Accelerating Digitization in Chemical Manufacturing with MQTT

Speaker: Ravi Subramanyan, Director of Industry Solutions Manufacturing at HiveMQ

Speaker

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Ravi is a product management leader with extensive experience delivering high-quality products and services that have generated revenues and cost savings of over $10B for companies such as Motorola, GE, Bosch, and Weir. His expertise spans industries such as Mining, O&G, Industrial Automation, Automotive, Mobile Devices, Enterprise communications, Automotive and Fleet Management. He also has technical expertise in Data Analytics, Artificial Intelligence (AI), Big Data, Data Security, Product Marketing, Product Engineering, Cloud Platforms, SaaS/PaaS, and Agile Methodologies.

Introduction to HiveMQ

- **Founded in 2012**, headquartered in **Landshut, Germany**, near Munich.
- For **manufacturing**, we **connect** data from different equipment sources and **aggregate** them in a **secure** and **reliable** way to enable **Industry 4.0** and Factory modernization
- **130+ customers** trust our solution to enable their digitization journey
- Raised **€49.3 million** in seed and series A funding

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Future of Manufacturing

Automation

Cybersecurity

Advanced Analytics

INDUSTRY 4.0

Smart Sensors

Cloud Computing

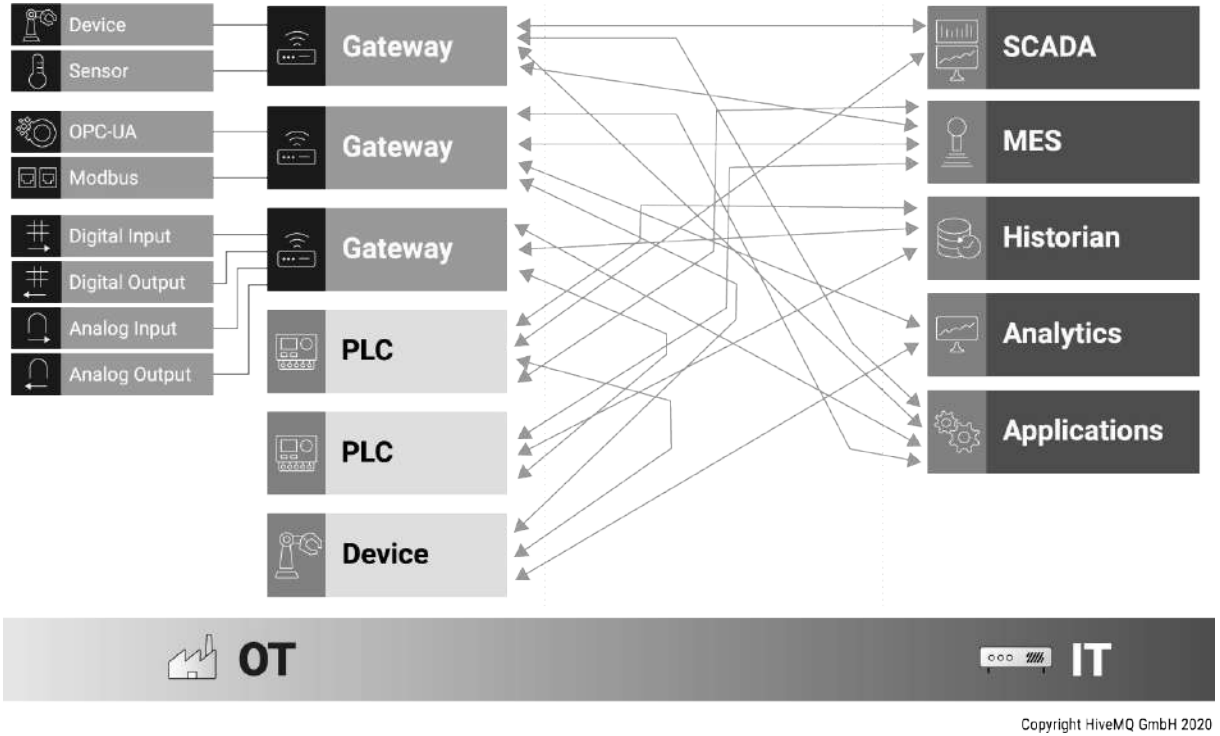
AI / ML

Business Drivers

- Automate regulatory compliance reporting
- Enable traceability to support audit management and product recalls
- Achieve higher Overall Equipment Efficiency(OEE)
- Enable remote monitoring
- Reduce carbon footprint
- Enable product innovations

