Data Analytics in the Digital Utility

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Analytics

Descriptive
Discovery and communication of meaningful patterns in data

Predictive
Modeling and machine learning to make predictions about the future or otherwise unknown events

Prescriptive
Suggests decision options to take advantage of predictions

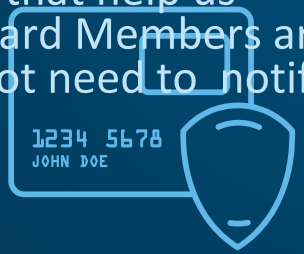
How Are They Used?

In Health: Wake County EMS -

100 people survived cardiac arrest without brain damage because they continued chest compressions after 30-minutes.

In Banking and Credit: A credit card company that I use –

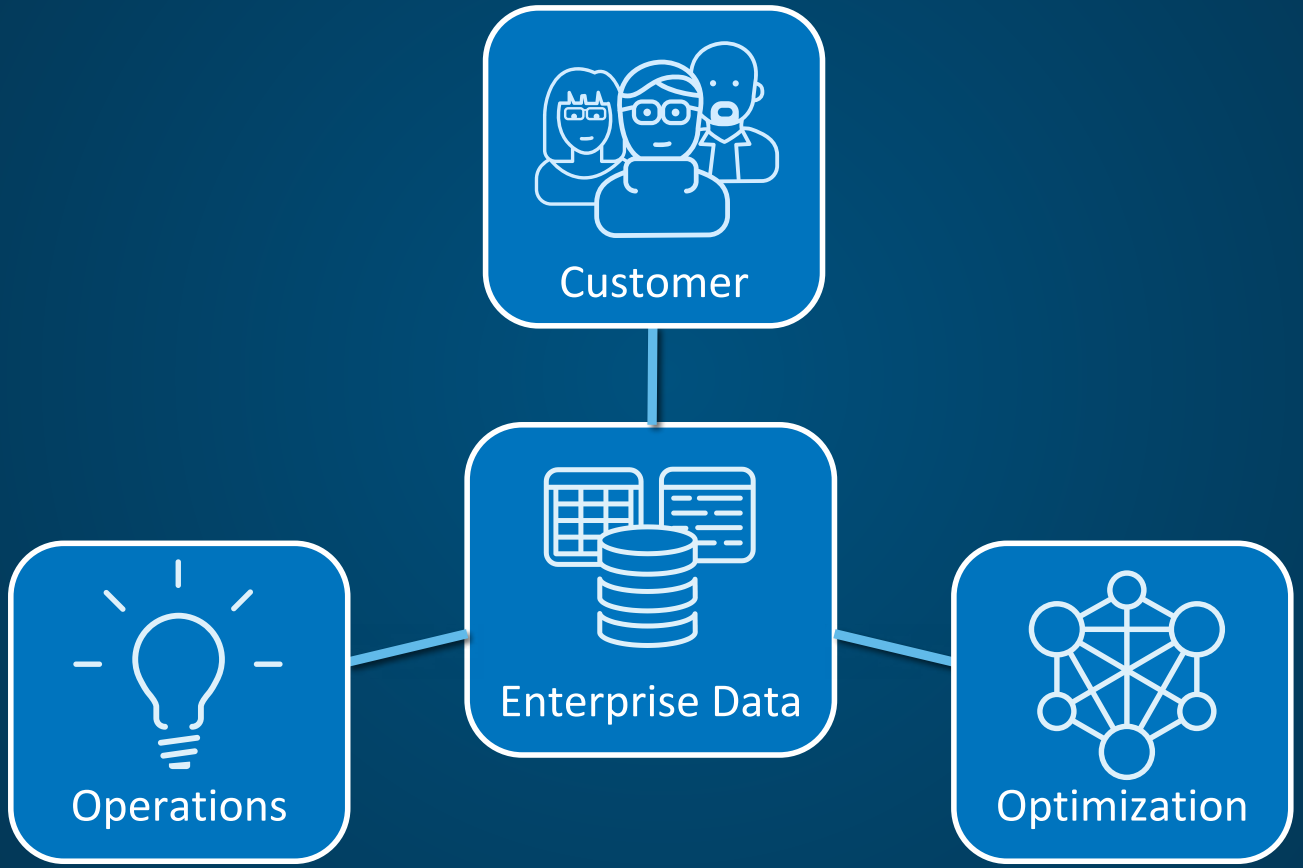
"We use industry leading fraud detection capabilities that help us recognize when our Card Members are traveling, so you do not need to notify us before you travel."



