

BOSCH IOT SUITE –

WE CONNECT EVERYTHING

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Bosch Software Innovations EOOD



THE INTERNET OF THINGS

What is the Internet of Things?

At the heart of a new wave of innovation

- ▶ The IoT is about connecting things and machines.
- ▶ Connecting devices results in more data intelligence.
- ▶ Data insights and analytics give rise to new solutions and services.

Generate value
through new business
models and revenue
streams

Complement
conventional product
business

Improve the way
of running a business

Streamline and
automate processes

Make lives of
customers, citizens, or
employees safer,
easier, or more
comfortable

The Internet of Things

Enabling new business with digital services



Thing



Connectivity
[HW | SW]



1

Thing-based
FUNCTION

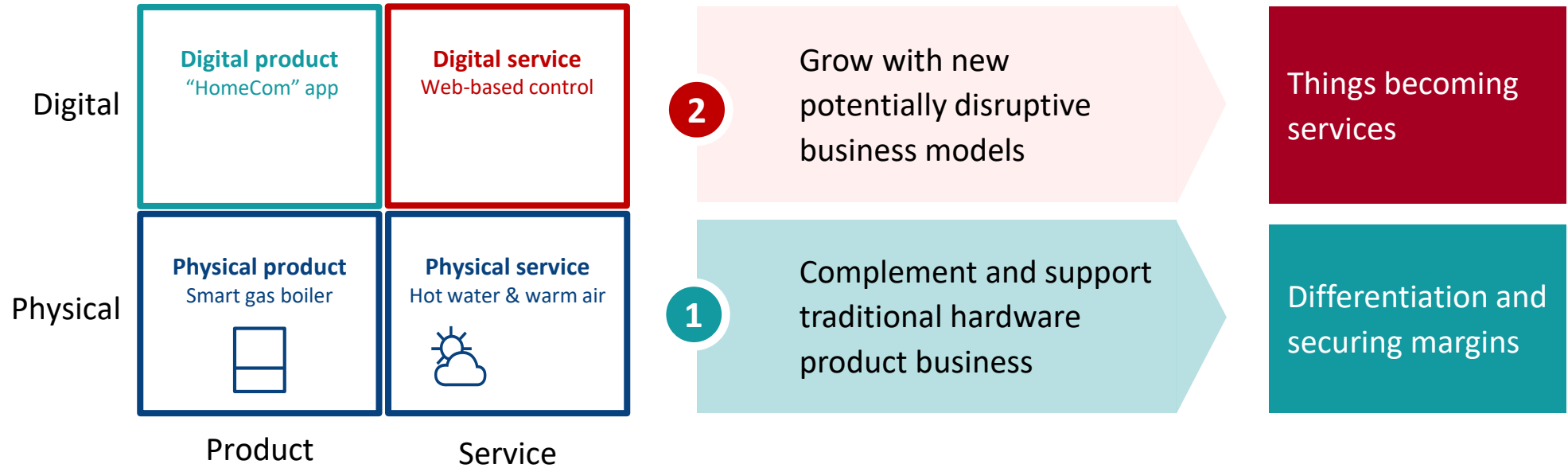
[Physical | Local]



2

IT-based
SERVICE

[Digital | Global]

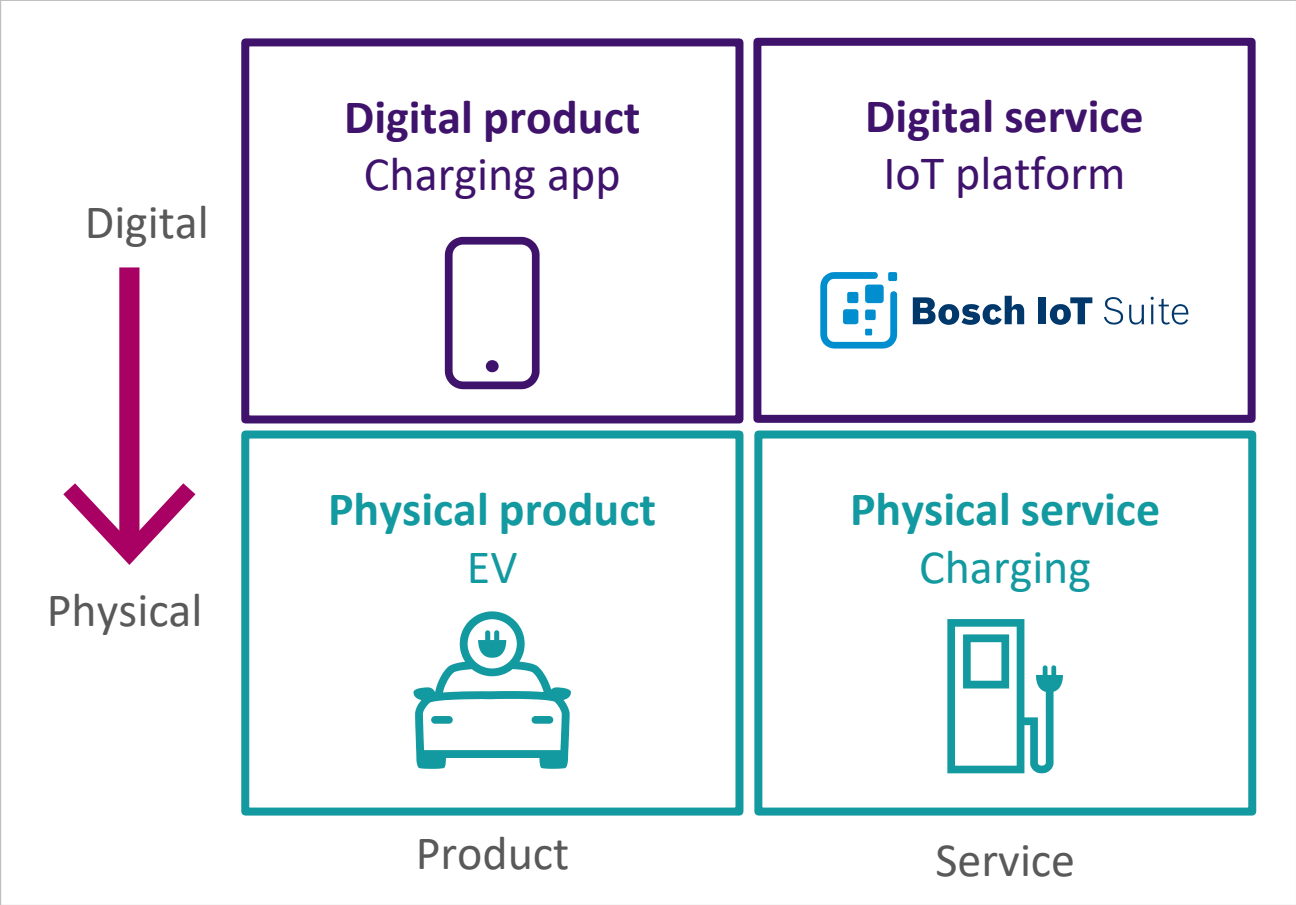
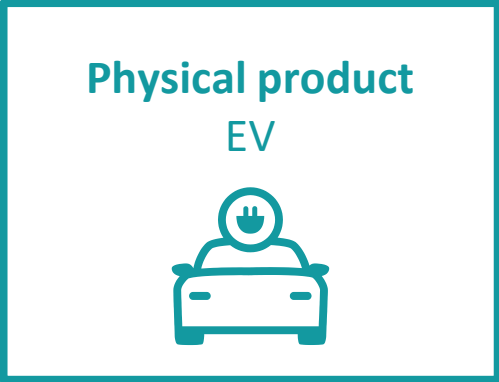


Sources: Prof. Elgar Fleisch, 2011, 2016

Bosch in the Internet of Things

From Physical Products to Digital Services

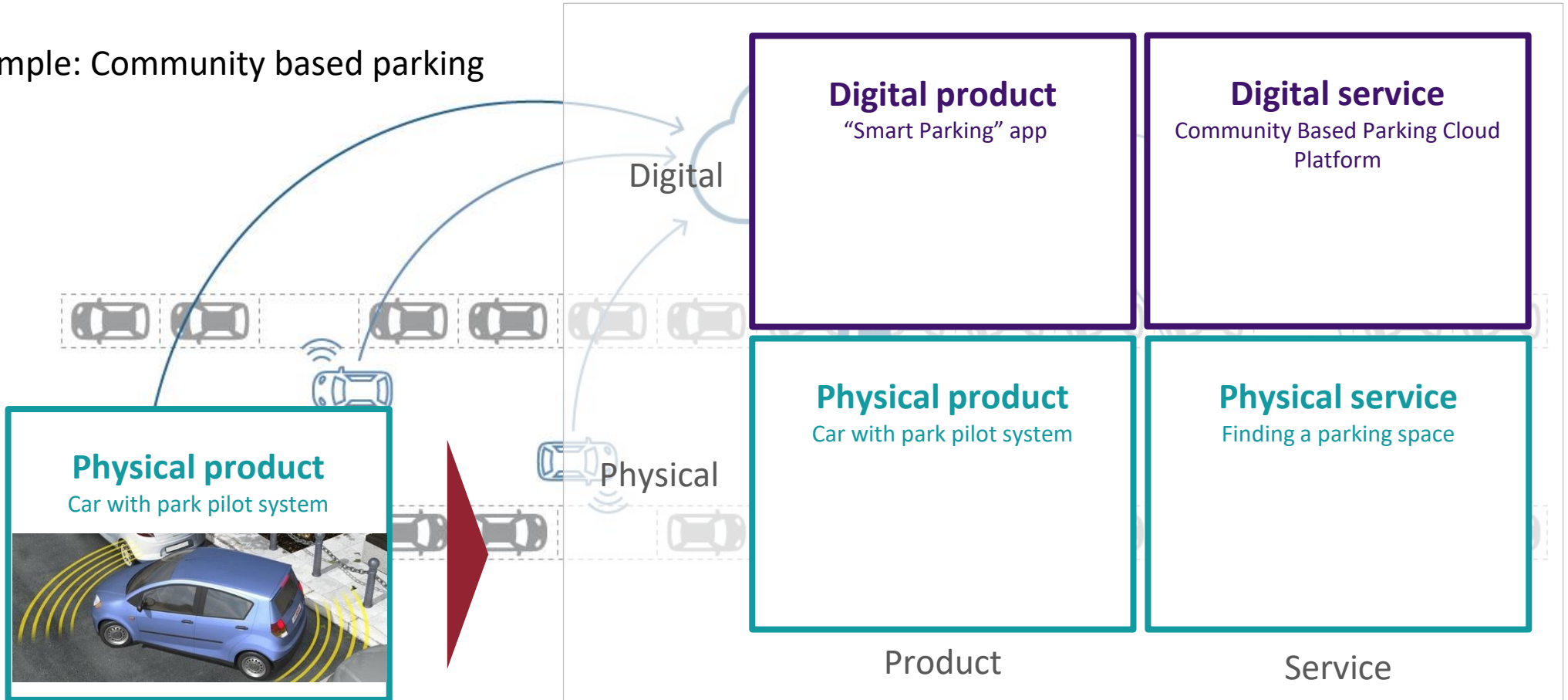
Example: EV Charging



Bosch in the Internet of Things

From Physical Products to Digital Services: Mobility

Example: Community based parking



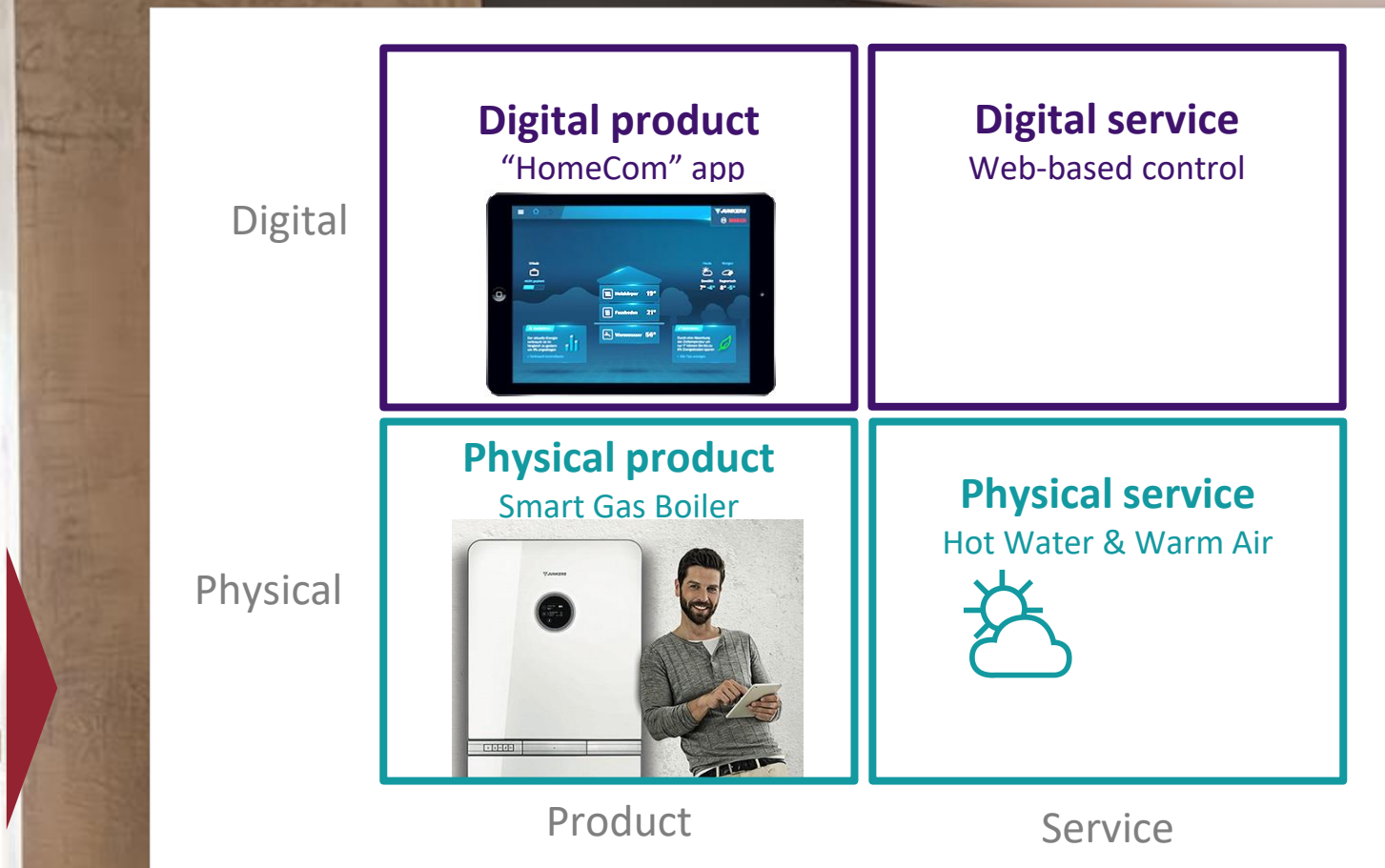

Hybrid Product Scheme: Prof. Elgar Fleisch, 2016

Bosch in the Internet of Things

From Physical Products to Digital Services: Smart Heating

Example:
Junkers Gas Boiler

Physical product
Gas Boiler (100 years ago)



Bosch in the Internet of Things

From Physical Products to Digital Services: Powertools

Example: "TrackMyTools"

Physical product
Electric Drill



Bosch Software Innovations

Global presence

Market presence

6.2m

connected devices using
Bosch IoT Suite



Know-how

800+

IoT experts around the world (Germany,
Bulgaria, Singapore, China, Japan, USA)



Projects in many
business areas

250+

IoT international projects in the areas of
manufacturing, mobility, energy, home &
building, city, agriculture ...