Lots of Data Silos

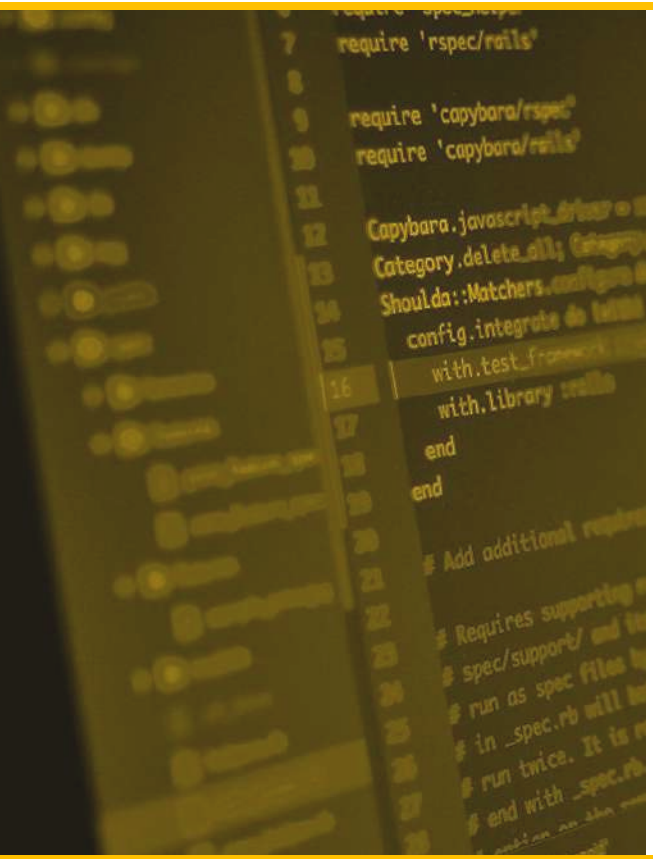
Siloed OT Systems - No Interoperability



Challenges

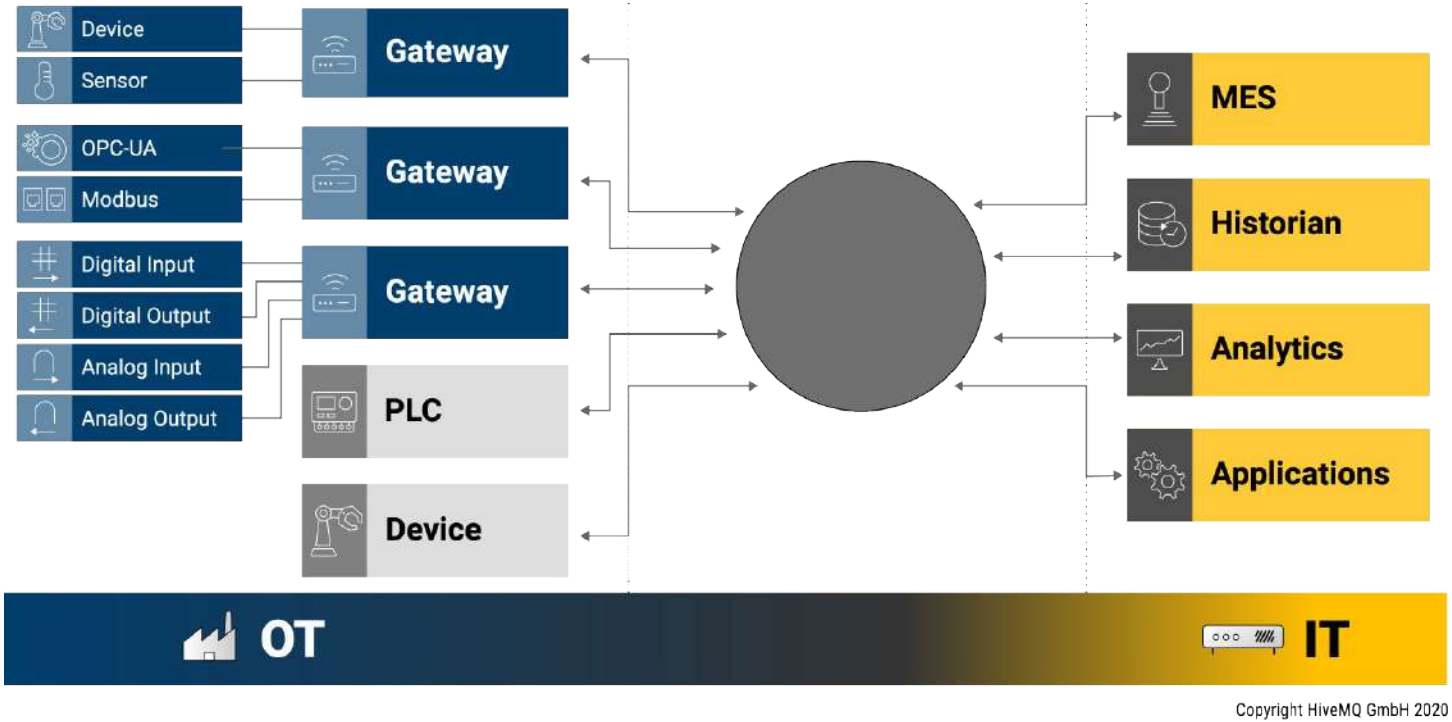
- Dealing with multiple rules and regulations to remain compliant with various agencies
- Need for information for Hazard analysis spread across multiple locations
- Lack of inventory visibility
- Quality control challenges
- Scrapping/reworking a batch

