SAP Industry 4.0 & the Internet of Things
Connected Manufacturing in Mill Products Industries

Chris Dorrow, May 2015
Trends in an Industrial World

Connected Devices

- Connected Processes
- Connected Business

50 Bn. Devices in 2020

Smart City

Smart Car

Smart Flight

Smart Energy

Smart Industry

Stakeholder

Complexity
Manufacturing Continues to Change

1st Industrial Revolution
adoption of mechanical production facilities by using water and steam power

2nd Industrial Revolution
adoption of work-sharing mass production by using electrical power

3rd Industrial Revolution
use of electronics and IT to automate the production

4th Industrial Revolution
based on cyber-physical systems

| End of the 18th century | Beginning of 20th century | Early 70s | Today |
## Industry 4.0 – Terms and Enablers

<table>
<thead>
<tr>
<th>M2M</th>
<th>Smart Anything</th>
<th>Cyber-Physical Systems</th>
<th>Internet of Things</th>
<th>Big Data &amp; Analytics</th>
<th>Mobile and Cloud</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machine-to-Machine</td>
<td>Devices provide Information</td>
<td>Machines connected to the business</td>
<td>Connected via one protocol</td>
<td>Mass data &amp; Semantics</td>
<td>Access to Information anytime anywhere</td>
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**Smart products, assets, and human beings in a hyper connected world**
Connected Manufacturing
5 Scenarios of “Connectedness”

5 Scenarios:

1. Shop floor to Top floor
   Intra company vertical integration

   Autonomous machines

3. eCommerce Integration
   Direct integration of online configurators

4. Manufacturing Collaboration
   - Visibility
   - Genealogy
   - Quality
   - Kanban / Direct replenishment

5. Machine Cloud
   - Predictive maintenance
   - Predictive quality
Next Generation Process Visibility – SAP MII & SAP Visual Enterprise

Currently In Development (Planned for MII 15.1 – Q4 2015/Q1 2016)
Connected Manufacturing: Manufacturing Data Across the Enterprise

Currently In Development (Planned for MII 15.1 – Q4 2015/Q1 2016)
SAP Connected Manufacturing
Cloud / On-Premise / Shop Floor

- Public Cloud
- On-Premise
- Shop Floor

- Process & Production Planning
- Monitoring

- SAP Business Suite (ERP, APO, …)

- SAP Manufacturing Suite (SAP ME, MII, PCo)

- Manual Data Entry
- Automatic Data Entry (Machine Connectivity)

- DCS
- MES
- Plant DB
- Plant Data Collection
- Plant Historian
- Wireless Integration
- LIMS
- SCADA / HMI
- Environmental Building Management

Powered by SAP HANA
# Integration Architectures for Industry 4.0 & IoT Scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Connected Plant</th>
<th>Connected Assets</th>
<th>Connected Logistics</th>
<th>Connected Car</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>Smart Plant with SAP Manufacturing Execution Suite (SAP ME, SAP MII, SAP PCo)</td>
<td>Predictive Maintenance &amp; Service, Cloud Edition</td>
<td>Smart Logistics for Ports</td>
<td>Fleet Management</td>
</tr>
<tr>
<td>Connectivity</td>
<td>SAP PCo Shop floor connectivity</td>
<td>SAP IoT Connector Device Connectivity</td>
<td>Partner Solution Connectivity into truck on-board units</td>
<td>Partner Solution / SAP IoT Connector Device Connectivity</td>
</tr>
<tr>
<td>Platform</td>
<td>SAP HANA Platform for IoT (Optional *)</td>
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</tbody>
</table>

*IoT is optional; mainly for future scenarios like Analytics cross Supply Chain (Production Network)*
Prove Points in Manufacturing
Responsive Manufacturing

With SAP solutions, companies can develop real-time visibility into manufacturing operations, optimize manufacturing processes and asset performance, and collaborate in global manufacturing and supply chain networks while lowering costs and exceeding customer expectations. Companies can execute quality management processes to prevent deficiencies, enable continuous process improvements, and sustain quality control.

**Design-to-order and project manufacturing**
Offer custom-designed and engineered solutions for profitability and competitive differentiation.

**Make-to-order manufacturing**
Offer highly customized solutions with short lead times, on-time delivery, high quality, and low cost.

**Production execution and visibility including make to stock**
Align and automate production execution activities for continuous monitoring and control.

**Quality management and compliance**
Exceed expectations for quality management and compliance.

**Asset operations and maintenance**
Ensure assets stay up and running with effective maintenance planning, scheduling, and dispatching.

SAP solutions enable building products companies to maximize return on assets and create custom products through:
- Enhanced productivity and reduced manufacturing costs
- Reliable and compliant products by managing lifecycle quality levels

SAP solutions provide streamlined processes for a variety of industry value chains by integrating horizontal lines of business with industry-specific solutions on premise, in the cloud, and through mobile devices.
Use Case Scenarios in Metal
Metal industry
Use case cold rolling mill

Description
Starting of coating line leads to losses during calibration phase.

Potential
Shortening of calibration phase reduces losses and so costs.

Solution approaches
• Real-time analysis of BIG DATA
• Analysis of historic data with predictive methods to improve real-time analysis
• Integrated analysis of data of different machines
Metal industry
Use case product quality

Description
Cost pressure leads to operation of machines at “lower limit” with ongoing reduction of safety tolerances.

Potential
As more precise the machines can be operated as lower the danger of quality issues and to run into related product depreciations.

Solution approaches
• Real-time analysis of BIG DATA
• Usage of predictive methods for maintenance
• Integrated analysis of data of different machines
Metal industry
Use case creation and operation of production assets

Description
Metal companies often operate machines of different manufacturers resulting in many different processes and machine data formats for interaction.

Potential
An aligned approach of asset manufacturers and operators can lead to improved processes and lower costs.

Solution approaches
- Harmonized definition of data and processes
- Nee distribution of “business tasks”
- New business models
Metal industry
Use case customer service by real-time

Description
Customers expect high quality, low costs and reliable information at increasing lower time horizons for order, last changes and deliveries (“Amazon for Steel”)

Potential
A seamless connection and usage of data in sales, procurement through production up to delivery is the base for competitive advantages.

Solution approaches
• Harmonized definition of data and processes
• Handling of real-time data
• New business models
Enable new business models for yourself and your customers

Take advantage of Industrie 4.0 technologies to improve your own processes

Improve your products and services by adding “cyber capabilities”