Is Industrial Internet a Disruptive Innovation in IoT

Kai Hackbarth, ProSyst Software (Bosch Group)
Member of Board of Directors OSGi Alliance

Bosch acquired IoT middleware specialist ProSyst

- Gateway software for smart homes, connected mobility, and Industry 4.0

Bosch IoT strategy

- Enabling connectivity in many areas of daily life and work
- Triad: sensor, software, service
- Systematically expand IoT software competencies
- Bosch electronic products are web-enabled to deliver fascinating new services
- Expand and foster IoT ecosystems
- Establish an open IoT platform with partners

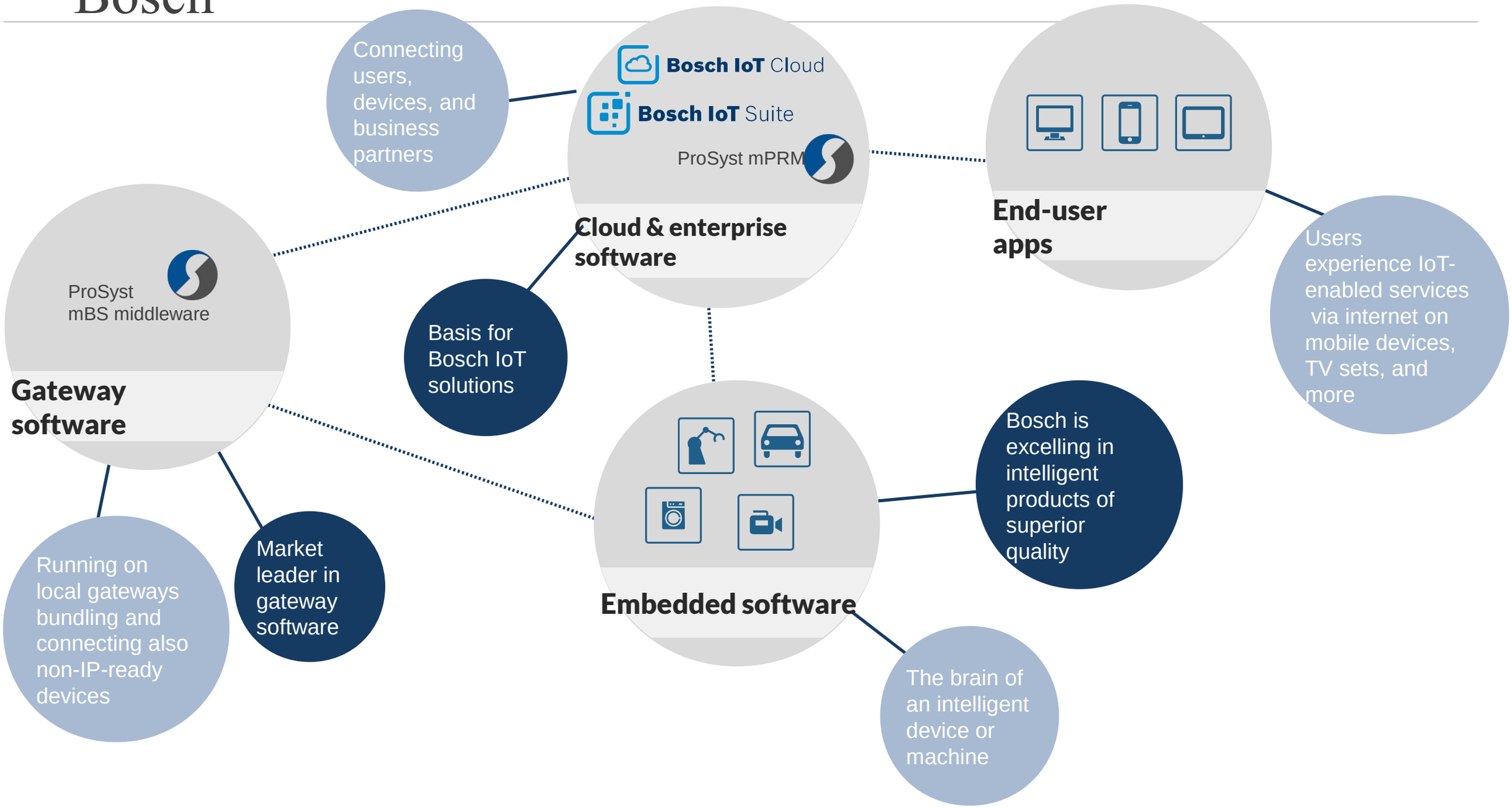
Reasons why

- ProSyst is market leader in gateway software
- Provides the fastest & most efficient OSGi container in the market with backend connectivity
- Complements the Bosch IoT Suite
- ProSyst associates are highly experienced software developers for embedded and backend software

Gateway software serves as a link between connected devices and the backend. It is part of many IoT solutions.

