Deterministic Communication for the Industrial IoT

Dr. Christoph Gugg
B&R Industrial Automation, Member of IIC
BU Open Automation Technologies

May 23rd, 2017 @ Intelligent Sensor Networks Conference, Düsseldorf
B&R Industrial Automation, Member of IIC

- automation solutions provider
- 75 countries with 180 offices
- 3000 employees

- 620.000.000 EUR turnover (2016)
- ~ 6.000.000 installed controllers
- > 3800 OEM customers

Industrial IoT
How to achieve the digital factory?

Internet

Industrial

Things

Time Sensitive Networking (TSN)
Publisher / Subscriber (Pub / Sub)
Characteristics of OPC UA

- Cross industry standard
- Standardized by OPC Foundation
- Largest ecosystem in 2018
- Time Sensitive Networking (TSN)
- Publisher / Subscriber (Pub / Sub)
- Industrial Internet of Things (Industrial IoT)
- Communication standard
- Secure network
- Requested by endcustomers
Press Release: OPC UA TSN for Industrial IoT

Leading automation and information technology suppliers drive OPC UA TSN for unified Industrial Internet of Things (Industrial IoT) communication to the controller level.

SPS IPC Drives 2016 (29.11.2016)
How does it work?
Industrial IoT: Communication Protocols

TCP/UDP/IP

machine A

handling

machine B

line integration: determinism via TSN & Pub/Sub

factory level [ms]
machine level [µs]
Enhancement of OPC UA

TSN working group at OPC Foundation

1.) Time Sensitive Networking (TSN)
   - deterministic communication in large scale networks
   - common timing among all network participants

**Ethernet TSN**
based infrastructure

\[ t = \text{constant} \]

\[ S = \text{Switch} \]
Enhancement of OPC UA

2.) Publish / Subscribe (Pub / Sub)

- enhances the existing OPC UA client / server communication
- cyclic data-communication / subscribe certain functionality

Network infrastructure

Ethernet TSN

publisher

Deterministic transmission

subscribers
Use Case: Brownfield Application (*Aging Plant*)

### Food & Beverage Industry

**Application:**
- Lifecycle management
- Connectivity to higher-level IT systems

**B&R Products:**
- Orange Box
- OPC UA bus coupler
- Panel PC

**Customer Value:**
- Improved brownfield competiveness
- Operational effectiveness

### Architecture

- **Industrial IoT Functionalities**
- **OPC UA MQTT**
Use Case: Fleet Management

Maritime Industry

Application:
• Process data acquisition
• Secure remote maintenance

B&R Products:
• APC2100, X20 PLC, X20 I/O

Customer Value:
• Enhanced lifecycle management
• Provide additional services
• Optimized end-user experience

Architecture
Use Case: Predictive Maintenance

Automotive industry

Application:
• Online vibration monitoring on assembly line
• Data aggregation on edge controller

B&R Products:
• X20CMxxx, X20 PLC, X20 I/O’s, APC910
• Automation Runtime, Aprol

Customer Value:
• Prevent secondary damage
• Predict achievable product quality and production quantities
• Reduced unplanned downtime

Architecture

Industrial IoT Functionalities

MQTT
Use Case: Remote Access

**Industrial Equipment**

**Application:**
- Secure remote maintenance

**B&R Products:**
- X20 PLC, Site Manager
- Gate Manager, Automation Runtime

**Customer Value:**
- Secure remote maintenance
- Operational effectiveness

**Architecture**

Industrial IoT Functionalities

Things are coming together.

www.iiconsortium.org
Contact Information

Dipl.-Ing. Dr.mont. Christoph Gugg
BU Open Automation Technologies
christoph.gugg@br-automation.com

Bernecker + Rainer
Industrie-Elektronik Ges.m.b.H

B&R Strasse 1
5142 Eggelsberg
Austria

Tel.: +43 7748 6586-1209
Mobile: +43 664 83 48 390