Bosch early IoT
visionary

2008

Bosch Software Innovations emerged out
of the two earliest acquisitions in the IoT
space



Our vision for the Internet of Things: The Connected World

Industry

Mobility

Energy

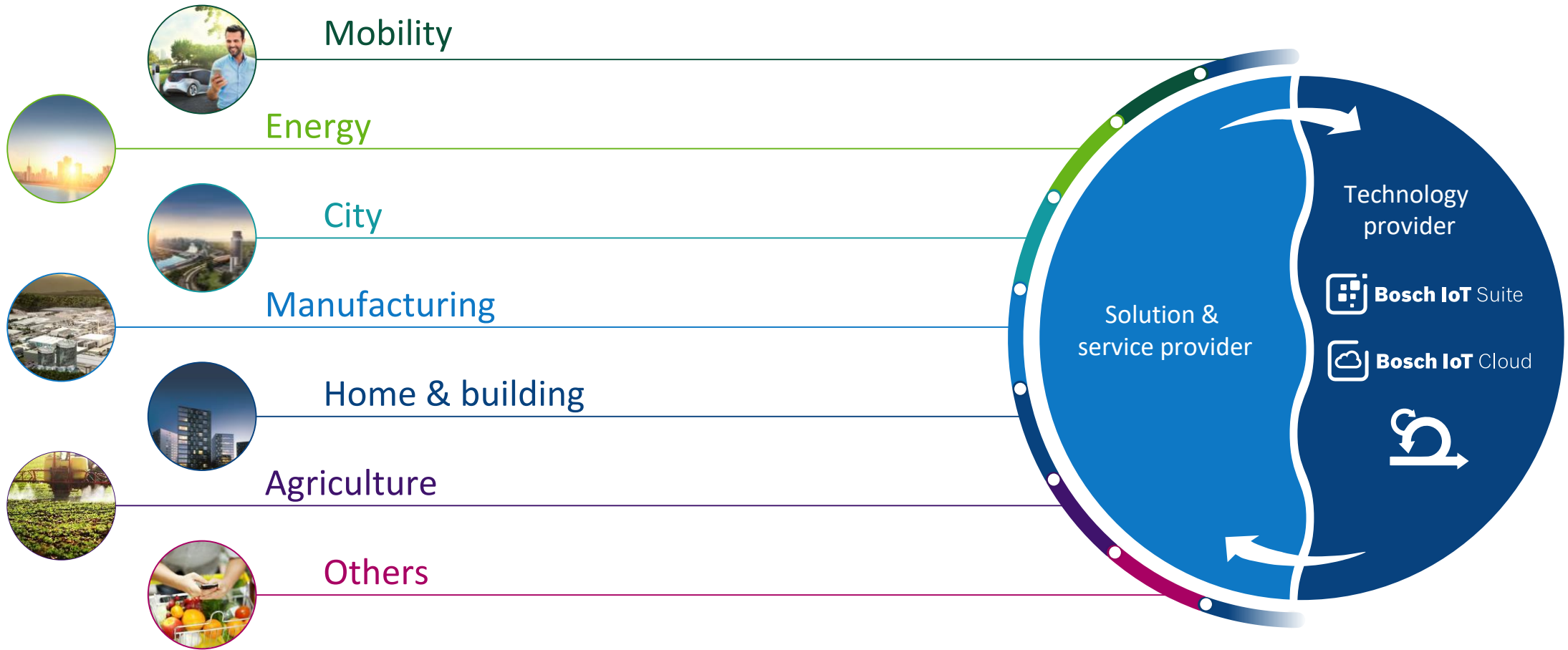
Home & Building

Smart City



Bosch Software Innovations

Business areas



Bosch Software Innovations

Our product groups and areas of activity

Mobility

Solutions for electromobility, intermodal transportation, and connected vehicles




Industry

Solutions for connected manufacturing



IoT General Projects

Tailored solutions for agriculture, cities, homes & buildings and new domains




Energy

Solutions for smart and simple energy management



PaaS

Core development of the Bosch IoT Suite



ProSyst

Gateway software and middleware for the IoT




Enterprise

Software for process management and business rules



Customer Success Services

Comprehensive IoT service and consulting portfolio



Spearheading the Internet of Things

IoT innovator, enabler, incubator & catalyst

Global IoT market

We develop, market, and sell

- ▶ IoT solutions for the manufacturing, energy, building, and mobility sectors.
- ▶ platform technology for customized IoT projects.

Bosch Group

We are an agile unit supporting the Bosch business units in a partnership approach for IoT competencies and technology.



We develop outstanding software solutions and products that take our internal and external customers to the next level of the Internet of Things.

The Bosch IoT Suite

Technology for the connected world

Trusted & secure

- ▶ Highest standards of data privacy
- ▶ State-of-the-art security technology
- ▶ Own data centers

Open & flexible

- ▶ Connectivity to other platforms
- ▶ Supporting different deployment models
- ▶ Actively engaged in open source communities and standardization bodies

Innovative

- ▶ Supporting innovative business models
- ▶ Opening up cross-domain use cases
- ▶ Consistent and systematic access to Bosch and 3rd party devices

Ready-to-Use

- ▶ Tailor-made for IoT
- ▶ Fast and easy subscription to services
- ▶ Deployment in a minute

Cost effective

- ▶ Shared platform – shared costs
- ▶ Easy entry pricing (service plans)
- ▶ Usage-based pricing

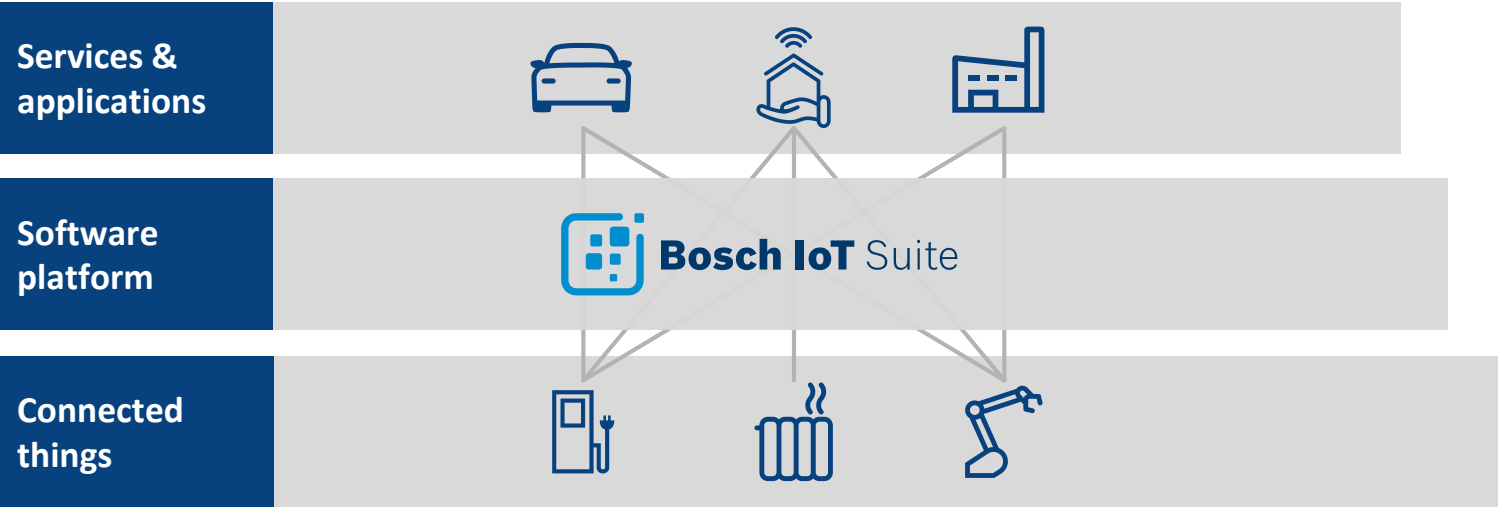
Key pillar for Bosch's IoT strategy

- ▶ Full service provider for connectivity and IoT (software, services, sensors)
- ▶ Domain knowledge from all divisions
- ▶ Lead supplier and lead user in IoT
- ▶ Ecosystem player



The Bosch IoT Suite

One open IoT software platform for all domains



Building
City
Energy
Manufacturing
Mobility



The Bosch IoT Suite Toolbox in the cloud for IoT developers



Bosch IoT Hub



Bosch IoT Things



Bosch IoT Rollouts



Bosch IoT Remote Manager



Bosch IoT Analytics



Bosch IoT Permissions

Software services
available on developer
marketplace

Successfully commercialize
prototype applications



The Bosch IoT Suite services

Tailor-made for Internet of Things scenarios



Bosch IoT Hub

Secure and reliable messaging for device-related communication between services in the cloud