Software components with strategic impact on IoT applications

- Technological, commercial, and user angles covered through Bosch



The IoT technology and solution provider

We lead companies into the connected world

Market presence

5.1m

connected devices using
Bosch IoT Suite and ProSyst

Projects in many business areas

150+

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

Know-how

700+

Started projects

IoT experts around the world

Bosch early IoT visionary

2008

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

In 2001 when I joined ProSyst

- ProSyst was one the few software vendors focusing on **Connected Home**
- The term **„Internet of Things“** was only used in the scientific research community
- An **Open Platform** was really scary !!
- Everybody was on the hunt for the **Killer Application**
  - SMS being the prime example
  - Investments were not made due to missing business models
- Customers **canceled their product launches**
- We were **offering a solution for a problem that did not exist**

Today

- Its all about **Platforms & Ecosystems**
  - **360+ IoT Platforms** (Soure: IoT Analystics)
  - Still growing amount **of communication protocols**
  - Witnessing first phase of **consolidation**

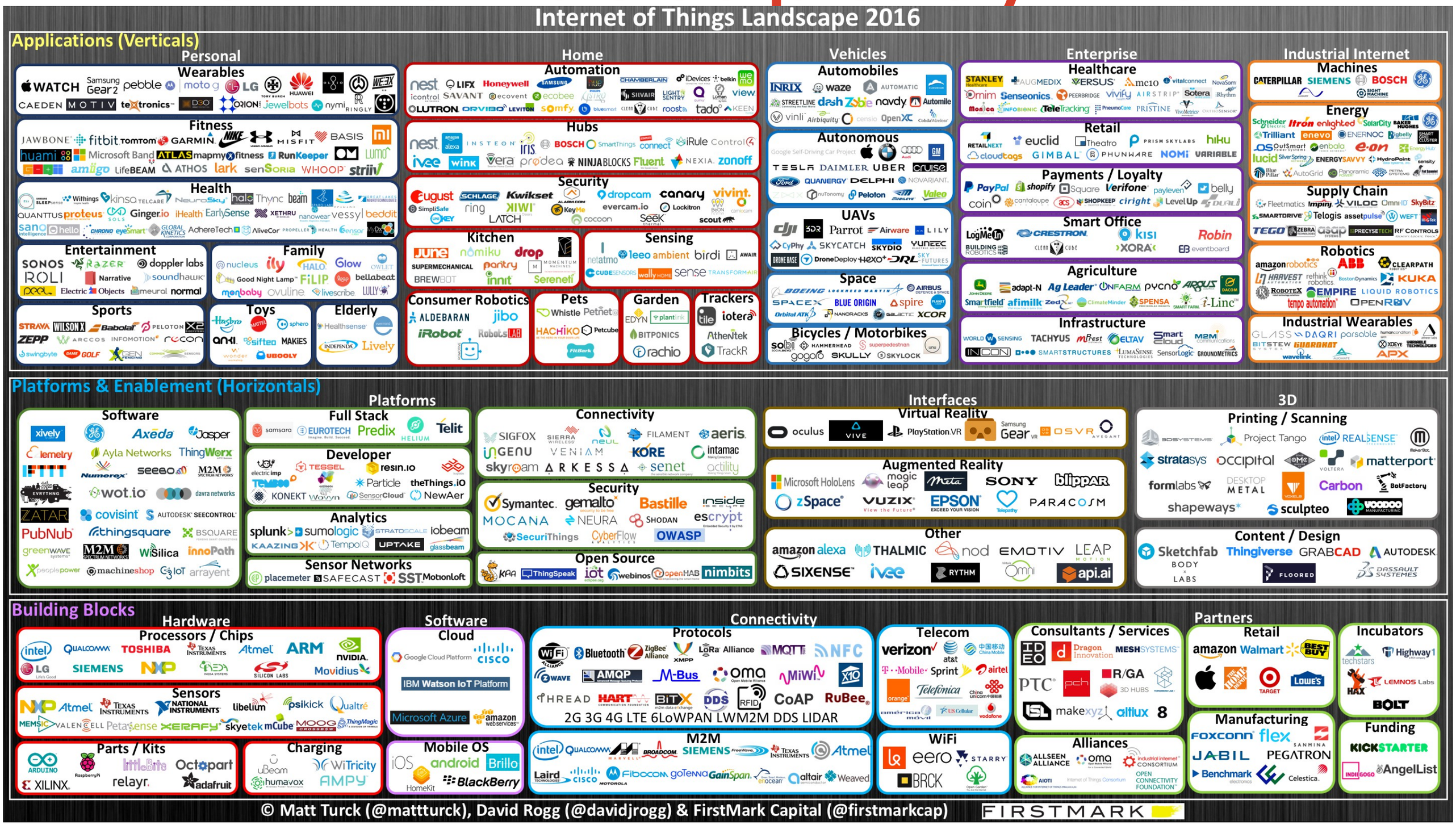
- **IoT Clouds** on the rise
  - Bosch, GE, Microsoft, Amazon, Salesforce
  - Lets not get started to talk about **Interoperability** among them

