Specification for Communication between applications in LNWS Melbu - Version 1.0

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Contents

1. 1 Introduction

- **Scope and Relevance:** This document specifies interfaces for communication between machines and software in a digitally driven company. It spotlights the availability of all data generated by production equipment and software to promote automation and efficiency.
- **Target group:** Equipment manufacturers, developers, purchasing managers, project managers, IT & OT operational managers, etc.
- **References:** Links to relevant documents, standards, or specifications:
  MQTT

  SparkPlug MQTT Topic & Payload Specification Rev 2.2
  OPC Unified Architecture (UA)

2. Terminology and abbreviations

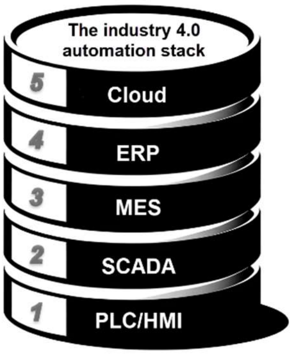
- **Application:** Hardware (machine) or software producing or consuming data.
- **Industry 4.0**: a term about using modern tools and all their possibilities for development, construction, and operation in a modern industry.
- **IIoT (Industrial Internet of Things):** Focuses on communication between machines and equipment in industry to make use of condition and efficiency measurements for use in both automated and controlled management of processes.
- **SCADA (Supervisory Control and Data Acquisition):** System for monitoring, control and data collection from machines, equipment, buildings, etc.
- **MES (Manufacturing Execution Systems):** A system for production control.
- **ERP (Enterprise Resource Planning):** is a software system that helps you run your entire business, supporting automation and processes in finance, human resources, manufacturing, supply chain, services, procurement and more.
- **MQTT (Message Queuing Telemetry Transport):** Lightweight communication protocol, particularly suitable for IoT/IIoT.
- **OPC-UA (Open Platform Communications - Unified Architecture):** Communication protocol for industrial automation.
- **API (Application Programming Interface):** An interface that provides direct access to data and functionality in a computer system.

3. Requirements for System and Communication

- **Communication protocols:** All systems must have available either the **MQTT** or **OPC-UA** protocol for communication.
- **Data Availability**: All systems must offer access to all condition and production information, whether it is hardware or software.
- **Exemption for Intellectual Property Rights:** Information that is relevant to intellectual property rights, or may reveal such, is exempt from the requirement for availability

4. Layering of the automation stack

The automation stack is divided into the following 5 layers:



5. Cloud-based applications and services

4. Applications and functions for resource planning at company level

3. Applications and functions for production management

2. Monitoring, control, and data collection

1. Machine control and user interface

5. Examples and usage patterns

- **Safety**
  - For applications in L1 to L4: The minimum requirement is that communication is secured with a username and password for authentication.
  - For applications in L5 and all communication that is open to the internet: Communication MUST be secured with SSL/TLS encryption.
- **Selection of communication protocol**
  - **OPC-UA:** For all process control between layers 1 and 2, OPC-UA must be used, either by machine controllers / PLCs having an integrated OPC-UA server or OPC-UA client.
    The structure of the tag hierarchy should be clear and the names of data tags should be descriptive.
    OPC-UA can also be used in layers 2 to 5, but this is not the preferred solution.
  - **MQTT:** For communication from layers 2 to 5, the MQTT protocol is preferred. Payload can be both "flat/Vanilla" MQTT, "flat/Vanilla" MQTT in JSON format, and in SparkPlug B / SparkPlug 3.
    Topic structure is desired to be as described in ISA-95 pt.2: (company/factory/department/line/machine) where possible.

Example:

- **Flat/Vanilla:**
- "factory/department/line/machine/measuring point/value" (bool/text string/number) - where the last term is the value of the tag, and the preceding term is the location of the measuring point in the form of MQTT-Topic.
- **Flat/Vanilla JSON:**
  Same as above, but here the value can be a key in a JSON payload so that the topic becomes: "factory/department/line/machine" and several values are sent in the same payload:

```
{
  "Metric 1": True,
  "Metric 2": 29,
  "Metric 3": "Product name"
}
```

- **SparkPlug**:
  SparkPlug will limit the ISA-95 division to 3 layers, and these will then be: "<Group ID>/<Edge Node ID>/<Device ID>" which is set up in each individual application. These must be possible to change/set up by the end user.
- **Exceptions / alternatives**:
  Suppliers are of course free to choose the communication protocol within their systems, between their products and products from other suppliers so that these can be coordinated/controlled. But the data points in the equipment must be made available in one of the above-mentioned alternatives.
  If the relevant application/machine cannot deliver data directly according to this specification, it must be delivered with a gateway solution so that the data is still made available to the customer.
  For applications in layers 3 to 5, it can exceptionally be accepted that data access and communication is handled with a REST API, but this requires that the API is well documented, and that the customer is given the opportunity to look through the documentation and accepts it before an agreement on delivery is entered.

Any additional costs to meet these requirements must be included in the price offer for equipment requested.

6. Revisjonslogg

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