Industry Data Model Solution for Smart Grid Data Management Challenges

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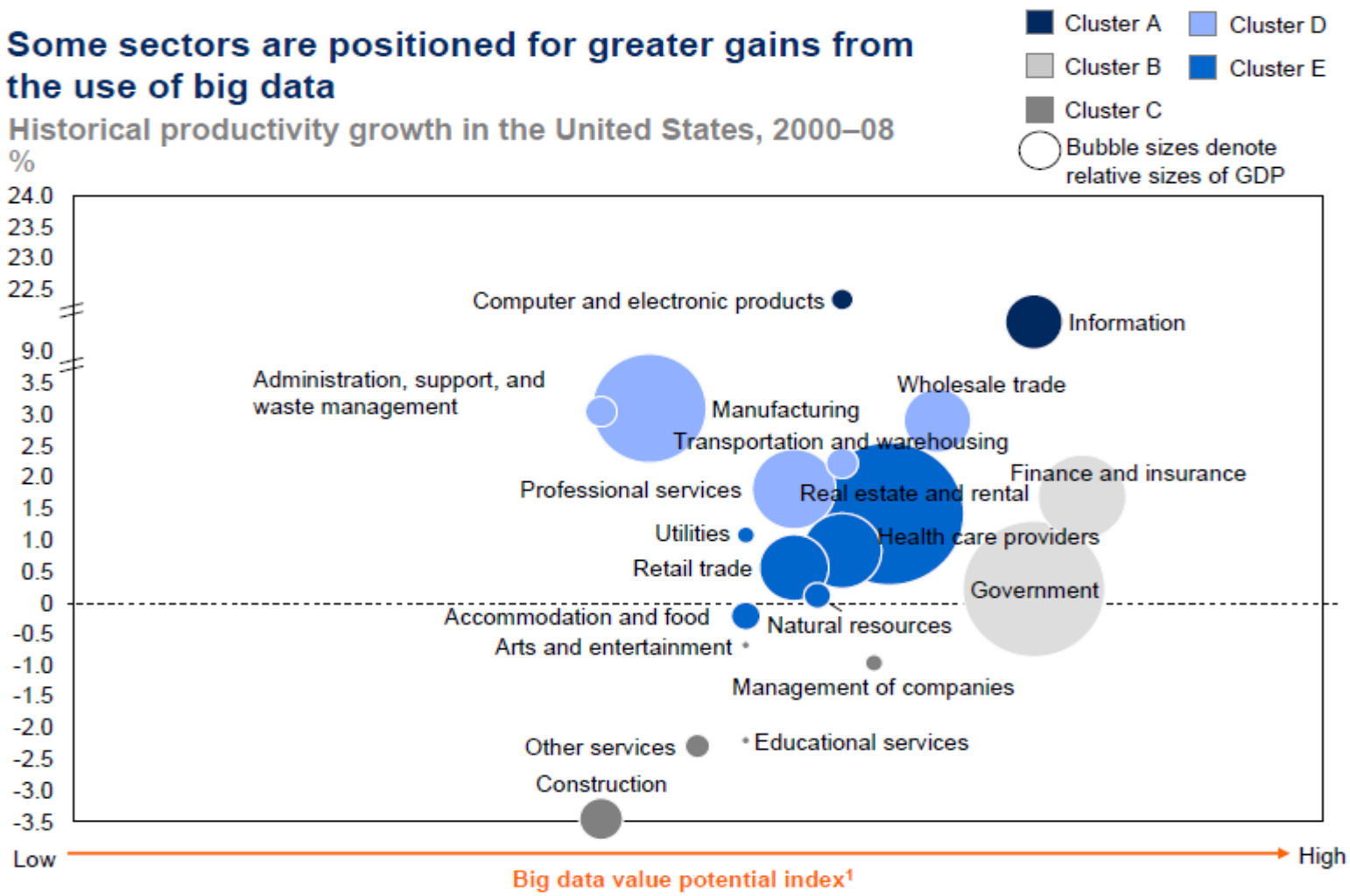
Topics