- The Industrial Internet will **fundamentely disrupt** the manufacturing industry
  - Cyber Physical Systems (CPS) change the **existing automation hierarchy**
  - **Increasing Operational Efficiency** by Managing Assets and Optimizing Processes
  - Reducing Downtimes with **Preventive Maintenance**

- Many **Proof of Concepts** but real adoption yet still to come
- The World Economic Forum expects IIoT to **disrupt business within the next 5 years**

ProSyst® Bosch Group

IoT Landscape by Matt



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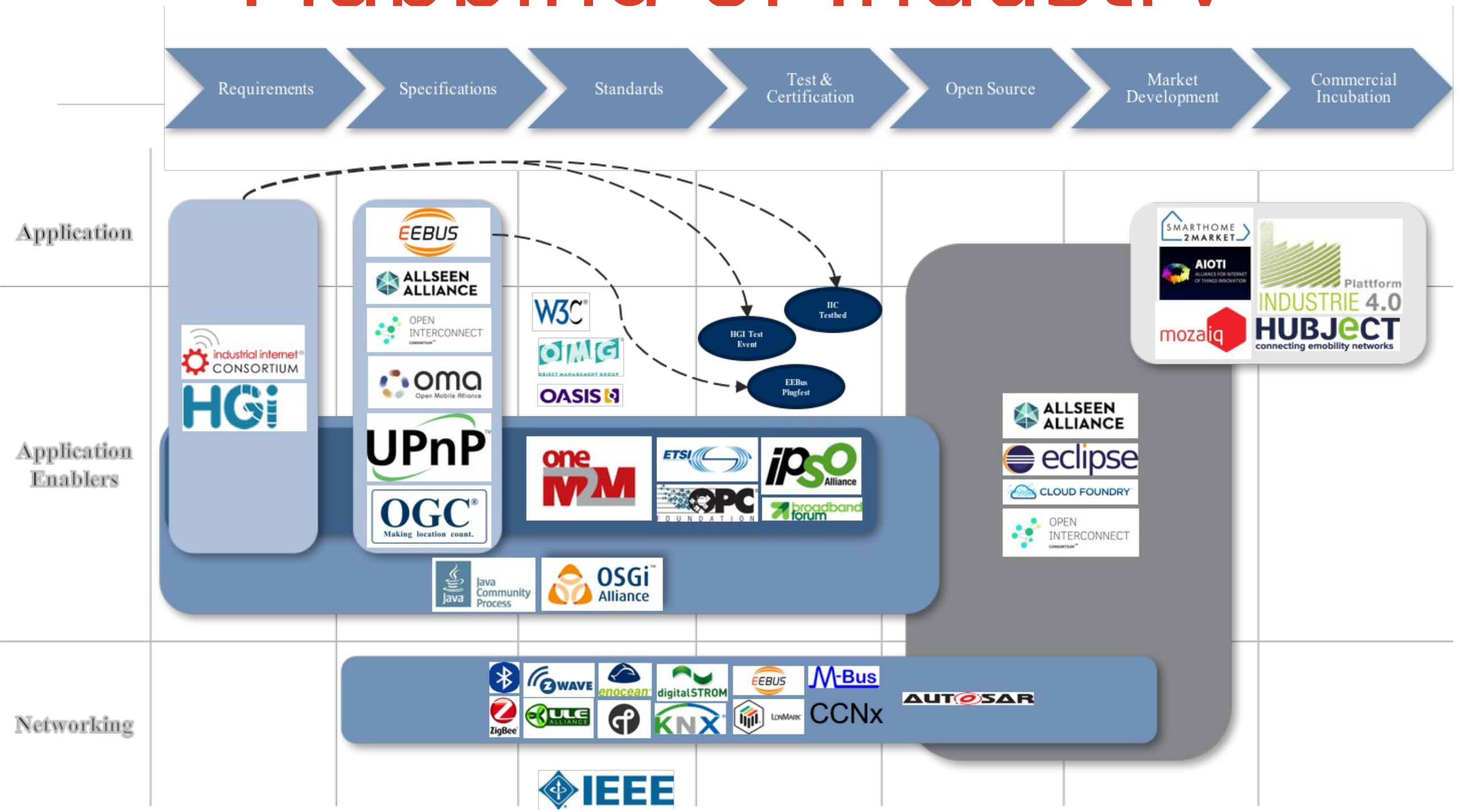
Mapping of Industry



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Background

OSGi Alliance

Founded in 1999

Proven, Mature Software Architecture

Transparent Development Process

Strategic Partnerships/Collaboration

Global Ecosystem

Best Practices

Industry & End User Adoption

BOSCH

OSGi Alliance

Members include...