Goals for Modernization



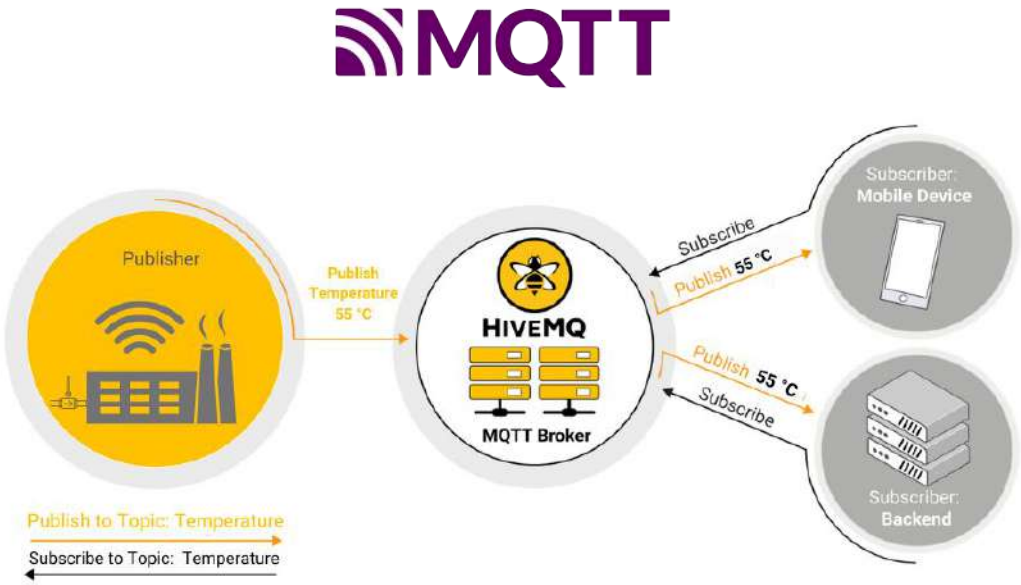
- Accessing real-time data
- Digitizing equipment health inspections
- Allowing modular automation in a manufacturing plant
- Identifying bottlenecks
- Maintaining electronic batch records
- Enabling digital traceability

Decoupled Architecture

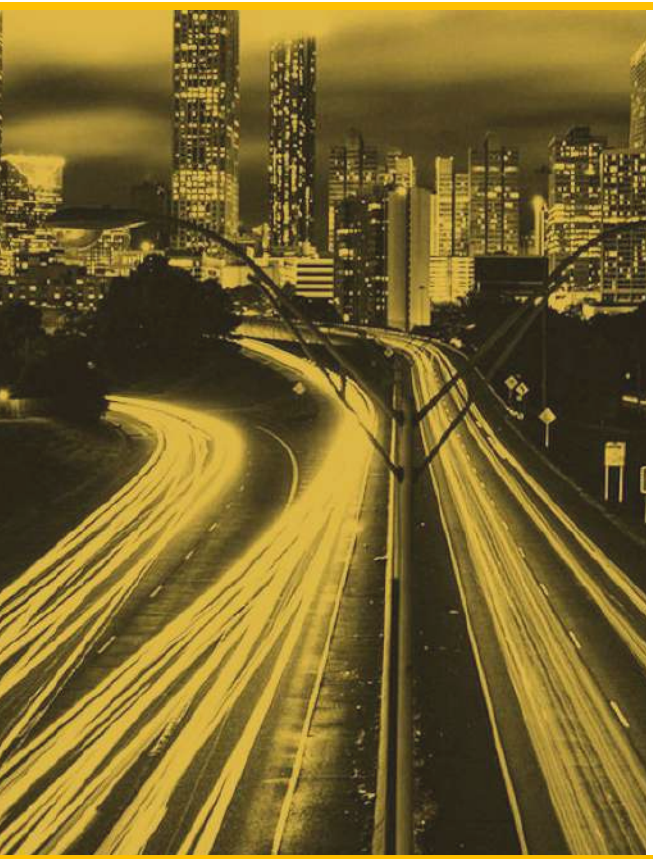


What is MQTT?

- A standard binary publish-subscribe messaging protocol designed for fast and reliable data transport between devices especially under very constrained conditions
- Constraints include unreliable network connectivity, limited bandwidth, limited battery power, and so on
- Built on top of TCP/IP
- Ideal for the Industrial Internet of Things



But There Are Still Issues



- Devices and endpoints have different topics, payloads and data structures
- Applications assuming specific formats and structure
- Data agnostic - payload must be interpreted but no context

What is Sparkplug?

KEY CONCEPTS

A simple, open specification, that will enable plug and play interoperability between IIoT devices and IIoT applications.

Sparkplug Defines:

