BOSCH CONNECTED INDUSTRY

Michael Goh

BOSCH

Bosch Group
Overview

Shareholders
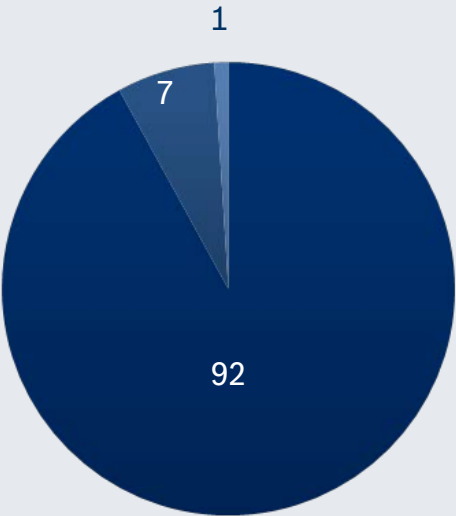
- **1** Robert Bosch GmbH
- **7** Bosch family
- **92** Robert Bosch Stiftung

4
Business sectors and divisions

Mobility Solutions

Industrial Technology

Consumer Goods

Energy and Building Technology

Mobility Solutions

World's largest supplier of cutting-edge automotive technology

Industrial Technology

Leading in drive and control technology, packaging, and process technology

Consumer Goods

World's largest power tool manufacturer
Leading the field in household appliances

Energy and Building Technology

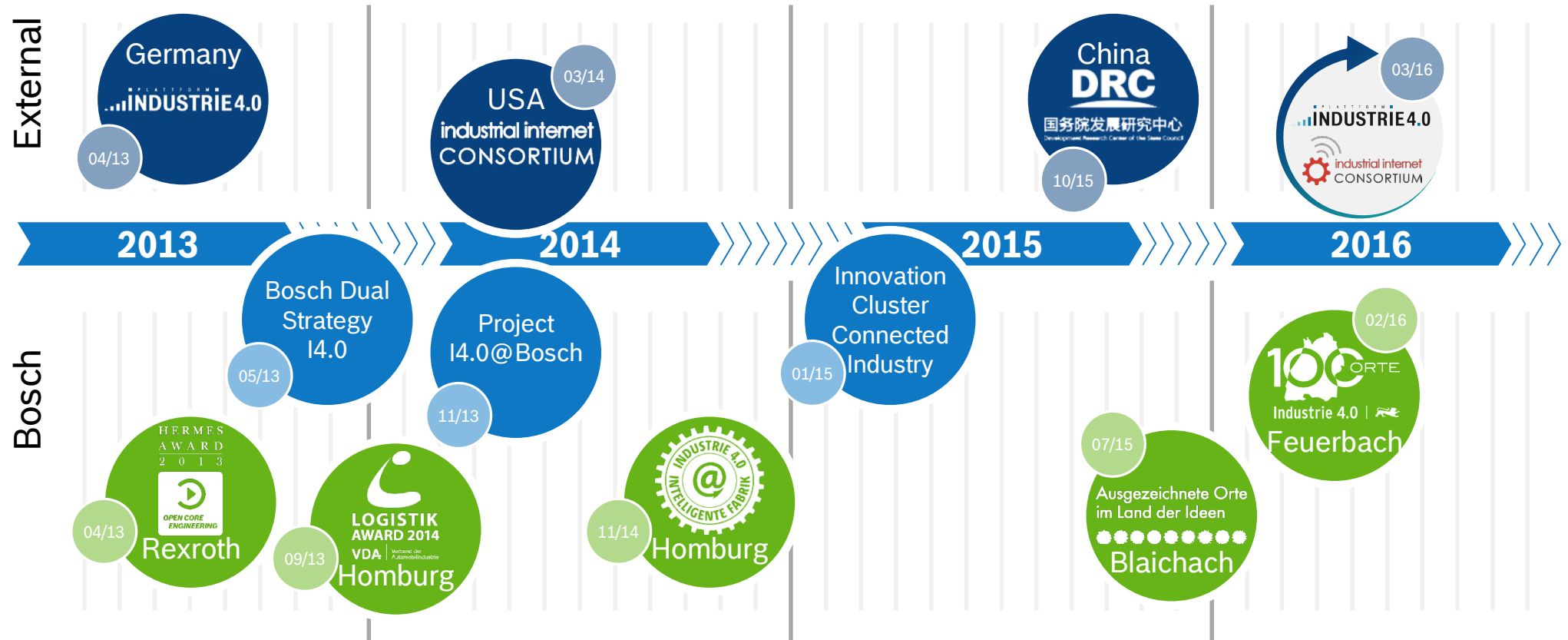Leading manufacturer of thermo, and building security technology; World's largest supplier of heat pumps

approx. **400,500** associates

78 billion euros in sales in 2017

Industry 4.0 live at Bosch
i4.0 our journey and achievements

External

Germany
...INDUSTRIE 4.0
04/13

USA industrial internet CONSORTIUM
03/14

China DRC 国务院发展研究中心
Development Research Center of the State Council
10/15

INDUSTRIE 4.0 industrial internet CONSORTIUM
03/16

2013 2014 2015 2016

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Bosch Dual Strategy I4.0
05/13

Project I4.0@Bosch
11/13

Innovation Cluster Connected Industry
01/15

100 ORTE Industrie 4.0
02/16

HERMES AWARD 2013 OPEN CORE ENGINEERING
04/13 Rexroth

LOGISTIK AWARD 2014 VDA Verband der Automobilindustrie
09/13 Homburg

INDUSTRIE 4.0 INTELLIGENTE FABRIK
11/14 Homburg

Ausgezeichnete Orte im Land der Ideen
07/15 Blaichach

Feuerbach

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Industry 4.0 live at Bosch
Industry 4.0 − more than a hype?

IoT / I4.0 in Germany

Expectations

I4.0 worldwide

Take advantage of our experience!

