Industry 4.0: Sensor Driven Manufacturing

AWS Enterprise Summit, Frankfurt, 2015
**Empowering the Eco-System of Connected Things**

SMARTRAC is the leading global company in the field of RFID technology. We make products smarter and enable businesses by allowing them to identify, authenticate, track and complement their product offerings with digital based services. Our technology enables businesses to link their specific product instances with back and front office IT systems as well as with Cloud services.

SMARTRAC is uniquely positioned to develop and provide high security, high-quality products and services that can be linked to any object, including industrial assets, consumer goods, credit cards, passports, access control solutions, vehicles, and many more.
Understanding RFID

1. Reader Sends RF Signal
2. Transponder Receives RF Signal
3. Transponder Sends RFID Data Back
4. Reader Receives Response
5. Software Processes RFID Data
6. Transponder is Identified

Technology Benefits

Security:
- RFID offers superior theft and fraud protection, as well as authentication features

Information:
- RFID enables access to relevant information about processes; surrogate key capabilities, 2FA, etc.

Efficiency:
- RFID automates processes

Longevity:
- Passive RFID does not require batteries; decades of use depending on environmental conditions
## RFID Strengths

<table>
<thead>
<tr>
<th></th>
<th>Barcode</th>
<th>QR-Code</th>
<th>RFID</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Range</strong></td>
<td>max. 5 cm*</td>
<td>max. 5 cm*</td>
<td>up to several meters</td>
</tr>
<tr>
<td><strong>Readable Items per Second</strong></td>
<td>1</td>
<td>1</td>
<td>up to 1000</td>
</tr>
<tr>
<td><strong>Resistant to Soiling</strong></td>
<td>✗</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td><strong>No Line of Sight Required</strong></td>
<td>✗</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td><strong>No Influence of Item Positioning</strong></td>
<td>✗</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Copy Protection</strong></td>
<td>✗</td>
<td>✗</td>
<td>✓</td>
</tr>
<tr>
<td><strong>Information Content</strong></td>
<td>Limited to Code</td>
<td>Variable, but Limited</td>
<td>Completely Variable</td>
</tr>
</tbody>
</table>

* Depending on Size
Industrial Revolution Timeline

1. Industrial Revolution
   - Follows introduction of water- and steam-powered mechanical manufacturing facilities
   - End of 18th century

2. Industrial Revolution
   - Follows introduction of electrically-powered mass production based on the division of labor
   - Start of 20th century

3. Industrial Revolution
   - Uses electronics and IT to achieve further automation of manufacturing
   - Start of 1970s

4. Industrial Revolution
   - Uses electronics and IT to achieve further automation of manufacturing
   - Based on cyber-physical systems, new protocols like MQTT/CoAP, and RFID for product identification
   - TODAY

- 1784
  - First mechanical Loom

- 1870
  - First production line, Cincinnati slaughterhouses

- 1969
  - First programmable logic controller (PLC), Modicon 084

- 2014
  - Machine-to-Machine (M2M), Product-to-Machine (P2M)
Embracing the Cyber Revolution

- Cloud Computing
- Mobile
- Advanced Robotics
- Advanced Analytics
- M2M P2M
- Community Platforms
- 3D Printing
Role of RFID in Industry 4.0

Data Security

Data Volume

Data Format

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Case Study: Passive Sensing

**Challenge:**
- Detecting water ingress into vehicle at final quality control check is an error prone, time consuming process (historical err rates > 8%)
- Critical issue in hybrid/electric vehicles with semi-sealed compartments

**Solution:**
- *RFMicron* and SMARTRAC provide passive UHF tags that are attached to the chassis during manufacturing
- Can pinpoint leak source and location before leaving the factory, reducing warranty claims
• **Challenge:**

  • Link details about custom design requirements and needed components, such as screws, hinges and glass to doors

• **Solution:**

  • Israeli door manufacturer *Pandoor* affixes passive UHF tags to the wood planks it uses to make its products

  • A SMARTRAC “Short Dipole” tag with an Impinj Monza 4QT chip is encoded with a Customer ID to track who ordered *that* door and what custom features and patterns have been requested
SMART COSMOS Platform Services

**PROFILES**
Profiles provides self-service transparency into the supply chain and manufacturing metadata associated with RFID transponders, creating uniquely powerful intellectual property and technical data management opportunities.

**OBJECTS**
Objects easily stores all types of data from connected sensors, smart devices, and automated workflows, optionally feeding data changes into external systems in near real-time.

**FLOWS**
Flows speeds the implementation of fully automated RFID and sensor-driven workflows, seamlessly integrating with disparate back-office systems to yield a higher degree of business productivity.
Without SMART COSMOS

In a world without SMART COSMOS, software engineers would have to **spend 80% of their time building out foundation infrastructure** before they could actually innovate in their specific vertical market.

With SMART COSMOS

In a world with SMART COSMOS, software engineers can **spend 80% of their time innovating**. SMART COSMOS platform services take care of the foundation necessary to build RFID-centric powered solutions in *any* vertical market.
The trade in fake goods could cost the global economy $1.7 trillion by the end of 2015, according to the International Chamber of Commerce.
Historical Concerns
- Data in Transit
  - TLS/SSL
- Data at Rest
  - Encryption in a database

Industry 4.0 Concerns
- AuthN / AuthZ
- Data at Rest on Premises
  - RFID tag, SIM card, etc.
- Data in Transit on Premises
  - RFID Reader, BTLE, Zigbee
- Data in Transit to Cloud
  - TLS/SSL
- Data at Rest in Cloud
  - Encryption in a database
Today

- Predefined production sequences limit flexibility
- Reconfiguration difficult or impossible to achieve
- Inability to support a custom “user experience” in the manufacturing process
- Employees’ work defined by structure of production line
- Dynamic manufacturing evolves because of new “separation of concerns”
- Parts and raw materials become vocal and define their current state
- Custom “user experience” can occur because assembly lines are no longer rigid and static
Final remarks

• We are in an industrial revolution… right now!
• User Experience must extend “from the screen to the shop”
• Security considerations continue to increase in scope
• AWS infrastructure and SMART COSMOS platform services are powerful options for realizing Industry 4.0
Jason Weiss  
VP, Cloud Platforms and Applications  
jason.weiss@smartrac-group.com

SMARTRAC TECHNOLOGY Fletcher, Inc.  
267 Cane Creek Rd  
Fletcher, NC  28732  
USA

smartrac-group.com