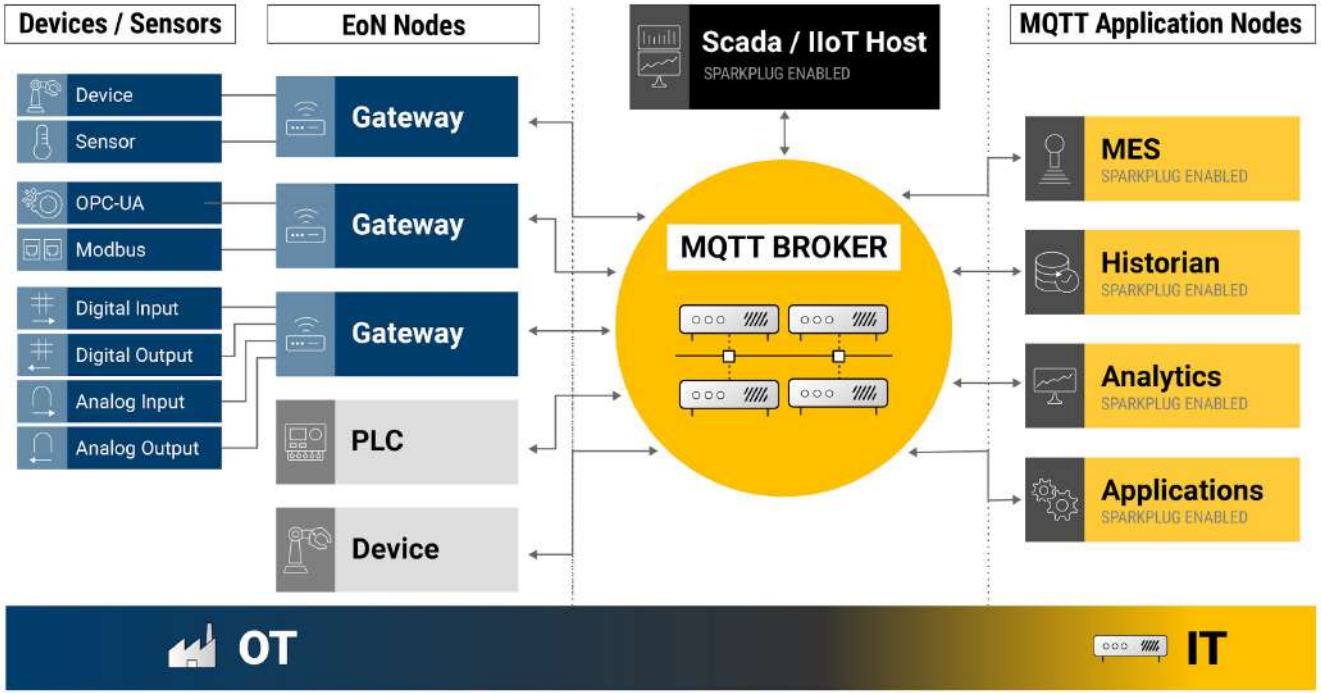
- Topic namespace
- Data Model and Structure
- Extensible process variable payload
- Defines MQTT state management

What is Sparkplug?

INTRODUCING

- Continuous Session Awareness
- Report by Exception
- Interoperability by consistent data format
- Auto Discovery

MQTT Sparkplug Architecture



Factory Components | SCADA/IIoT Host

SCADA / IIoT Host

- Application responsible for monitoring and control MQTT EoN node
- Maintain continuous session state awareness of all participants (machines, devices, PLCs, sensors, gateways and applications)
- Not responsible for establishing or maintaining connections directly to the device
- In Sparkplug, devices, EoN and SCADA/ IIoT Host connect to central MQTT broker to publish and subscribe to data; allowing report by exception

Factory Components | EoN Nodes

EDGE OF NETWORK (EoN) NODES

- EoN provide physical and logical gateway function for devices that don’t implement Sparkplug
- EoN manage the state and session of itself and the connected sensors
- EoN allows devices that implement protocols like OPC-UA, Modbus, and proprietary PLC to connect to a Sparkplug architecture

Factory Components | Devices

Devices

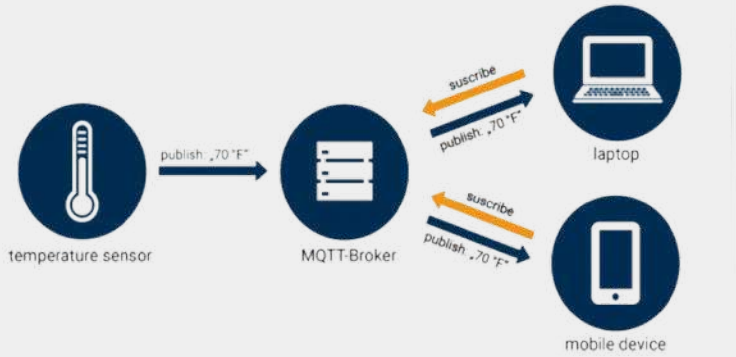
- Devices and sensors are the key endpoints in any industrial automation system
- Devices and sensors connect with EoN that bridge the data from these devices into the Sparkplug protocol

Factory Components | MQTT Application Nodes

MQTT APPLICATION NODES

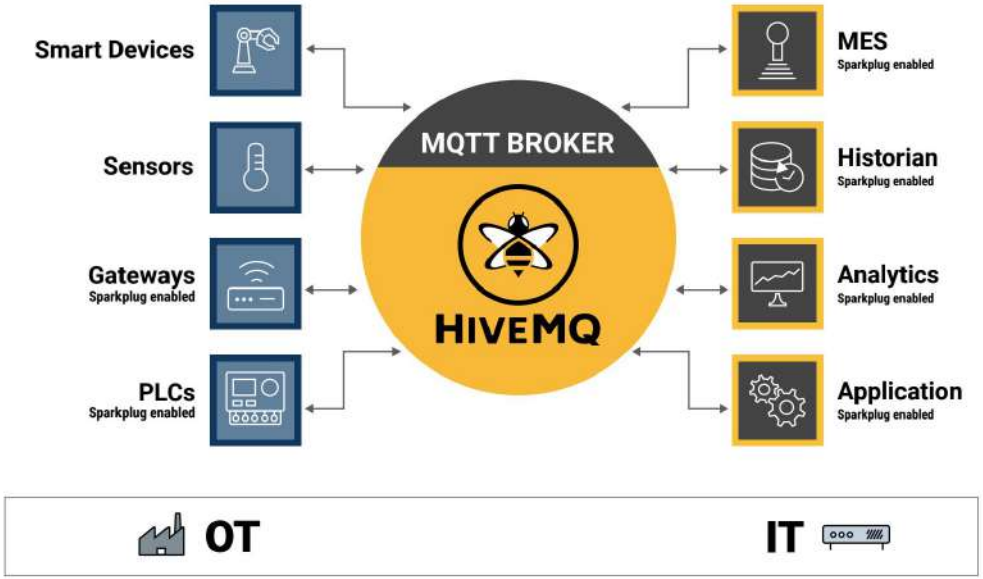
- MQTT Application Nodes can produce and consume Sparkplug messages but don’t act as a SCADA / IIoT Host.
- Typically Application Nodes are MES, Historians, Analytics systems

