Internet of Things is Transforming the Utility Business

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September 18, 2016
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Program Agenda

1. IoT IS Transforming the Utility Business
2. Oracle IoT – A Complete Solution
3. IoT for Utilities
4. Demonstration
5. Conclusion
IoT is Transforming the Utility Business

• Grid and energy optimization requires integration of Distributed Energy Resources and consumer energy technologies

• Asset performance management leverages the proliferation of low-cost Field Sensors

• Consumer-driven Transactive Energy Markets are moving closer to reality

• Grid assets and consumer products increasingly act as utility “customers”, driving service requirements and influencing behaviors
Expansion of Real-time Monitoring and Control Solutions

Integration of real-time data across the grid edge essential for 21st century grid operations

Smart Grid Gateway

- Smart meters
- Smart sensors
- DER monitors
- Smart consumer technologies

- Asset
- Customer
- Meter
- Grid Ops
- Work

- D-SCADA

Smart homes: 339 million devices (83% growth)

Smart buildings: 518 million devices (42% growth)

Utilities: 314 million devices (21% growth)

Utilities: 314 million devices (21% growth)

Sensors

2016 worldwide estimates and yearly growth rates
Source: Gartner, Dec 2015
For Utilities, What is The Value Proposition ?

• Ability to translate vast quantities of sensor-based information into action — the faster, the better.

• Securely connect devices, analyze real-time and historical data, and integrate to back-end application:

• Enabling your business to deliver innovative new services faster and with less risk.

• Track crew locations and remote parts inventories to more efficiently dispatch technicians in the field

• Transforming Business from the Edge to Enterprise - Control and maintenance of new generation assets
The World is Changing...

Maintenance
- Break / Fix or Scheduled
- Preventative
- Predictive
- Prescriptive

Consumption Model
- Ownership
- As a Service

Business Analytics
- Static Analytics
- Real-Time
- Big-Data Analytics

Service
- Central Service
- Self-Serve / Self-Guided Service

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72% of energy employers are having difficulty finding quality candidates to fill their positions”

- Electric Light & Power, April 2015
To Make This Real, You Need IoT Application

- Maintenance
  - Break / Fix or Scheduled
  - Preventative
  - Predictive
  - Prescriptive

- Business Analytics
  - Static Analytics
  - Real-Time
  - Big-Data Analytics

- Consumption Model
  - Ownership
  - As a Service

- Service
  - Central Service
  - Self-Serve / Self-Guided Service

- IoT Application

- IoT Platform

- Devices / Sensors

Value created

Discussion scope
Accelerate IoT Deployments with Smart Applications

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<tr>
<th>Building an IoT Solution with platform components requires...</th>
<th>Packaged IoT Apps leveraging Oracle’s domain expertise</th>
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<td>LOB Focused User Interfaces</td>
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<td>Oracle App Logic &amp; Predictive Metrics</td>
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<td>User Interfaces, Mobile Apps</td>
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<td>Define Application Data Model</td>
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<td>Implement Business Logic</td>
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<td>Develop Predictive Algorithms</td>
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Have to manage, optimize, scale, upgrade multiple components used in the solution

Accelerate IoT Deployments

- Up to 3x Faster Time-to-Value
- Up to 70% Lower Ongoing Maintenance Cost
- Up to 50% Lower Implementation Time
IoT Deployment Phases

- **Connected Assets**
  - Remote monitoring
  - Business validation

- **Predictive Analytics**
  - Proactive decisions
  - Improved products

- **Service Excellence**
  - IoT blended into enterprise applications
  - Differentiation through customer experience

Time-to-Value:
- 0-3 Months
- 3-6 Months
- 6-12 Months
IoT Insights Application Example – Asset Monitoring

For monitoring assets, their utilization, availability, and data from connected sensors.
IoT Insights Application Example – Asset Monitoring

For monitoring assets, their utilization, availability, and data from connected sensors

- **Location Tracking**
  - Tracking of indoor and outdoor location
  - Where is the nearest available asset?

- **Asset Health**
  - Are my assets working?
  - Are any alerts and incidents open against my assets?
  - OBD connectivity for Fleets

- **Asset Performance**
  - Are my assets connected and online?
  - Geo-fence based business rules
  - Are my assets abused?

