INDUSTRIAL INTERNET MEETS INDUSTRIE 4.0 - COMBINING THE BEST OF TWO WORLDS

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Opportunities of the IIoT Value Chain Transformation

- Product Improvements
- Production Improvements
- Product Performance and Usage Data
- Source: Enterprise IoT
- Targeted Sales
- Remote Services
- Remote Management
- Improved Support
- Digital Services
- Product Improvements
- Remote Services
Challenges of the IIoT Value Chain Transformation

- IT meets Manufacturing
- Cultural Diversity
- Agile
- UX
- Design Thinking
- FOTA
- DevOps
- OnPrem vs Cloud

Source: Enterprise IoT
Working with IIC and I4.0 to address these Challenges

Zurich, 11/2015: Exploratory Workshop on IIC/I4.0 Collab.

Bosch ConnectedWorld, Berlin 03/2016: Presentation of IIC/I4.0 collaboration, first joint Testbed proposal

Chicago, 05/2016: Joint Workshop on architecture, testbeds and standardization

Walldorf, 09/2016: Joint IIC/I4.0 Event, hosted by Bosch and SAP

1 Complementary Domain Focus

2 Cross-Domain Interoperability

3 Testbed Collaboration
Working with IIC and I4.0 to address these Challenges

- Testbeds
- Reference Architectures
- Best Practices
- Interoperability & Standards
- Projects & Deployments
Working with IIC and I4.0 to address these Challenges

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Testbeds Help Driving Innovation

1\textsuperscript{st} public IIC testbed: Track & Trace (Bosch, TechM, Cisco)
- 2015: From idea to commercial deployment in less than 1 year
- 2016: New use case „Forklifts“ (Bosch & SAP)

Value
- Validate technologies
- Blueprints for commercial solutions
- Generate best practices and standards
- Promote creation of partner ecosystems

Testbeds @ I4.0
- Bosch has joined Labs Network Industrie 4.0
- Support I4.0 testbeds
- Enable further collaboration between IIC and I4.0
- Foster integration of SME’s into IIoT value chain
Problems

"I think, that our forklift drivers drive inefficient ways and have too many and too long empty runs, but I don’t know it exactly."

Fleet Manager

"The operating costs are too high and we have no real-time transparency about the efficiency level of our fleet."

Safety Officer

"We want to avoid personal injury to 100% as well as damage to buildings and equipment"
SAP IoT Applications, Vehicle Insight

Field data aggregation, correlation, micro-services

Solution

SAP ERP, EWM, Analytics
Where IIC and I4.0 are Adding Value

- Testbeds
- Reference Architectures
- Best Practices
- Interoperability & Standards
- Projects & Deployments
IIC and I4.0 Help Managing the IIoT Value Chain

RAMI4.0
I4.0 Reference Architecture

- Provides common language
- Maps physical to virtual world
- Covers product life cycle

IIRA
IIC Reference Architecture

- Provides common language
- Reduces complexity
- Ensures scalability
Where IIC and I4.0 are Adding Value

- Testbeds
- Reference Architectures
- Best Practices
- Interoperability & Standards
- Projects & Deployments
Best Practices Help Ensuring Project Success

Best Practice =

Reference Architecture
+ Project Experience

Need for

- Certified IIoT experts
- Tools and support for IIoT project managers
- Lean description of best practices
Re-Usable Best Practices, derived from Testbeds
Re-Usable Best Practices, derived from Testbeds

Example: Change asset design to provide required fixtures for sensors and telematics unit of IIoT solution. Also, prepare asset production to include assembly of sensors and gateway, plus pairing of final asset with digital twin.
Where IIC and I4.0 are Adding Value

- Testbeds
- Reference Architectures
- Best Practices
- Interoperability & Standards
- Projects & Deployments
From Testbeds to Standards

- Production Performance Management (PPM) testbed: Bosch plant in Homburg
- Optimization of production performance: on-time delivery, OEE, energy utilization
- Open standard, derived from Homburg PPM testbed
- High relevance for both, SME’s and large enterprises

PPM Protocol (PPMP)
PPM Protocol Ensures Interoperability

PPM Protocol
- Easy to use
- Utilizes standard Internet technologies
- Open source

PPM
Data aggregation (digital twin) and conversion to KPI’s

PPM dashboard, advanced analytics, simulation

PPM Protocol

Machine components, sensors, ...

Energy, HVAC, building, ...

Industrial Internet Consortium

BOSCH
Where IIC and I4.0 are Adding Value

- Testbeds
- Reference Architectures
- Best Practices
- Interoperability & Standards
- Projects & Deployments
Why is all of this important to a company like Bosch?
Production Planning & Control

Typical Challenges

- Real Time situation
- Kanban System
- Material Order
- Push/Pull systems
- ERP integration
- Levelling
- Available to Promise (ATP) checks
- Micro services
- Visualization
- KPI reporting
- Agile Response
- MES integration

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Production Planning & Control - ProCon
Solution based on established Kanban Demand approach
Production Planning & Control - ProCon
Leveraging Best Practices from IIC + I4.0
Production Planning & Control - ProCon

Example: Use of IIC Reference Architecture

Edge Tier
- Proximity Network
- Data Aggregation
- MES Integration
- OTD* Integration

Platform Tier
- Business Rules Management
- Business Process Management

Enterprise Tier
- MARS
  - Line Assignment Rules
  - Production Monitoring
  - Production Controls

Data Flow
- Control Flow
- Access Network

OTD* Integration
- Access Network
- MES Integration
- Data Aggregation

Example: Use of IIC Reference Architecture
Deployments
Summary

- IoT transforms traditional industrial value chains
- Bosch already uses IoT solutions in own plants
- For broad deployment and accessibility especially for SME’s interoperability is key
- PPMP as an example for standardization through open source
- Bosch supports IIC and I4.0 consortia and their initiatives