The MQTT Broker



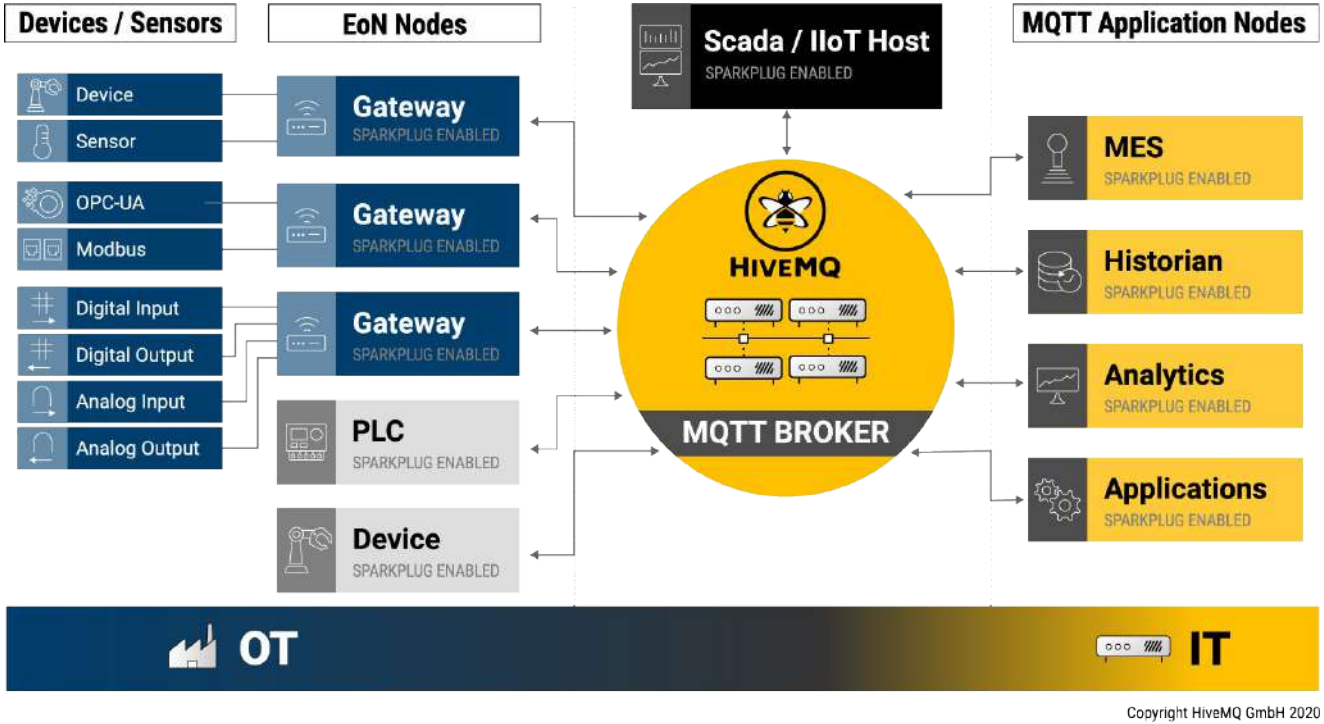
- MQTT broker is the central data distribution point in a Sparkplug architecture
- MQTT broker requirements:
  - 100% compliant to MQTT 3.1.1
  - Requires features like Retained Messages, Last Will and Testament and QoS
  - Not all MQTT brokers support these features: MS Azure IoT Hub and AWS IoT can't be used with Sparkplug

