2014 Software Global Customer Conference
Industrial Internet of Things Software Solutions

Steve Garbrecht
VP of Software Product Marketing, Schneider Electric
What is IoT

Connected world solutions combine sensors and technologies to enable objects and infrastructure to interact with monitoring, analytics and control systems over Internet-style networks.

Source: Forrester
IoT Market Size

2018

Banking: $154 B
Manufacturing: $913 B
Retail: $326 B
Healthcare: $313 B
Transportation: $325 B
Utilities: $201 B
Government: $570 B
Other: 1.78T

Total: $4.93T

2014

Banking: $92 B
Manufacturing: $472 B
Retail: $160 B
Healthcare: $132 B
Transportation: $156 B
Utilities: $100 B
Government: $301 B
Other: 750B

Total: $1.93T
Challenges for IoT

- Security
- Scalability
- Mobile Assets
- Real-time Data
- Constrained Devices

Success
IoT is an ongoing journey…

Current State

Some “people”
Some “times”
Some “places”
Some “things”

Future State

Any one
Any time
Any where
Any thing

- visualization
- consumption
- workflow
- security
- governance
- real-time
- standards
- scalability
- reliability
- interoperability
- modularity
- cost
- form factor
- cost
- form factor
- context
- control
- capture
- control
- context
IoT: From the industrial perspective

Control theory is first published…

Computing comes to industrial processes…

Process control of thing/physical asset
(motors, pumps, etc. / sub-seconds)

Supervisory control for coordinating multiple assets
(work center / seconds - minutes)

Orchestration of production resources
(factory / minutes - hours)

Proliferation of the Internet …

Lifecycle management of enterprise assets
(enterprise, supply chain / hours - weeks)
## Invensys focus and contributions

<table>
<thead>
<tr>
<th>Then</th>
<th>Now</th>
<th>Invensys Positioning</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>“low resolution snapshots”</strong></td>
<td><strong>“high resolution movies”</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Contextualize</strong></td>
<td><strong>Connect to/from any “where”</strong></td>
<td><strong>Manufacturing intelligence platform (predictive models)</strong></td>
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<tr>
<td></td>
<td></td>
<td><strong>BPM as a “process playbook” enabler for managing plants</strong></td>
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<td><strong>Simulation portfolio in Oil &amp; Gas</strong></td>
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<td><strong>50 billion smart objects by 2020</strong></td>
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<td><strong>Leverage current technology advances and adoption of open architectures</strong></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Limited connectivity</th>
<th><strong>Connect</strong></th>
<th><strong>Capture</strong></th>
<th><strong>Control</strong></th>
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<td><strong>Connect</strong></td>
<td><strong>Capture</strong></td>
<td><strong>Control</strong></td>
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<tr>
<td><strong>Proprietary architectures</strong></td>
<td><strong>IP-based networks</strong></td>
<td><strong>Smarter &amp; cheaper sensor technology</strong></td>
<td><strong>Proprietary architectures designed for “lock-in”</strong></td>
</tr>
<tr>
<td><strong>Silos of voice, data, video, etc.</strong></td>
<td><strong>Virtualization &amp; Cloud</strong></td>
<td><strong>Cheaper data storage</strong></td>
<td><strong>More industry standards but “lock-in” mindset still prevalent</strong></td>
</tr>
<tr>
<td><strong>Silos of P2P, P2M, M2M</strong></td>
<td><strong>Wireless/Mobility</strong></td>
<td><strong>Making “big data” more available</strong></td>
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<td><strong>Streaming Video</strong></td>
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<td></td>
<td><strong>IP-networks for Industrial environments</strong></td>
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<td></td>
<td><strong>Integration of P2P2M2M</strong></td>
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<td><strong>Hardware-agnostic HMI/SCADA platform</strong></td>
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<td><strong>COTS technology (Microsoft .NET)</strong></td>
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<td></td>
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<td><strong>I/O – higher scalability @ lower cost</strong></td>
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</tbody>
</table>
For business, IT-OT convergence is a critical step

Some “people”

Some “times”

Some “places”

Some “things”

Current Reality

IT today: Managing a world of “Persons”

- grow
  (market share, margin)

- make

- move / store

- sell / consume

Financial Control Loop
“Did I make money?”
[Days – Weeks]

Operational Control Loop
“Did I fulfill the order?”
[Minutes – Hours]

Process Control Loop
“Did I execute the task?”
[Real-Time]

OT today: Controlling a world of “Things”
Smart Cities Example
Why do cities need to be smart?