Bosch IoT Remote Manager

Remote IoT gateway and device management service



Bosch IoT Things

Managed inventory of IoT device assets



Bosch IoT Analytics

Leverage the data of IoT connected devices



Bosch IoT Rollouts

Rollout software and firmware updates to devices

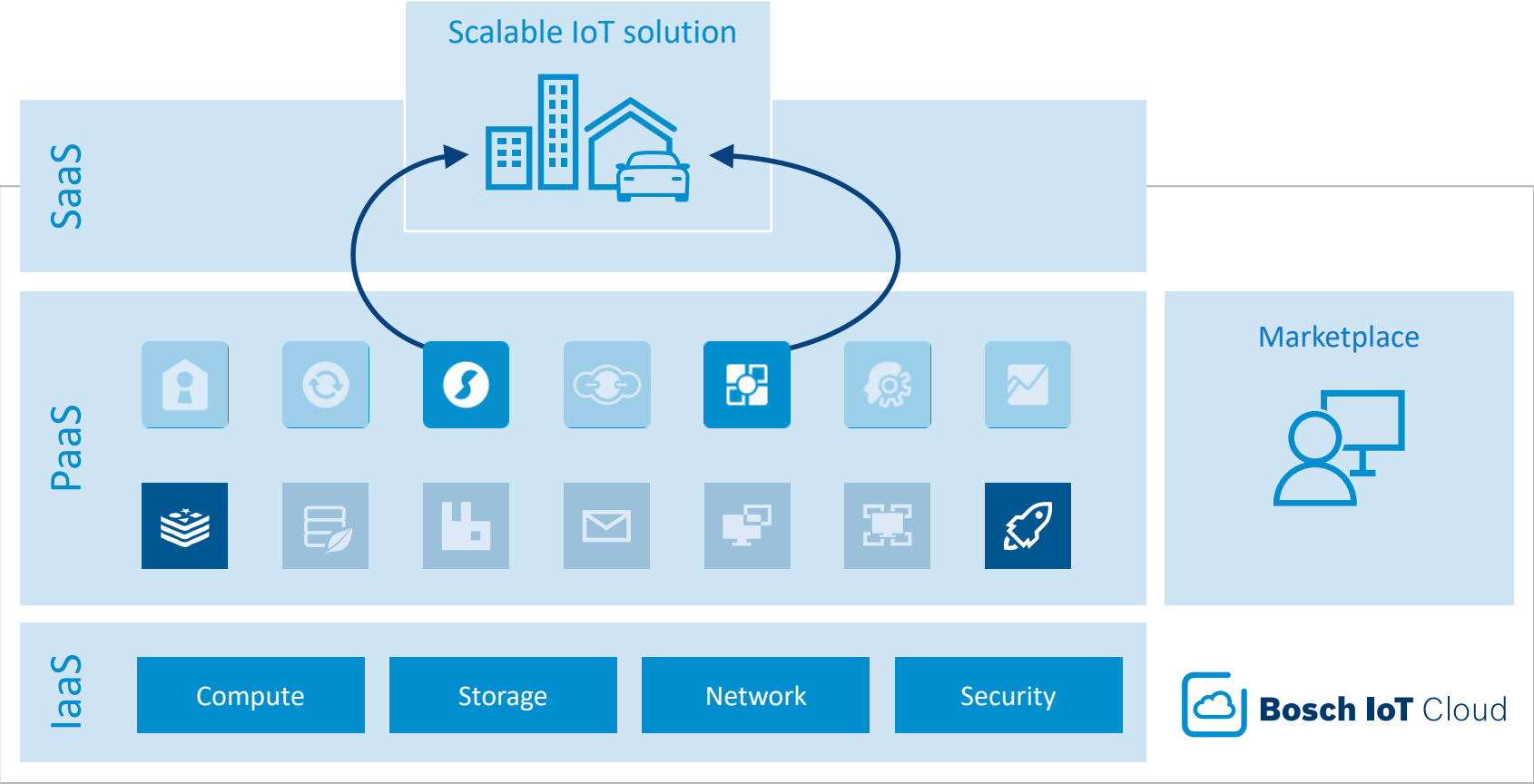


Bosch IoT Permissions

Authorization management for IoT applications

The Bosch IoT Suite

Developer building blocks for creating IoT solutions





Strategic completion of our sensor,
software, and service portfolio

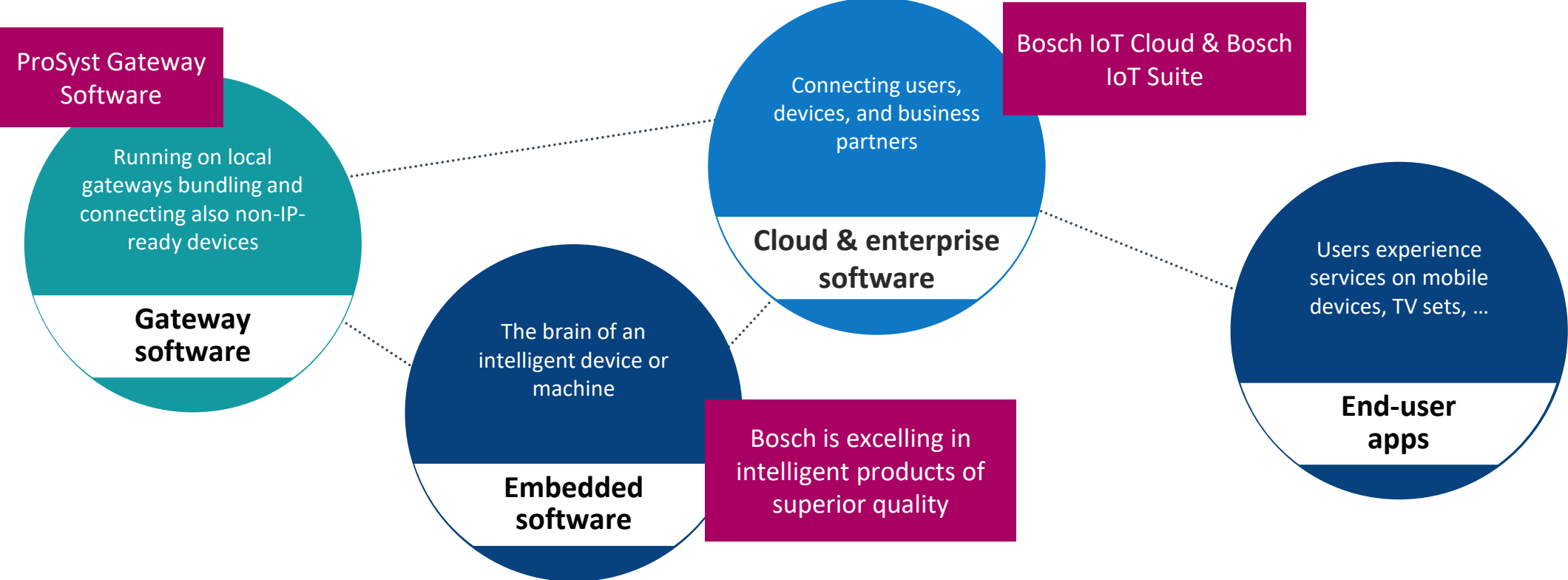
Foundation for IoT solutions delivered
by Bosch and our partners

Strong focus on privacy and security

Important milestone in our transformation into a
product company with advanced IT capabilities

Software components

Strategic impact on IoT applications

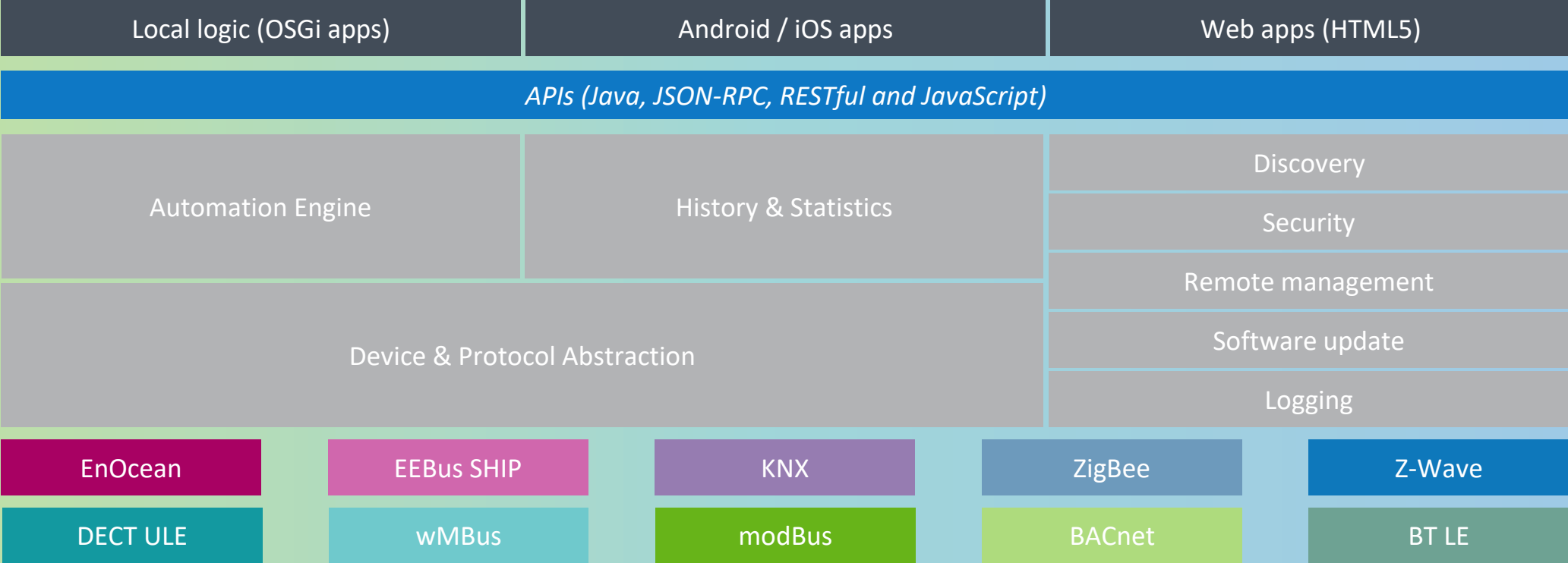


Technological, commercial, and user angles covered through Bosch

ProSyst Gateway Software

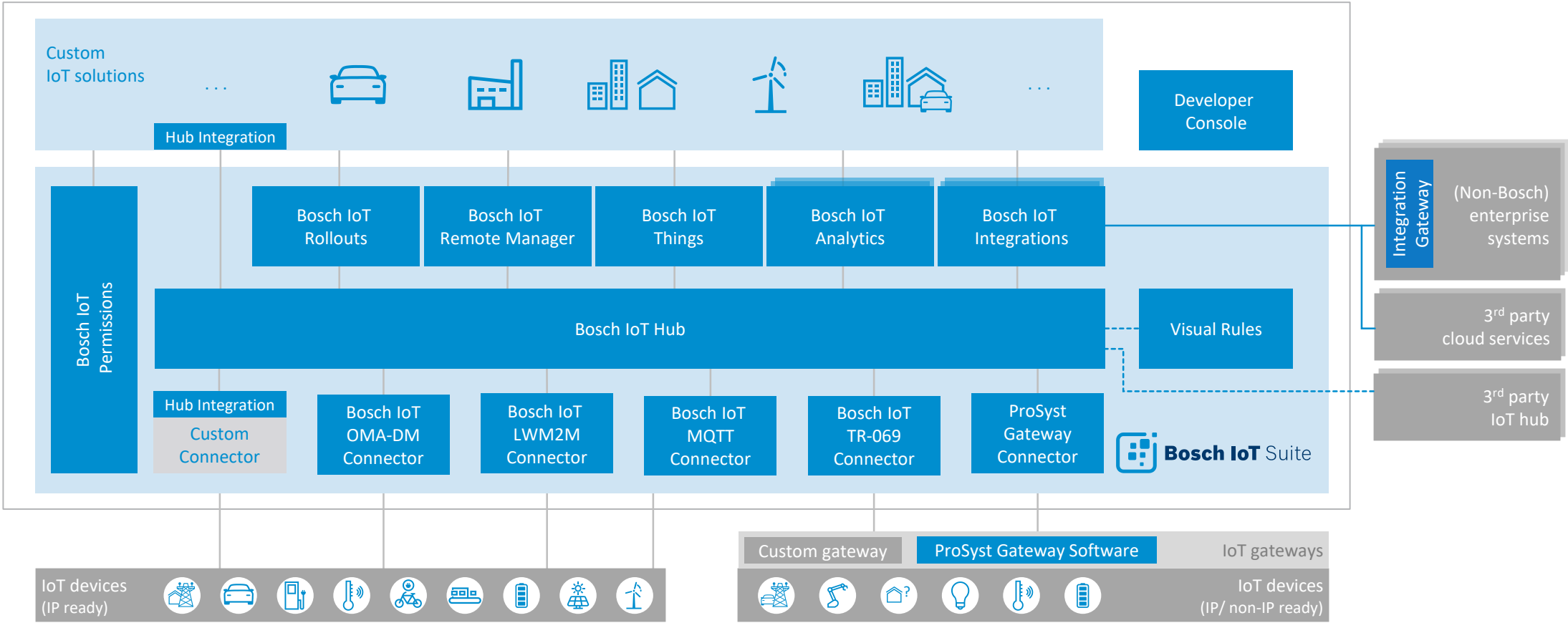
Overview device protocols

ProSyst OSGi middleware stack



The Bosch IoT Suite

Target architecture



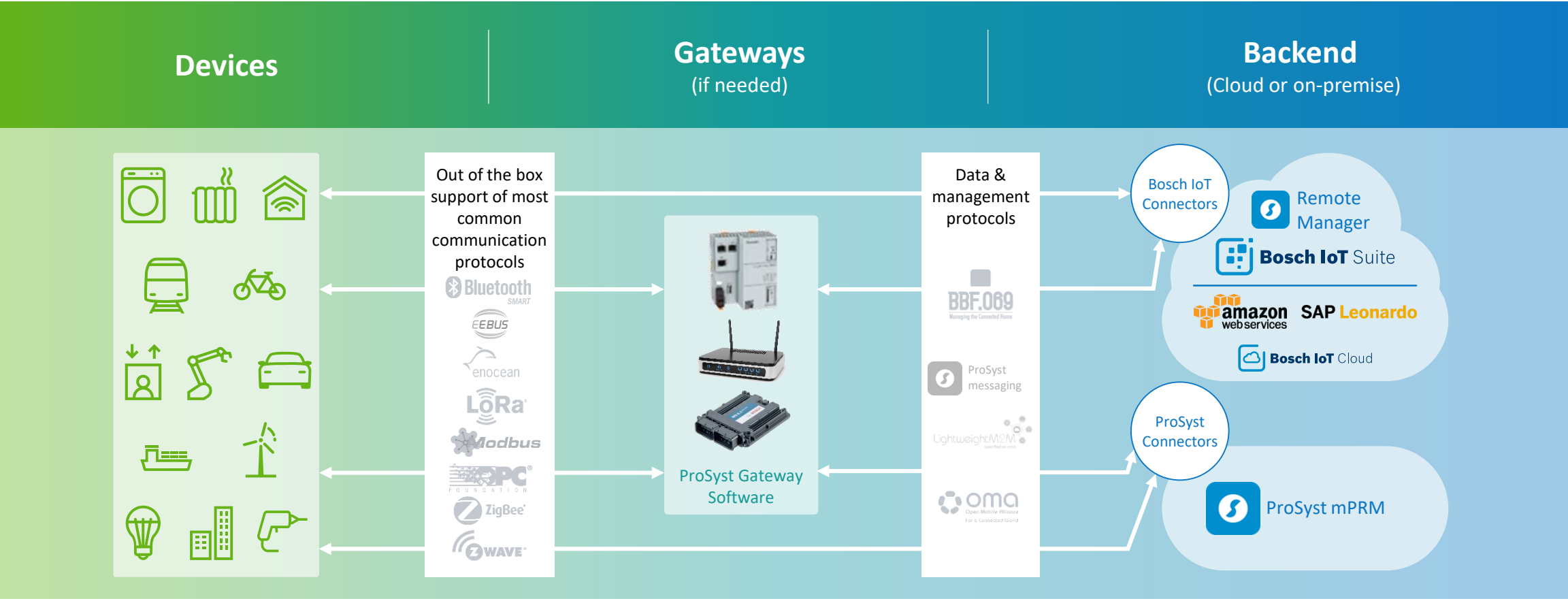
The Bosch IoT Remote Manager

Managing diverse IoT deployments

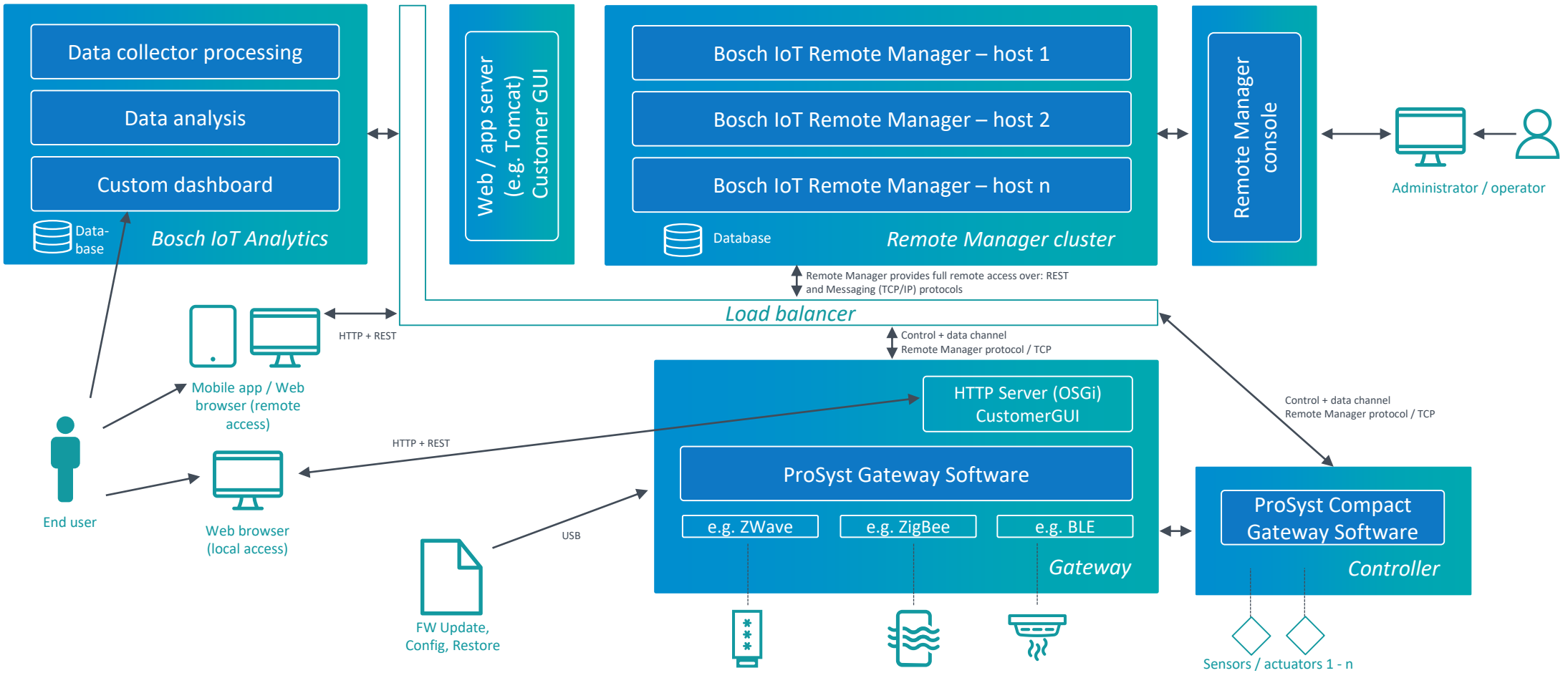


End-to-end IoT solutions

The components needed ...