In Sports: Oakland Athletics -

In 2012 was ranked 28th in revenue, but 5th in operating income. They used analytics in assembling the team.

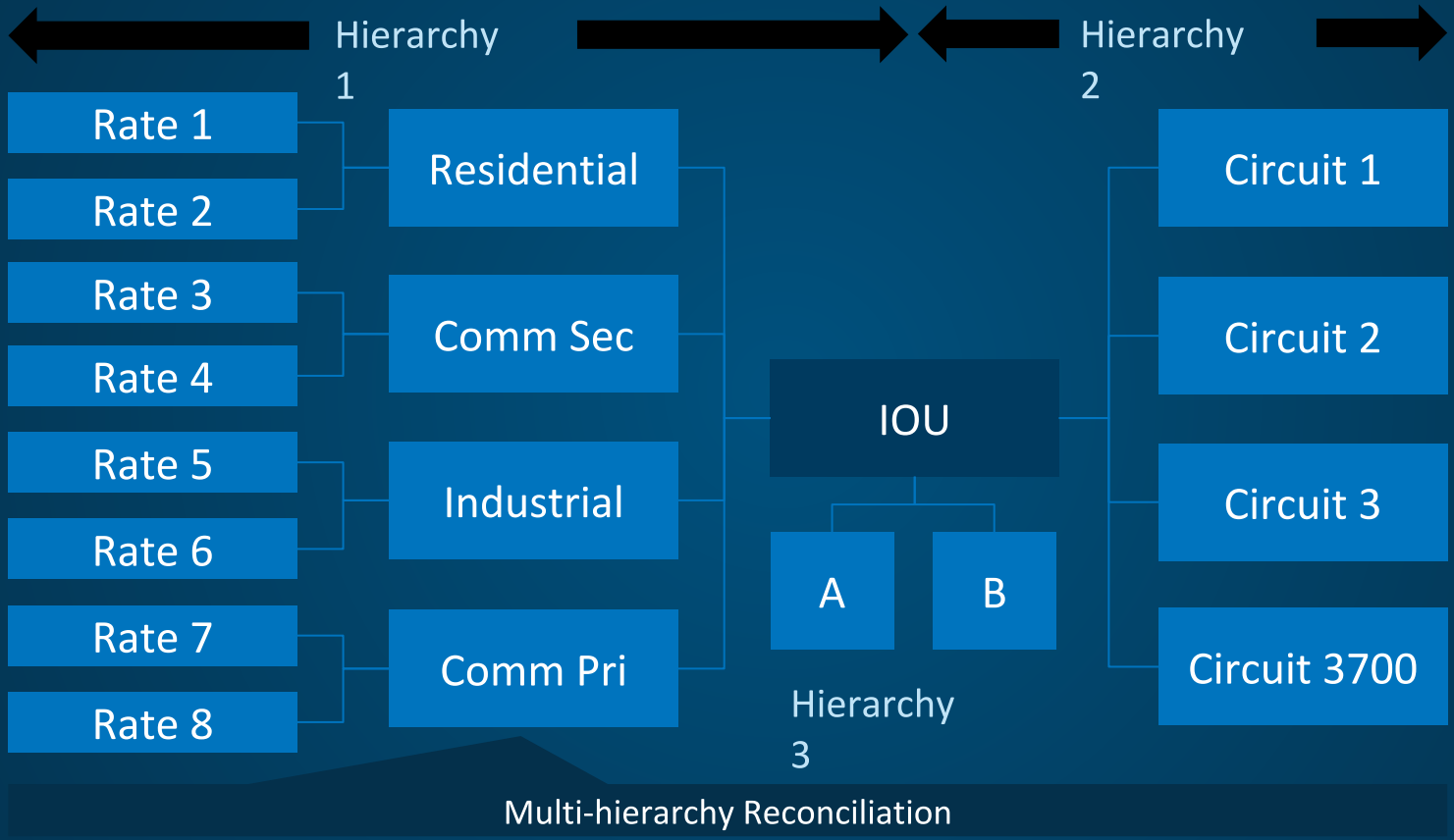
Analytics Technologies for the Digital Grid



Technologies for the Smart Grid

- Enterprise Analytics
  - Situational awareness, One source of truth, Visualization
- Grid Operations Analytics
  - Stability, Security, Reliability and Resilience
- Consumer Analytics
  - Energy Forecasting, Consumption Analysis
- Cost Optimization
  - Generation Scheduling, Distribution Dispatch, Revenue Protection