I4.0 applications within Bosch

| Innovation Trigger | Peak of Inflated Expectations | Trough of Disillusionment | Slope of Enlightenment | Plateau of Productivity |

Time
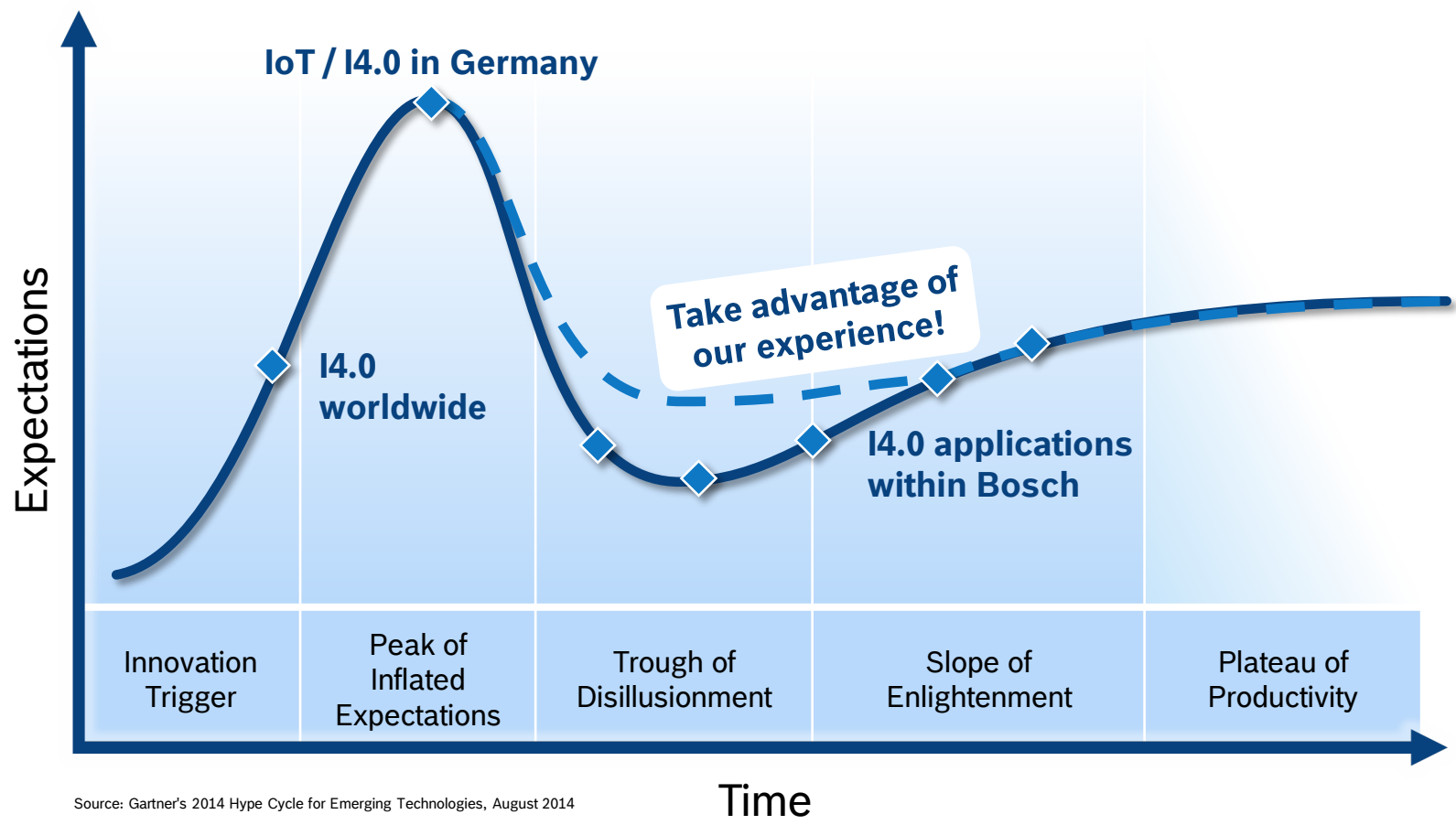
Source: Gartner's 2014 Hype Cycle for Emerging Technologies, August 2014

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Industry 4.0 at Bosch
Connected Industry: our dual strategy

Sensors

Drives & Controls

Software & Data Analytics

Machinery & Robotics

Logistics

Services

Leading Provider
70+ Solutions

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By 2020
EUR ~1bn
extra turnover

Leading User
270+ Bosch Plants
700+ storages
Worldwide

· · · · · · · · · · ·

By 2020
EUR ~1bn
extra savings

Bosch Connected Industry –
Benefits of Connectivity and Industry 4.0

Connectivity and Industry 4.0 create continuous transparency and efficiency throughout processes in production and logistics.

This leads to lower maintenance and repair costs and higher machine availability.

Smart software solutions and services from Bosch Connected Industry simplify the daily work of employees and optimize production and logistics processes when it comes to transparency, agility, costs, quality.

TRANSPARENCY   AGILITY   COST   QUALITY   TIME

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Industry 4.0 live at Bosch
i4.0 use cases and benefits – examples

Digital Supply Chain
- ✓ stock saving
- ✓ efficiency increase
- ✓ transparency along supply chain

Convertible Equipment
- ✓ fix cost reduction
- ✓ efficient M2H collaboration
- ✓ human relief of heavy load / repetitive tasks

Shop Floor Mgmt. Information
- ✓ real time data
- ✓ fast escalation
- ✓ paperless