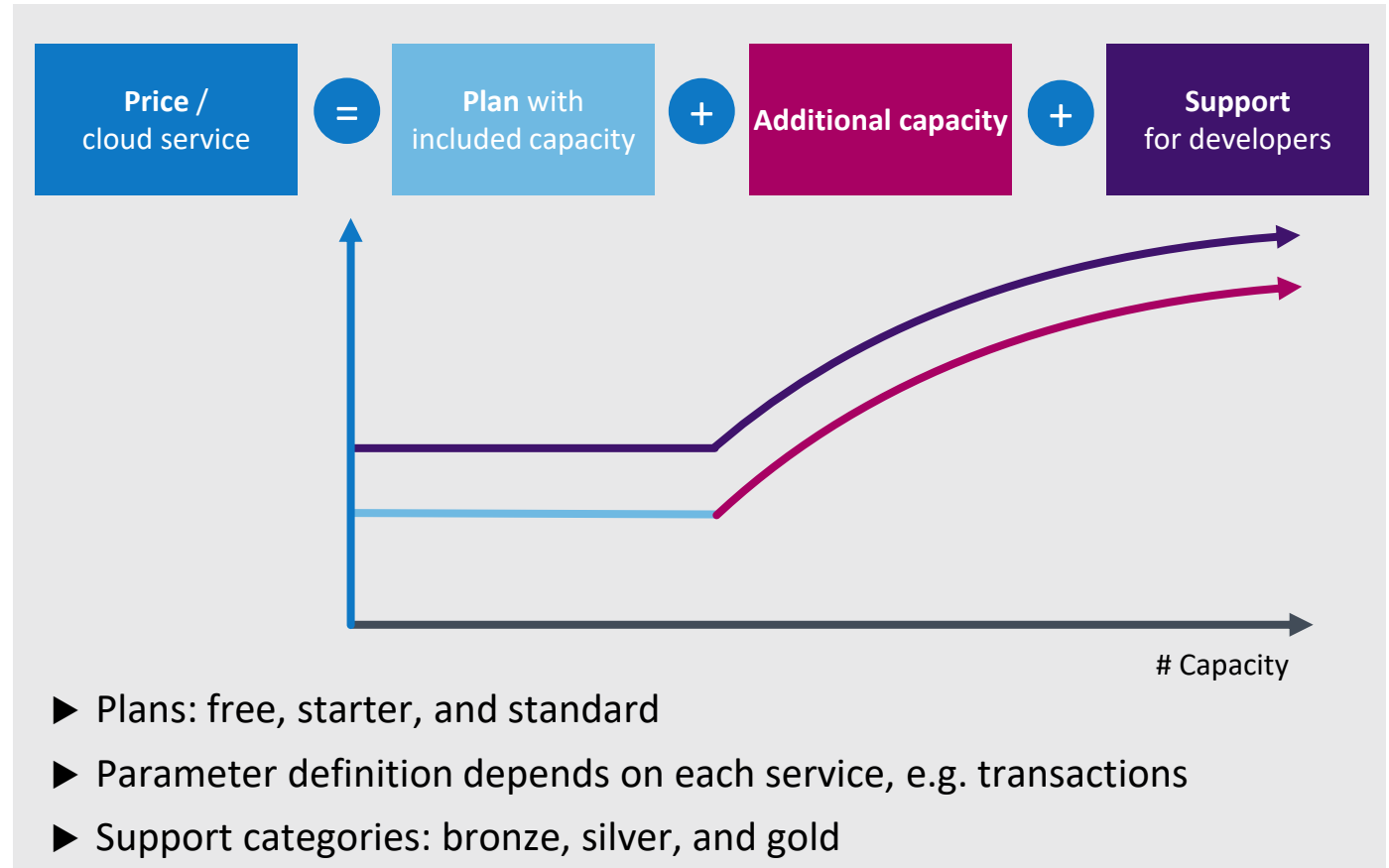
Demo architecture – modular approach



The Bosch IoT Suite services

Pricing principles

- + Pay-per-use
- + Performance-based
- + Monthly subscription
- + Transparent and predictable
- + No software license





Bosch IoT Suite

Toolbox in the cloud for IoT developers

[Explore](#)

www.bosch-iot-suite.com

NO ONE CAN DO I(O)T
ALONE.

Leading companies and organizations build an open IoT

GE and Bosch: Industrial IoT leaders work towards interoperability and open source collaboration

Industry 4.0: Bosch and SAP combine expertise

Eclipse project proposal: Bosch initiates new machine language for Industry 4.0

Bosch and IBM: Collaboration for Industrial IoT; Bosch IoT Rollouts on IBM Bluemix

Bosch and Amazon Web Services: Making Bosch IoT Suite available on AWS cloud

Bosch and Software AG: Joint Bosch IoT Analytics cloud service

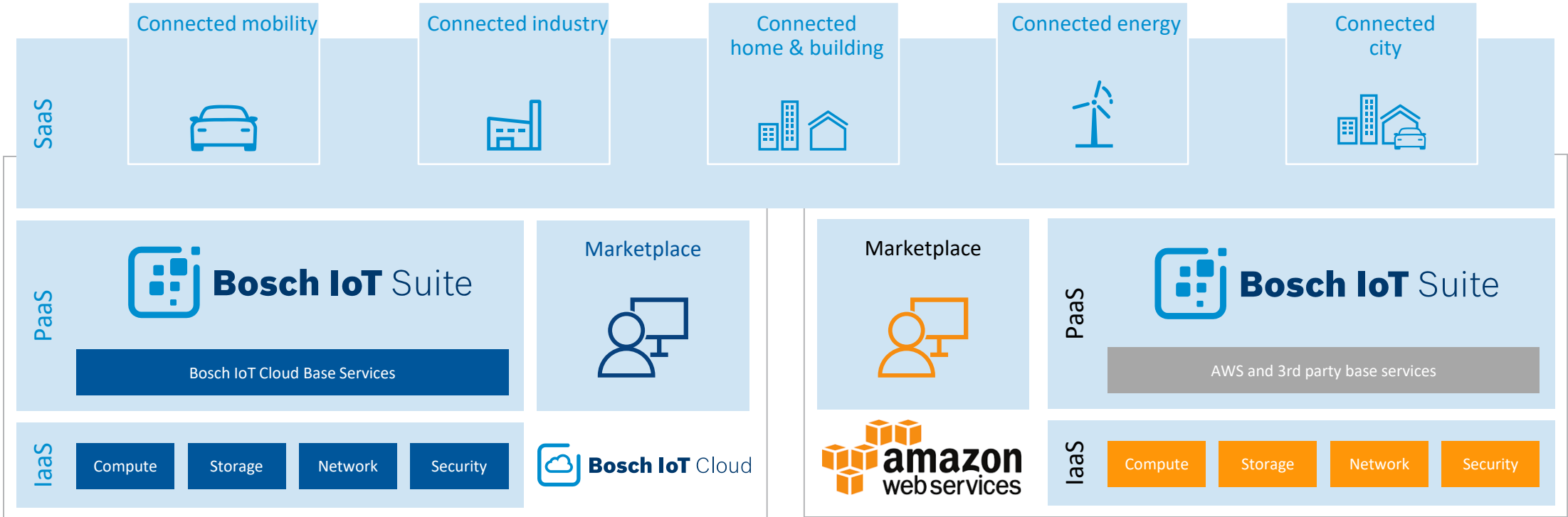
Bosch, through ProSyst, is active member of the OSGi Alliance since 1999

Bosch joins Industrial Internet Consortium

Industrial partners Bosch, Tech Mahindra, Cisco, and National Instruments form IIC testbed

The Bosch IoT Suite

Now also available on Amazon Web Services (AWS)



Bosch IoT Rollouts cloud service via IBM Bluemix

Reduce customers' IoT software provisioning risks and costs



Bosch IoT Rollouts available in IBM marketplace via Bluemix

Available in EU as (free of charge) experimental service for evaluation purposes by Q2/2017

Next steps:

- ▶ Watson IoT Integration for device connectivity
- ▶ Make it available as (paid) service for productive use, also for NA and AP



Bosch IoT Rollouts

IoT and partner ecosystem

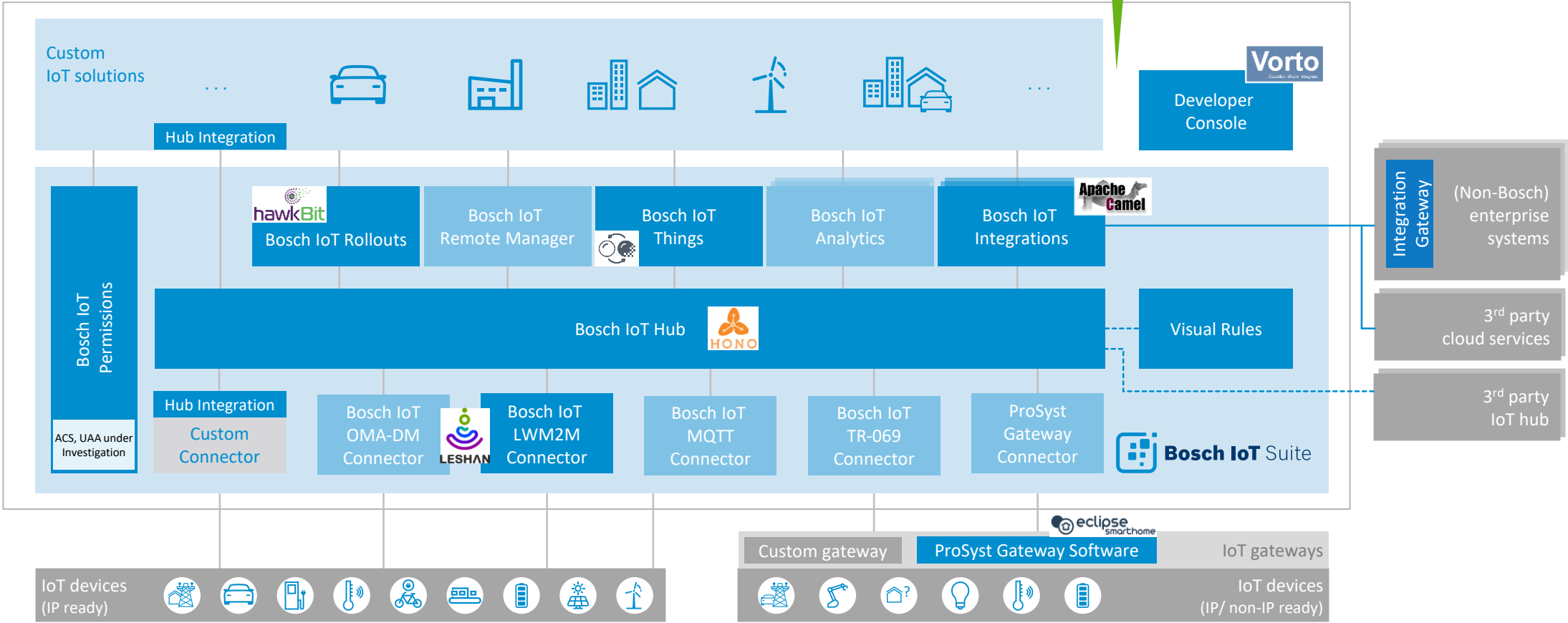
Working together for innovative applications

Consortial Engagement									
Implementation Partners									
Semiconductor Partners									
Cloud Strategy Partners									
Technology Partners									
Consulting Partners									
Open Source									

The Bosch IoT Suite

Open source basis

- ▶ Focus on device/user attach/control points.
- ▶ Drive forward cloud/docker capability.
- ▶ Observe and leverage momentum around Kapua.



Eclipse Foundation: strategic membership

Reasons for Bosch to upgrade existing solution membership

The Eclipse Open Source Community has become a major technology enabler for multiple Bosch businesses impacting more than 10,000 Bosch software developers.

