Intro to Industrial Internet of Things (IIoT): MQTT Protocol

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Digital Design, Analysis and Manufacturing

Decentralized Manufacturing Service Sys.

Biomedical Manufacturing - Biofabrication

Additive Manufacturing - 3D Printing

Badges

Industrial Internet of Things (IIoT) with MQTT Protocol Badge

- IIoT—Industrial Data Flow
- IIoT—MQTT Protocol
- IIoT—Factory Dashboard with MQTT
- IIoT—Raspberry-PI with MQTT

Equip yourself with essential skills in Smart Manufacturing, MQTT communication, and practical applications using Raspberry Pi.

Take one micro-badge or complete all four to earn the badge!

Earn the badge and gain the ability to:

- Describe how data flows from the machine asset to the factory information system
- Identify, interpret, and apply publish-subscribe (Pub-Sub) based MQTT communication protocol
- Develop a front-end User Interface (UI) using the Plotly Dashboard Python-based framework
- Deploy middleware services that connect the backend and front end of an IIoT hardware-software stack

Synchronous Online

IIoT : MQTT Protocol

Learning Outcome

Participants will be able to explain the foundational principles of the MQTT protocol, and the specific SPARKPLUG specification for industrial communications.

Skills

Decentralized Comms | MQTT-SPARKPLUG | MQTT | Node-Red | Pub-Sub Architecture

Earning Criteria

- Give contemporary examples of the applications of the MQTT Protocol within Industry sectors.
- Build a Factory Dashboard with Node-Red using MQTT protocol.

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What is Smart Manufacturing

*Smart Manufacturing is the information-driven, **event-driven**, efficient, and collaborative orchestration of business, physical and digital processes within plants, factories and across the entire value chain.*

By CESMII – The Smart Manufacturing Institute

Reference: https://www.cesmii.org/what-is-smart-manufacturing-the-smart-manufacturing-definition/

