GE
In search of a truly connected world

Lennart Christensson GE Intelligent Platforms
Industrial Internet
OPC and MES Day Finland 2014
Introduction to the Industrial Internet…
The Next Industrial Revolution:

Watch YouTube Video
Market dynamics

In the next five years …

40% of skilled manufacturing workers will retire\(^1\)

50b machines will connect to the Internet\(^2\)

#1 priority of CIOs is to drive more business insight\(^3\)

A new generation of workers expects answers at their fingertips


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Enabling technologies

SOFTWARE
The integration of traditional industries and IT technology reshapes the competitive landscape …

Examples
Amazon, Trip Advisor

CONNECTIVITY
Secure, trusted and high-performance connectivity on public networks

Examples
Skype, CrashPlan

CONSUMER ELECTRONICS
New levels of computing power and networking enable solutions that are more accessible, simple, and powerful

Examples
Smartphones, Navigation systems, Home electronics

COLLABORATION FRAMEWORKS
Cloud-based platforms provide faster routes to solutions, higher quality content & better manageability than traditional equivalents … with better financials for all

Examples: Wikipedia, Salesforce, Topcoder

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GE’s Industrial Internet vision

“I always think about what’s next. The ability in our world to go man-to-machine, to marry real-time customer data with real-time performance data of our products… that is the holy grail.”

- Jeffrey Immelt, GE CEO
<table>
<thead>
<tr>
<th>PEOPLE</th>
<th>DATA</th>
<th>MACHINES</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;1,000 Monitoring data</td>
<td>&gt;5TB of machine data collected every day</td>
<td>&gt;25,000 GE aircraft engines</td>
</tr>
<tr>
<td>&gt;3,000 field engineers using the data to solve problems</td>
<td>&gt;12PB of data from every machine built or retrofitted since 1960</td>
<td>&gt;7000 GE gas turbines</td>
</tr>
<tr>
<td>&gt;5,000 Using data to improve products</td>
<td>&gt;800 new developers working on insights and visualization</td>
<td>&gt;15,000 GE locomotives</td>
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The Industrial Internet

1. Brilliant Machines
   Connect the world’s machines, facilities, fleets and networks with advanced sensors, controls and software applications

2. Data + Analytics
   Combines the power of physics-based analytics, noise reduction techniques, predictive algorithms, and deep domain expertise

3. People at Work
   Connecting people at work, any place, any time & any for intelligent operations

Decreasing time to insight.....
GE Intelligent Platforms gets you connected

Connected Machines
Digital connection at the source

Connected Data
Islands of information aggregated

Connected Insights
Analytics in real-time

Connected People
Cloud-based, Mobile access, Collaboration

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GE Intelligent Platforms Industrial M&D – Monitoring and Diagnostics
Performance & Reliability Center

Improving the performance of critical assets

Our experienced equipment and software engineers monitor 4000+ assets, 7 days/week more than 70 sites globally in Mining, Oil & Gas, Power Generation, and Aviation

Each month:
- **3000** customer advisories
- **500** cases
- **200** catches

Air Heater  Heat Exchanger
Blower  HRSG
Chiller System  Incinerator
Compressor  Jet Engine
Condenser  Level Control Valve
Cooling Tower  Mill
Engine  Motor
Fan  Pulverizer
FCC  Pump
Feedwater Heater  Steam Turbine
Gas Turbine  Tower
Gearbox  Transformer
Generator  TRVL Screen
GE M&D Center
Big Data and Analytics
Turning fleet knowledge into action – 24x7 Global Operation
M&D is enabling the Industrial Internet

As one of the world’s largest OEMs, we are actively applying Remote Monitoring & Diagnostics (RM&D) technology ourselves to better serve our end customers and deliver on the promises of the Industrial Internet.

Examples:

**GE Oil & Gas FieldVantage**
Provides visibility into status of electro submersible pumps for lifting and pumping, and monitors asset health information to enable predictive maintenance.

**GE Aviation myEngines**
Tracks engine parts and communicates real-time to GE and airlines to manage engine fleets and improve productivity.

**GE Digital Energy Grid IQ SaaS**
Fee-for-service model enables utilities to monitor, manage and control their grid via a cloud-based system.
The “Appliances Model”
Making the Industrial Internet REAL for our customers

An “appliance” is a pre-engineered and pre-built solution for a specific problem that dramatically reduces the engineering costs (NPI, requisition, commissioning) and risks for customers.