Goals

- ▶ Promote and establish an open platform as de-facto standard for IoT in IWG* IoT
- ▶ Establish worldwide common SW-Tool-Chains for automotive development in IWG Automotive
- ▶ Provide long term support over 12 years for critical development tools in IWG Long Term Support (LTS)
- ▶ Get early developer feedback in case of contributions
- ▶ Promote open technology



Eclipse Foundation: strategic membership

Actively engaged within the Eclipse IoT Working Group



Eclipse Ditto

... where IoT devices and the state of their digital twins get together



Eclipse Leshan

A Java library for implementing Lightweight M2M servers and clients



Eclipse hawkBit

A domain-independent, back-end solution for managing software rollouts in IoT



Eclipse Vorto

A smart, open approach to the interoperability of IoT products



Eclipse Hono

Enabling device-related communication between connected devices and IoT applications in the cloud



Open standardization

Adopted rapidly by growing industrial community

- ▶ Founded in 1999
- ▶ Common software platform for distributed devices and multi-device-vendors with complex software requirements
- ▶ Providing modular, dynamic architecture for multiple industries
- ▶ Software framework targeting all device classes
- ▶ Worldwide accepted standard
- ▶ ProSyst software is built on OSGi technology

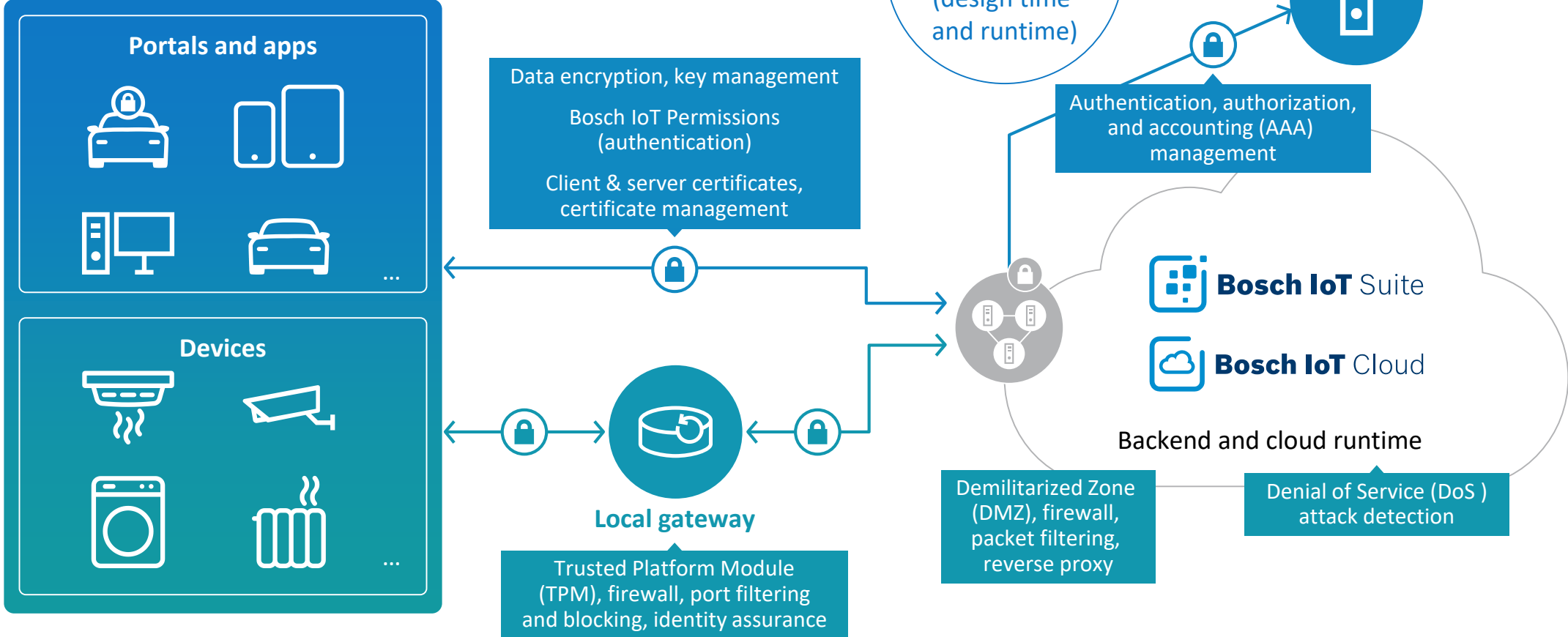


SECURITY

The Internet of Things Security challenges

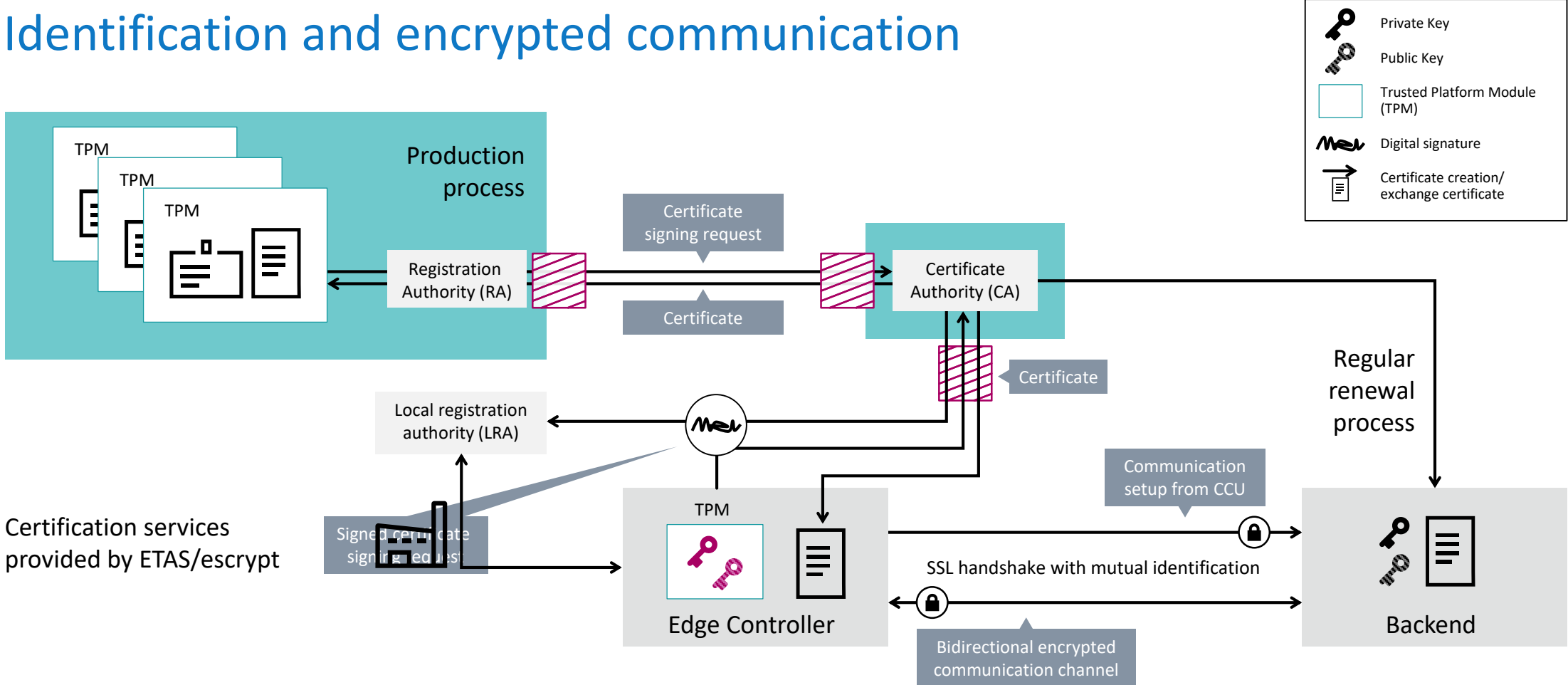


The Bosch IoT Suite Security concepts



The Bosch IoT Suite

Identification and encrypted communication



Automated deployment essential for initial and regular rollout of certificates



Recommendations and best practices

Holistic IoT security – white paper

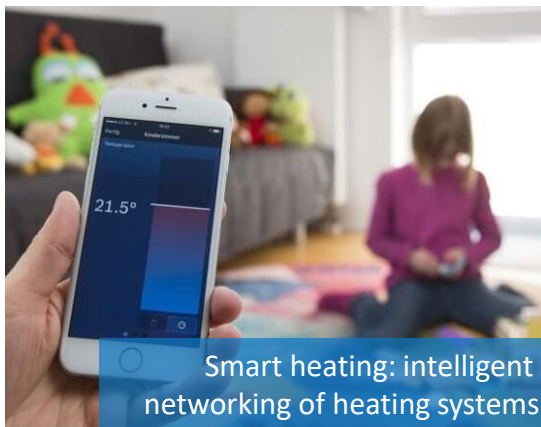
Bosch-si.com/iot-security

We connect every thing

Bosch IoT Suite in practice



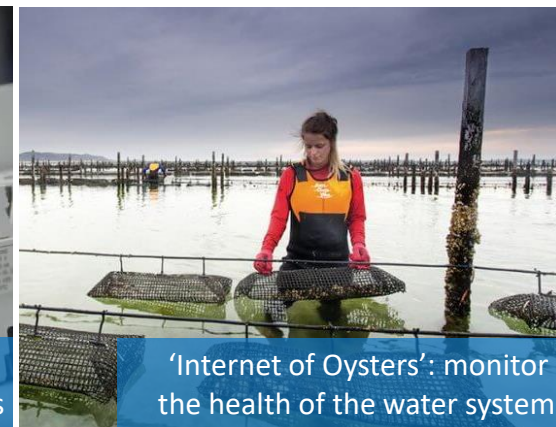
Device management for connected filters



Smart heating: intelligent networking of heating systems



IoT Gateway: easy connection to Industry 4.0 environments



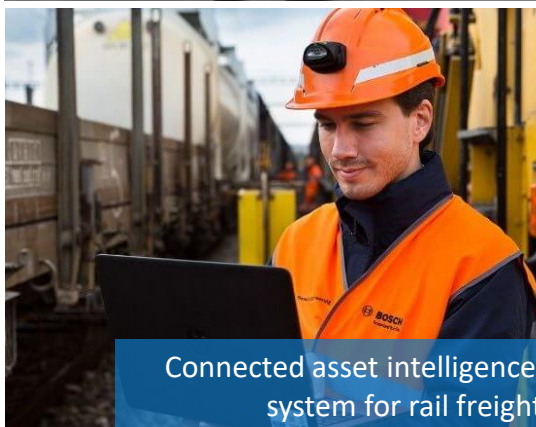
'Internet of Oysters': monitor the health of the water system



TrackMyTools: a smart inventory management system



Indego Connect: intelligent device management



Connected asset intelligence system for rail freight



Firmware and software updates over the air

Leading vendor: Bosch Software Innovations PAC Report Bosch IoT Suite “Best in Class Device Management”



The PAC analysts rated Bosch Software Innovations as above average in several categories, noting in particular the company’s strong strategic focus on the Internet of Things (IoT).

In addition, they designated the Bosch IoT Suite’s device management the leader in the European market and awarded it the “Best in Class” seal, thanks in part to the company’s strong references.

Vendor benchmark: Industry 4.0 Platforms

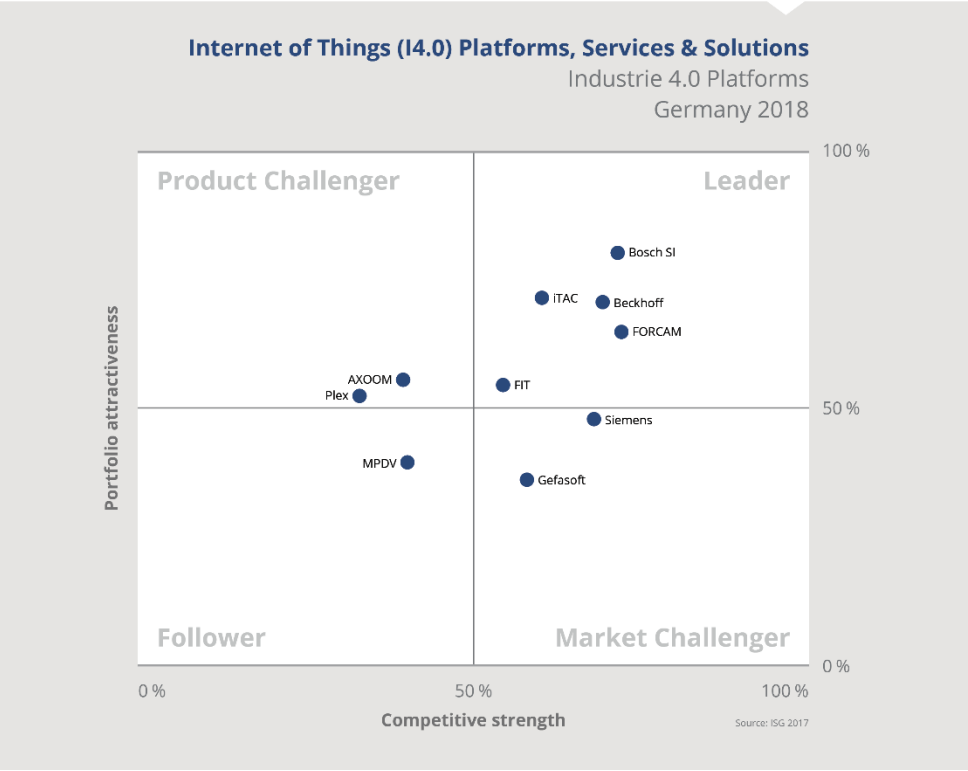
Leader position: Bosch Software Innovations

2018

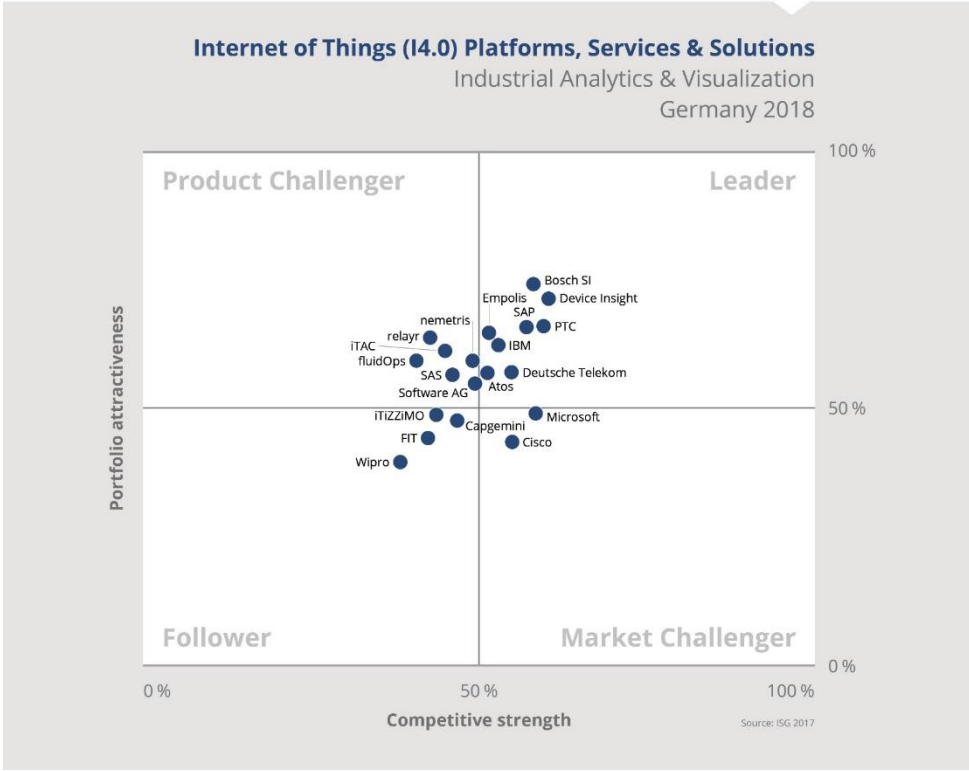
Internet of Things (I4.0)
Platforms, Services & Solutions
Leader Germany

ISG Provider Lens™

ISG Provider Lens™



ISG Provider Lens™



Importance of business models for the IoT

Solid foundation for highly complex projects

The Business Strategy and Innovation Framework is the most in-depth Industrial IoT-focused business strategy framework comprising expert vision, experience and business strategy best practices from IIC members, including Bosch Software Innovations, InterDigital, Hewlett Packard Enterprise, and Machina Research.