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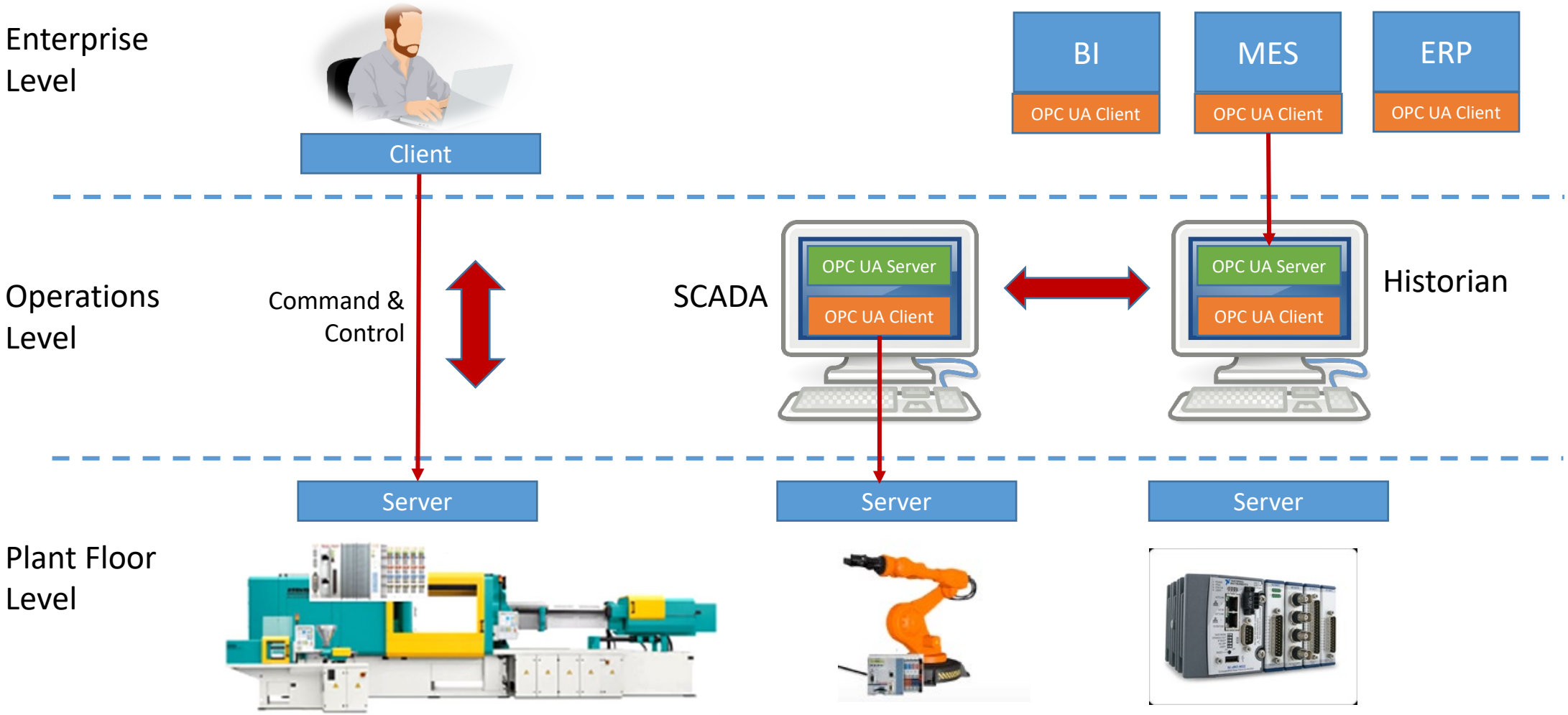
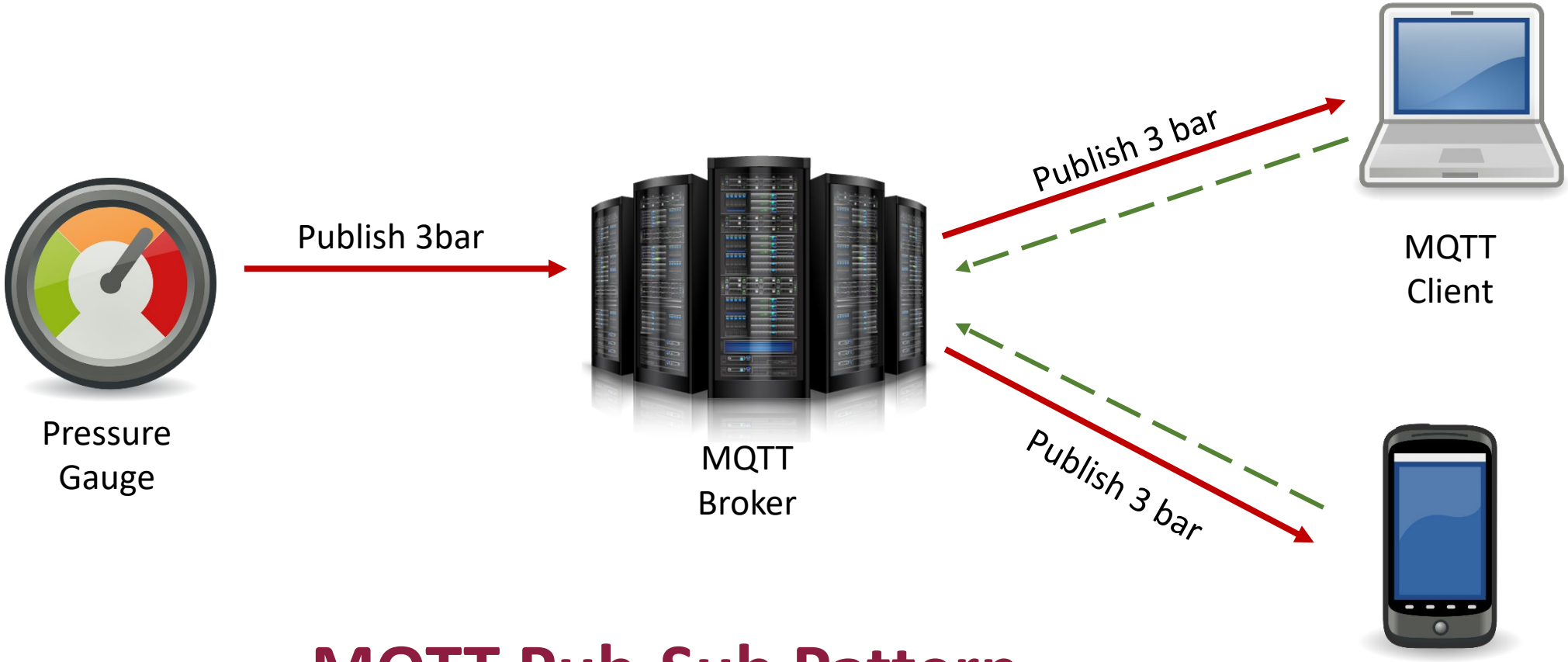
Industrial Data Flow



10hr Agenda

- Module 1: Intro to the MQTT Protocol (4hrs)
  - Class Intro
  - Pub-Sub Communication Pattern
  - Introduction to the MQTT Protocol
  - Test out the MQTT Protocol via Python (PAHO-MQTT)
  - MQTT SparkPlug Protocol
- Module 2: MQTT & Node-Red (3hrs)
  - Node-Red Intro
  - Simulate a machine as an MQTT Publisher Client
  - Build a Node-Red Factory Dashboard
  - Display of Node-Red Dashboard Projects
- Module 3: Role of IIoT in Industrial Sectors (3hrs)
  - MQTT Implementation in Industrial Sectors
  - Conclusion

