COMMUNICATIONS NETWORK

Plain Old Telephone Service (POTS)
Leased Line

BRIDGING THE GAP BETWEEN LEGACY AND MODERN SUBSTATION COMMUNICATIONS
An Emerging Trend Toward Ethernet/IP

What does the modern substation communications infrastructure look like?
Current trend in the electric utility industry, particularly in substation automation is toward a common architecture

- Driven by the major North American utilities under the technical auspices of EPRI
- Resulting standard known as UCA2.0
- Now developed into an international standard known as IEC 61850
- Ethernet is the underlying network technology
As a result, Ethernet communications products and applications are rapidly becoming more entrenched as the new standard for data transport to and within substations and Control Centers.
Benefits and advantages of Ethernet/IP

- Bandwidth efficiency and scalability
  - Shared medium and dynamic bandwidth allocation

- Flexible architecture
  - Easily accommodates different network configuration and circuit routes and multiple protocols

- Open standard
  - Flexible interoperability between any vendors

- Cost effective
  - Ethernet networks are less costly to build and maintain
Concerns with Ethernet/ IP

- Delays
  - Deterministic latency

- Dependability
  - Reliability and Security

- Downtime
  - Recovery time and outage time
Bridging the Gap

How do you bridge the gap between traditional and modern substation communications to allow the integration of TDM-based legacy devices in the modern Ethernet/IP-based infrastructure?
Bridging the Gap

Communications Model

TDM over IP
IP Access Multiplexer

Ethernet/IP/MPLS COMMUNICATIONS NETWORK
GigE

Analog Radio
2/4-Wire Audio
Analog Phone

RS-232/RS-485 Serial Server (Serial – IP)

IP Camera
Ethernet

RTU
RS-232/RS-485

C37.94

Protective Relaying

High Speed Serial Communications

T1/E1 DS0 Grooming

Protective Relaying

IP Phone
Ethernet
LAN
Conclusion

What will the modern 21st Century substation communications infrastructure look like?
Conclusion

- Ethernet/IP in critical communications infrastructure
- Ethernet networks deployment in substation communications growing fast
- Critical applications such as SCADA/RTU, Teleprotection and Protective Relaying over Ethernet/IP networks using MPLS and/or TDM over IP.