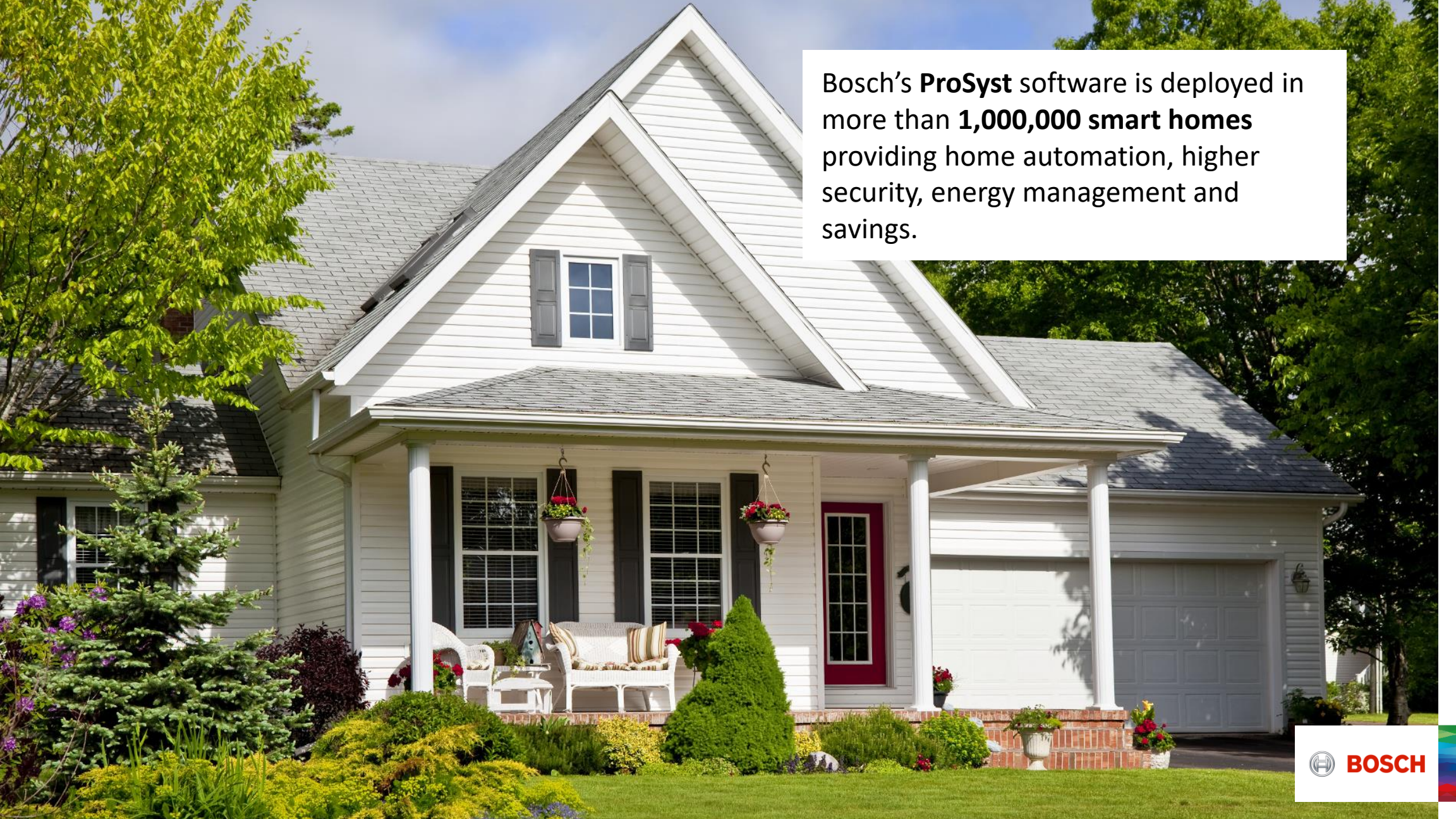
IOT PROJECTS



Together with **FivePoint**, Bosch is creating more livable, healthier and connected communities in **San Francisco**.



Reliably connecting motor vehicles: Already connecting more than 1.5 million vehicles



Bosch's **ProSyst** software is deployed in more than **1,000,000 smart homes** providing home automation, higher security, energy management and savings.

Making life more convenient

Thanks to intelligent technology, your home can now adjust many things in the background without you having to lift a finger, making your life more convenient, secure, and sustainable.

This intelligent home control is based on interconnected devices that communicate with one another via the Bosch IoT Suite and automatically adapt to the changing circumstances of your day-to-day life.

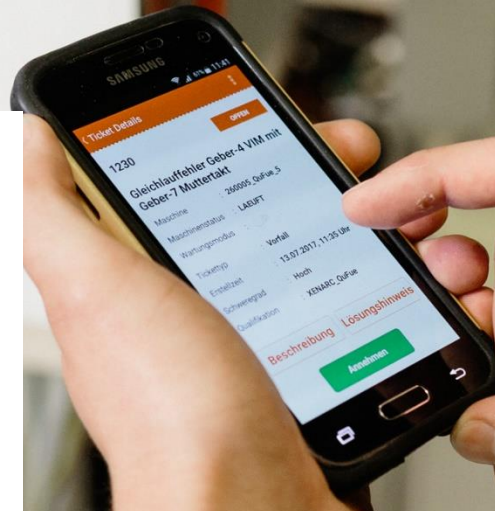


Cross Domain Development Kit (XDK) connected to the Bosch IoT Suite

Get started:
<http://www.xdk.io/cloud>

Prototyping IoT applications:
the XDK enables professional users and software developers to immediately **start an IoT demo or PoC.**

Bosch Software Innovations has connected over 80 different machines, some older than others, for the lighting manufacturer Osram in Berlin. The company's plant for xenon lamps in Berlin now has an Osram Ticket Manager. In this way, Osram is helping its workforce put digital, flexible manufacturing into practice.

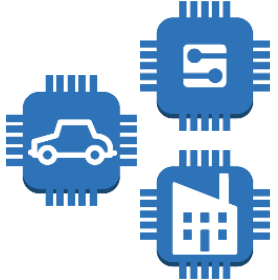
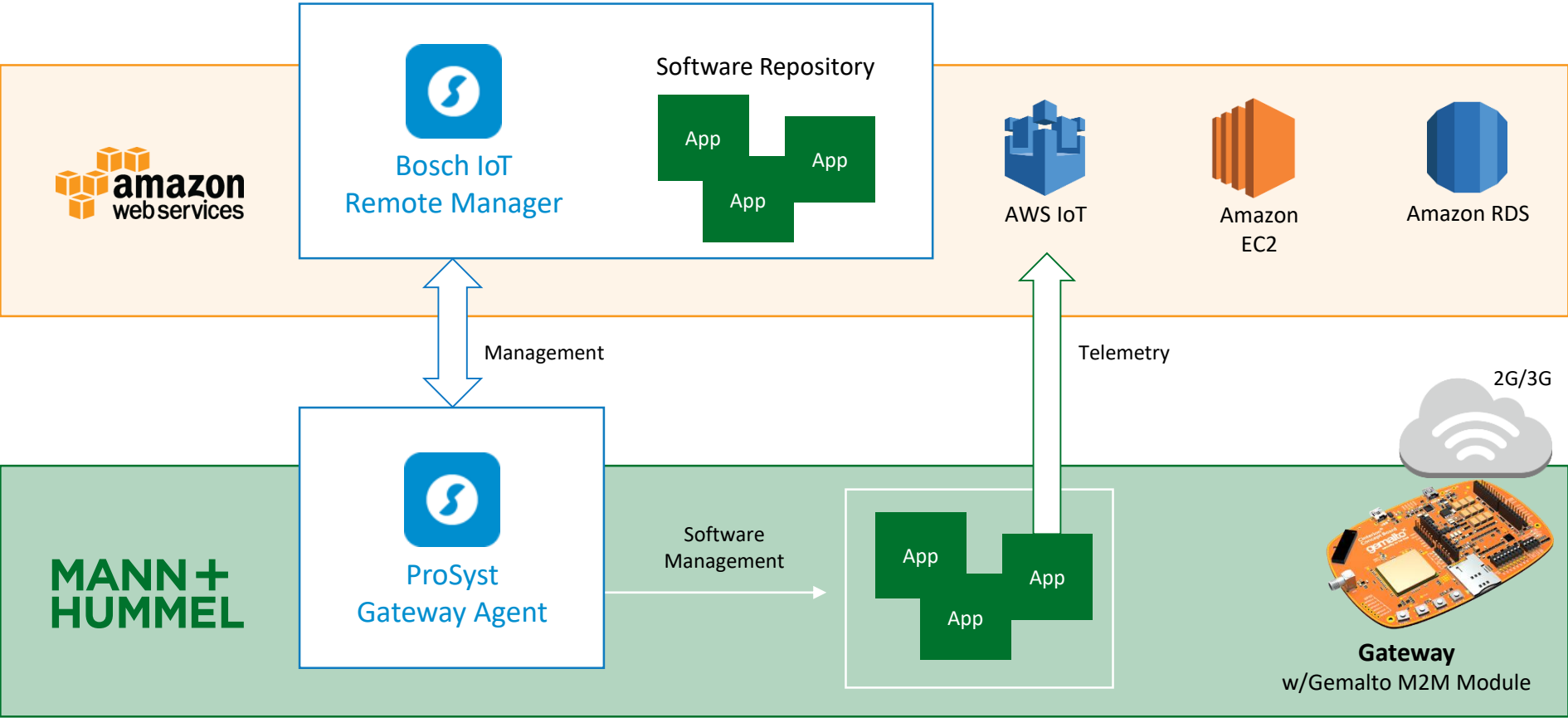




Filtration leader MANN+HUMMEL deploys **IoT solution on AWS** with **Bosch IoT Suite** services and uses the **Bosch IoT Remote Manager** to securely connect and manage their filtration systems in the field.

Customer case: Mann+Hummel

Managing 3G-enabled M2M devices



Bosch IoT Gateway for Industry 4.0

Apps for data collection, data processing and data publishing



The IoT Gateway provides

- ▶ **Dashboard App** for system administration, configuration and parameterization
- ▶ **Devices App** for integration of I/O-modules and sensors
- ▶ **Processing App** for processing of signal values and forwarding of information to MES systems, database and cloud application



Bosch IoT Gateway for Industry 4.0 Pilot Project

Existing machines



Hydraulic test bench

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Bosch IoT Remote Manager

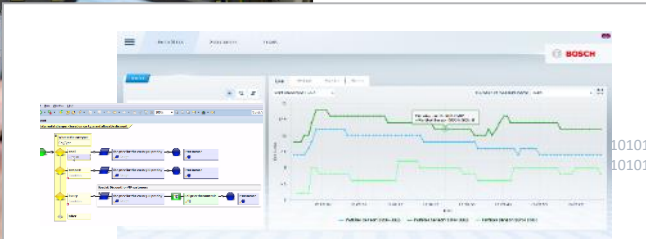
Rexroth
Bosch Group

IoT Gateway
 ProSys Gateway Software

BOSCH
Software Innovations



Connect



Production Performance Manager and Production Rules Configurator

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Maintenance Support System

ROI < 1,5 years

Reduction Maintenance costs about 25%

Open standards

OEE Increased by up to 5%

The Outlay of manual testing reduced by 20%



- ▶ Maintenance notification/tickets
- ▶ Maintenance completion

How can machine manufacturers benefit from the IoT?

Predictive maintenance

Prevention of production downtimes

thanks to continuous remote monitoring of machine data



New Aftersales offerings

new services can be offered based on data analytics

Improved SLA management

Improved KPI monitoring, enables new service-based business models instead of traditional product sales



Future-proof investment

Sustainable technology for future applications and economical invest both for low- and high-wage countries

Machines at customer's premises are distributed globally

Agile IoT software development

Asparagus field 2.0

In 3 weeks from scratch to solution

Conventional asparagus cultivation



Best growth at 20°C
Best profit from asparagus season



Control via cover sheet

Consider weather forecast

Tomorrow

8h

12°C

4°C

▼ **BETTER YIELD** ▼ **BETTER QUALITY** ▼ **BETTER DECISIONS** ▼

The Bosch innovation project



“Internet of Oysters”: The Yield, an Australian AgTech business, helps oyster farmers reduce the risk of unnecessary harvest closures caused by weather.