Multiple Hierarchies



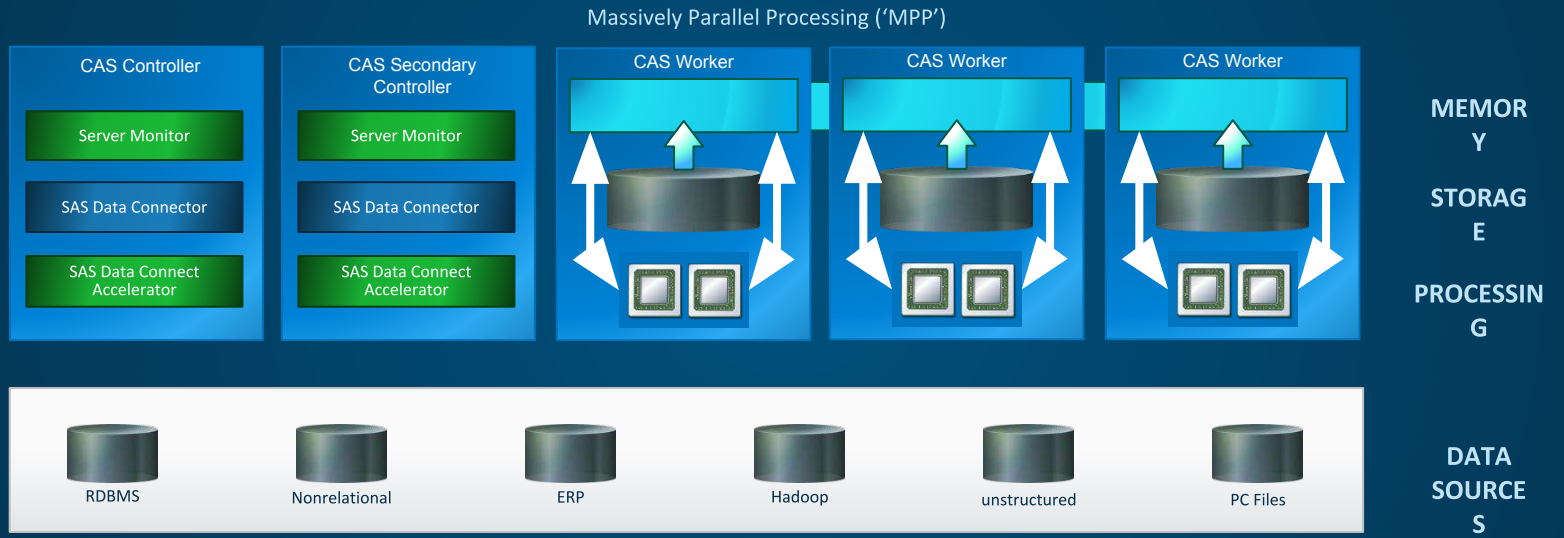
Big Data

Big Data is Relative, not Absolute

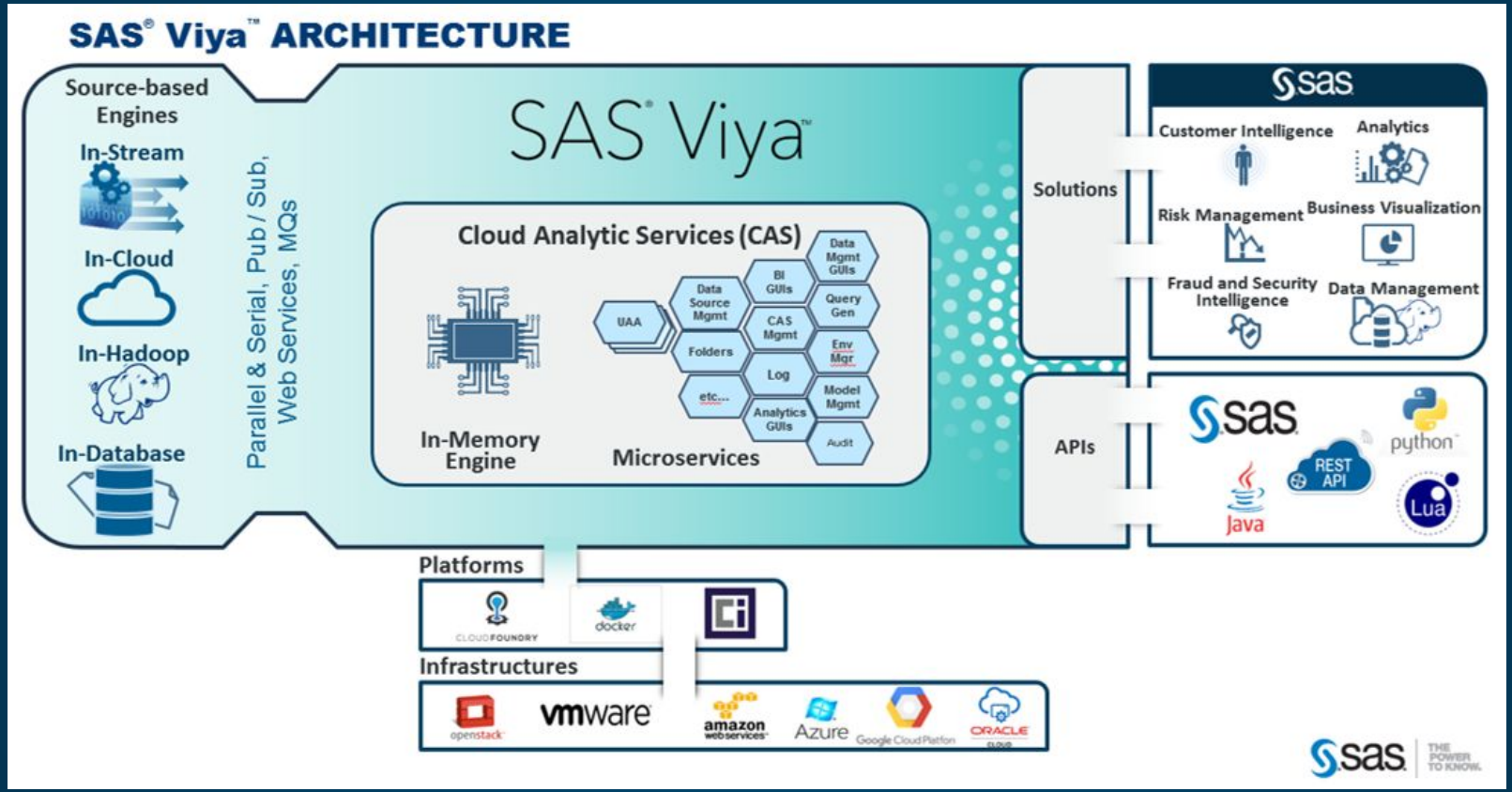
When volume, velocity and variety of data exceeds an organization's storage or compute capacity for accurate and timely decision-making

Meter	Traditional	AMI Meter	SCADA	PMU
Reads/Month	1	2880	1296000	77760000

Analytics Server Architecture



Analytics Server Architecture



Operations Analytics

Stability, Security, Reliability and Resilience

Reliability
The probability of its satisfactory operation over the long run.

Security
The degree of risk in its ability to survive imminent disturbances (contingencies) without interruption of customer service.

Stability
The continuance of intact operation following a disturbance.

Security

Electric grid security refers to the activities that utilities, regulators, and other stakeholders play in securing the national electricity grid.

Operations Analytics

Stability, Security, Reliability and Resilience

Business Disruptions

$100B yearly

Health Problems

1000 2015

Outages

2X every 5

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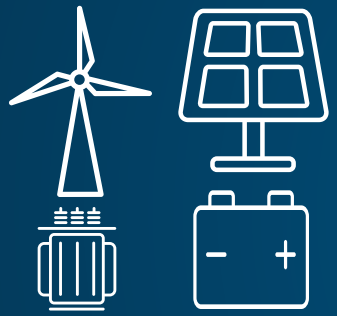
Operations Analytics