- **Utilization**
  - Are my assets available?
  - Are my assets utilized?
Oracle IoT – A Complete Solution

<table>
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<tr>
<th>IoT Cloud Service</th>
<th>IoT Apps</th>
<th>IoT Platform</th>
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<td><strong>Engage</strong></td>
<td>Dashboards, Business Insights</td>
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<td><strong>Execute</strong></td>
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<td>Core Data Model, Business Analytics</td>
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<td>REST APIs</td>
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</tbody>
</table>

Oracle IoT SaaS Applications

Voice of Factory
Reliability Centered Maintenance

Business Applications

- Manufacturing, Supply Chain, Asset Mgmt
- Customer Relationship Mgmt, Sales, Service
- Vertical Apps – Utilities, Healthcare, Retail

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Oracle IoT Cloud Service, whether in the Cloud or in your Data Center with the Oracle Cloud Machine

Oracle IoT Cloud delivers IoT Applications

and extend the reach of the IoT and business applications to your physical devices and sensors

Devices

- Asset Monitoring
- Production Insights
- Fleet Management
- Connected Worker

Built on a solid foundation of an IoT Platform

IoT Cloud Service Platform

Connect
Analyze
Integrate / Act

that integrates with your enterprise applications

Business Applications

- Manufacturing, Supply Chain, Asset Mgmt
- Customer Relationship Mgmt, Sales, Service
- Vertical Apps – Utilities, Healthcare, Retail
Oracle Utilities for IoT

**Manage**
- Registration
- Awareness
- Capabilities
- Intended use

**Communicate**
- Enterprise and asset visibility
- Data process integration
- Interoperability

**Control**
- Proactive and automated
- Enterprise and assets
- Grid optimization

- Operational Device Management
- Meter Solution Cloud Service
- Smart Grid Gateway
- IoT Cloud Service
- Network Management System
- Customer Solution

## Advanced Analytics

- Data preparation
  - Basic prediction & forecasting
- Network and system Performance Monitoring analytics
- Intelligent insights enabling Closed-loop systems

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Real Time Reliability

Sensor based device management

1 Use Case
- Smart sensors on distribution lines
- Communications cloud services to enable real time engagement with enterprise systems

2 Process
- Communicate: IoT Oracle CS enables message ingest, enrichment, storage and stream processing
- Manage: Devices can interact with the IoT Cloud Service through various methods

3 Value
- Distributed intelligence throughout
- Enables real time reliability with minimal operations
Improved Operations

**Condition based maintenance for DER**

1. **Use Case**
   - Control and maintenance of new generation assets
   - Communications cloud services to enable real time engagement with enterprise systems

2. **Process**
   - Communicate: Smart Grid Gateways facilitates interoperability within the enterprise
   - Control: Advanced analytics automated decision making and optimally tunes assets

3. **Value**
   - Enables new technology integration such as renewables at scale

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**Use Case**

- Communicate: Smart Grid Gateways facilitates interoperability within the enterprise
- Control: Advanced analytics automated decision making and optimally tunes assets

**Process**

- Enables new technology integration such as renewables at scale

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**Value**

- Distributed energy resource
- Asset condition risk

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**Utility Cloud or On Prem**

- Service Work Order
- CRM/program management with CIS: connect, dynamic rate, preferences
- DERMS/DRMS, operations and planning with OMS: kw/kvar, voltage, set points
- Asset registry: with Device Mgmt device configuration and settings

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Increase Customer Engagement

Smart Homes

1. Use Case
   - Monitor and Control in home smart devices
   - Integrate with other in entertainment and security systems

2. Process
   - Manage: Embedded analytics capabilities allow for native closed loop actions
   - Control: Leverage Open ADR and enterprise systems for demand response operations

3. Value
   - Engage and empower end customer with new technology and performance
Network Management System

**Outage Management**
- Outage Prediction
- Dispatch/Tracking
- Customer Status
- Storm Management

**Distribution Management**
- Switch Plans/Tagging
- Powerflow Analysis
- Fault Locations
- Predictive/Self-Healing

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Real-Time Network Model

Model Updates
- GIS
- CAD
- Planning System
- Manual / One-Lines

Real-Time

- SCADA
- Field Operations & Mobile
- AMI & DSM/DR
- DER (IoT) & Sensors/Controls
- Customer Interaction & Reports

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Asset Performance Management

Oracle DataRaker and IoT CS for Asset Performance Management (APM)

Near real-time data ingestion and multivariate pattern detection for APM
DEMO

How Oracle’s IoTCS helps Utilities Manage High Load Network Connected Devices
Utilities IoT - Summary

Create new growth opportunities

IoT solution optimizes the flow of information

Take advantage of IoT sensor data for real-time, condition-based maintenance

Go beyond smart grids by connecting low-power devices within the home

Provides Utilities with a scalable, flexible, and more modular infrastructure
Integrated Cloud
Applications & Platform Services