Smart Oyster Harvesting

Conventional oyster harvesting



If harvested at the wrong time, oysters can be dangerous to eat
Regulators conservatively control harvesting via coarse rainfall data



BETTER DECISIONS

BETTER HARVESTING

BETTER YIELD

The Yield & Bosch innovation project



Measure Water Salinity



ProSyst IoT



Harvesting Regulator & Growers

BENEFITS

- Improve scheduling of harvesting operations by predicting closures
- Extended harvest periods so more oysters make it to the market

Connected Building

Intelligent solutions for commercial buildings



LifeCycle Tower One in Dornbirn

Bosch IoT Suite integrates sensors, lighting infrastructure, users, and existing IT systems.



zumtobel group



BOSCH
Invented for life

Mobility

Improving quality of life by simplifying parking

Active parking lot management

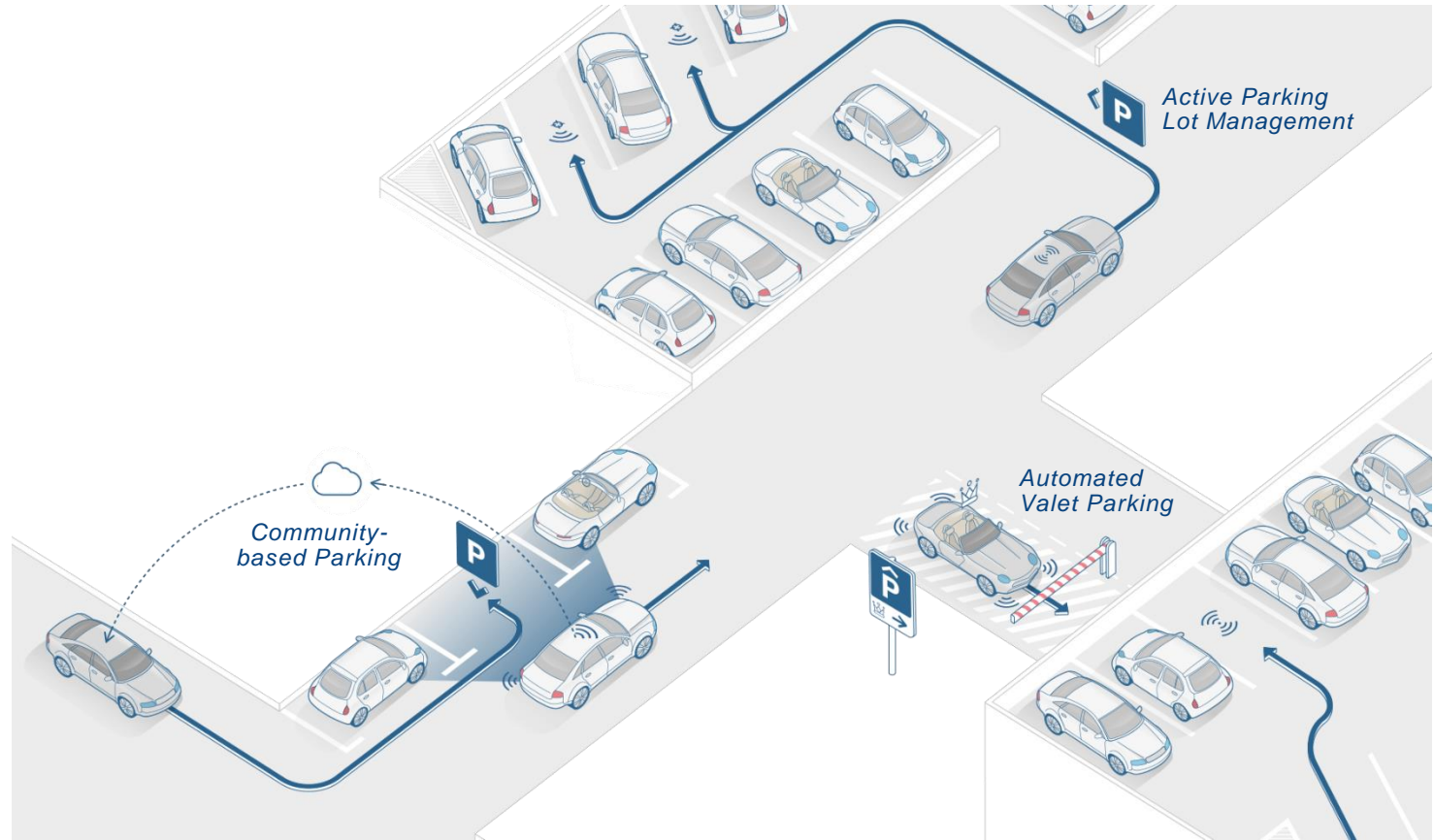
- ▶ Bosch simplifies parking for drivers, parking lot operators and car manufacturers

-30%

traffic volume possible through reduced search for parking space

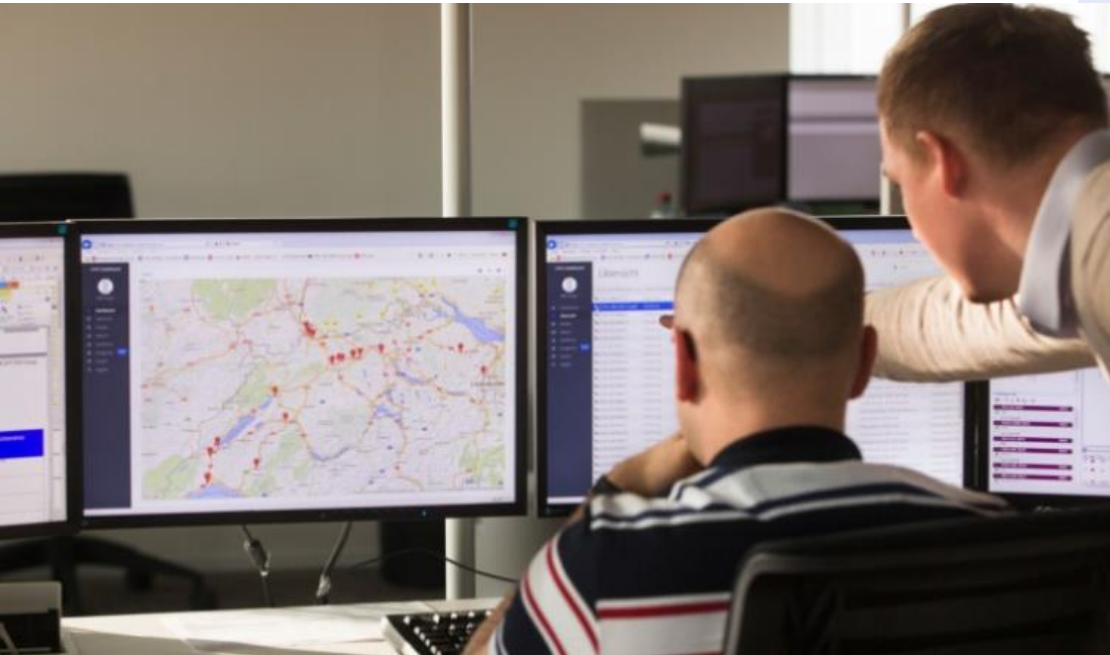
-CO₂

through shortened search for parking space

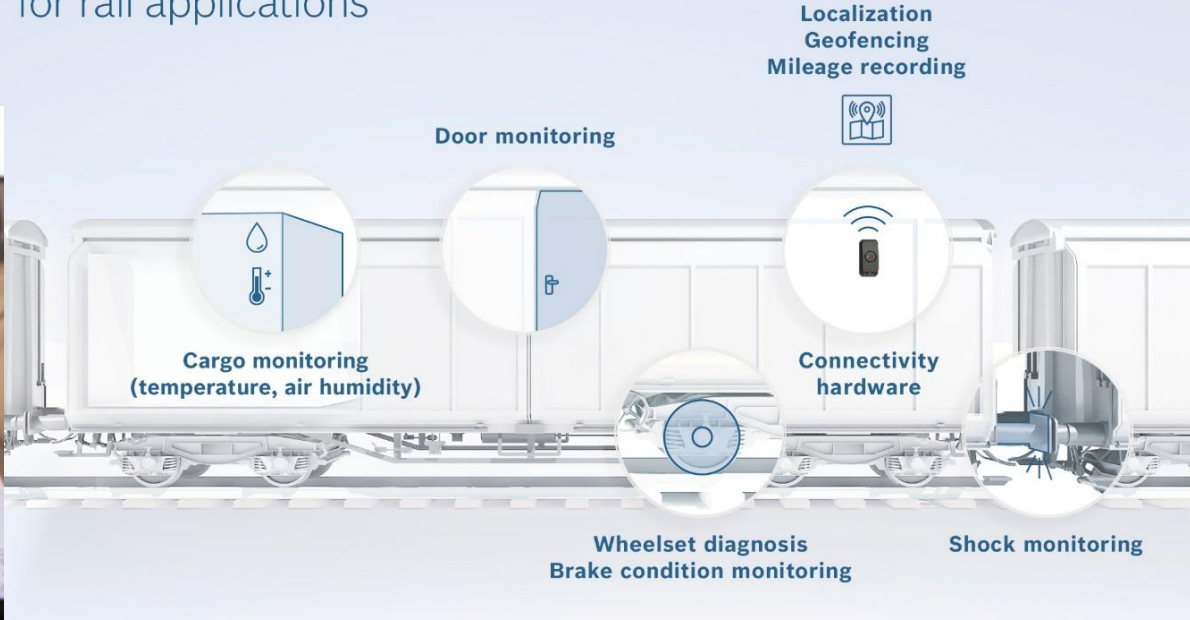


Logistics

Asset monitoring for railway applications (AMRA)



Condition monitoring system for rail applications



Fleet operators and goods recipients can review the status of railway cars at any time.



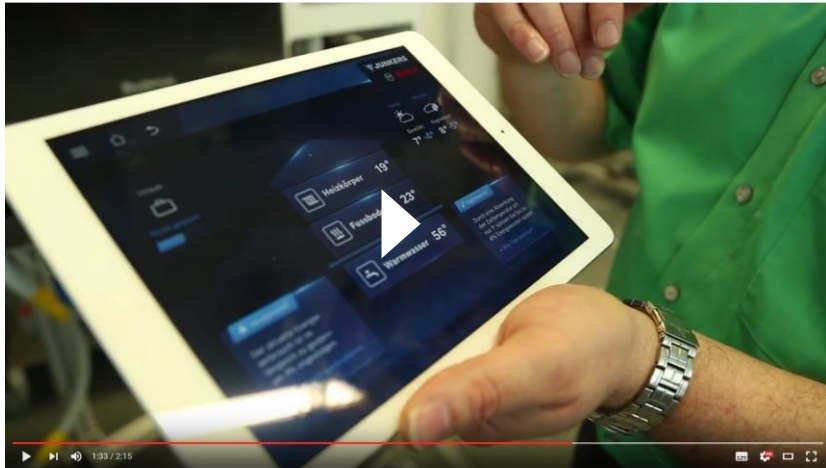
Connected forklift trucks enabling digital intralogistics solutions:

Zeno Track creates an intralogistics hub running in the Bosch IoT Cloud. By connecting forklift trucks via the Bosch IoT Suite the operational data generated allows to create new digital solutions.

Connected Products

B2C and B2B heating portal

- ▶ Cloud-based solution for consumers and installers to get access to heating systems – at any time, from anywhere.
- ▶ Remote monitoring reduces service costs while increasing service effectiveness



Status

Heizung: **on**
 Warmwasser: **off**
 Zeit: **20-07-2015**
 Letzte Störung: **20/07/2015 16:04**

Anlage

Buderus
 GB145-15 V2
 Letzte Wartung: **20-07-2015**

Kunde

Sara Felliciano
 Aveiro

Diagnose

%	Mögliche Ursache	Lösungsansatz	Aufwand	Ersatzteile	Austausch
70%	Lambdasonde ist beschädigt	Lambdasonde austauschen	ca. 1,00 h	Lambdasonde 4.9 everp 8718586497	
30%	Anschlusstecker von der Lambdasonde ist nicht komplett aufgesteckt	Anschlusstecker an der Lambdasonde komplett aufstecken	ca. 0,50 h		

Das Problem kann durch Folgendes verursacht werden:

Störung durch P...

Impressum | Datenschutz | Rechtliche Hinweise

0.2.21

WE ARE BOSCH



Our past

Efficiency = Control

Fast = Central

Bigger = Better

Hierarchy = Fast



Today

Agile

Iterative

Distributed

Networked

Open

Flat

Agility at Bosch

Success factor in the connected age



Becoming more agile

- ▶ Start-up platform / innovation clusters as incubators for new business ideas
- ▶ Scrum as anchor of agile IoT development for products, software, and service

“We can draw on the strengths of the Bosch Group: we take the steadfastness, power, and range of an ocean-going tanker and combine it with the speed and agility of a speedboat.”

Dr. Volkmar Denner,
chairman of the Bosch board of management

The essentials: IoT@Bosch

Intro: how Bosch sees the connected world



The essentials: IoT@Bosch

When it comes to the IoT, what are Bosch's business goals?



- ▶ To consecutively make its products web-enabled, also with the help of cloud computing
- ▶ To use connected products and solutions to take its traditional business forward
- ▶ To open up new business opportunities, especially in services
- ▶ **Main aim: to be a globally leading IoT company**

The essentials: IoT@Bosch

What is the motivation behind Bosch's IoT activities?



In various areas, Bosch is extending its acknowledged expertise as a manufacturer and provider of solutions in order to make everyday life easier. **Invented for life**

The essentials: IoT@Bosch

How does Bosch intend to become a leading IoT player?



Bosch plans to...

- ▶ ...make all its electronic products web-enabled by 2020
- ▶ ...offer new, connected services with its web-enabled products
- ▶ ...in this way expand its product and services business with connected solutions, and generate additional sales as a result

The essentials: IoT@Bosch

Why are sensors so important?