Power / Energy Management
- ✓ peak reduction
- ✓ energy cost saving

Operator Support
- ✓ agility & quick reaction
- ✓ quality increase
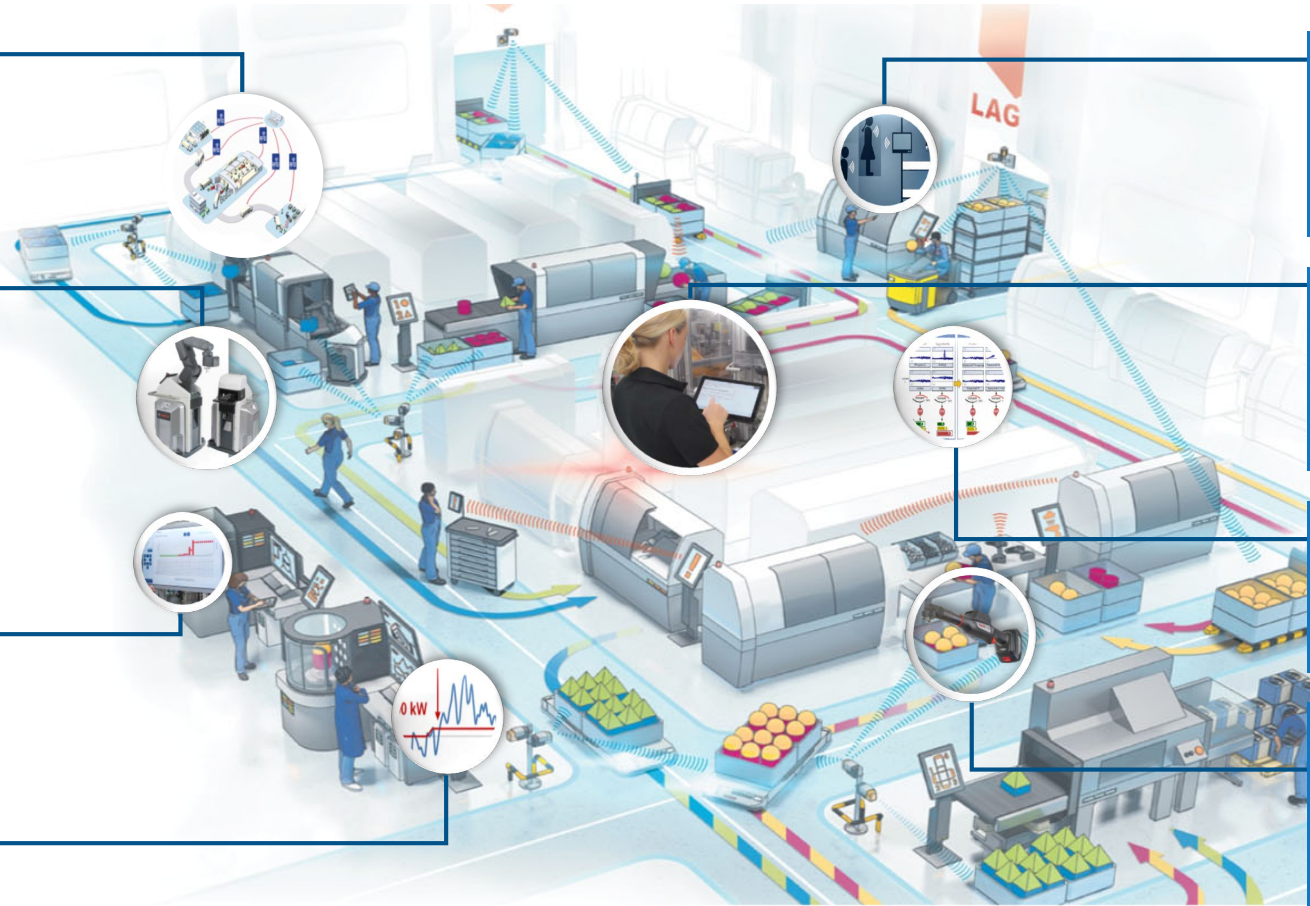- ✓ efficiency increase

Predictive Maintenance
- ✓ improve OEE
- ✓ no sudden breakdown

Adaptive Testing
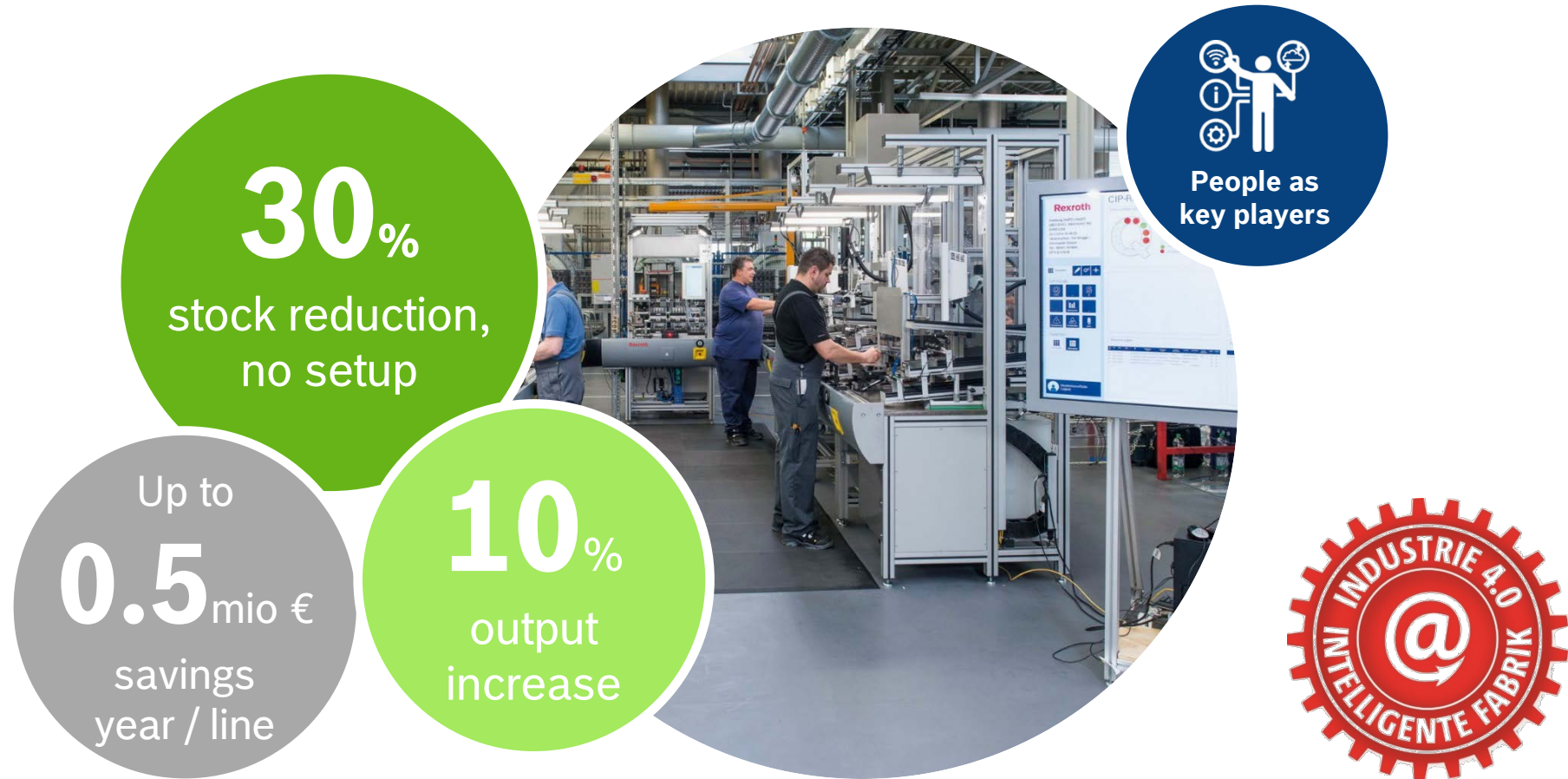- ✓ increase efficiency
- ✓ less invest