Deutsche Telekom

HUAWEI

LIFERAY

Paremus

NTT

Adobe

ORACLE

ProSyst Bosch Group

software AG

IBM

What is OSGi ?

Modularity & Services

Modular Software architecture

- Execution environment, APIs, device abstraction
- Application development framework
- Common architecture is applicable to Cloud, Enterprise, M2M & IoT architecture
- Can run locally on one device, all the way through to distributed across 1,000's of servers

Dynamic Service lifecycle enables:

- True 24/7 remote maintenance
- Remote software updates
- Aftermarket sales of upgrades and extensions

Portable and re-usable software modules enable

- Faster time-to-market
- Increased agility and reduced development effort and project risk
- Reduction in maintenance costs
- Ecosystem based solutions

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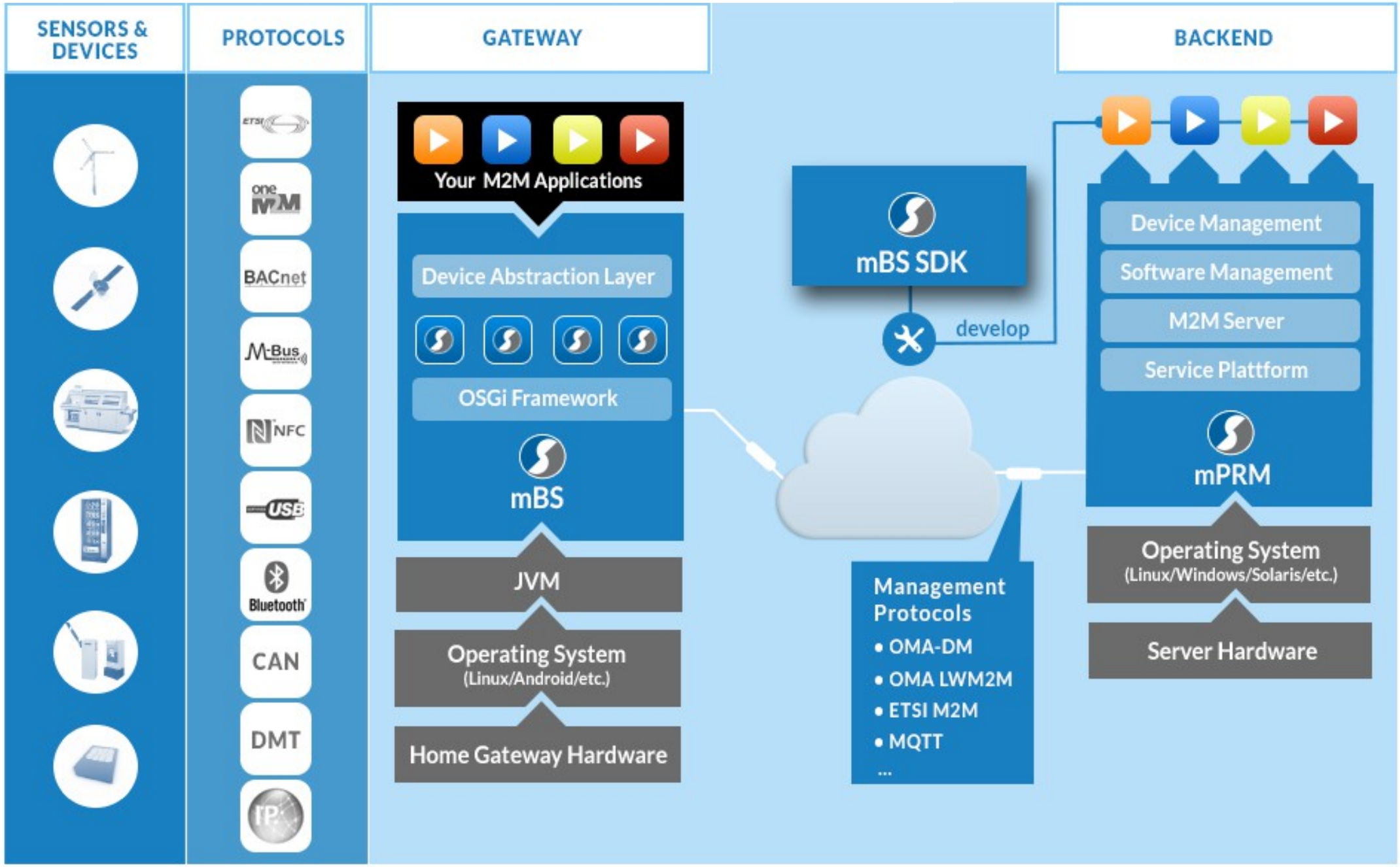
OSGi Reference