Stability, Security, Reliability and Resilience

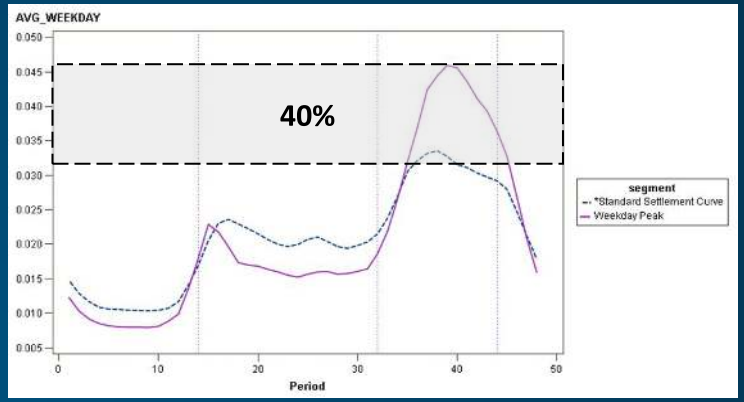


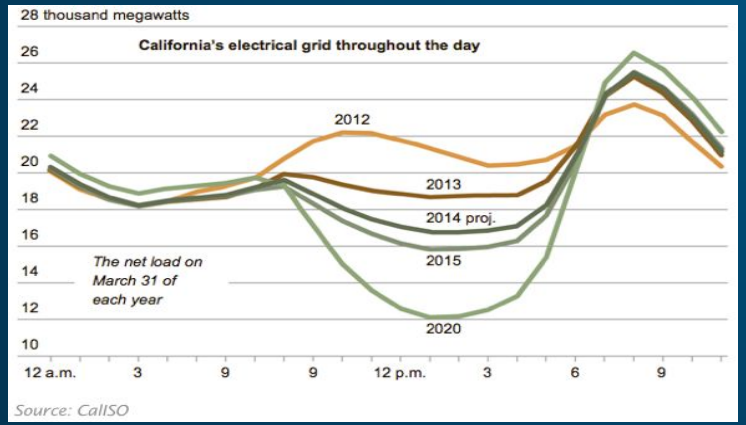
Microgrids and storage

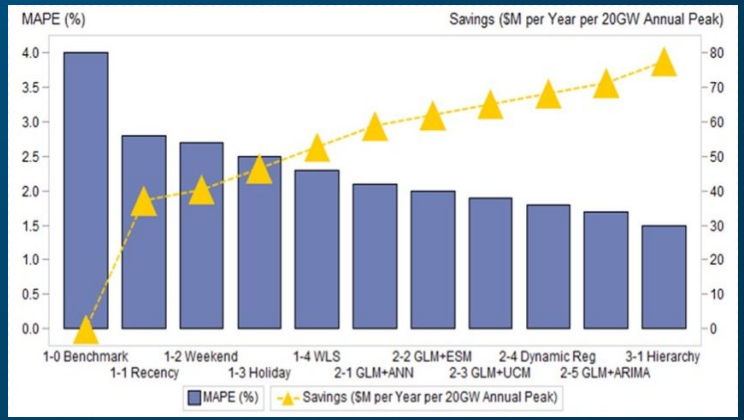
Techniques for detecting effects of malware