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

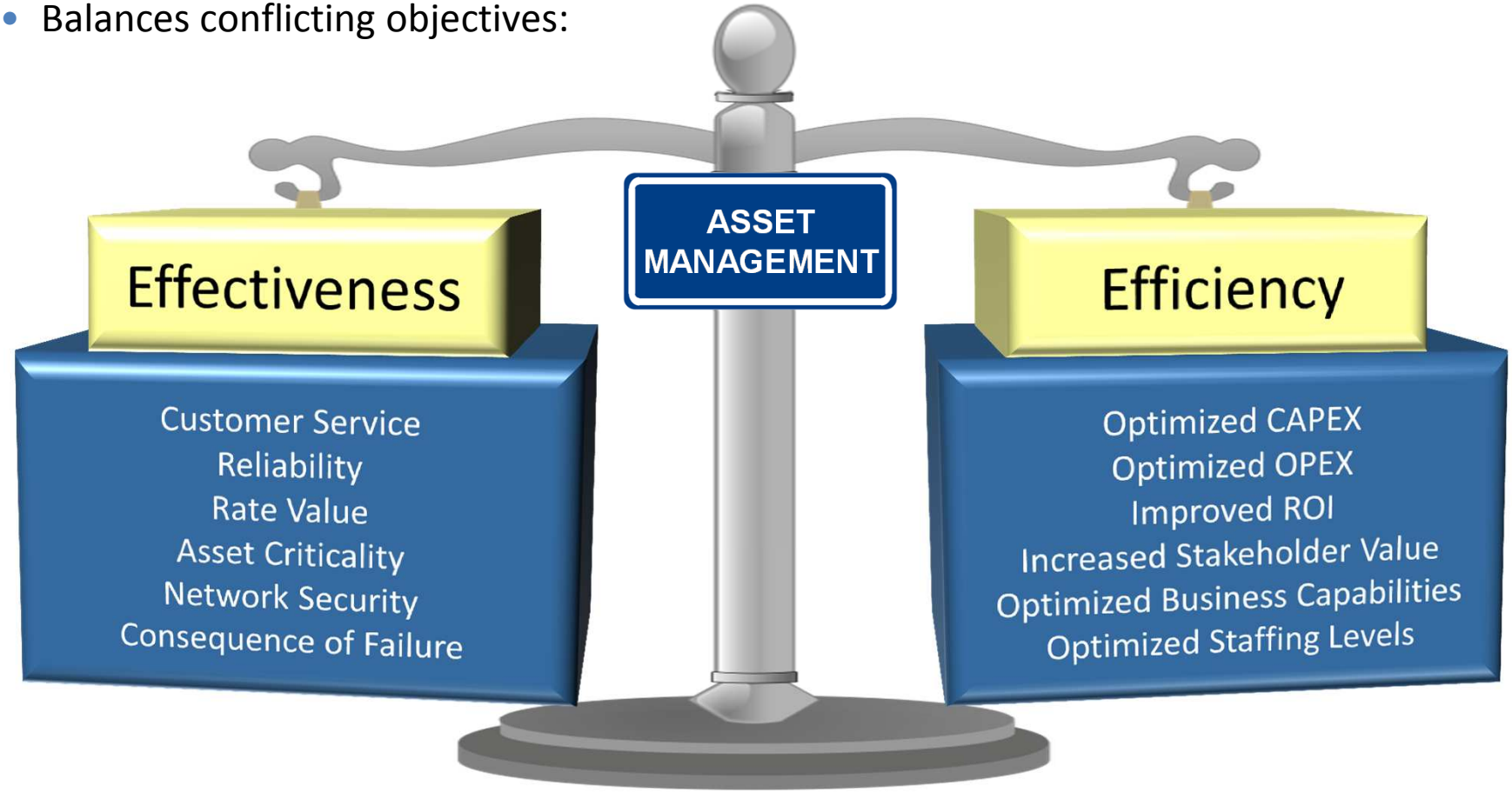
Big Data Value



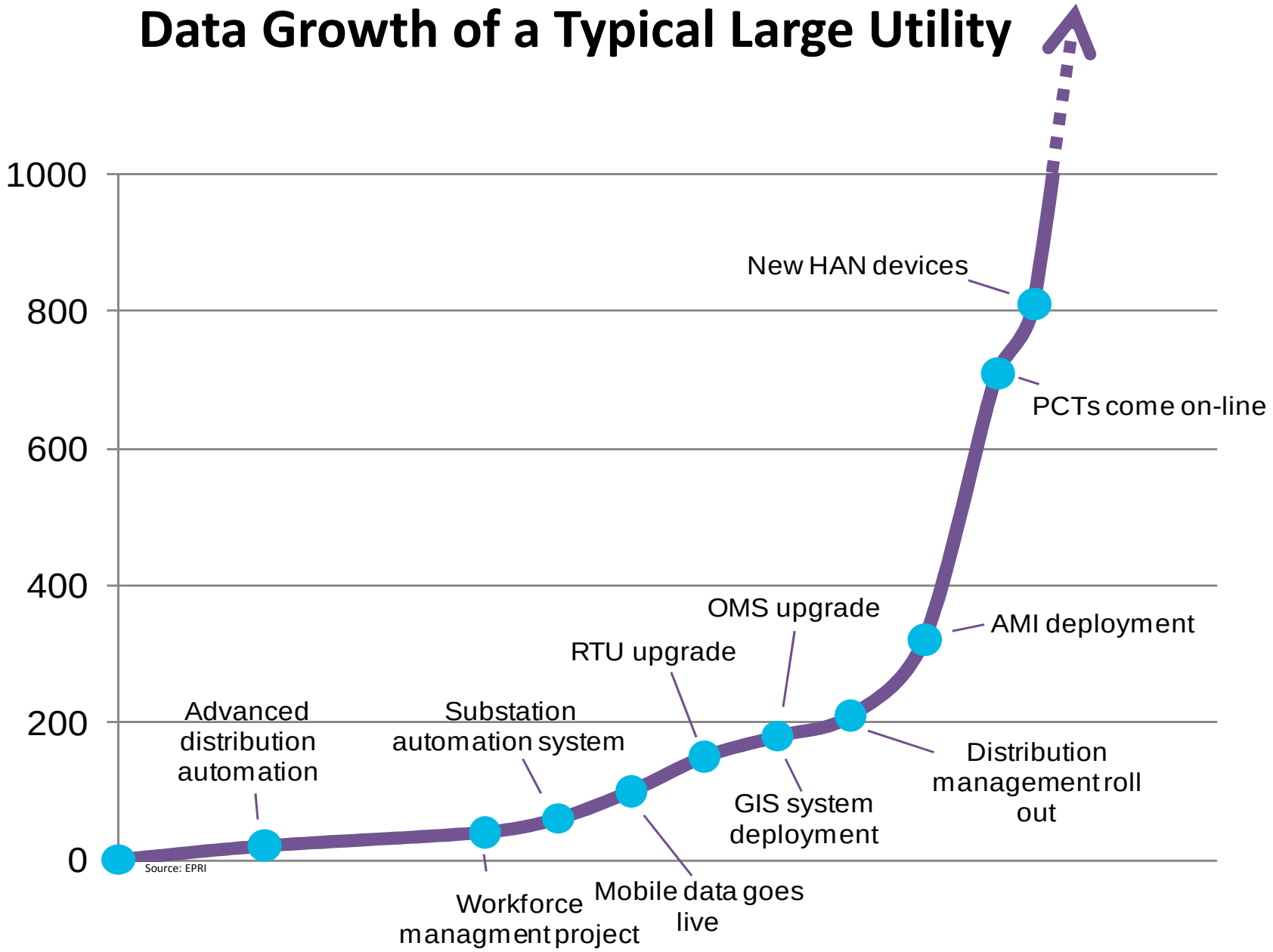
Source: Big data: the next frontier for innovation, competition and productivity - McKinsey

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
- Balances conflicting objectives:



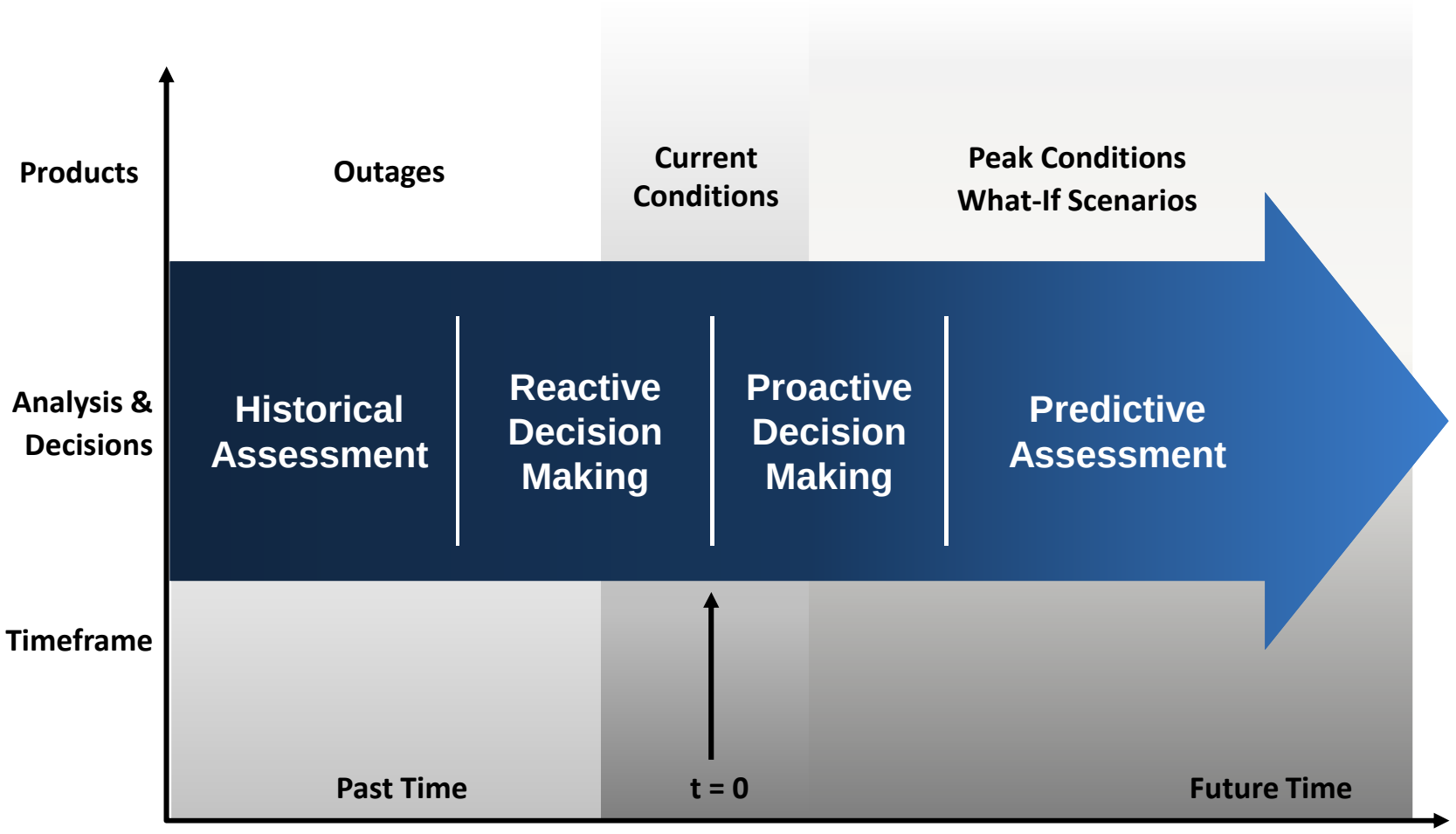
Data Growth of a Typical Large Utility



The Real-Time and Proactive Utility

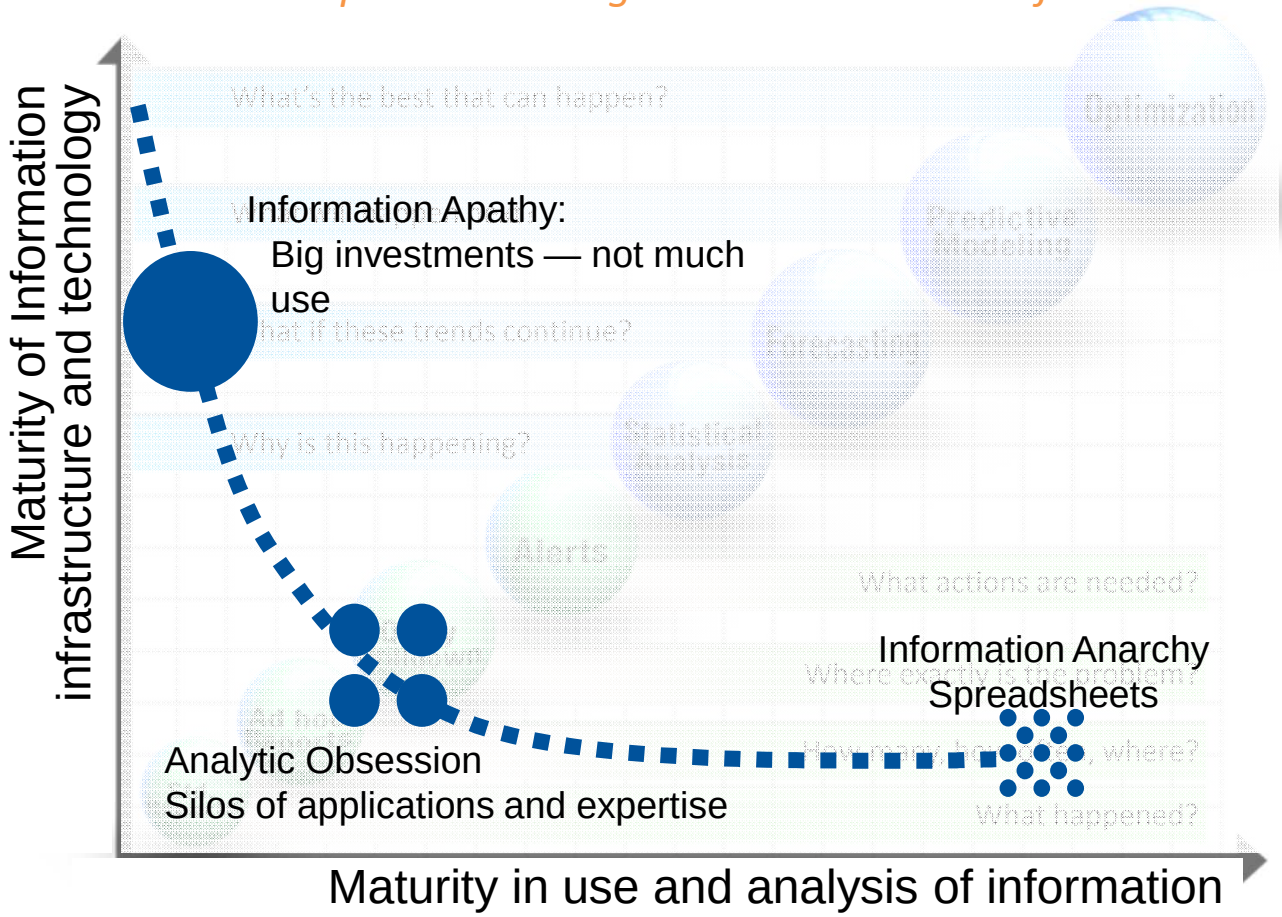
Transactional to real-time:

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



Predictive Analytics
(the "so what"…and the "now what")

Future oriented and is the source of competitive advantage if deployed pervasively

Descriptive Analytics
(the "what")

"Rearview mirror" - provides necessary foundation and insight, but does not capture full value on its own

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

Discovery | **Ad-Hoc Queries** | **Data Mining** | **Statistical Analysis**

- Customer Analytics
- Revenue Analytics
- Credit and Collections Analytics

- Meter Data Analytics
- Work and Asset Analytics
- Failure Analytics

- Mobile Workforce Analytics
- Outage Analytics
- Operational Performance Analytics

Standardized Business Intelligence Metadata Layer

CIS, CSS, CRM, DSM	*MDMS, CMMS, AMFM, GIS*	*OMS, DMS, SCADA, MWMS*
		
Customer	Meter & Asset	Grid & Operations

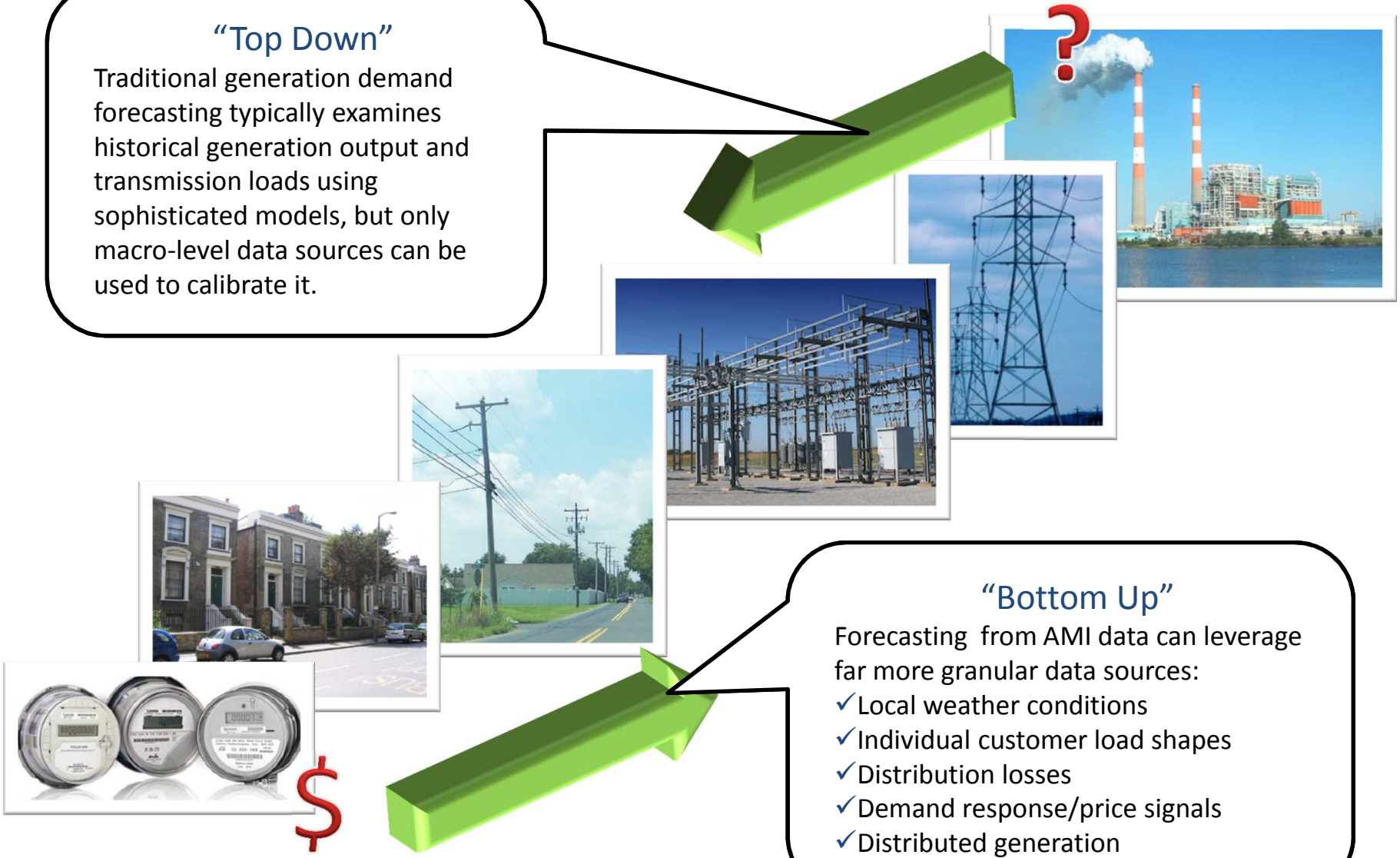
Potential Analytics Use Cases

- 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
  - Thermostat on Water Heater
  - Pool Pump
  - Ag Pumps
  - Sprinklers
- Predictive Churn Models
- Pricing Elasticity
- Modeling of Tariffs
  - Optimal
  - Winners and Losers
- Predictive Maintenance
  - Load/Temperature
  - Failure Rates
  - SCADA
  - Pri(?) Fault
- Pole Failure Rates
- Underground Cables
  - Faults
  - Loads
- Faults
  - Special Events
  - Real-time Rating
- Credit Strategy
- Libraries of Signatures
- Targeted Vegetation Management
  - Tree Profiles
  - Momentary Outages
- Load Control
  - Control failures
- Batch Analysis
  - Fault Detection
- Lifecycle
  - 3-4 years out
  - Common Mode Failures
- Water Quality
  - Meter Failure
- Technical and Non-Technical Losses
- Asset Risk
  - Replacement Strategies
- Correlation of Revenue to Assets

Example: Improving Short-Term Forecasting

"Top Down"

Traditional generation demand forecasting typically examines historical generation output and transmission loads using sophisticated models, but only macro-level data sources can be used to calibrate it.