Industrial Internet



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IoT Expert Group

OSGi Alliance

- The IoT EG was formally announced in September
  - 12 OSGi member companies are actively contributing
- The IoT EG RFP pipeline is starting to fill up
  - RFP 175 - Improvements to the Device Access Specification
  - RFP 176 - A Bundle security testing platform
  - RFP 177 - Constrained Application Protocol support
  - RFP 180 - MQTT integration
- OSGi Community Event IoT Demo
  - A live IoT demo involving *LEGO*® Trains
  - Very popular among attendees
  - Numerous competition entries providing train managers

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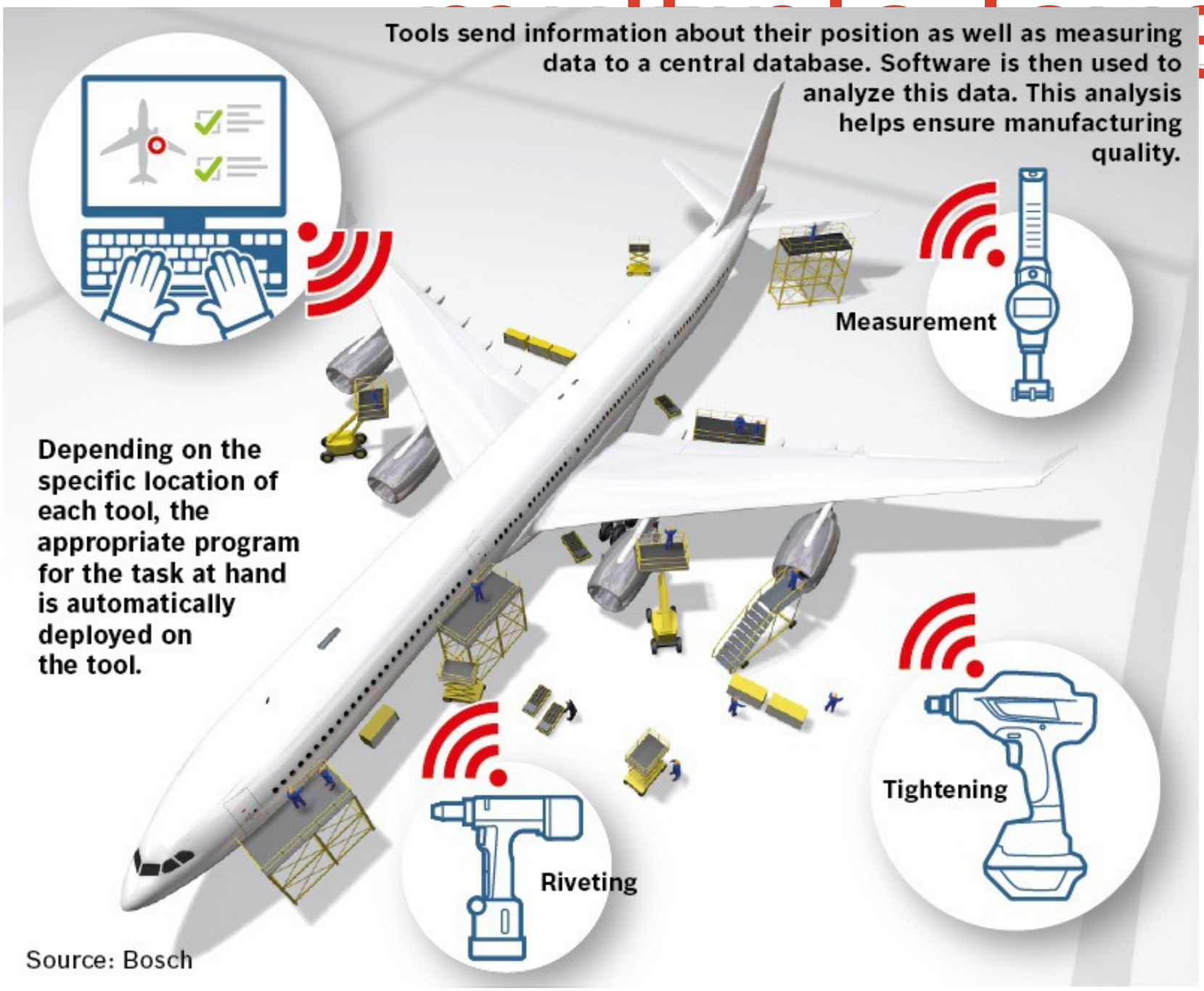
The Three Challenges of IoT Solution Development

1. **Rapid application development for IoT**:
   - Quickly and efficiently building user interfaces and applications for IoT use cases that require cost efficiency and fast time to market.
2. **Managing heterogeneity and diversity**:
   - Handling large numbers of heterogeneous, constantly evolving assets and devices in the IoT.
3. **Building customizable IoT solutions**:
   - Supporting IoT solution vendors in creating solutions that can be easily customized for different use cases.