Planning for disturbances

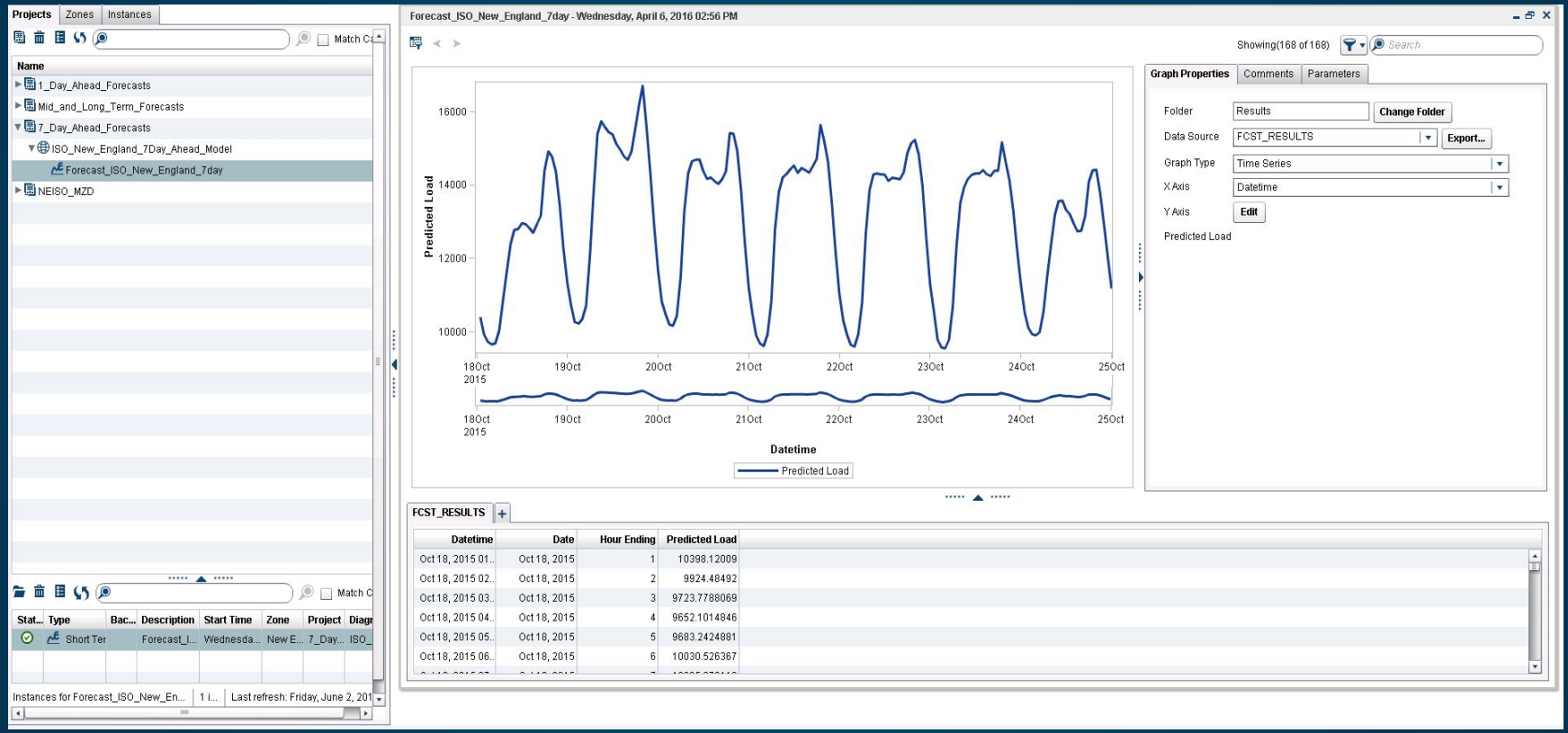
Customer Analytics



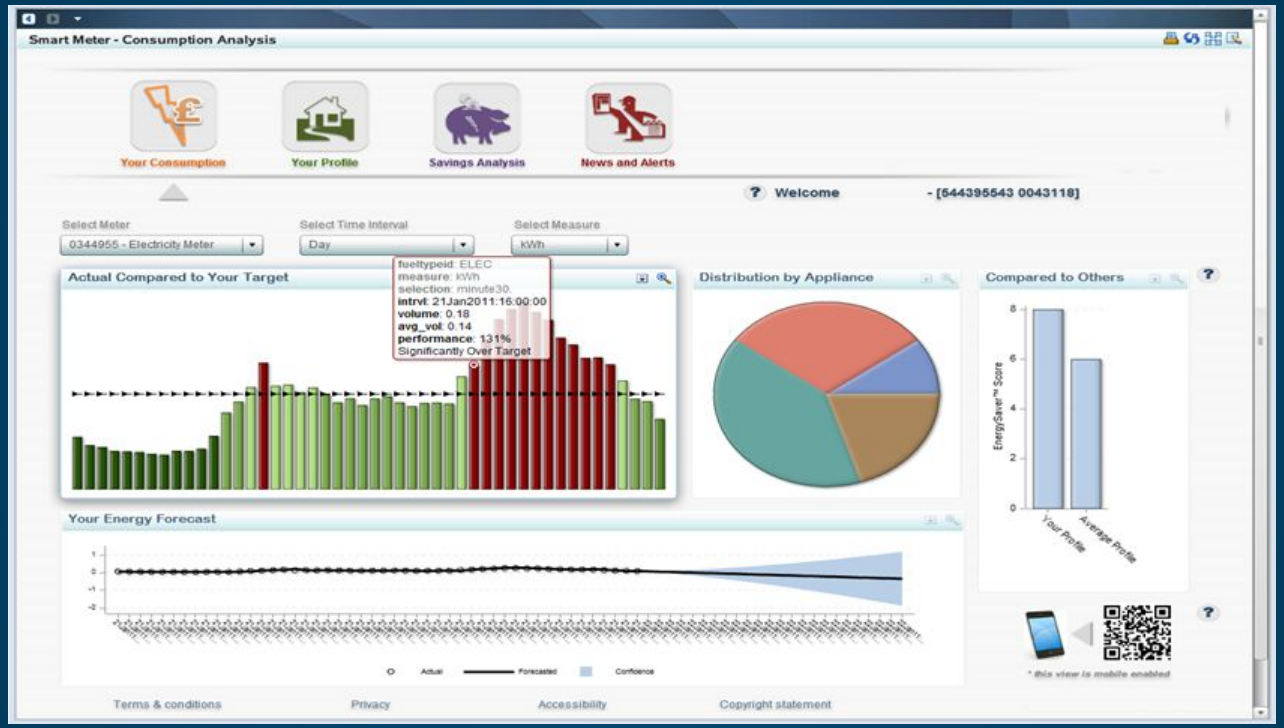




Energy Forecasting



Customer Analytics



Load Profile Comparisons via Segmentation