Bernie Anger, GM Intelligent Platforms
Equipment manufacturer challenges

OEMs need data to differentiate & improve profitability

Improving asset uptime

I need to improve visibility into installed equipment performance

How can I improve asset availability?

Can I leverage maintenance insight to optimize equipment?

Growing services revenues

I need to sell new monitoring & preventative maintenance services contracts

I want to capture increased parts and repair revenue

How can I expand to cover my competitors' installed base?

Share information & Enhancing customer experience

How can I schedule downtime & improve time-to-serve?

How can I increase my share of retrofit/repeat business?

What else can I do to differentiate from my competition?

Reducing cost-to-serve

I need to reduce compliance & warranty risk

How can I improve services capacity utilization and reduce "windshield time"?

I want to reduce software development & maintenance overhead costs

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THE EQUIPMENT INSIGHT SOLUTION, FROM GE PREDICTIVITY™

Your machines create millions of data points ... every day. Are you making the most of them?

Let GE’s Equipment Insight solution help your business grow.
Equipment Insight, from GE Predictivity™

Turn your data into actionable information

Powered by GE’s leading Proficy® software and rugged RXi IPCs

Data collection
Machine data collection uses encryption and firewall friendly communications to send data to the Equipment Insight historian.

Data analytics
Data analytics enable prediction of downtime events so customers can be contacted before their process goes down.

Role-based geo intelligence
Get the right information to the right person, wherever they are, on any device.

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How Equipment Insight works

Cloud-based mobility available anytime, anywhere

OEM X

EQUIPMENT INSIGHT SERVER

TABLET/PHONE FOR OEM SERVICE PERSONNEL

PUBLIC INFRASTRUCTURE

END USER 1

Tablet

Field Agent

Rx3i Controller

END USER 2

Browser

Field Agent

Third Party Controller

END USER 3

Phone

Third Party Controller

Field Agent

RX3i Controller

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GE IP Monitoring Service for Predictive Maintenance
Optional add on to Equipment Insight Proficy Smart Signal from GE IP

Any Equipment, Any OEM

The most comprehensive coverage of Assets.
Rotating Equipment. Processing Equipment.
Any Equipment. Any OEM.
Similarity Based Modeling Solves Customer Problems

Stand-alone equipment protection

Axial position

Gas pressure

Bearing Temp

SmartSignal Alerts / Incidents

Dynamic Bands

Machine Trip

Alarm / Trip

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TempuTech
Changing a business model

Challenges:
• Needed to differentiate from competition
• Low revenue on home-grown software investments
• Disparate systems required manual intervention
• Technical limitations prompted need to modernize

Actions:
• Selected & installed GE’s Equipment Insight solution, from GE Predictivity™
• Developed revenue-generating services strategy

Results:
“By deploying the solution at one of our customers grain facilities, we are able to access and provide actionable information about the health of their system and deliver it to them in real-time so they can avoid downtime and quality issues”.
- Tom Herrera, Sr. Owner

“Virtually centralizing unlike applications, devices and sensors via a web-based remote monitoring & diagnostic solution is improving our ability to service this account, enhancing our value to them as a vendor, and reducing our overall costs-to-serve”.
- Adrian Merrill, Vice President of Operations
Philadelphia Electrical Equipment Company
“Leapfrogging” the competition

Challenges:
- Customers requesting greater visibility into their systems
- PEECO looking to offer RM&D SW system to their customers that is available anywhere, anytime.

Actions:
- Selected & installed GE’s Equipment Insight solution, from GE Predictivity™
- Implementing cloud-based portals for customers
- Creating revenue models for both monitoring and predictive maintenance service contracts

Results:
“Ultimately, because this is a cloud-based solution, it’s going to allow us to leapfrog our competition. It’s an innovative, more forward thinking solution, helping us to monitor every parameter within a [customer’s] system – allowing us to be more proactive than reactive on their maintenance.

Ultimately, we plan on saving our customers money – that’s our #1 goal. Goal #2 is to make PEECO more profitable. At the end of the day, their success is our success.”

- Steven Chambers, VP of Business Development

Watch the video
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The BRILLIANT MACHINES ARE COMING

with the technology, scale, and ability to make the world better.

Thank You