- **Greenfield Cities**
  - Get it right the first time

- **Rapidly Emerging Cities**
  - Relieve pain points

- **Growth Cities**
  - Retain competitiveness

- **Mature Cities**
  - Regain competitiveness
  - Meet environmental targets

- **Obtain federal funds**
  - Prepare for major events
From siloed management to a holistic plan

With pain-points to solve

Energy

Mobility

Water

Buildings

Public Services
Wonderware Smart City Example

Scenario

<table>
<thead>
<tr>
<th>Value</th>
<th>Reduced Energy Costs</th>
<th>Improved Asset Mgmt</th>
<th>Improved Efficiency</th>
<th>Improved Satisfaction</th>
</tr>
</thead>
</table>

Person

<table>
<thead>
<tr>
<th>Manager</th>
<th>Operations Manager</th>
<th>Maintenance Manager</th>
<th>Facilities Manager</th>
<th>Transportation Head</th>
<th>Citizens</th>
</tr>
</thead>
</table>

Contextualize

“real-time” insight for improved decision making

Collect & Analyze to Assess Assets and People and to Manage Energy Use

Monitor & Manage Energy Use

Make Available and Manage Airports, Railways, Roadways, etc, incl Ticketing, Scheduling, Facilities

Wonderware System Platform & CEM

Connect

<table>
<thead>
<tr>
<th>Plant Networks &amp; SCADA</th>
<th>BMS</th>
<th>BMS &amp; Passenger Info Mgmt System</th>
</tr>
</thead>
</table>

Capture & Control

<table>
<thead>
<tr>
<th>Energy Data &amp; Assets</th>
<th>Energy Data &amp; Environmental</th>
<th>Traffic Mgmt &amp; Operations</th>
</tr>
</thead>
</table>

Thing

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Challenges:
1. High Utility Costs/Efficiency
2. Aging/Inadequate Infrastructure
3. Citizen Satisfaction/Convenience

Scenario

Value

Person

Contextualize

“real-time” insight for improved decision making

Connect

Capture & Control

Thing

Water & Electric Networks

Buildings & Facilities

Transportation Systems

Energy Data & Assets

Energy Data & Environmental

Traffic Mgmt & Operations

Improved Asset Mgmt

Improved Efficiency

Improved Satisfaction

Operations Manager

Maintenance Manager

Facilities Manager

Transportation Head

Citizens

Collect & Analyze to Assess Assets and People and to Manage Energy Use

Monitor & Manage Energy Use

Make Available and Manage Airports, Railways, Roadways, etc, incl Ticketing, Scheduling, Facilities

Wonderware System Platform & CEM

Plant Networks & SCADA

BMS

BMS & Passenger Info Mgmt System

Reduced Energy Costs

Improved Asset Mgmt

Improved Efficiency

Improved Satisfaction

Operations Manager

Maintenance Manager

Facilities Manager

Transportation Head

Citizens

Wonderware System Platform & CEM
Carson City - A "smart city" success story

Goals
• Efficiently manage the City’s water, wastewater, transportation, landfill, fleet, environmental and renewable power systems around the clock
• Leverage the latest virtualization technologies, including iPads and smart phones, to increase the efficiency of operators and management, as well as increase situational awareness to achieve a high level of operational readiness

Challenges
• Deliver affordable and reliable transportation, power, water, and wastewater services to citizens and visitors to Carson City and surrounding counties.
• Reduce administration and overhead costs while significantly increasing the City’s operations reliability and disaster recovery processes