HiveMQ MQTT Platform

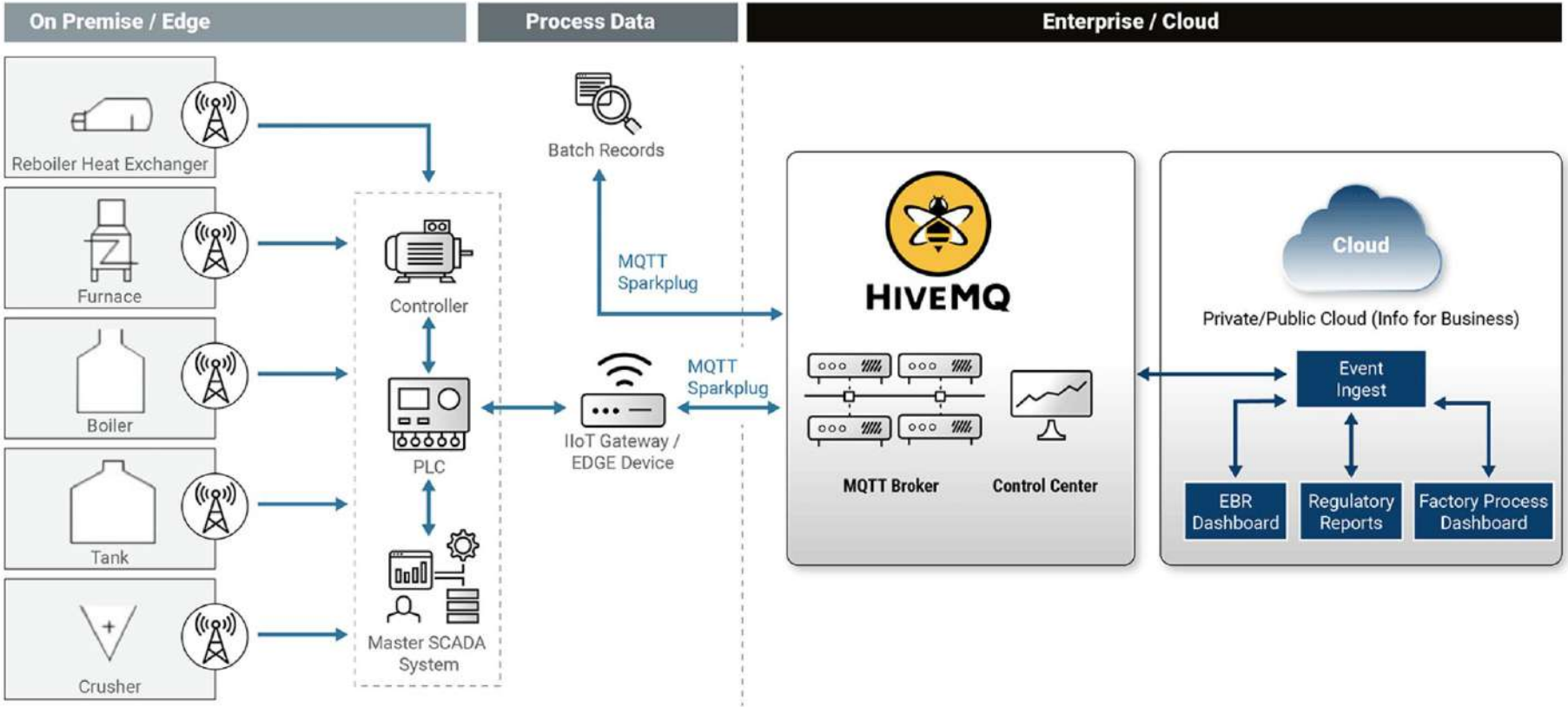


- High availability
- 100% MQTT compliant
- Scalability
- Observability
- Enterprise Security
- Integration with OT/IT Systems

