Real Communications for a Real Smart Grid

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Real Smart Grid

- Smart Grid—we are beyond the marketing hype – not always sexy, but is proving effective
- Applications: AMI, DA, SA, DR, Teleprotection, etc. – Back office apps
- Comm Levels:
  - Tier 1 fiber/high capacity PTP RF ring
  - Tier 2 connect to substations and AMI/DA aggregation points
  - Tier 3 End points, such as meters, DA (cap bank monitors, volt/var control, reclosers, etc.)

Real Applications

- Tier 1 ring and Teleprotection (high value, mission-critical assets) – 1/4 cycle response time—about 4ms on 60Hz power system. Fiber with redundant PTP
- Tier 2 communications. Fiber or broadband RF to collect aggregated AMI/DA data and substation communications/SCADA
- Tier 3 communications. 802.15.4g or other “longer” range mesh for meters, DA downline devices, etc. Technology may be different for same coverage area based on terrain, population density, etc.

Real Situation

- No “silver bullet” or single technology. Combination of physical media and transport and application protocols to get data from Tier 2 and Tier 3 to Tier 1 and ultimately back office
- Combination of wired (Ethernet, serial, PLC), wireless (narrowband, wideband, broadband, PTP), fiber (long range, short range, MM, SM)
- Combination of transport, application, and industry-messaging protocols

Real Requirements

- Balance of throughput and range to support application requirements and minimize infrastructure
  - Water well control does not need broadband speeds
  - Aggregation locations (substations/SCADA, AMI and DA backhaul etc.) requires higher speed for multiple applications
- Security (Authentication, Encryption, Physical)
- Prioritization (e.g. QoS) to support multiple applications
- Support multiple physical media and transport protocols
- Support industry-standard messaging (e.g., IEC 61850 GOOSE Messaging)

Real Solutions

- Options can lead to “analysis paralysis”—high level of ground noise and confusion
- It can work today! New technology will improve efficiencies, but technology exists today to realize “smart” grids
  - More of a standards evolution than revolution – similar across all communications technology over the decades (the USB was a great step in a long line of fossilized connectors).
  - Applies to physical connectors, transport media, transport protocols, networking protocols, application protocols, industry-adopted messages, etc.
- Consultants and vendors have an opportunity to strive to be as unbiased as possible – history of fulfilling promises with few change orders.