Keynote

Dr. Gerd Scheying, Director, RFID Competence Center @ Bosch
Relevance of Confining Standards for Business in the IoT and Industrie 4.0

Dr Gerd Scheying
Center of Competence RFID@Bosch
Robert Bosch GmbH,
Stuttgart, Germany
Overview

- Introducing Bosch

- Connected Industry (Industrie 4.0) Initiative at Bosch

- Internet of Things (IoT) and Industrie 4.0 (I4.0)

- Standardization as Key Element
Overview

➔ Introducing Bosch

➔ Connected Industry (Industrie 4.0) Initiative at Bosch

➔ Internet of Things (IoT) and Industrie 4.0 (I4.0)

➔ Standardization as Key Element
Who’s Bosch
A Global Enterprise with 4 Business Sectors…

- Mobility Solutions
- Industrial Technology
- Energy and Building Technology
- Consumer Goods
…that generated these Key Figures in 2014

**Bosch Group**
- 48.9 billion euros in sales
- 290,000 associates
- 360,000 associates as per April 1.15*

**Mobility Solutions**
- One of the world’s largest suppliers of automotive technology

**Industrial Technology**
- Leading in drive and control technology, packaging, and process technology

**Energy and Building Technology**
- Leading manufacturer of security technology
- Global market leader of energy-efficient heating products and hot-water solutions

**Consumer Goods**
- Leading supplier of power tools and accessories
- Leading supplier of household appliances

*including BSH Hausgeräte GmbH (formerly BSH Bosch und Siemens Hausgeräte GmbH) and Robert Bosch Automotive Steering GmbH (formerly ZF Lenksysteme GmbH).
...that is present in some 150 Countries

<table>
<thead>
<tr>
<th>Region</th>
<th>Share of Sales</th>
<th>Associates</th>
<th>Manufacturing Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Europe</td>
<td>53%</td>
<td>174,025</td>
<td>134</td>
</tr>
<tr>
<td>Americas</td>
<td>20%</td>
<td>33,879</td>
<td>33</td>
</tr>
<tr>
<td>Asia Pacific</td>
<td>27%</td>
<td>82,279</td>
<td>56</td>
</tr>
</tbody>
</table>

*Bosch Group: 48.9 billion euros in sales, 290,183 associates, 360,000 associates as per April 1.15*, 223 manufacturing sites.

*Including BSH Hausgeräte GmbH (formerly BSH Bosch und Siemens Hausgeräte GmbH) and Robert Bosch Automotive Steering GmbH (formerly ZF Lenksysteme GmbH). As of 12.14
Over the past five years, Bosch has invested more than 20 billion euros in research and development.

Some 45,700 researchers and developers work at Bosch:

- At 94 locations worldwide, in a single network
- Bosch files 18 patents on average per working day
- Our objective: To develop innovative, useful, and exciting products and solutions to enhance quality of life – Technology that is Invented for life
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GS1 Industry and Standards Event 2015, Warsaw

Connected Industry (Industrie 4.0@Bosch)
“Web 3.0” links the digital world to the physical world of things and vice versa. Thus, it opens the path to entirely new business models.
Bosch’s Industrie 4.0 dual strategy

<table>
<thead>
<tr>
<th>Lead Provider</th>
<th>System manufacturer/ Production resource view</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I 4.0 solution provider with external business</td>
</tr>
<tr>
<td><strong>Rexroth</strong></td>
<td>Drive and Control Technology</td>
</tr>
<tr>
<td>Bosch Group</td>
<td></td>
</tr>
<tr>
<td><strong>Bosch Software Innovations</strong></td>
<td>Bosch Sensortec</td>
</tr>
<tr>
<td><strong>Packaging Technology</strong></td>
<td>Innovations-management Logistik</td>
</tr>
<tr>
<td><strong>Assembly Systems and Special Machinery</strong></td>
<td>Machine Platforms</td>
</tr>
<tr>
<td><strong>Bosch Connected Devices &amp; Solutions</strong></td>
<td>Data Mining, Big Data</td>
</tr>
<tr>
<td>...</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lead Operator</th>
<th>Product manufacturer/ Product view</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>223 Bosch plants world wide</strong></td>
<td></td>
</tr>
<tr>
<td>▪ Manufacturer of products</td>
<td></td>
</tr>
<tr>
<td>▪ Machine operator</td>
<td></td>
</tr>
<tr>
<td>▪ Plant operator</td>
<td></td>
</tr>
<tr>
<td>▪ Interface to customers/suppliers</td>
<td></td>
</tr>
</tbody>
</table>

Many practical pilot applications are bundled within the ‘Innovation Cluster’
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Outlook to 2020

- Volatile markets
- Individual customer requirements
- Shortened delivery times
- Shortened product life cycles
- 24/7 worldwide service
- Social behavior, new cooperation
- Disruptive business models

2020
7 billion connected people

2020
50 billion connected things

1997
6 million computers on the internet

1995
40 million connected people

1997
The Smart Factory of i4.0 is part of the IoT
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The World of Things

IoT: Entirety of physical objects or Things

I4.0: Objects (e.g. in manufacturing) as part Cyber Physical Systems

The triangle is representing virtually all physical objects.

Active (powered)

Smart devices, identified via e.g. IPv6

Passive

No power available

Or

Not wanted for cost reasons

Simple objects, identified via

GS1 Industry and Standards Event 2015, Warsaw
I 4.0 / IoT Data Exchange

Active (powered)

Passive
No power available
Or
Not wanted for cost reasons

Label, Smart Label, NFC / UHF RFID Tag
Common Language or Green Field Approach?

Object ID and Event

Identify → Share

Capture

ISO/IEC 15961, 15962
ISO 17363 to 17367

EDIFACT?
OPC UA?

New Coding Scheme?
or
Maybe GS1 ID-Key?

New <XML> scheme?
or
Maybe EPCIS?
Example: German Automotive Industry (VDA)

- **Object ID** based on ISO/IEC
  - Select Data Identifier (DI)
  - Select Appl. Fam. Identifier (AFI)
  - Choose IAC (DUNS, Odette, …)
  - Design your ID pattern
- **ID Key**: SGTIN or CPID
- **Issue company specific rules**
- **Company specific data exchange**
- **Instruct your supplier base**
- **Use well documented and maintained GS1 Standards**
It’s working productively with GS1 Standards

- Logistics operation
- Manufacturing control
- Asset-Management
- OE Products
- Car pool management
- Tool management, …

- RFID Gates
- FIFO Lanes
- Kanban Booking
- Inventory Taking
- Container (RTI)
- OE Products
- Value Stream Control
Thank you for your attention 😊