Quality Improvement
- ✓ instant feedback
- ✓ fast identification of error sources

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i4.0 in an entire line − example Homburg

30% stock reduction, no setup

Up to **0.5** mio € savings year / line

10% output increase

People as key players

INDUSTRIE 4.0 @ INTELLIGENTE FABRIK

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Logistics with RFID

30% reduction of stock in processes

10% efficiency increase in processes

LOGISTIK AWARD 2014
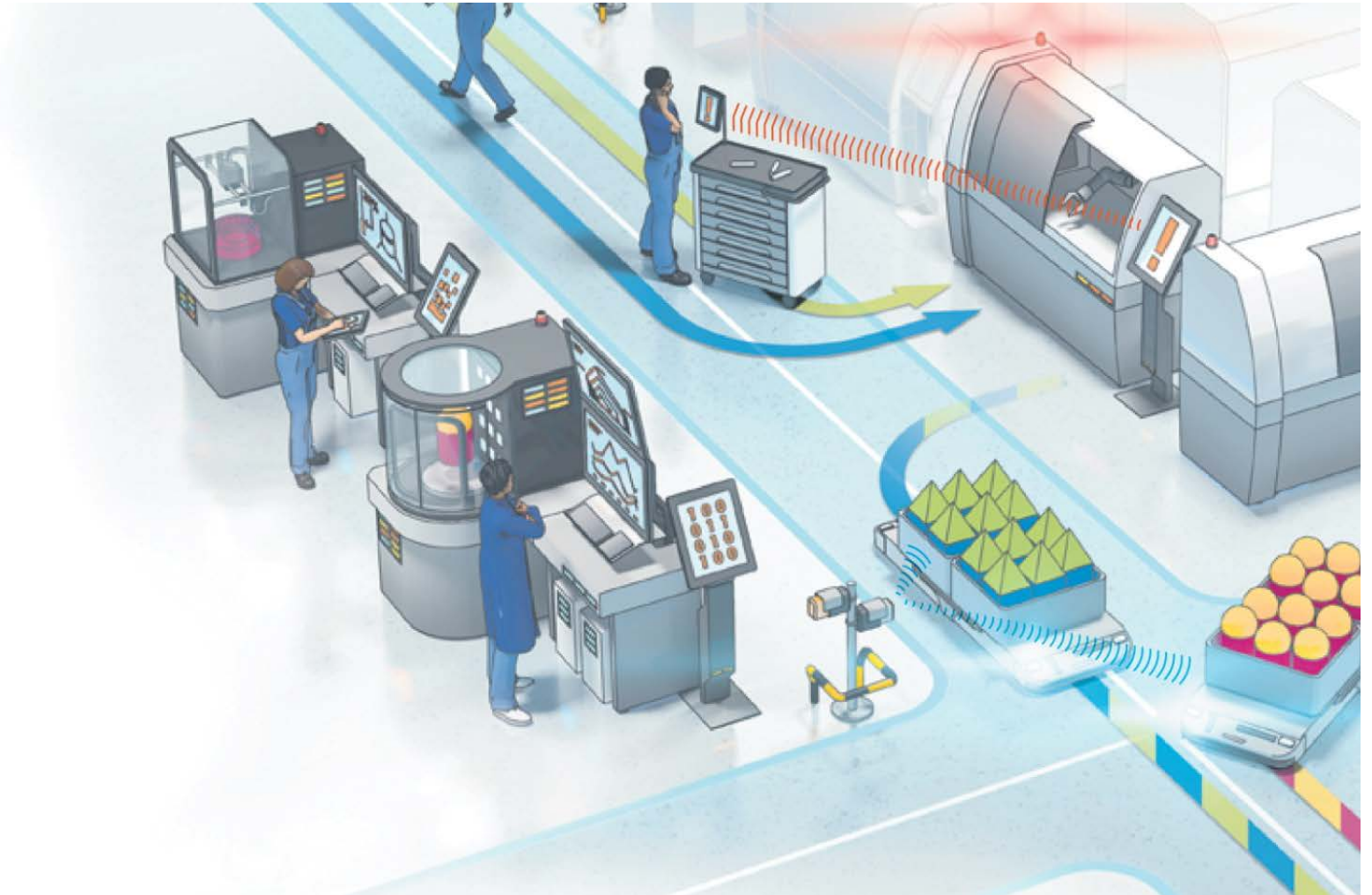VDA | Verband der Automobilindustrie

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Predictive quality:
Close examination of questionable parts based on millions of data points.

Data mining for quality:

At the Anderson plant in the U.S. "data mining" already gets used to improve quality.

