IT AND OT CONVERGENCE
Prepare for the Inevitable
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PEAK 2020
Introduction

- SCADA began in 1920s
  - Control adjacent substation from power plant
- IED
  - More information
  - Better protection
IT—Automation and Standardization

1960s: Computers are stand alone
1970s: ARPANET starts to enable packet-based comms
1980s: TCP/IP finalized as standard comms protocols
The rest is history
Continued IT/OT Convergence

- Data Analytics
- Protection and Control
- Substation Design
Data Analytics

- Efficiency Improvements
  - Neural network trained on weather forecasts and historical wind turbine data
  - Predict power output 36 hours ahead and provide scheduled delivery commitments
  - Increased value of power
Data Analytics

- Resource management
- Equipment monitoring, predictive analytics and diagnostics infrastructure
- 384 potential issues identified
- $31.5M reduction in repair costs
Data Analytics

- Autonomics
  - Autonomic Intelligent Cyber Sensor (AICS)
  - Holistic look at interconnected systems
  - Adapt continually as attacks are attempted
  - Learning to spot new threats
Protection & Control

Protective Relays

- Mechanical: 1890s
- Electromechanical: 1930s
- Digital Multifunction: 1980s
- Virtual: 2020s
Protection & Control

- IEC-61850: Framework of the future
- Enables the Virtual Relay

Station Bus—10/100/1000 MB Ethernet

- Relay(s) Subscribe to Datasets
- IED
- Process Bus
- Optical I/O
- Network
- Remote Access
- IED
- Optical CT
- Optical I/O
- PT1 I/O Optical CT
- PT2 I/O CT2
- MU=Merging Unit
- 1/10 GB Ethernet
- MU Publishes V/I/Status Datasets
- MU
- MU
- MU
- Clk1
- Clk2
Protection & Control

- Redundant networking
- Highly accurate time service
Substation Design

- Old School: Each sub is unique
- Newer School: Reusable components
- Newest School: 3D design using BIM
Prepare for the Future

- OT—Control the Physical World and associated risks
- OT Security—focus on safety, availability and integrity
Prepare for the Future

- OT Operations—scheduled maintenance during outages
- OT Processes—may require revalidation or recertification

Don’t Lose OT Core Values and Principles
Advantage Steps for IT and OT Convergence

Strategic Planning—DER Control Systems

System Management

IEDs
Advantage Steps for IT and OT Convergence

Risk Management—changing threats and priorities

1. CATEGORIZE
2. SELECT
3. PREPARE
   Process Initiation
4. IMPLEMENT
5. ASSESS
6. AUTHORIZE
7. MONITOR

Process Initiation
Advantage Steps for IT and OT Convergence

Engage in Standards Development
Advantage Steps for IT and OT Convergence

Resilient Operations
SUMMARY

• Modern OT systems—not one-offs
• IT standardization brings tremendous benefits
• OT communications sees similar impact
• Rise of DER will enable data analytics and better efficiency
• Prepare
  • Strategy
  • Update risk management
  • Drive standards from utility perspective
  • Resilience will drive best of both worlds