Optimization

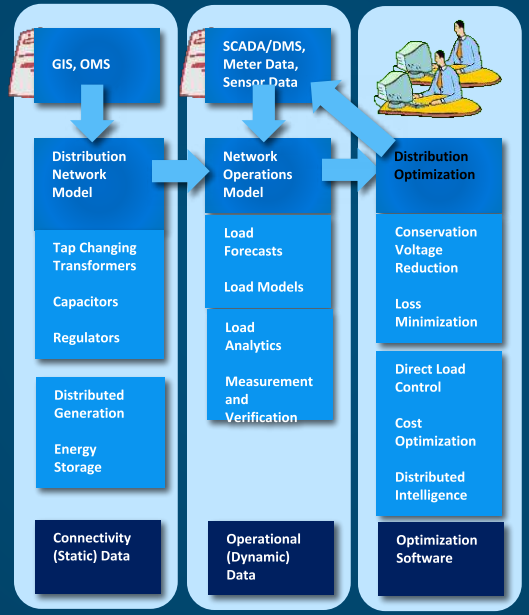
Non-Technical Losses

$100 000 000 pa

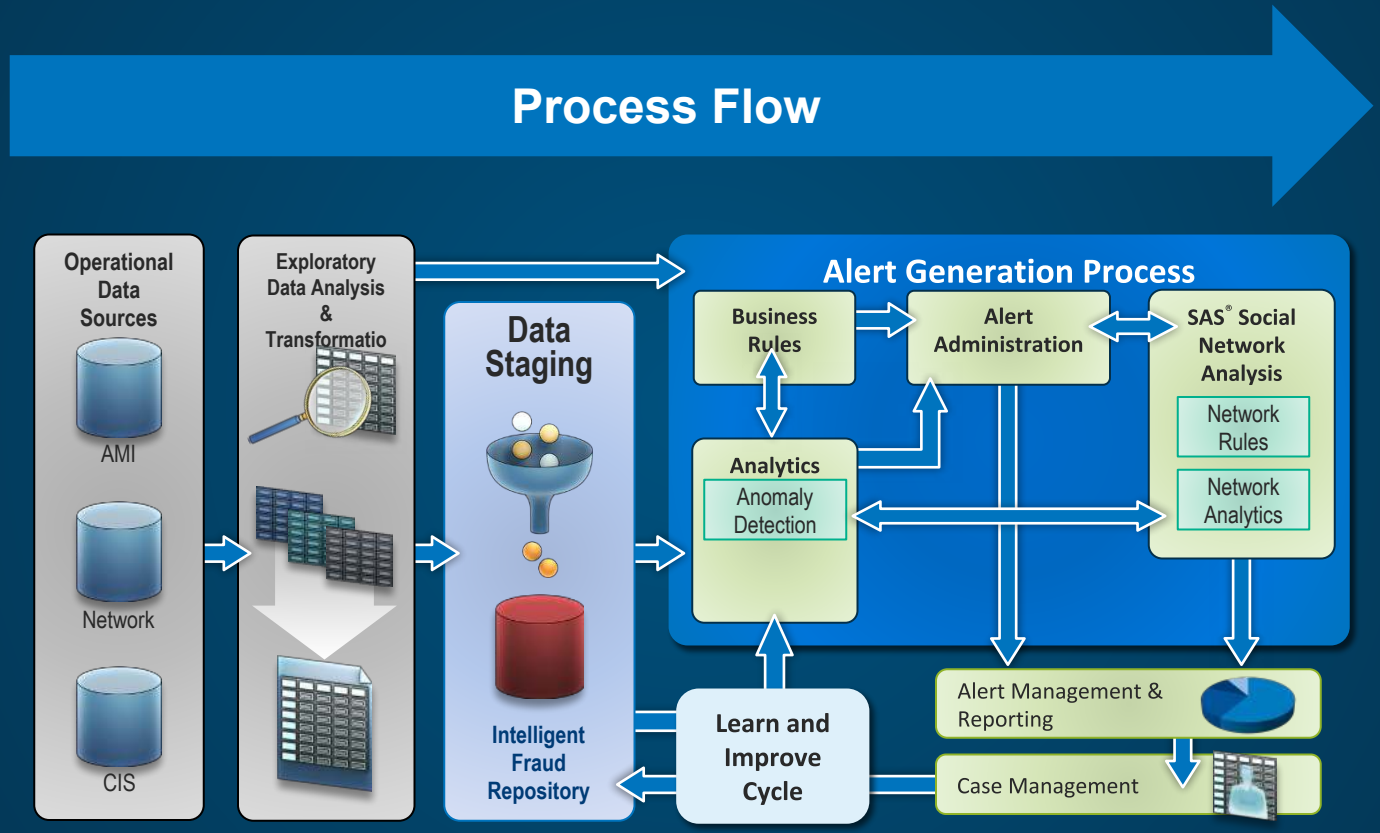
Coincident peak credits for average distribution utility (1M kW) - $75000/mo.