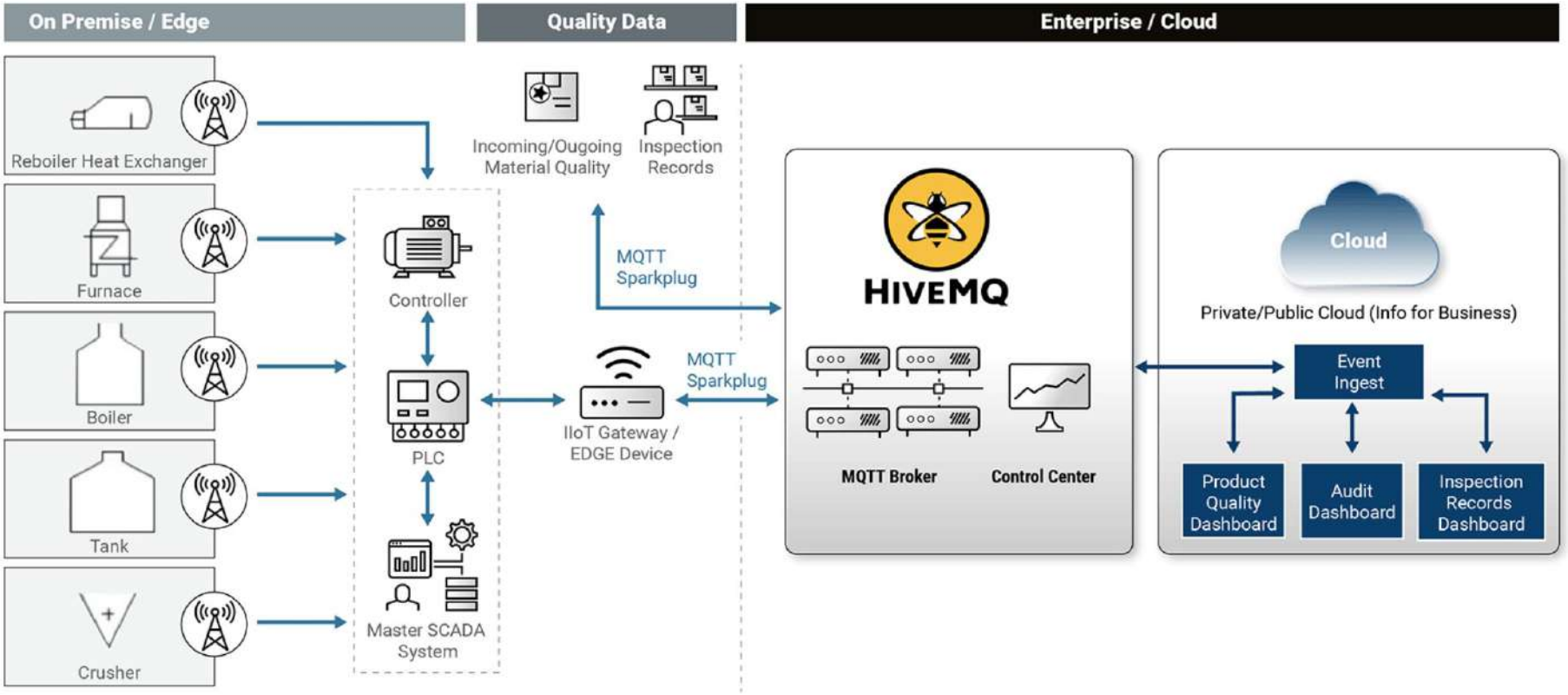
MQTT with Sparkplug Architecture



Regulatory Reporting Use Case Architecture



Product Traceability Use Case Architecture



Which of the following protocols do you use today

to connect your equipment?

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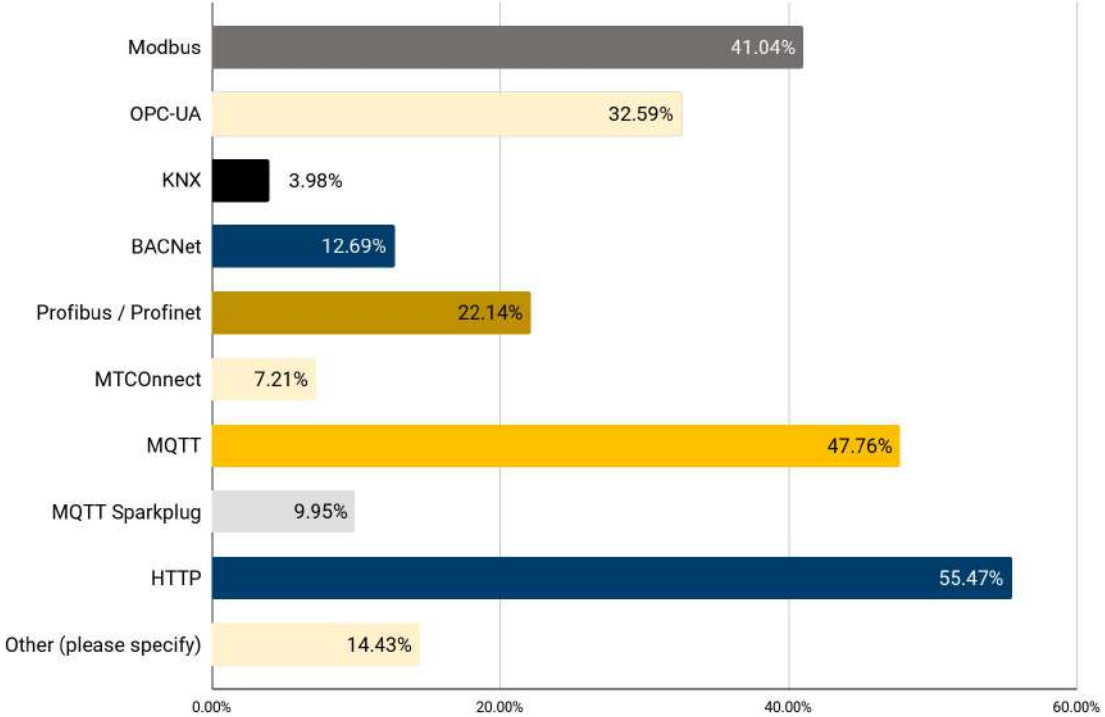

Which of the following protocols do you consider strategic to fulfill your IIoT strategy?

