RAIN RFID ALLIANCE

EUROPE MEETING
27 JUNE 2018, VIENNA

BOSCH

RFID@BOSCH 2018

OPPORTUNITIES & CHALLENGES

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RFID@BOSCH 2018: Opportunities and Challenges

Content Overview

- Introducing the Bosch Group
- Bosch Connected Industry
- RFID@BOSCH
  - History and Status
  - Opportunities and Challenges
- Summary

BOSCH – TECHNOLOGY TO ENHANCE QUALITY OF LIFE

The Bosch Group
A Global Network

402,166* Bosch associates make these solutions possible

60* countries – 440 regional subsidiaries

Four business sectors

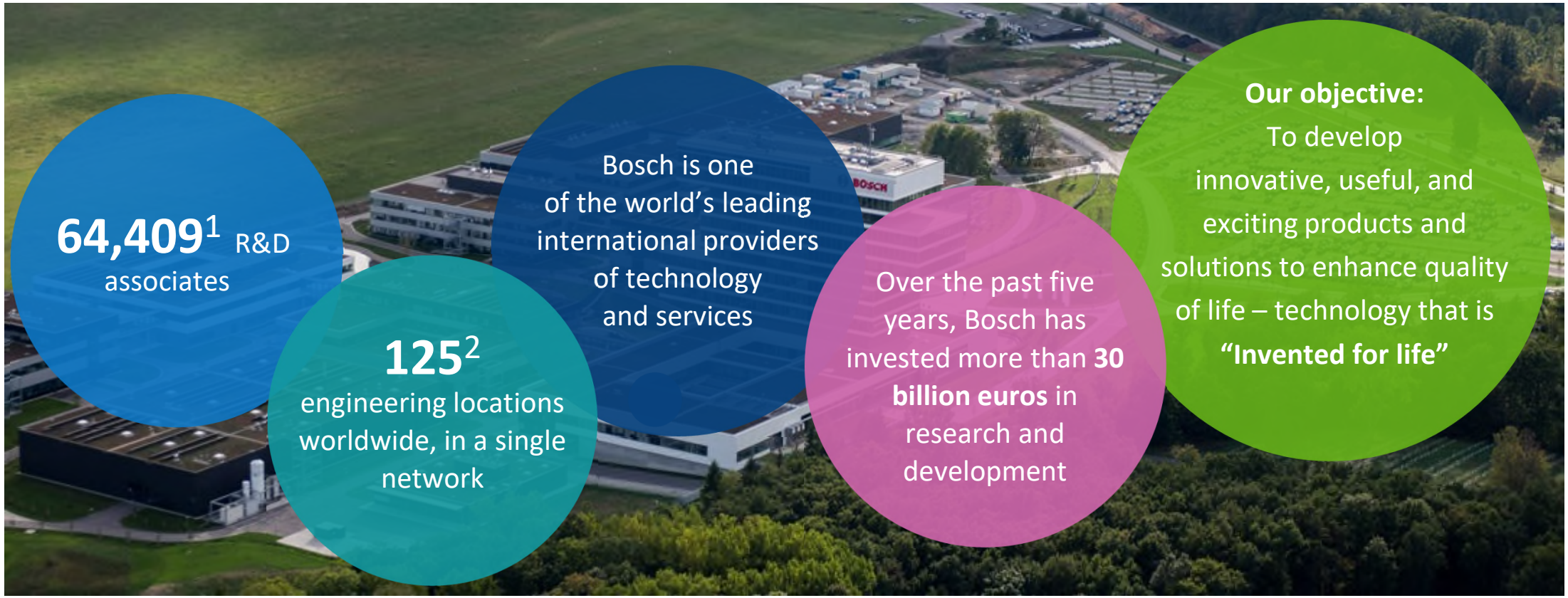
- Mobility Solutions
- Industrial Technology
- Energy & Building Technology
- Consumer Goods

Including sales and service partners, Bosch's global manufacturing and sales network covers nearly every country in the world.