Optimal unit commitment and economic dispatch can save utilities up to 3% of costs

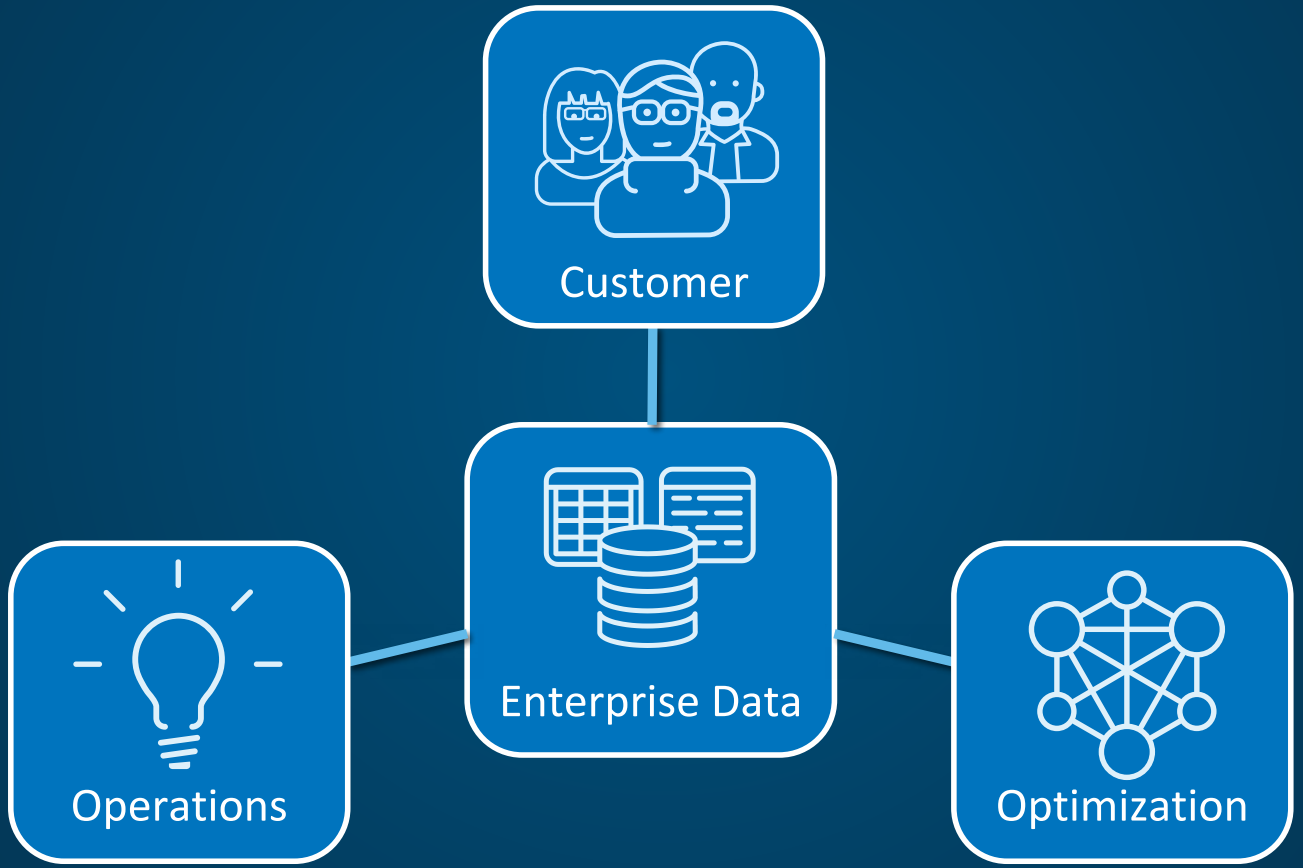
Distribution Optimization



Loss Prevention Framework



Analytics Technologies for the Digital Grid



Thank you