Publish-Subscribe Communication



MQTT Pub-Sub Pattern

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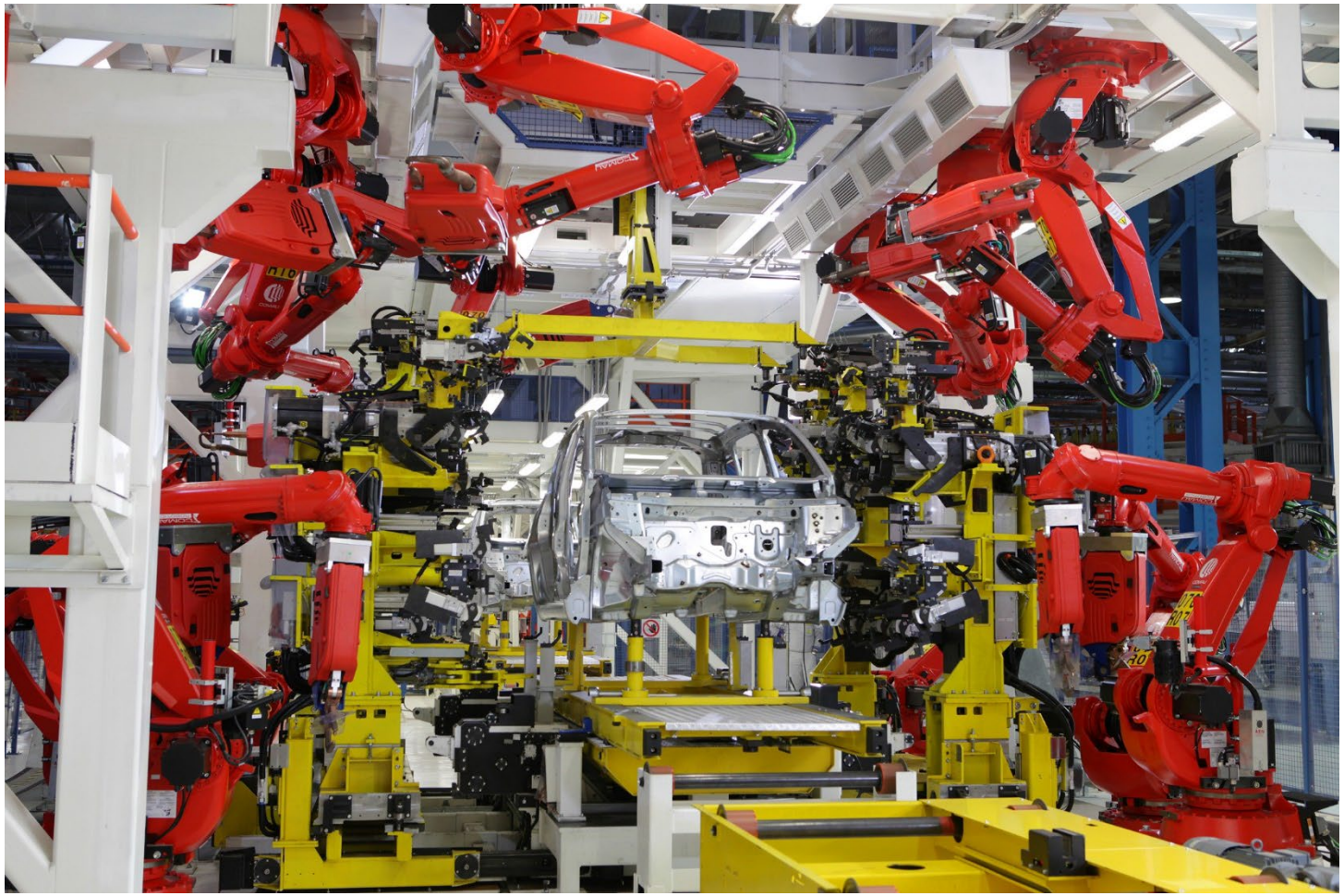
How is MQTT Relevant to SM



1. Various Machines Assets
2. From Various Vendors
3. Industrial Environment
4. Assets on the field with low infrastructure
5. Generated with varying frequencies.

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What Next?

- Industrial Internet of Things: Industrial Data Flow
- **Industrial Internet of Things: MQTT Protocol**
  - We will use Python as a programming language to test and use the MQTT protocol
  - Use the Node-Red framework to build out a dashboard
- Industrial Internet of Things: Factory Dashboard & Streamlit
  - We will use Python as a programming language to test and use the MQTT protocol
  - Streamlit Python Framework to build web deployable dashboards
- IIoT: Implementation with Raspberry Pi & Streamlit
  - Python
  - Requires a RaspberryPi (3,4,5)

See Full Schedule at: IIoT: MQTT Schedule LINK