Information Technology Needs and Trends in the Electric Power Business

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• What are the pressing IT needs:
  - data integration and information exchange
• What are the promising IT trends:
  - real-time processing, fault-tolerant architectures, wireless communications and mobile agent computing
• Can IT play a major role in providing greater security:
  - Yes, both through using public networks and implementing customized (closed) solutions
ISO Open system Requirements and IT Needs

• Access to network monitoring data
• Access to relevant databases
• Ability to understand possible contingencies/risks/limits associated with particular energy transactions
• Coordination of maintenance schedules for improved generation and network availability and reliability
The IT’s Role in Implementing Open Systems Concept for EMS

- Power system monitoring, control and protection infrastructure is still “closed” for data integration and information exchange with EMS
- Old, substation legacy solutions, need to be substituted with open systems
- New applications are needed to fully motivate and utilize open systems
Existing Infrastructure

LEVEL I
CENTRALIZED LOCATION

CFL
MS
PE
EMS

LEVEL II
SUBSTATION

LMS

LEVEL III
SWITCHYARD INTERFACE

FL
DFR
IED
DPR
RTU
SOE

A
S
A
S
A
S
A
S
A
Future Infrastructure

Email, Fax, Hosting, WWW, Pager Notification

Intranet

Wide-area networks (hubs, routers, gateways)

Mobile Agent Server

System wide analysis

System wide control

Substation Analysis and Control

DFR

DDR

SER

IED

DPR

RTU

GPS

IEC 61850 COMTRADE

Substation Analysis and Control

DFR

DDR

SER

IED

DPR

RTU

GPS
Substation Automation IT Needs

- Wireless communications:
  - enable introduction of new IEDs
  - provide required robustness
  - facilitate data integration
- Mobile agent computing:
  - facilitates use of distributed databases
  - enables integration of legacy systems
  - provides effective means of information exchange
Substation Automation IT Needs (continued)

• Real-time processing:
  - smart sensors
  - analog/digitals signals processing
  - “continuous” data processing

• Fault-tolerant architectures:
  - substation/device applications
  - distributed data bases
  - alternative communication paths
Data for line protection

Data for transformer protection

Transformer

Data collection zones for protection functions in a typical transmission substation

Data for bus protection
IT role in providing greater security

- Intrusion detection and attack mitigation
- Redundancy capability for supporting enhanced tolerance to failures
- Ability to dynamically reconfigure and/or switch data sources
- Graceful degradation for reduced functionality and fail-safe provision for forced system shut down