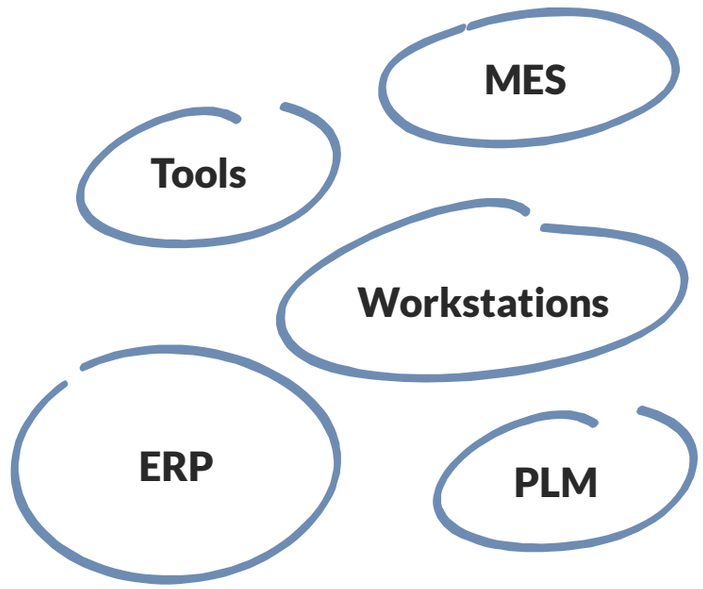
Practical example

Factory integration at multiple levels

- Handheld industrial power tools automatically do what needs



> There is no other solution like this out there; I am convinced that it harbors major potential for industry as a whole.
>
> *Dr. Richard M. Soley, Executive Director of the Industrial Internet Consortium*



Highest quality and efficiency standards in connected manufacturing

1 Open standards and interfaces mastering heterogeneity

2 Indoor localization accuracy

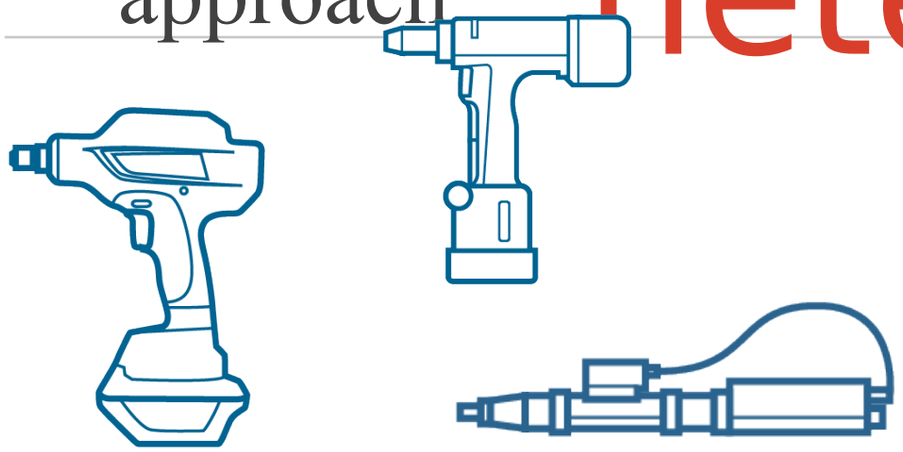
3 Factory integration at multiple levels

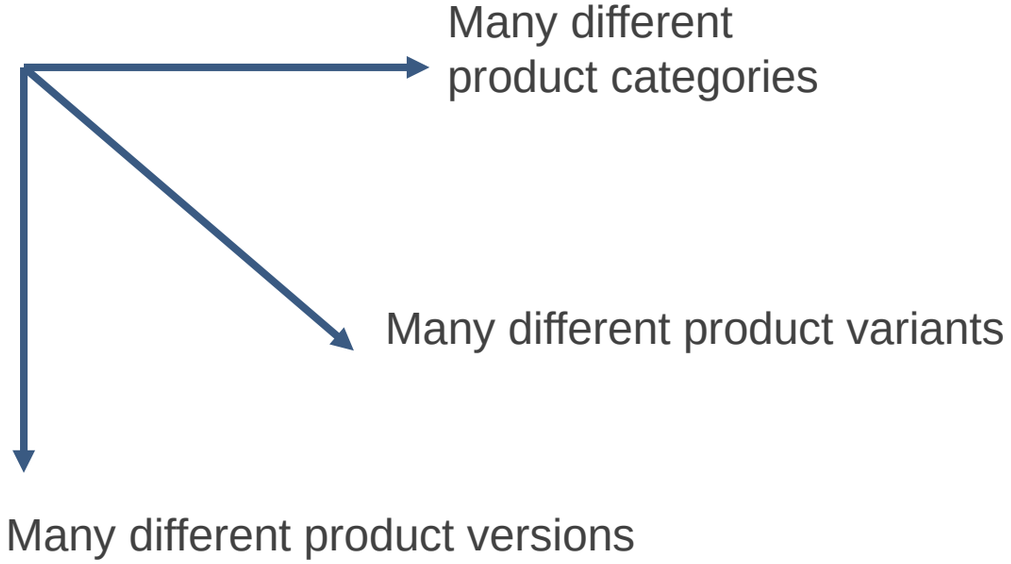
4 Joint solution architecture

5 Ecosystem of collaborating partners

Managing device heterogeneity

- Heterogeneous environments in IoT require a new, very open approach





Bosch IoT Suite

- Reliable device connection and control
- Operating a secure, flexible and transparent infrastructure for distributed devices