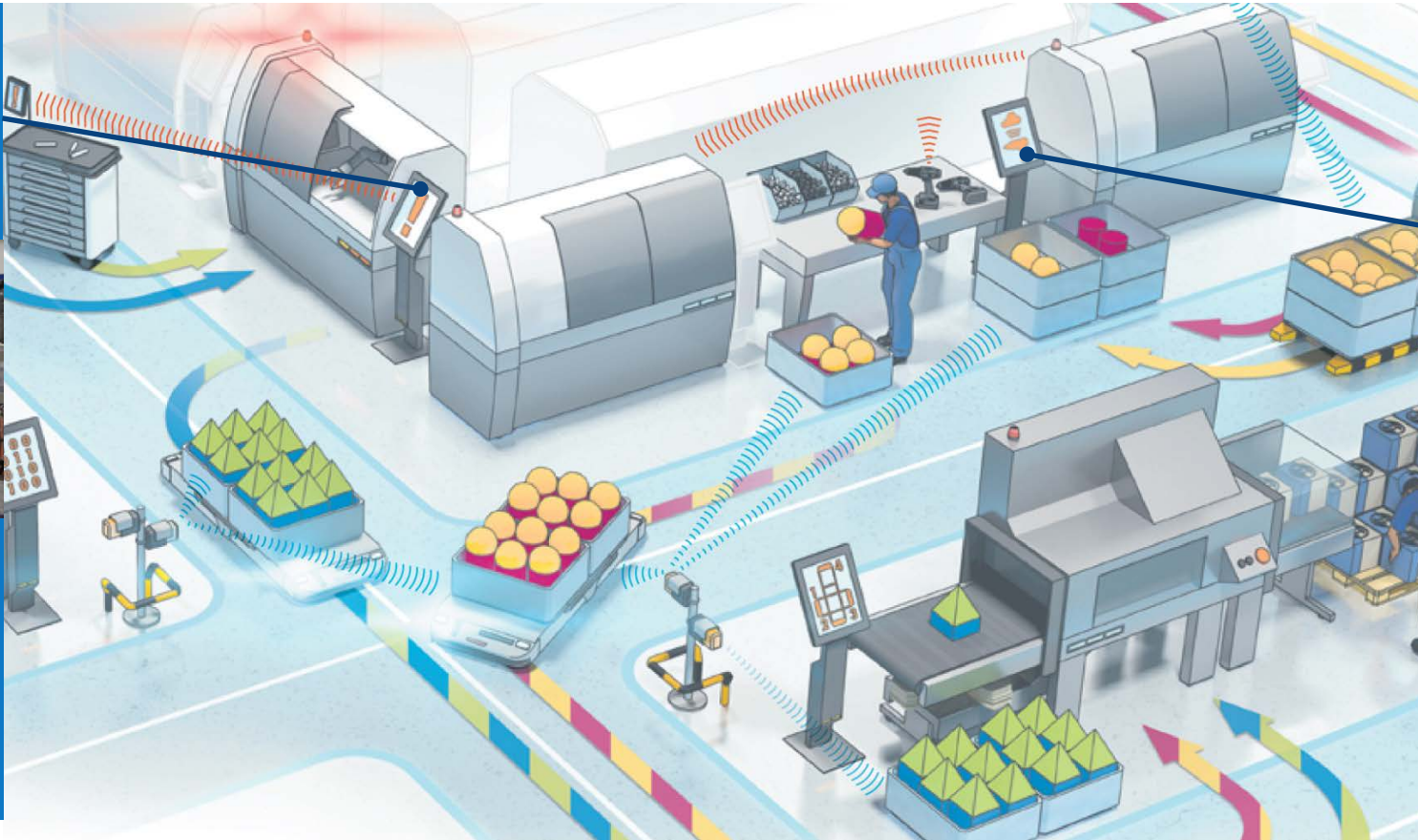**BOSCH**

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Facilities predict problems:
Smart lines analyze data and report problems directly to the service department.

Predictive Maintenance:
A pilot is up and running at Bosch. Bosch Software innovations offers this type of solution.

Data from Tools:
Tools are networked and send important data to server for quality proof.

"Nexo" Smart Tightening:
Screwdriver is able to measure and submit the tightening torque and screwing angle for quality prove.

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Condition Monitoring and Collaboration

| Data Acquisition | Analytics | Collaboration |

Machines with no connectivity

IoT Gateway

8-in-1 Sensor

Production Performance Manager

Active Cockpit
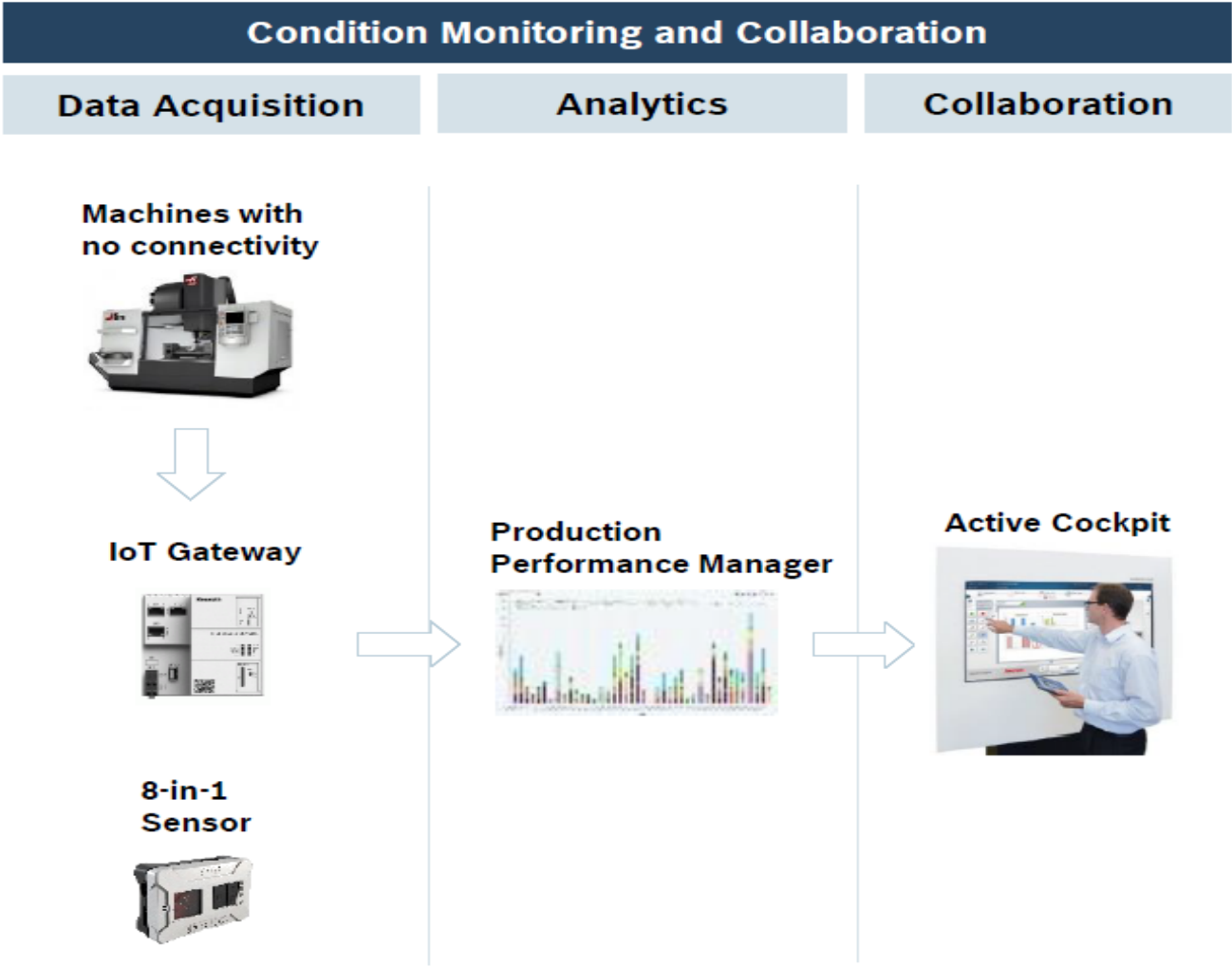
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Industry 4.0 live at Bosch
Production quality: Smart tightening