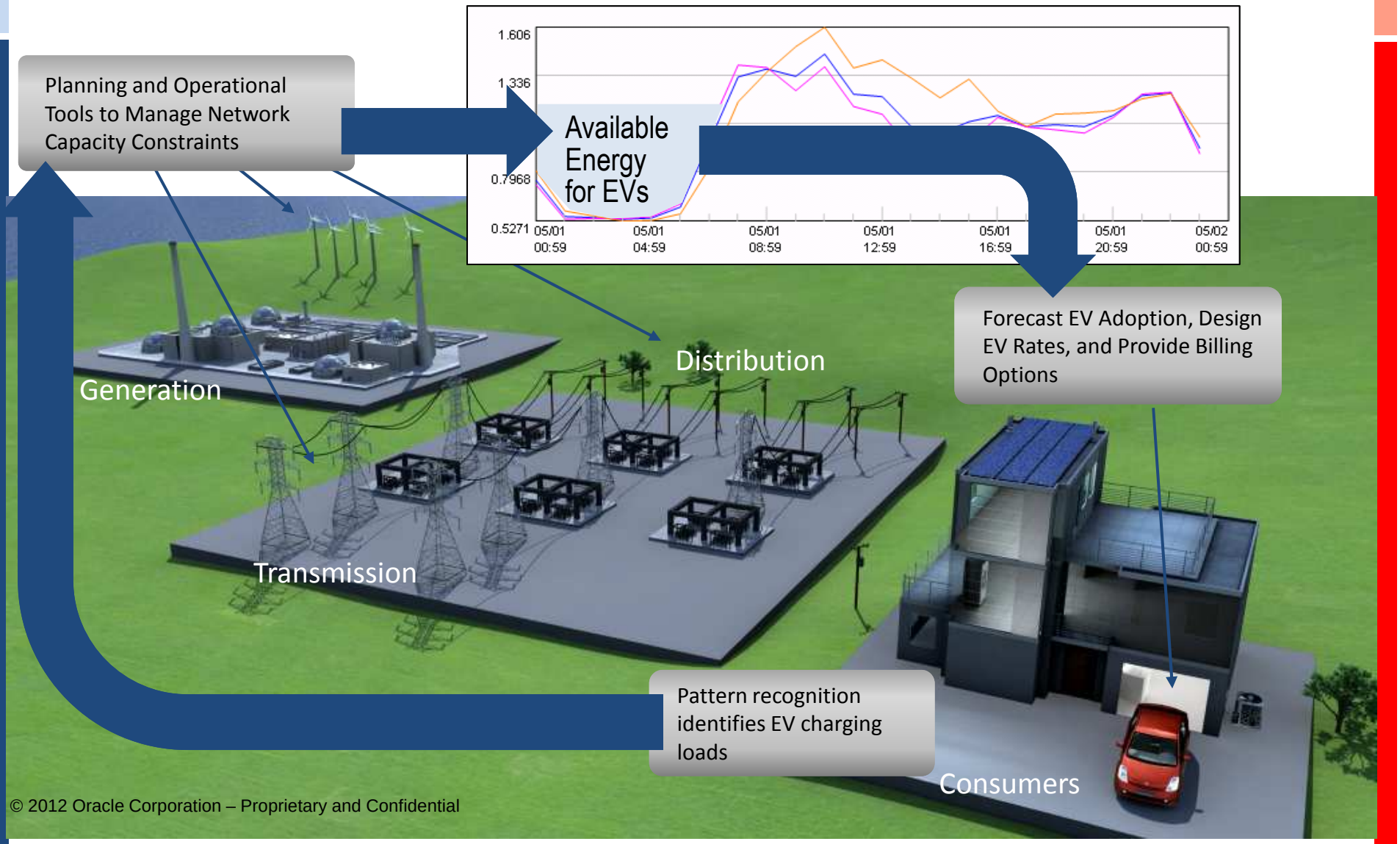


"Bottom Up"

Forecasting from AMI data can leverage far more granular data sources:

- ✓Local weather conditions
- ✓Individual customer load shapes
- ✓Distribution losses
- ✓Demand response/price signals
- ✓Distributed generation

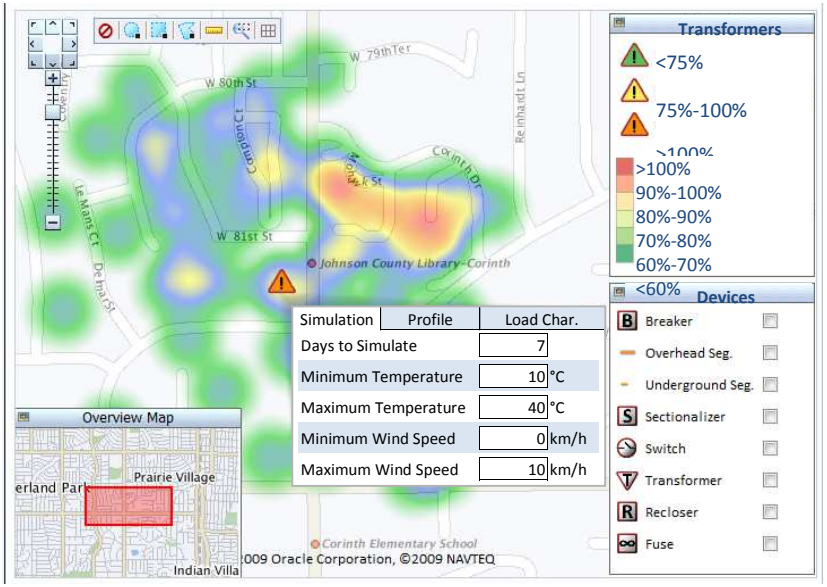
Example: Predictive Analytics for Electric Vehicles



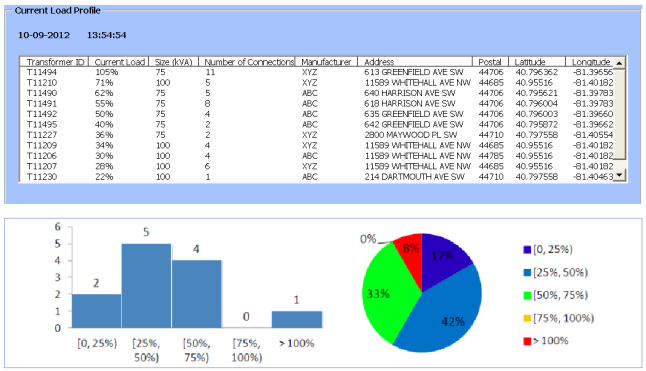
Example: Transformer Load Management

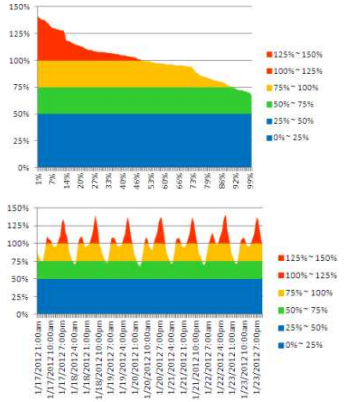
- Single largest T&D asset class by investment
- Uneconomical to monitor
- Recent smart grid investments (AMI, MDM, OMS/DMS) can provide detailed insight into performance