Eclipse Vorto

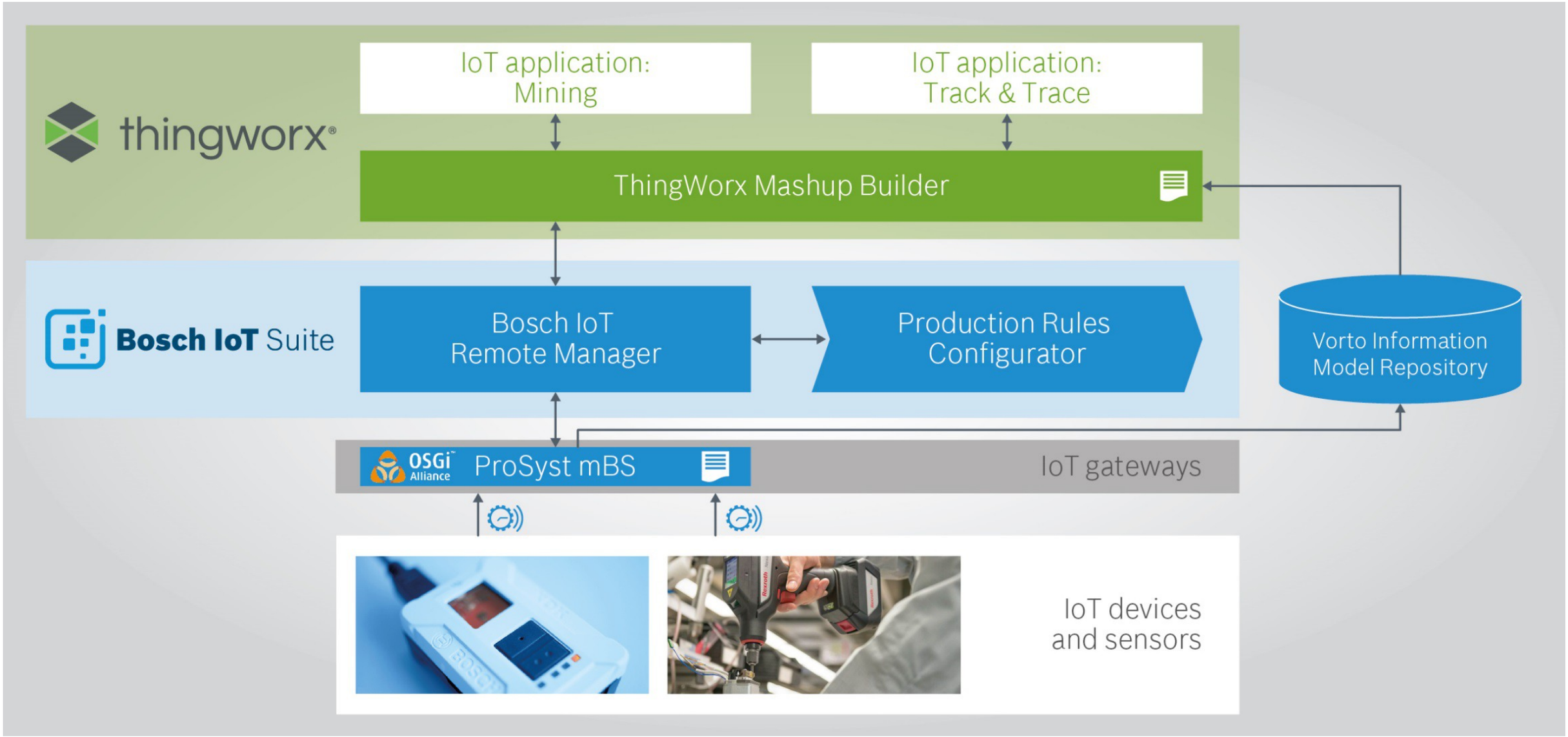
- Open source tool initiated by Bosch Software Innovations
- Developed by Eclipse IoT
- Enables creation and management of information models for integration into different platforms


Rexroth
Nexo
Vorto
Describe. Share. Integrate.
Bosch IoT Suite
ThingWorx
A PTC Business