Estimate: down time reduced by **10**%

Estimate: failure costs reduced by **10**%

Failure reaction time drastically reduced
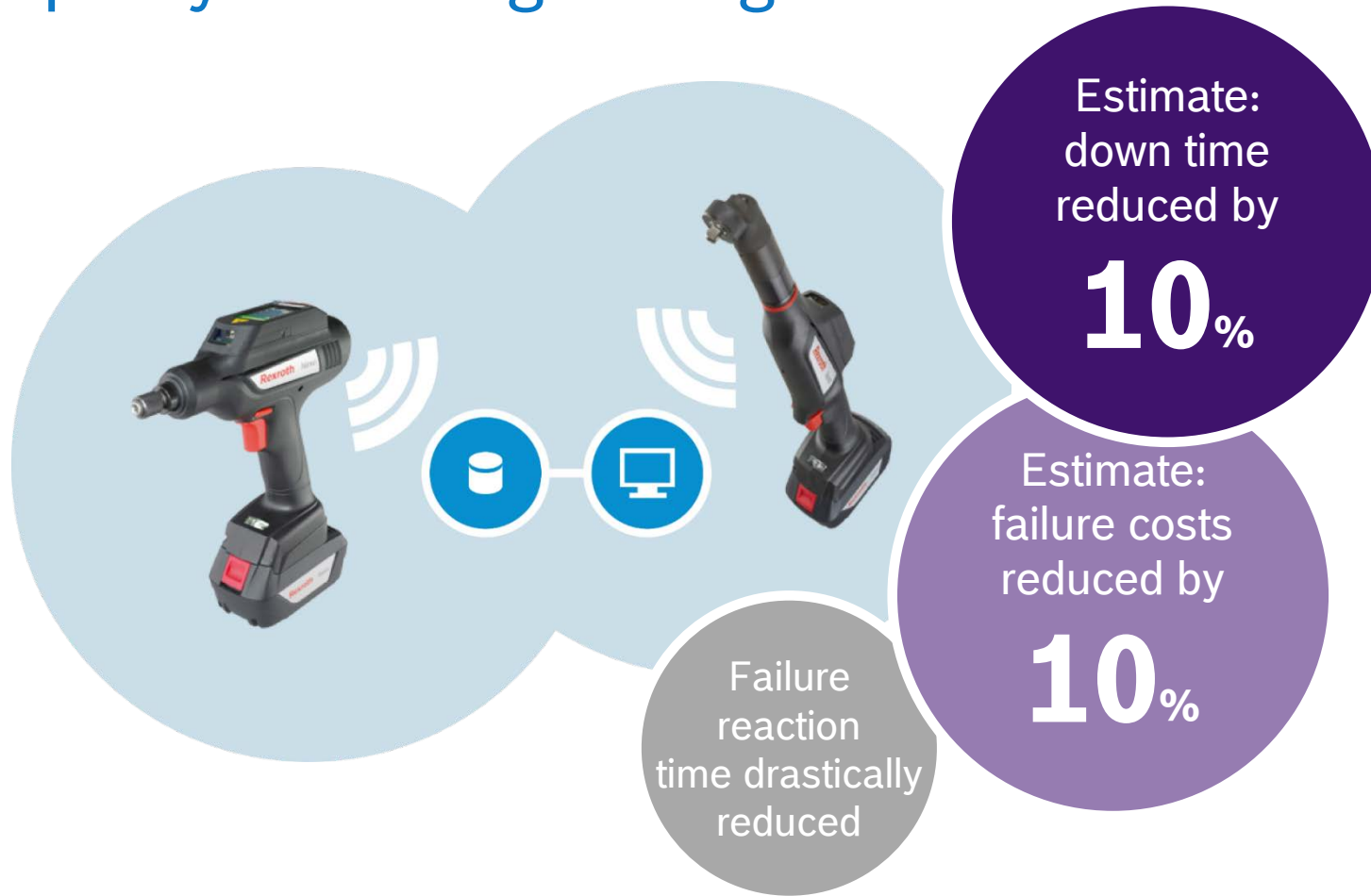
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i4.0 in an IPN − example ABS / ESP

