Industry Data Model Solution for Smart Grid Data Management Challenges

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UCAiug Summit 2012, New Orleans, LA

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Topics

- Utility Data Management Challenges
- Data Management Best Practices
- Utility Data Model Solution
- Open Discussions

Big Data Value



Source: Big data: the next frontier for innovation, competition and productivity - McKinsey



Asset Management Requires Quality Information

- Effectively allocates scarce resources to provide higher levels of customer service and reliability while balancing financial objectives
- Communicates return on asset investment in terms of customer value and risk avoidance



The Real-Time and Proactive Utility

Transactional to real-time:

Leveraging information to act faster and smarter



Defining "Analytics" as a Driver of Efficiency

Analytics is the process of using quantitative methods to derive predictive insights and drive successful outcomes from data



Derived From: Competing on Analytics: The New Science of Winning (Davenport / Harris), Accenture, and Gartner

Unleashing Your Data:

Leveraging Standards, Tools and Industry Best Practices



Standardized Business Intelligence Metadata Layer



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Potential Analytics Use Cases

- Load Balancing
 - Phase based on Load
- Regulated Standards on Power Quality – Voltage Standards
- Premise Vacancy Retail Driven
 - Must disconnect after 6 months
 - People in properties and don't know why
- Appliance Reliability
 - Based on usage changes and signatures
 - \circ $\;$ Thermostat on Water Heater
 - $\circ \quad \text{Pool Pump}$
 - o Ag Pumps
 - o Sprinklers
- Predictive Churn Models
- Pricing Elasticity
- Modeling of Tariffs
 - o Optimal
 - Winners and Losers

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- Predictive Maintenance
 - Load/Temperature
 - o Failure Rates
 - o SCADA
 - Pri(?) Fault
- Pole Failure Rates
- Underground Cables
 - o Faults
 - \circ Loads
- Faults
 - o Special Events
 - o Real-time Rating
- Credit Strategy
- Libraries of Signatures
- Targeted Vegetation Management
 - o Tree Profiles
 - o Momentary Outages

- Load Control
 - Control failures
- Batch Analysis
 - Fault Detection
- Lifecycle
 - 3-4 years out
 - Common Mode Failures
- Water Quality
 - O Meter Failure
- Technical and Non-Technical Losses
- Asset Risk
 - Replacement Strategies
- Correlation of Revenue to Assets

Example: Improving Short-Term Forecasting



Example: Predictive Analytics for Electric Vehicles



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Example: Transformer Load Management



- Single largest T&D asset class by investment
- Uneconomical to monitor
- Recent smart grid investments (AMI, MDM, OMS/DMS) can provide detailed insight into performance

Transformers < > > **(** <75%) 75%-100% <u>\100%</u> >100% 90%-100% 80%-90% 70%-80% 60%-70% Iohnson County Library-<60% Devices Simulation Profile Load Char. B Breaker Days to Simulate Overhead Seg. 10 °C Minimum Temperature - Underground Seg. 📃 40 °C Maximum Temperature S Sectionalizer Overview Map 0 km/h Minimum Wind Speed Switch 100 Maximum Wind Speed 10 km/h Prairie Village Transformer 1 erland Pa R Recloser 100 🗪 Fuse Corinth Flementary School 1 009 Oracle Corporation ©2009 NAVTEC Indian Villa

Strategic Fleet Performance Planning



Tactical Operational Efficiency

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Smart Grid Data Management Challenges

Multiple communications technologies

- No one size fit all due to utility customer segmentation and geographical variations.
- Likely to drive up network management apps integration needs.
- Explosion of field and customer devices that will be attached to the energy delivery network.
 - Exponential growth of frequency and volume of data from field and customers devices
 - Security, reliability and liability of data and communication
- Real time processing of events with automation and visualization
 - Ability to process and react to events in real time
 - Humans will need HELP to operate the grid of the future
- Tighter integration between operational systems and enterprise systems to drive business performance (productivity and financial)
 - Grid operational decision will have much more impact on the top and bottom line of the utility business.
 Demand response to affect revenue, outage detection to affect cost, etc.
- Tighter integration with other businesses and customers third party access, customer participation, distributed energy resources, PHEV, etc.
 - Provide access to data/information to third parties (retailers, value-added service providers, etc.)
 - Provide more real time data access to customers

Data Management Best Practices

DATA MANAGEMENT

- •Biggest area of focus for CIOs, CTOs.
- •50 -80% of resources and time spent in data sourcing and Data quality
- Data layer is the most strategic component of enterprise analytics architecture.
- Reporting is only as complete, timely and accurate as the data.
- Bad data means bad decisions
- •Reference data and reporting dimensions should be used across all lines of business.



Integrated Information Architecture



Source: Oracle Information Architecture: An Architect's Guide to Big Data.

Enterprise Semantics for Utility Data Management Needs



The Industry Data Model – The Common Semantics



Why Do We Need Industry Data Model?

- Comprehensive
 - Industry Domain experience captured in one model
- Standards-based
 - Leverage the best practices of open standard models, such as CIM, MultiSpeak, etc.
- Flexible/Extensible
 - Built with the future in mind relevant (up-to-date)
 - Saves time on initial development with improved precision due to common definition
 - Prevents re-architecting the DW
 - Quicker to gain industry specific insight
- Cross Industry Expertise and Compatibility– applied to a given industry yet reuse common definitions
 - Shared concepts and structures across industry models allow for cohabitation and future expansion.
- Convergence to a large scale 'open' data model
 - Can be used for SOA, ODS or other data integration effort

Implementing Utility Data Model for Advanced Analytics



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Key Takeaways

- Data is Not Just Data
 - Data about data is key to manage data.
- Think Enterprise Act Domain Specific
 - Infrastructure, Models, Tools, Standards, Competency Centers
 - Focus on specific business and domain requirements, solve real world problems
- Advanced Analytics is not just IT.
 - Business, IT and Statisticians must come together.
 - It is about the solution, not just tools for analysis and dashboards.
 - It is about building long lasting competencies.

Thank You

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