Smart Grid—A New Data Paradigm for Utilities

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Smart(er) Grid Is NOT
Big Data Is NOT New
Data is NOT Information
The Smart(er) GRID Evolution

- Manual
- Drive-by
- Hourly
- 1/Mo
- 15 Minutes
- AMR
- AMI
The Smart(er) GRID Evolution

- Advanced Metering Infrastructure (AMI)
- Geographic Information Systems (GIS)
- Outage Management Systems (OMS)
- Field Staking Systems
- Automated Vehicle Location (AVL)
- Fiber Optic Cable for Communications
- RF Networks
- Broadband over Power Line (BPL)
- Digital Substations
- SCADA
Smart(er) Grid = IT

- Customers
- Meters & Gateways
- Distribution Assets
- Substation Automation
- IED Automation
- Xfrm Switch
- DG PV DR
- Industrial
- CDMA Mesh
- BPL/PLC DR
- Commercial
- Renewable DG PV
- Residential
- Customers
- PV EV DR
- Customers Meters & Gateways
- Last-Mile Comms
- Backhaul Comms
- Real-Time Frontend
- SCADA
- RF Fiber
- Microwave
- CDMA
- WiFi/Wimax
- T1 AMI Frontend
- AMR
- Data Acq & Control
- IVR
- System Operations
- Ops Data Warehouse
- EMS
- DMS
- GIS
- DSM
- System Planning
- Forecasting
- Scheduling
- ISM
- Corporate
- HR
- Trading
- Settlemnts
- Billing & Acctng
- Power Marketing
- Finance
- System Planning
- Data Warehouse
- Engineering & Maintenance
- ERP
- Corporate
- Work Mgmt
- Asset Mgmt
- Customer Service
More Frequent Data

1 Reading/Month  
35000 Readings/Year
Data Growth Example

100,000 Smart Meters → Interval Data – Online 250 GB Other: Register Reads, Summary Tables, Staging – 50 GB = 300 GB Per Year

Transactional Storage Capacity

1,000,000 Smart Meters → Year 1 = 3TB Year 2 = 6TB Year 3 = 9TB Year 4 = 12TB
New Sources of Data
New Types of Data

- Device & Sensor Data
- App Data
- Network Data

PETABYTES
Five Stages of Smart(er) Grid Data

- Data Generation
- Transport
- Persistence
- Transformation
- Integration
Utility Back Office Under Stress
## Data Management Challenges Facing Utilities

**Correlating Information**
- Matching data acquisition infrastructure to required outcomes

**Achieving Scale**
- Learning to apply new tools, standards, and architectures to manage grid data at scale

**Adapting New Processes**
- Transforming business processes to take advantage of smart grid technology

**Managing New Silos**
- Dealing with addition of new enterprise silos.

**Managing Cost**
- Infrastructure, Hardware, Storage, Bandwidth
New Data New Possibilities

Pro Active Load Mgt

Advanced Outage Mgt

Revenue Protection

Accurate Billing

Demand Response
ROI to Utilities

- Revenue Protection:
  - *Improvements of 2% - 4% of annual revenues*

- Reduce maintenance cost
  - *Annual savings of 60K by reducing transformer losses*
  - *100K+ Truck rollouts – $150 per rollout (30% false alarms)*

- Demand response: *Reduction in peak load by 5%*

- Voltage Optimization: *3.5% Voltage Reduction at Substation Bus with a CVR Factor of 0.85 Factor equals a 2.98% reduction of system load*

- Customer Service
  - Identify billing inconsistencies
  - *First call resolution Improvement by 50%*
Data Management Vision

The Data are not created relevant, they become so!
Data Available Now

Untapped
Short Term Objectives

• Derive value from existing systems and data through the use of advanced analytics

• Identify cost savings and efficiencies without committing millions in investment

• Establish business case with stronger ROI for future smart grid initiatives
Deficiencies in Existing Solutions

• **Cost of Analysis and Storage** on proprietary systems does not support trends towards more data

• **Limited Scalability** does not support trends towards more data

• **Closed and Proprietary Systems**
Gaps in Today’s Data

- Siloed
- Scale
- Scope
- Cost
Solutions Driving Down Costs

OLTP

Proprietary Warehouse

Architectural Shift

Confidential & Proprietary
Smart(er) Grid Utilities

Cost & Risks

Plug in & Go! Use As Needed

Right Sized, Pay Per Use

Ops Staff, IT Infrastructure

Data Center, NOC

Utility In House

1980

1990

2000

2010

2015

Confidential & Proprietary
Shift in Data Management Solutions

- Requirements Driven
- Enterprise Silo
- High Cost
- Long Implementation Cycles
- Custom Integrations

Data Management

- Results Driven
- Hybrid
- Low Cost
- On Demand, Operational in Days
- No Custom Development

System Evolution