* As of 12.17

Bosch – A Global Network

Technology to enhance quality of life



[1] as of 12.17 [2] R&D locations with >50 associates, as of 12.17

Bosch – A Global Network

Four Business Sectors

Mobility Solutions

Industrial Technology

Energy & Building Technology

Consumer Goods

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CONNECTED INDUSTRY

FROM THEORY TO PRACTICAL IMPLEMENTATION


Bosch Connected Industry

Industry 4.0 at Bosch

Connected Industry: our dual strategy

Sensors

Drives & Controls

Software & Data Analytics

Machinery & Robotics

Logistics

Services

Leading Provider

Leading User

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IoT@Bosch
Connectivity at Bosch

Industry 4.0 at Bosch

Connecting the entire value stream

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Market and figures for 2017* & Reader Inventory

Bosch Group

- € 78.1 billion euros in sales
- 402,166 associates
- 280 manufacturing sites

Europe

Share of sales	52%
Associates	245,040
Manufacturing sites	160
UHF RFID "RAIN" Devices	2944

Asia Pacific[1]

Share of sales	30%
Associates	112,817
Manufacturing sites	78
UHF RFID "RAIN" Devices	875

Americas

Share of sales	18%
Associates	44,309
Manufacturing sites	42
UHF RFID "RAIN" Devices	480

* as of 12.17

[1] Including other countries

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History and Status

- RFID@BOSCH was founded in 2010:
  Bosch Diesel Equipment plant Homburg participating in government funded *RAN Project*

- By end of 2013, IT setup for RFID reader implementation had been standardized
  - Flawless automatic triggering of ERP transactions – automated SAP bookings by RFID reading events

- Foundation of CoC RFID@BOSCH in 2014 led to separation of technology from shop floor processes

- The fields of action of the CoC are
  UHF RFID Hardware, incl. IT connectivity
  Object Identification, incl. schemes and number ranges

- RFID@BOSCH today stands for a highly standardized UHF RFID technology implementation

RFID@BOSCH 2018: Opportunities and Challenges

Opportunities

- UHF RFID is the least expensive approach to make passive objects available in the (industrial) IoT
  - Items – products – things with no source of energy can participate at a digital world
- GS1 Gen2 / ISO 18000-63 reader conformance is almost 100% in the market
- UHF RFID Hardware became less expensive in the past years - but still room for improvement…
- Industrial RFID implementation is 2018 still at its beginning
  - Actually roughly only 15% of value streams are RFID-enabled
- VDA kicks-off RTI pool tagging (of approx. 90 m RTI)
- UHF RFID as communication interface for low cost (environmental) sensing devices

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Challenges – Hardware

- Reliability of RFID transponders
  - Bit flip at Volkswagen led to scrapping of car body in paint shop, as ID was lost
  - 3 cases of bit flips of RFID ICs at Bosch so far – monetary loss ~ 1000 €
  - IC manufacturers have been made aware

- No uniform communication interface between UHF hardware and computing devices (e.g. via BLE)
  - Many different operating systems of mobile devices with integrated computer
  - Discretely developed apps – on iOS or Android (or Win10 mobile) – always work with only 1 reader series
  - Separate UHF reading devices from e.g. mobile phones will persist - standardized BLE interface would help

RFID@BOSCH 2018: Opportunities and Challenges

Challenges – Data Encoding Schemes

- Inhouse implementation of GS1 ID keys scheme, e.g. for RTI (GRAI), since 2014
  - SAP ERP (AII) had to be reworked, advanced, to fulfil all requirements
  - In 2015 VDA tagging recommendations were released, requiring 6bit compression and use of AFIs and DIs
  - TDS and ISO/IEC standards paperwork doesn't offer much compatibility

- Capture of everyday items – THINGs – in the IoT requires more standardization of the EPC memory
  - Object IDs should reveal an object type / object class
  - Proprietary IDs dominate

- Storage of sensor data in UM (used as EEPROM)
  - No international open standard available
  - Enhancement of GS1 GenSpec or proper ISO paper is missing - proprietary solutions dominate
  - Implementation of new application identifiers is on hold by GS1

RFID@BOSCH 2018: Opportunities and Challenges

SUMMARY

- We believe that UHF RFID has a great future as the leading Auto-ID technology
- We think that it’s role in the IoT is highly underestimated
- We appreciate the work of standardization bodies like the ISO TCs and GS1
- We appreciate the work of industrial alliances like RAIN® to keep the air interface protocol clean
- We’re convinced that wider use of UHF RFID requires appropriate enhancement of standards

THANK YOU

Invented for life

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