Results
• Remote management capabilities have resulted in 15% reduction in operations staff hours due to saved “drive time”
• Reduced work week from five eight-hour days to four ten-hour days
• Helps manage the city’s solar plants that provide up to 748,000 KWH of clean power each year
• Delivers more than 22 million gallons of water while processing 6.9 millions of gallons of wastewater each day

“Carson City has realized about a 50% reduction in staff time as a result of the Wonderware software.”
James Jacklett, Electrical/Signal Supervisor, Carson City Public Works

Detailed success story   View video
A future Smart City - Schneider Electric

A City with a Digital Overlay

Source: IDC Government Insights, 2013
Innovating for better outcomes tomorrow

Integrated city management platform to leverage efficient urban infrastructure and provide more effective public services as well as innovative citizen applications.

City Government
More efficient city management

City Residents
Services & information

Integrated Management Platform

- Information Sharing
- Business Intelligence
- Decision Support
- Incident Management

- Smart Energy Systems
- Smart Mobility Systems
- Smart Water Systems
- Smart Public Services Systems
- Smart Buildings & Homes Systems

Communications Network(s)

Continuous Optimization of Infrastructure Efficiency
Smart Asset (Mining Industry Example)

- **Production**
  - Accounting
  - Inter Process Coordination
  - Plants Performance
  - Planning
  - Productivity

- **Energy**
  - Demand
  - Regulations
  - Quality
  - Contingencies
  - Planning & Forecasting

- **Assets**
  - Availability
  - Utilization
  - Performance
  - Tracking
  - Scheduling
  - Health

- **Health & Safety**
  - Natural Resources Usage
  - Accidents
  - Emissions
  - Regulations
Smart Asset Management Example

Scenario

<table>
<thead>
<tr>
<th>Value</th>
<th>Reduction in Energy Costs</th>
<th>Improvement in Operations &amp; Overall Business Practices</th>
<th>Reduced Risk (Compliance &amp; Safety) Risks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Person</td>
<td>Maintenance Manager</td>
<td>Safety Personnel</td>
<td>Reliability Engineering</td>
</tr>
<tr>
<td>Contextualize</td>
<td>Avantis EAM and Condition Manager</td>
<td>Workflow</td>
<td>IntelaTrac</td>
</tr>
<tr>
<td>“real-time” insight for improved decision making</td>
<td>Collects &amp; Analyses to Predict Failure &amp; Assess Asset Health</td>
<td>Actions based on knowledge and best practices</td>
<td>Disconnected data collection</td>
</tr>
<tr>
<td>Connect</td>
<td>Plant Network</td>
<td>EAM &amp; ERP</td>
<td>Onboard Sensors</td>
</tr>
<tr>
<td>Capture &amp; Control</td>
<td>Emissions Tracking</td>
<td>Equipment specific data (payload, tire pressure, acceleration etc.)</td>
<td></td>
</tr>
</tbody>
</table>

Challenges:
1. High Energy Costs
2. Aging Workforce
3. Risk Mitigation, Compliance & Safety

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Goals
• Automate maintenance data collection at each facility for a well-defined enterprise asset management process to support equipment performance reliability

Challenges
• Improve the availability and utilization balance of production assets and develop a standardized solution for each of its nine separate production facilities, while maintaining production

Results
• A $2 million first year inventory reduction
• Improved ability to manage inventory, as many as 8,000 items at each plant, maintaining between $2 million to $12 million in inventory
• Compliance with the Federal Environmental Protection Agency (EPA) regulation called the Portland Cement Maximum Achievable Control Technology (PC MACT)
• Minimizes the potential loss of $3,000 per hour for every hour the kiln is offline

Ash Grove Cement
Overland Park, Kansas

“By closely monitoring and managing what we use, reorder activities, and parts and materials pricing, we have reduced inventory by at least $2 million in the last few years. This is a significant contribution to keeping our prices competitive in the marketplace.”