Tactical Operational Efficiency



Strategic Fleet Performance Planning





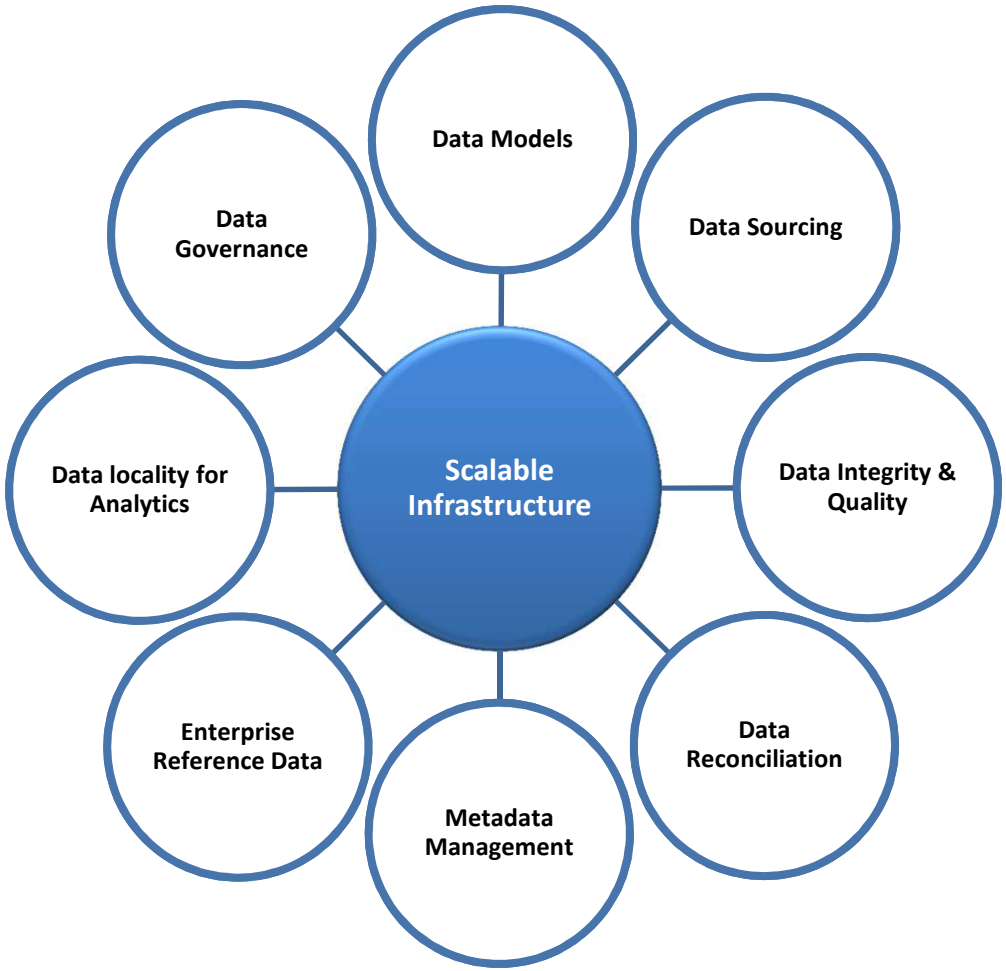
Smart Grid Data Management Challenges

- **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

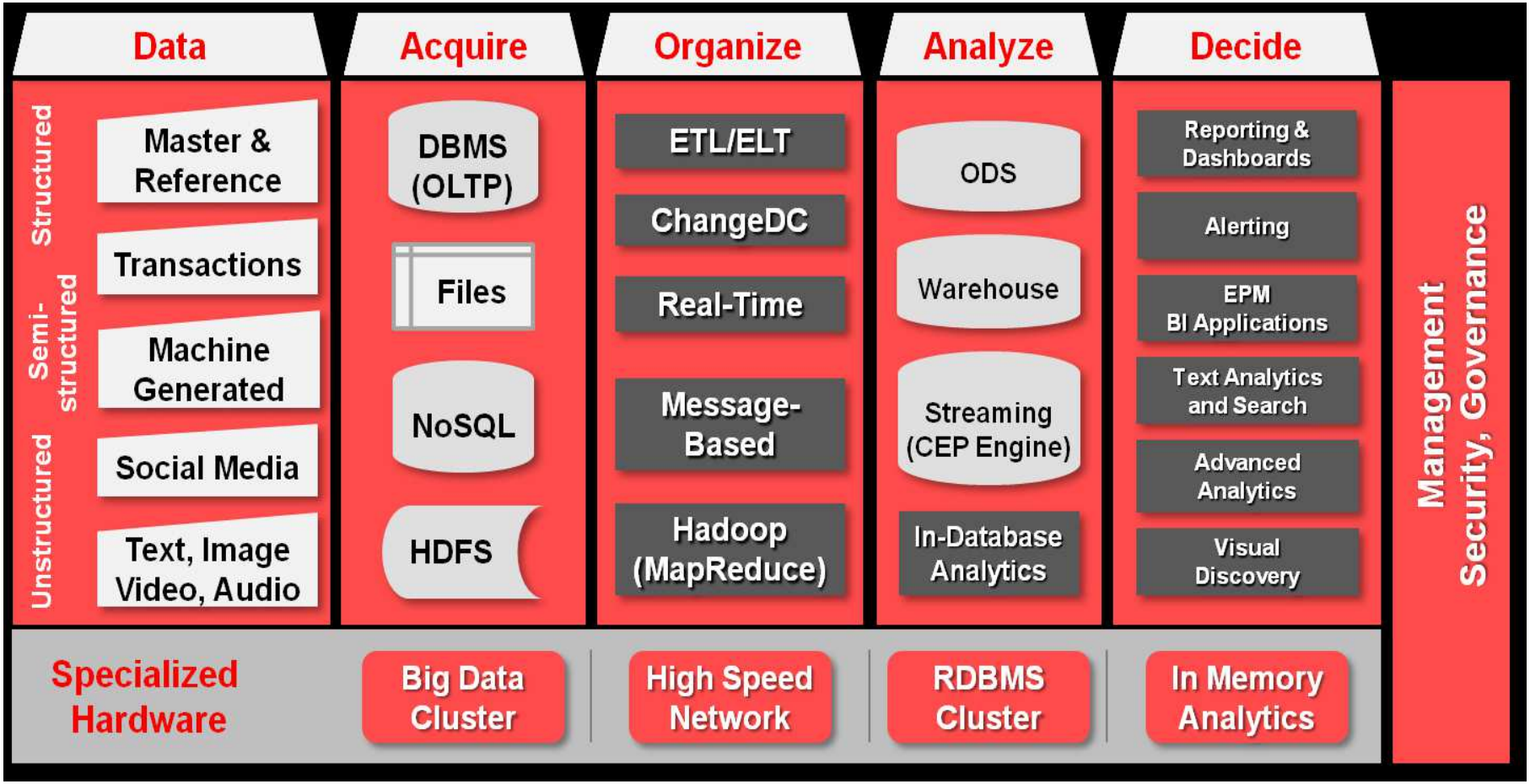
Data Management Best Practices

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.