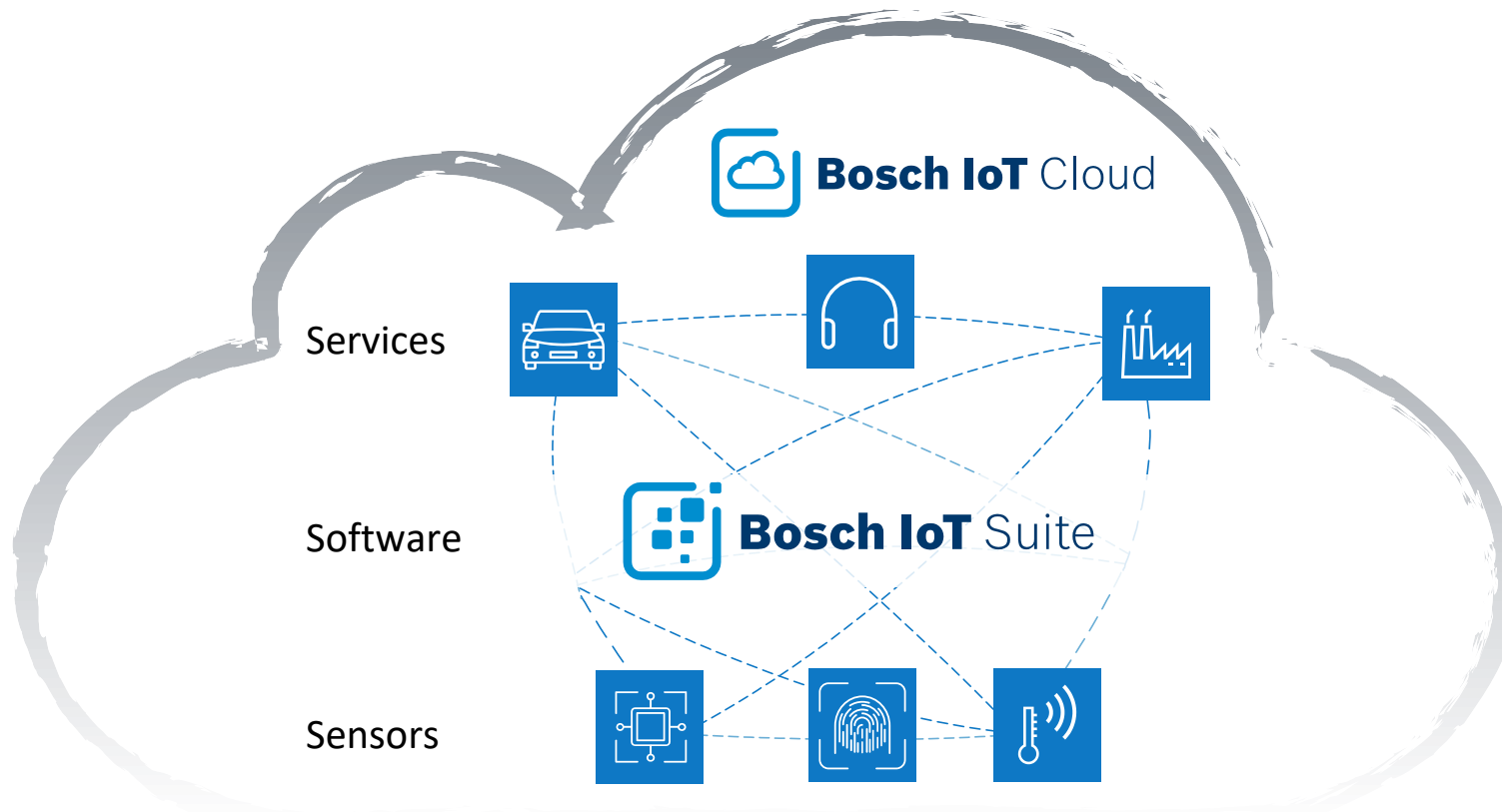


Sensors are indispensable for the IoT

- ▶ Bosch uses sensors to teach things how to feel.
- ▶ Bosch is the world's leading supplier of MEMS sensors (4 million a day).
- ▶ **Sensors** and **software** are the basis for a multitude of new **services**, such as connected parking in the mobility sector.
- ▶ This is why we at Bosch often speak about the **3 S's** of the IoT.

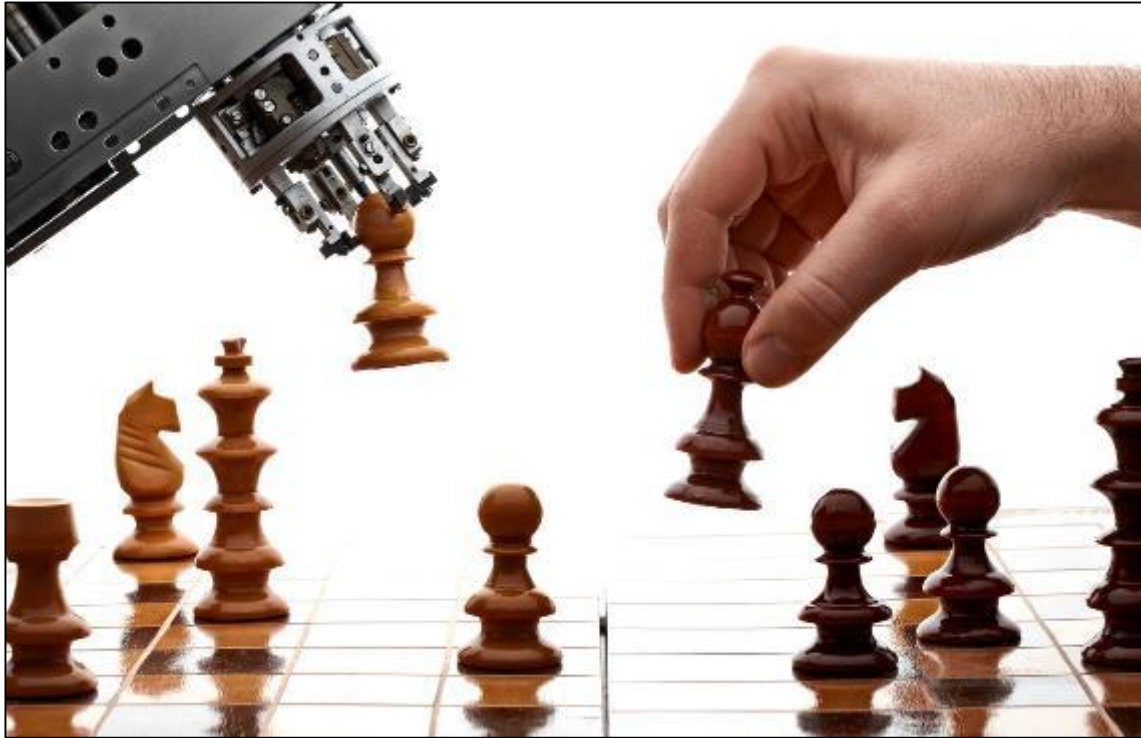
The essentials: IoT@Bosch

What role does the Bosch IoT Cloud play?



The essentials: IoT@Bosch

Why does Bosch need artificial intelligence?

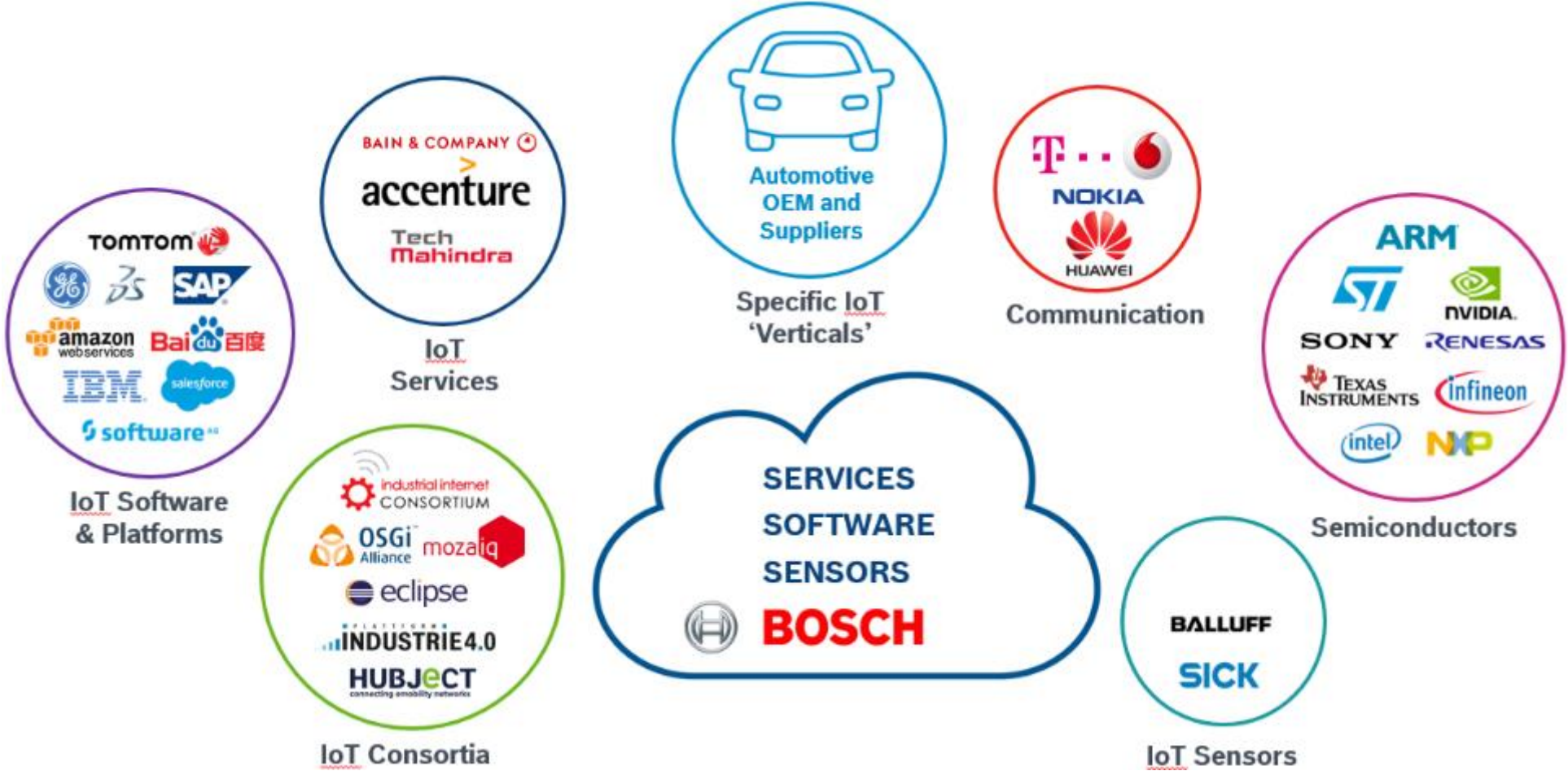


Products and systems have to become capable of learning

- ▶ Mobility (e.g. automated driving)
- ▶ Industry (e.g. condition monitoring of machinery)
- ▶ Homes (e.g. controlling central heating systems, voice recognition in home assistants)
- ▶ Artificial intelligence will increasingly allow machines to become personal assistants

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Who is partnering with Bosch on this journey?



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What role will people play?

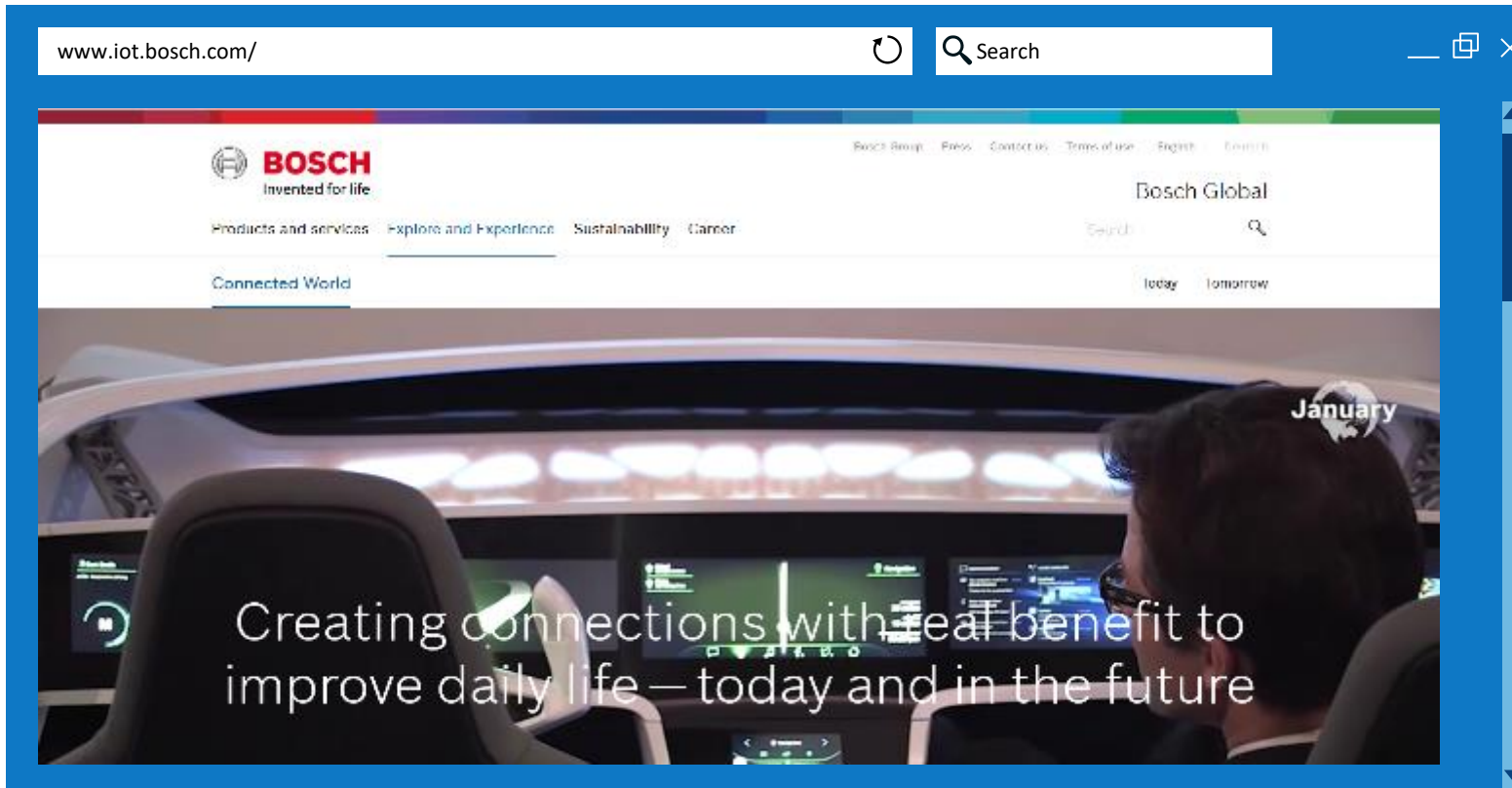


In the IoT age, people will...

- ▶ ...contribute their flexibility.
- ▶ ...form intelligent teams together with connected objects.
- ▶ ...experience everyday convenience and a reduced workload, and expand their job profiles.
- ▶ ...also benefit from technology that is **“Invented for life.”**

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Where can I get more information and concrete examples?



www.iot.bosch.com 

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