11 plants

>5000 machines connected

Worldwide plant benchmarking based on MES

Up to 25% productivity increase

More than 26 mio. units / year
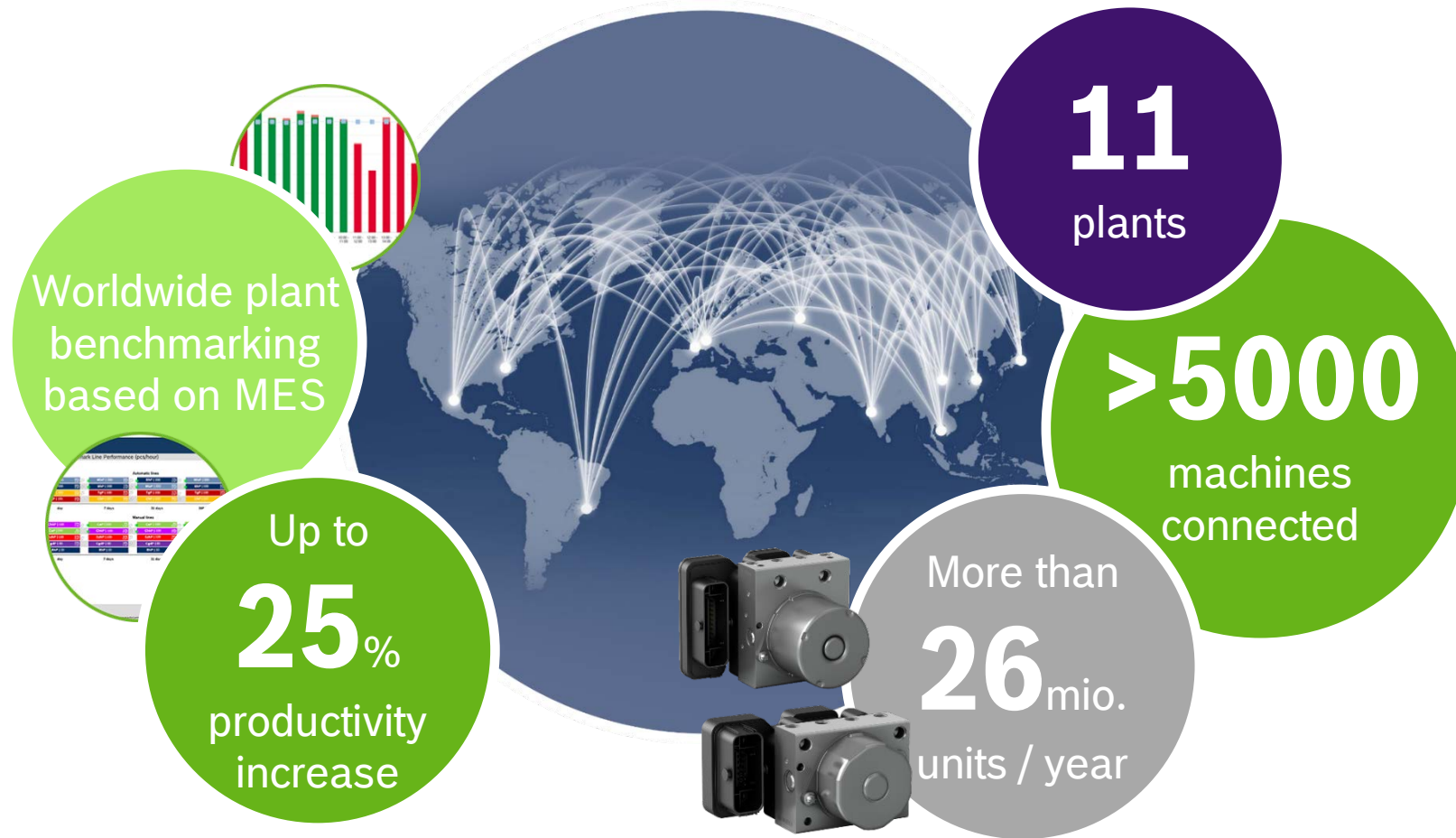
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Industry 4.0 live at Bosch
Active Assist Industry 4.0 Workplace

freely configurable and adaptable

Ergonomic

Worker Guidance

Hand Tracking

Nutrunner Positioning

Assembly data documentation

Interactive Instructions

Product identification

Interactive guiding of assembly steps

Reduced failure costs

Rexroth ActiveAssist
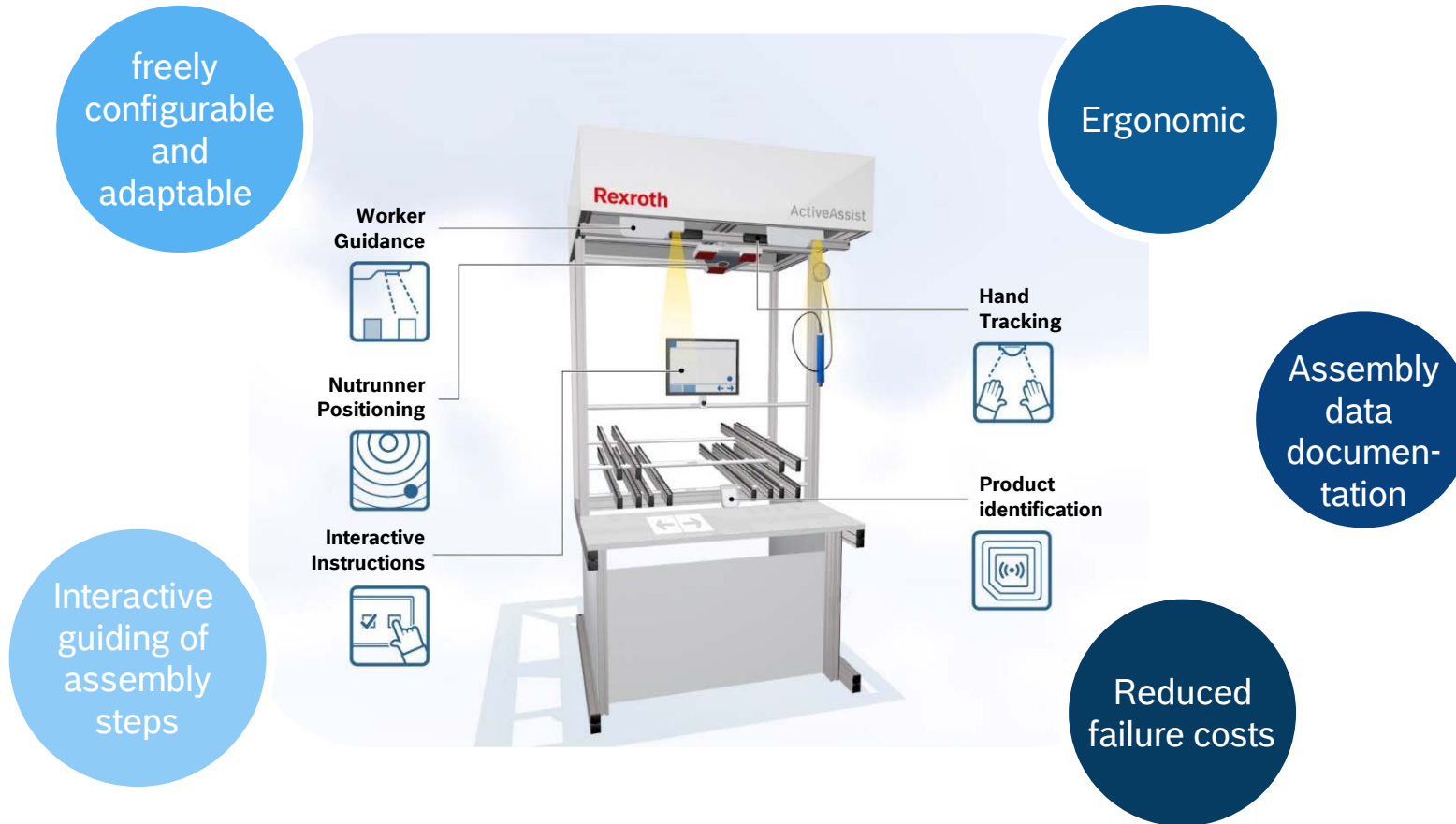
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Industry 4.0 live at Bosch
Flexible Automation - APAS assistant