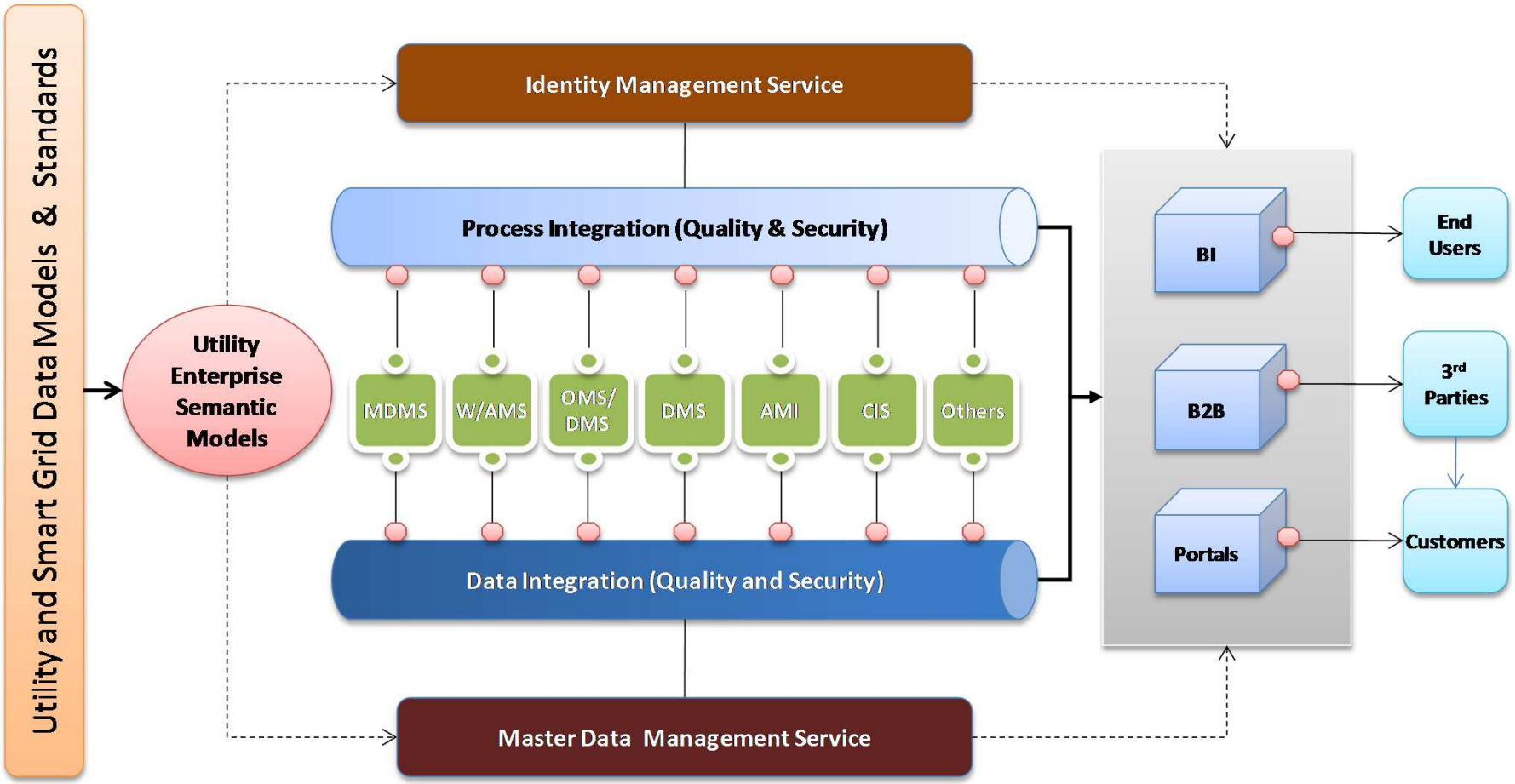


Integrated Information Architecture

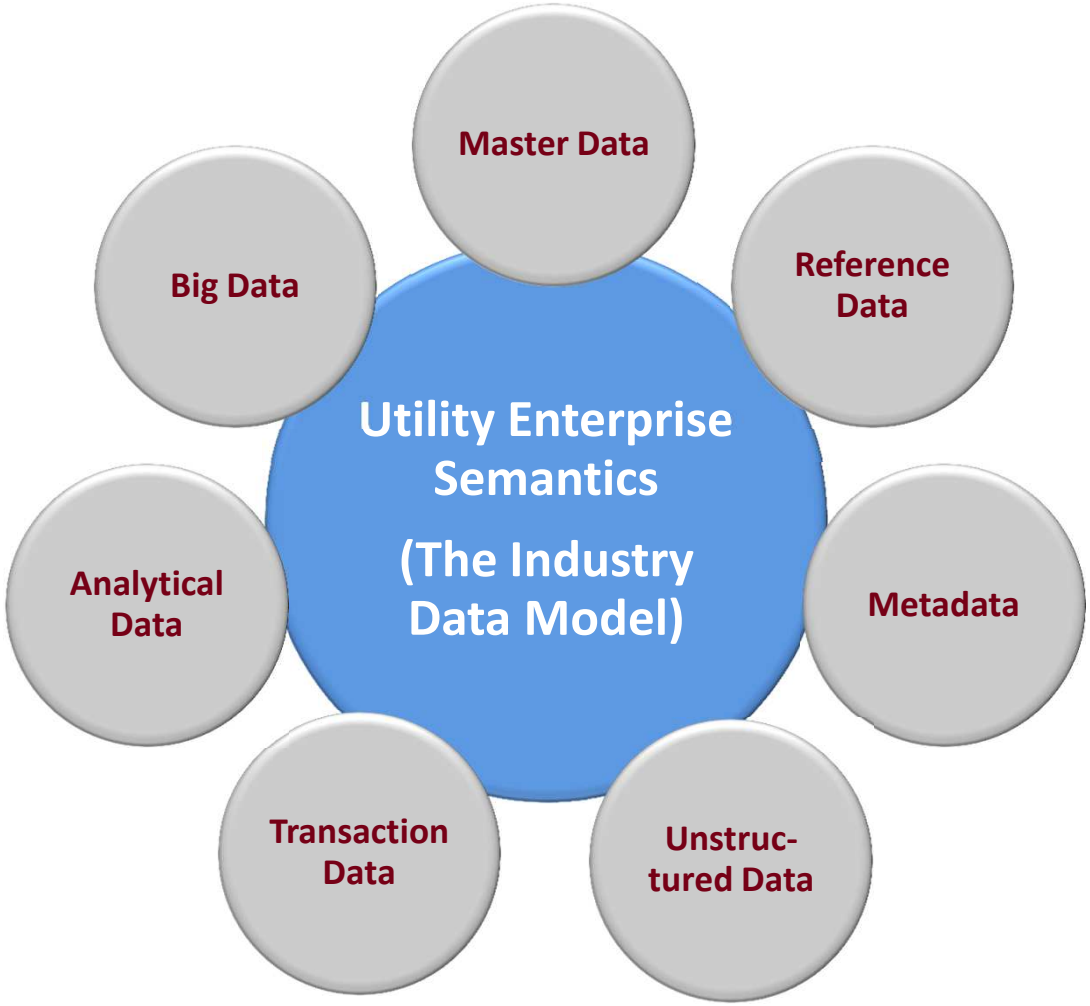


Source: Oracle Information Architecture: An Architect's Guide to Big Data.

Enterprise Semantics for Utility Data Management Needs



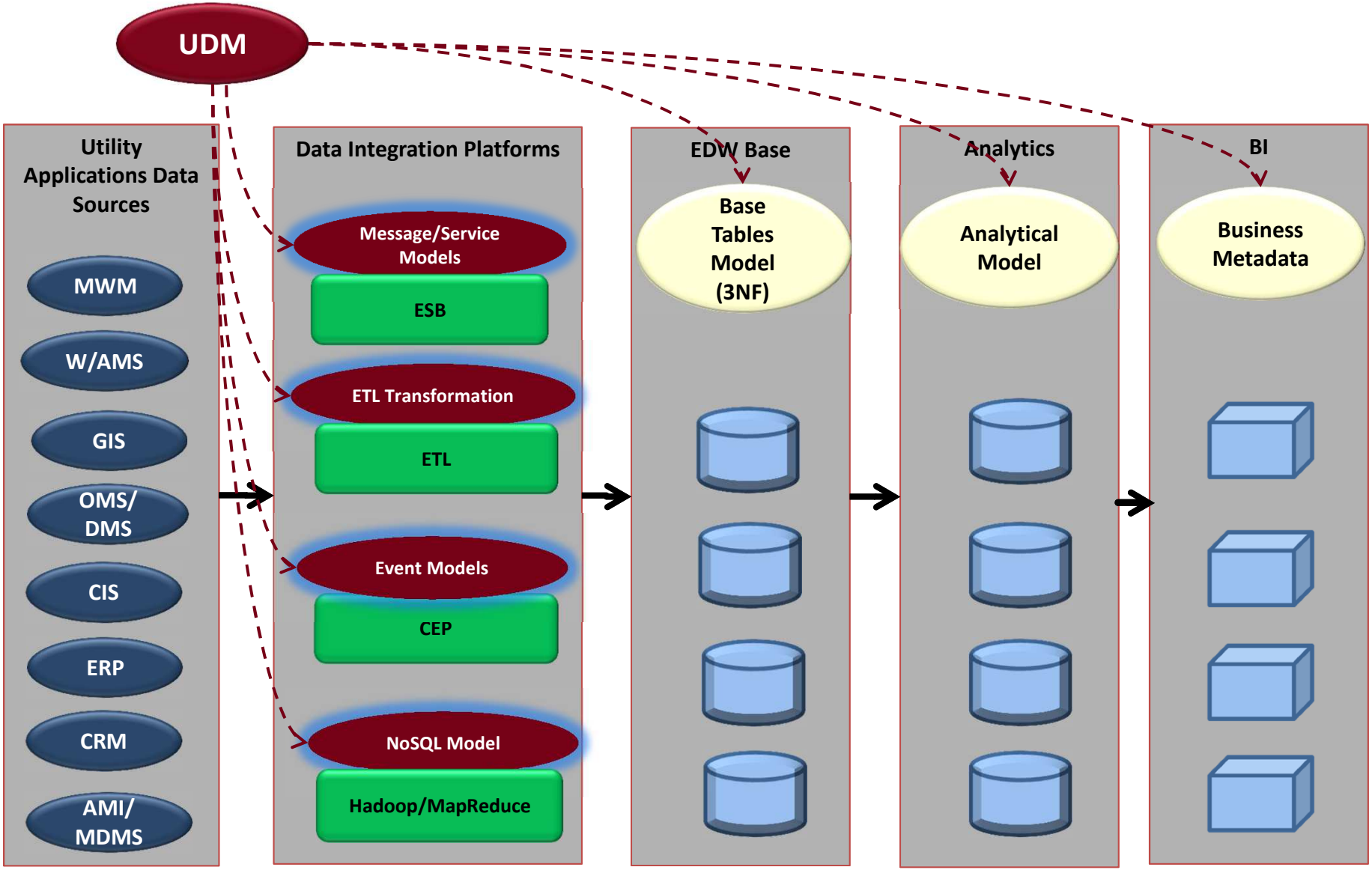
The Industry Data Model – The Common Semantics



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



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

- For further information and/or collaboration, please contact:

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  - Tom Eyford – tom.eyford@oracle.com