Select all that apply

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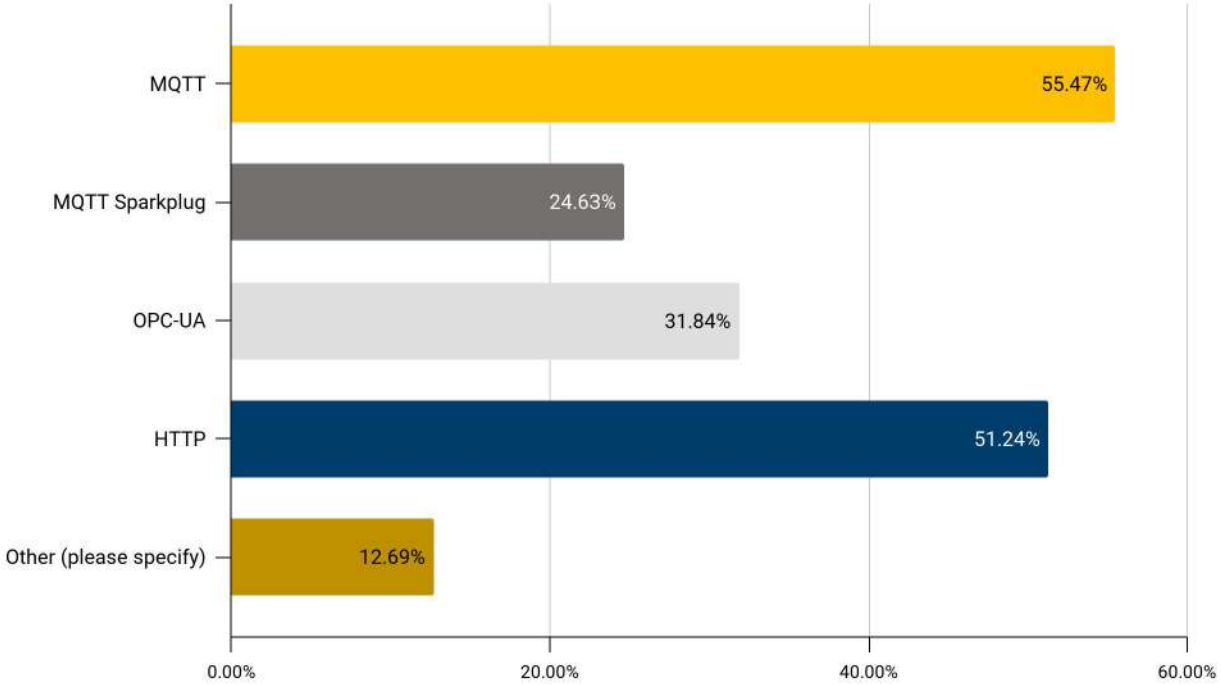

What best reflects your experience with Sparkplug?

Select all that apply

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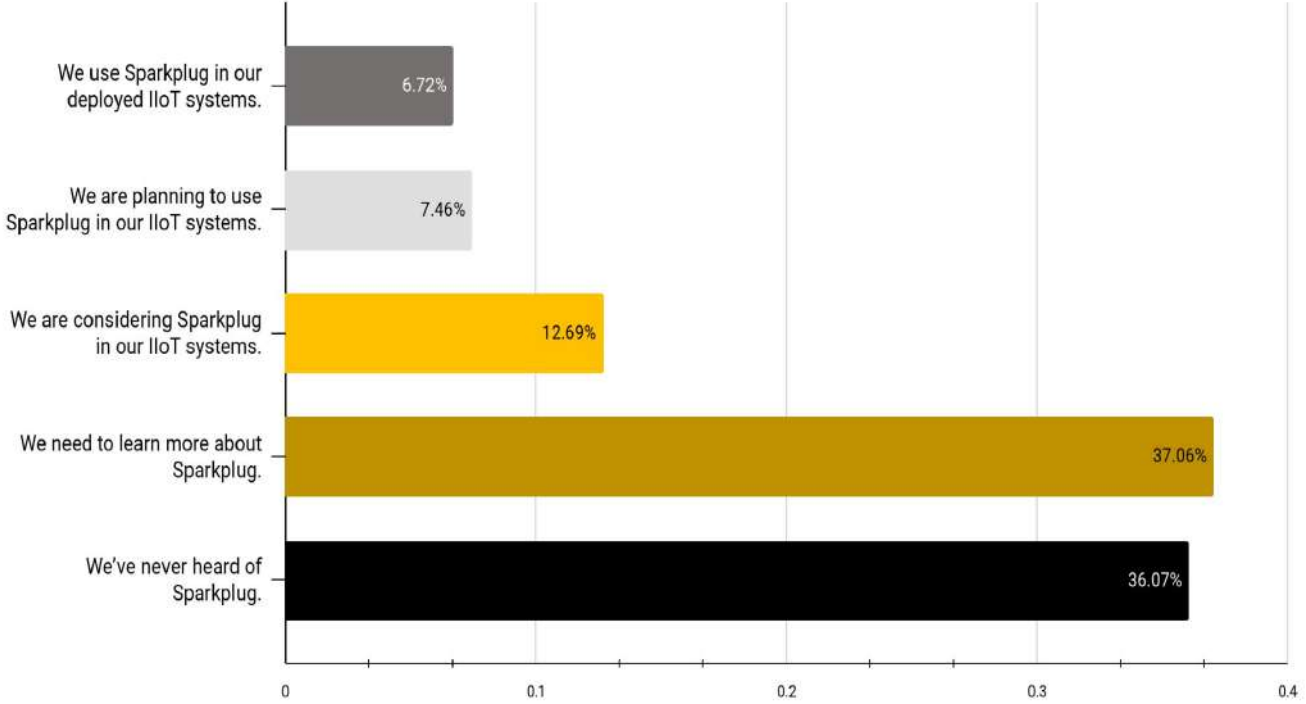

Sparkplug Ecosystem

https://www.hivemq.com/solutions/technology/mqtt-sparkplug/

Next Steps

Read our whitepaper: [Digitization of Chemical Manufacturing Industry]

New to MQTT? [Get the MQTT Essentials e-Book]

New to MQTT Sparkplug? [Get the MQTT Sparkplug Essentials e-Book]

Next Steps

Try out HiveMQ today: https://www.hivemq.com/downloads/

Not ready to try our platform yet? Book a demo to see how HiveMQ supports the Sparkplug specification

ANY QUESTIONS?

THANK YOU

Contact

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