- Flexible
- Mobile
- Collaborative
- Connected

Direct and safe collaboration
Sensorskin

Autonomous recognition of objects
Integrated 3D image processing system

Configuration instead of programming
User interface

Sensitive three-finger gripper
Universal gripper

Workspace monitoring Additional feature
APAS speed switch

Location-independent
Quick release castors

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Industry 4.0 live at Bosch
Advanced manufacturing for educational institutions

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Bosch IoT Suite
Architecture
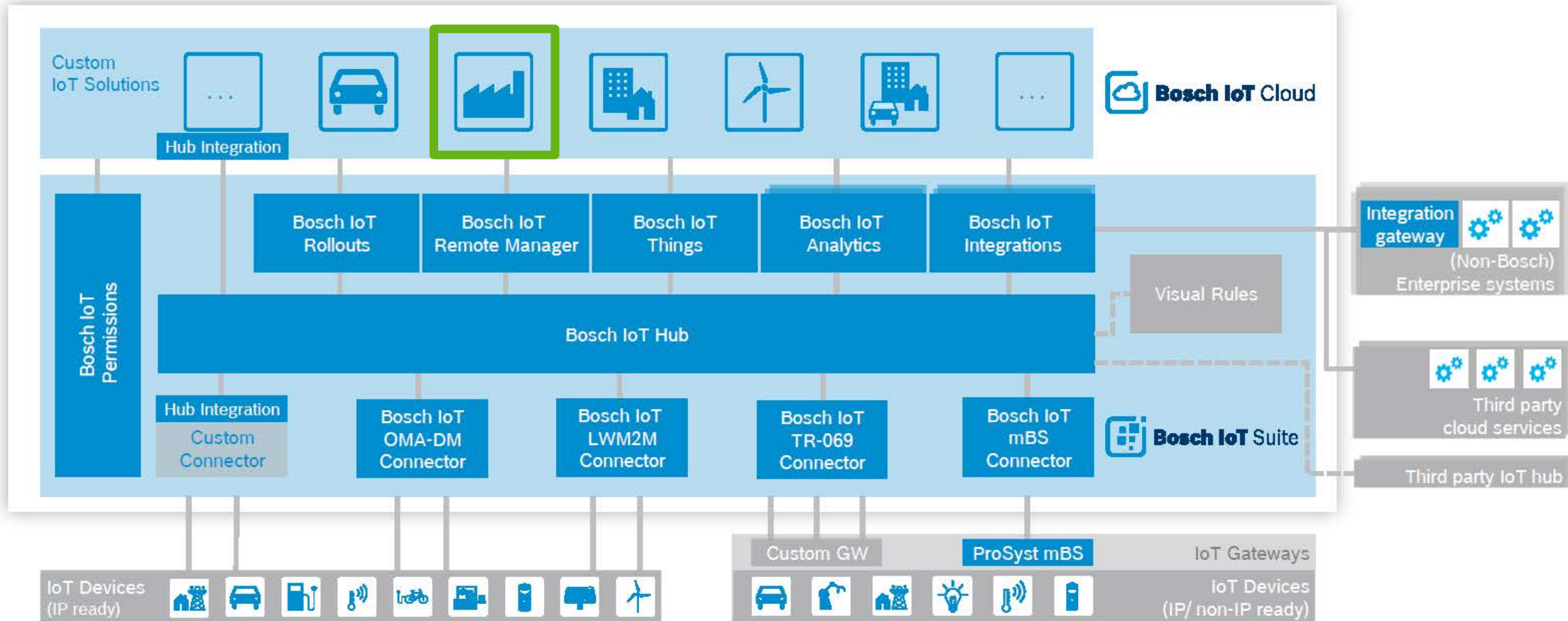
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Bosch Connected Industry
Nexeed Portfolio

NEXEED

Portfolio overview

Nexeed Connected Manufacturing								Nexeed Connected Logistics	
Nexeed Manufacturing Execution System / Nexeed Maintenance Support System	Nexeed Transparency Kit	Nexeed Automation	Nexeed Production Performance Manager	Nexeed Remote Shopfloor Access	Nexeed Data Analytics	Nexeed Device Portal	Nexeed Energy Platform	Nexeed Track & Trace	Nexeed Intralogistics Execution

Nexeed Open Integration
Harmonization solution of different software systems and applications for production and logistics.
Integration of Bosch Connected Industry solutions, Bosch solutions and third-party solutions.

THANK YOU FOR YOUR ATTENTION!

For further enquiries, please kindly contact:
Michael Goh
HP: +65 9834 3700
Email: michael.goh@sg.bosch.com

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