ProSyst Bosch Group

Bosch Software Innovation & PTC ThingWorx

Joint Architecture



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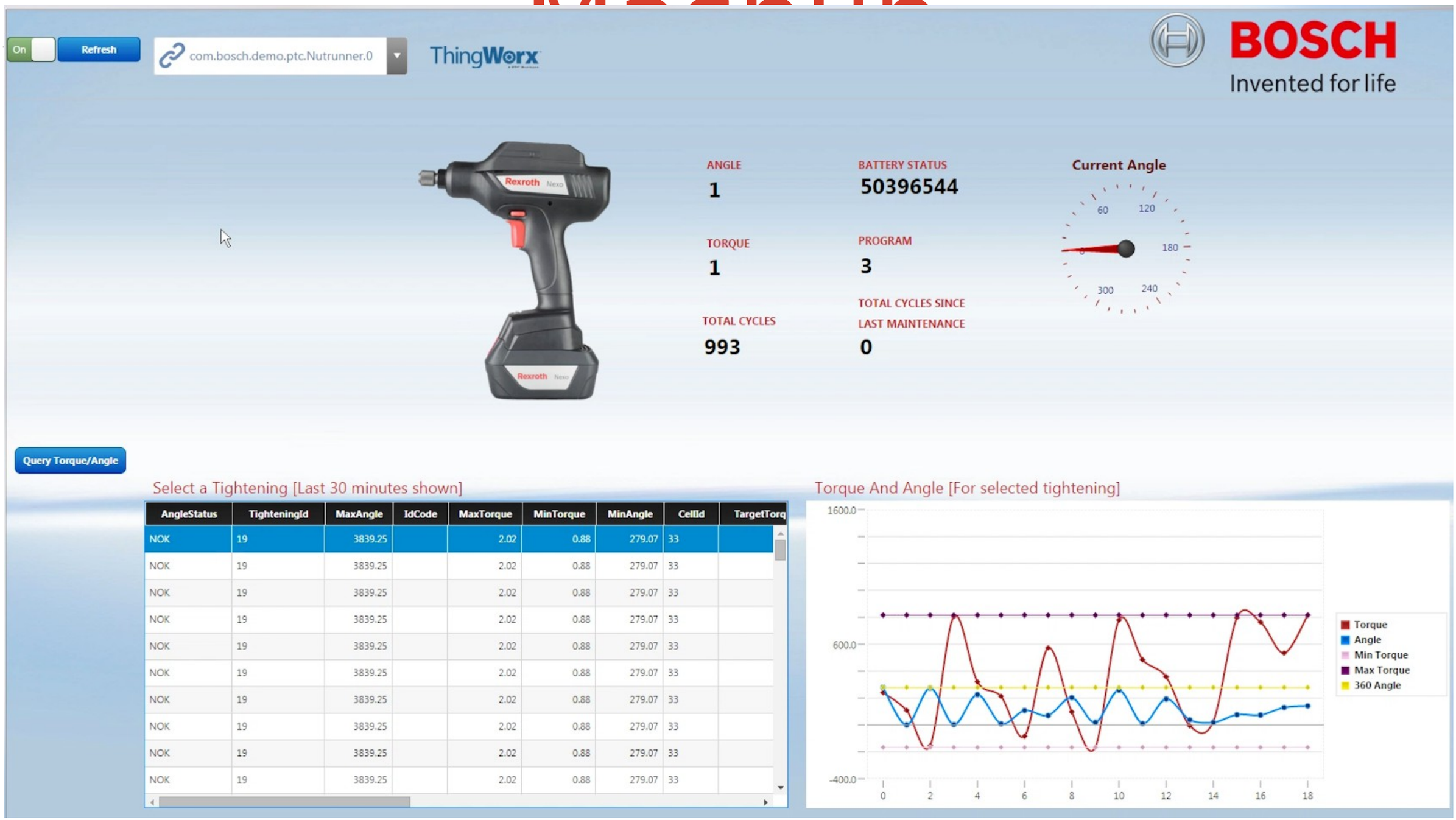
Example for a Nutrunner Mashup



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Towards a global IoT standard

Two central approaches actively driven by Bosch Software Innovations

Gateway ("Frontend")

- OSGi Alliance www.osgi.org
  former "Open Service Gateway Initiative"
- OSGi is a Java framework for developing and deploying modular software programs and libraries of two main elements
  - a specification for modular components ("bundles" or "plug-ins")
  - a Java Virtual Machine service registry that allows bundles to publish, discover and bind to services (SOA).
- Developed since 1999

Information models ("Backend")

- Eclipse Vorto
  www.eclipse.org/vorto
- Vorto ("the word" in Esperanto)
  allows to create and manage technology agnostic, abstract physical device descriptions ("information models") used within IoT applications.
- Eclipse Vorto supports use cases of
  - device manufacturers
  - vendors of IoT platforms
  - solution developers

IoT standardization will happen in open source.
Now is the time to shape open source communities.

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Thank you for your attention!

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