

IoT/IIoT Enablement Overview

Machine / Device / Equipment

- Make/Model
- Description
- Use cases
- Users

Objectives

- Operational data**
 - production: On-off duty cycle, production rate
 - consumption: energy, efficiency, ...
- Maintenance and support**
 - Uptime / Downtime measurement
 - Reduction of downtime
 - Prediction of failure
 - ...
- your specific objectives ...

Cloud GUI

- Drill down
- KPIs
- Alerts
- Actions
- User specific
- Dashboard
- Charts
- Reports

Cloud Analytics

- Formula/Algorithm
- Synthesized parameters
- Feature extraction
- Machine learning
- Deep Learning

Data Modelling

- Digital Twins
- ...

Configuration

- Assets hierarchy
- Device Provisioning/Management
- ...

Cloud Protocol

- MQTT
- AMQP
- Web services
- authentication
- Provisioning
- Security**

Cloud/Server

TheEdge/Field Gateway

Interface to Field/Sensors

- Via Existing Controller**
 - Protocols**: Modbus, BACnet, Profibus/Fieldbus etc, CAN
 - Available sensors (monitor)**
 - Digital**: Name, Interface, Address, remarks
 - Analog**
 - <<Temperature>>**: Frequency frequency, Logging Frequency, Resolution and range (-10 to 50 deg, 0.1 deg)
 - Pressure
 - ...
 - Actuators (control)**
 - Analog
 - Digital
- Direct Interface**
 - Interface**
 - Wired**: Serial, USB, LAN, I2C, SPI, GPIO, ...
 - Wireless**: Bluetooth, BLE, ZigBee, ...
 - GPS**: location
 - Added/Retrofitted Sensors (monitor)**
 - Digital**: Name, Interface, Address, remarks
 - Analog**
 - <<Temperature>>**: Frequency frequency, Logging Frequency, Resolution and range (-10 to 50 deg, 0.1 deg)
 - ...
 - Interfacing modules/controllers/PLCs**
 - Actuators (control)**
 - Digital
 - Analog

Edge Analytics

- Statistical summary of sensor values**: Mean, median, variance etc, duration, number of samples
- Synthesized parameters**
 - Formula/Algorithm
 - Thresholds
 - Actions: logging, send record, measure related parameters and send
- Notifications**
 - local indication: LED / LCD/etc
 - direct external: SMS, email
 - Event published to cloud

Cloud connection

- LAN
- WiFi
- GPRS/3G/4G
- LoRa
- ...

Management

- Provisioning**: Remote configuration and configuration upgrade, add/remove sensors
- OTA**: over the air upgrade of software/firmware
- Security**

Gateway (Edge) Hardware

- Footprint**: processor/microcontrollers, RAM/Flash/EEPROM, integrated peripherals and modules
- OS**
 - Without OS
 - With OS: FreeRTOS, Linux, Windows 10 IoT Core, variety others
- Framework**: Predix Machine, IBM Foundation, Proprietary, ...