Mike Ralls
Plant Systems Administrator

Click for more information
Future Schneider Electric Digital Services Energy & Building management Platform

1. Measure
2. Collect
3. Understand

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Secure Gateway
Utility Meters
Wireless Meters
Clamp on CTs

SE Apps
3rd Party App
Service Bureau
Analytics
Digital Services Platform
Lightweight M2M (Machine to Machine)
Data Communication Interface to the Cloud
Operational Intelligence Platform

Analytics execution utilizing a Modern Data Architecture
Big Data & Analytics capabilities to address new challenges and opportunities

Real-Time Data Processing & Analytics
Information Integration & Governance
Systems
Security
Storage
Cloud, as a Service

What can I learn, What is best?
What is happening?
What action should I take?
What could happen?
Why did it happen?

Discovery
Reporting
Decision Management
Predictive Analytics
Deliver Insight and New Value to the Business

- What’s The Best That Can Happen?
- What Will Happen Next? (Machinery Failure)
- What If Trends Continue?
- Why Is This Happening?
- How Many, How Often, Where? (Top 5 Sites Energy Usage)
- What Happened? (Daily Energy Usage)
- What Action Is Needed? (Check HVAC)
- What Is The Cause of The Problem? (Temperature)
- How Many, How Often, Where? (Top 5 Sites Energy Usage)
- What Happened? (Daily Energy Usage)

Degree of Intelligence

Competitive Advantage

- Statistical Analysis
- Forecasting
- Predictive Modeling
- Optimization

Standard Reports
- Ad Hoc Reports
- Query Drilldown
- Notification Alerts
# The Data Science of Schneider Electric

Studying data to research potential trends, to analyze the effects of certain decisions or events, or to evaluate the performance of a given tool or scenario to improve the business by gaining knowledge which can be used to make improvements or changes.

<table>
<thead>
<tr>
<th>Data Mining</th>
<th>Unstructured Data Mining</th>
<th>Forecasting</th>
<th>Optimization</th>
<th>Visualization</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Create models by uncovering previously unknown trends and patterns in vast amounts of data through Classification, Regression, Clustering, Associations &amp; Sequencing Models</td>
<td>• Discover &amp; extract meaningful patterns and relationships from text or unstructured data which are used to improve the Product/service or understand competition</td>
<td>• Analyze &amp; forecast processes that takes place over the period of time e.g. predict seasonal energy demand using historical trends, Predict how many ice creams cones are required considering demand</td>
<td>• Use of simulations techniques to identify scenarios which will produce best results e.g. Sale price optimization, identifying optimal Inventory for maximum fulfillment &amp; avoid stock outs</td>
<td>• Enhanced exploratory data analysis &amp; output of modeling results with highly interactive statistical graphics</td>
</tr>
</tbody>
</table>

*2014 Software Global Client Conference*
Hybrid App Development Toolbox

- WebStorm
- git
- Jenkins
- GRUNT
- Native Apps
- JIRA
- Confluence
- Karma
- Spectacular Test Runner for JavaScript
- Bootstrap
- kinvey
- PhoneGap
- node
- npm
- Bower
- A package manager for the web

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Schneider Mobile Hackathon
Accelerating Innovation

7 Teams
(Industry, ITB, Buildings, Energy, Global Solutions)

21 Contestants
(Varied skills and background)

Interactive training kickoff

48 hr app development

Live app demo

Hackathon Judges

May 28 – 30, 2014
Boston Campus Center
**Smart Comfort App**

Cloud

- MBaaS
- App Users & Settings
- EWS Mapping
- Analytics
- User Engagement (notifications, emails, sms)

On-Premise

- Mobile Data Link
- Mobile Optimized API
  - HTTP-REST-JSON
  - EWS REST ↔ SOAP

- Schneider BOC Wifi (Gateway)
- Hybrid App Development (HTML/JS/CSS)
  - iOS and Android

- StruxureWare Building Operation

- Schneider Thermostat
  - SE8350U5B00

- AS-B Automation
  - Enterprise Server

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Schneider Electric Software is enabling the Internet of Things Today

- Connect
- Contextualize
- Capture (sense)
- Control (respond)

- Real Customers
- Real solutions
- Enabling Better Decisions
Thank you!