

# MQTT Sparkplug: A Novel Solution to Data Interoperability in Industrial Automation

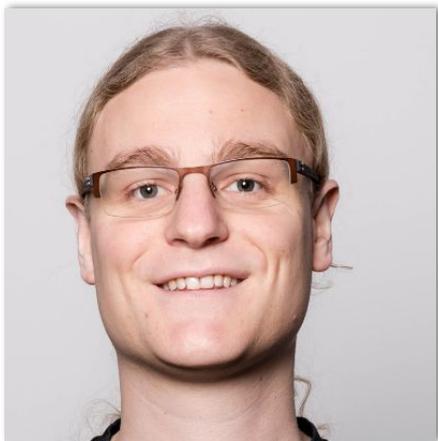
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Speaker: Dominik Obermaier, CTO and Co-founder of HiveMQ



# HIVEMQ

# Speaker



**Dominik Obermaier**

CTO and Co-Founder of HiveMQ

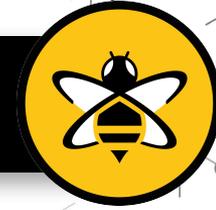
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Dominik Obermaier is the CTO and the co-founder of HiveMQ. He is a member of the OASIS Technical Committee and is part of the standardization committee for MQTT 3.1.1 and MQTT 5. He is the co-author of the book “The Technical Foundations of IoT” and a frequent speaker on IoT, MQTT, and messaging.



# Introduction to HiveMQ



- **Founded in 2012**, headquartered in **Landshut, Germany**. 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



Audi



SIEMENS



LIBERTY GLOBAL

DAIMLER



# Future of Manufacturing



Automation



Cybersecurity



Advanced Analytics



**INDUSTRY 4.0**



Smart Sensors



Cloud Computing



AI / ML



# Business Drivers



- Improve factory efficiency
- Optimize intra plant logistics
- More flexible manufacturing
- Measure and Increase OEE <sup>1</sup>:
  - Increase availability of our equipment by avoiding non-planned standstill
  - Analyze and increase quality
  - Tune the performance of our machines and processes

<sup>1</sup>overall equipment effectiveness

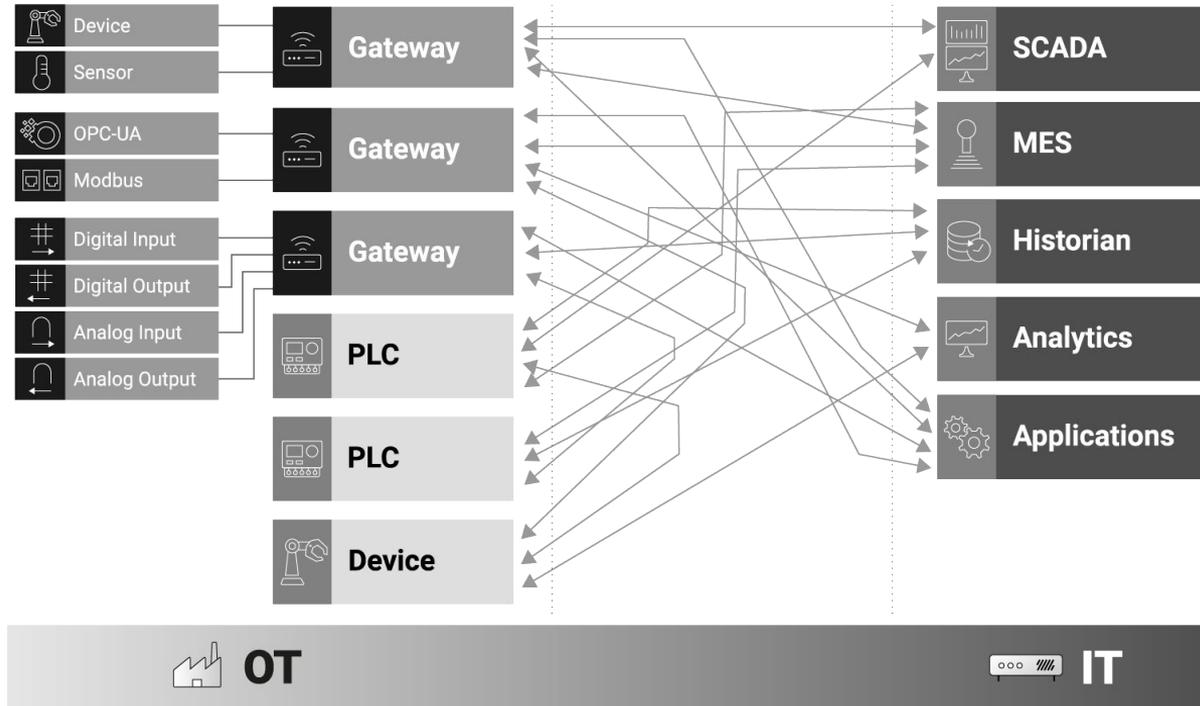


# Lots of Data Silos





# Siloed OT Systems - No Interoperability



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# Challenges



- Difficult to change workflows and processes
- Difficult to setup a new system/facility
- Difficult to analyze data across the entire system



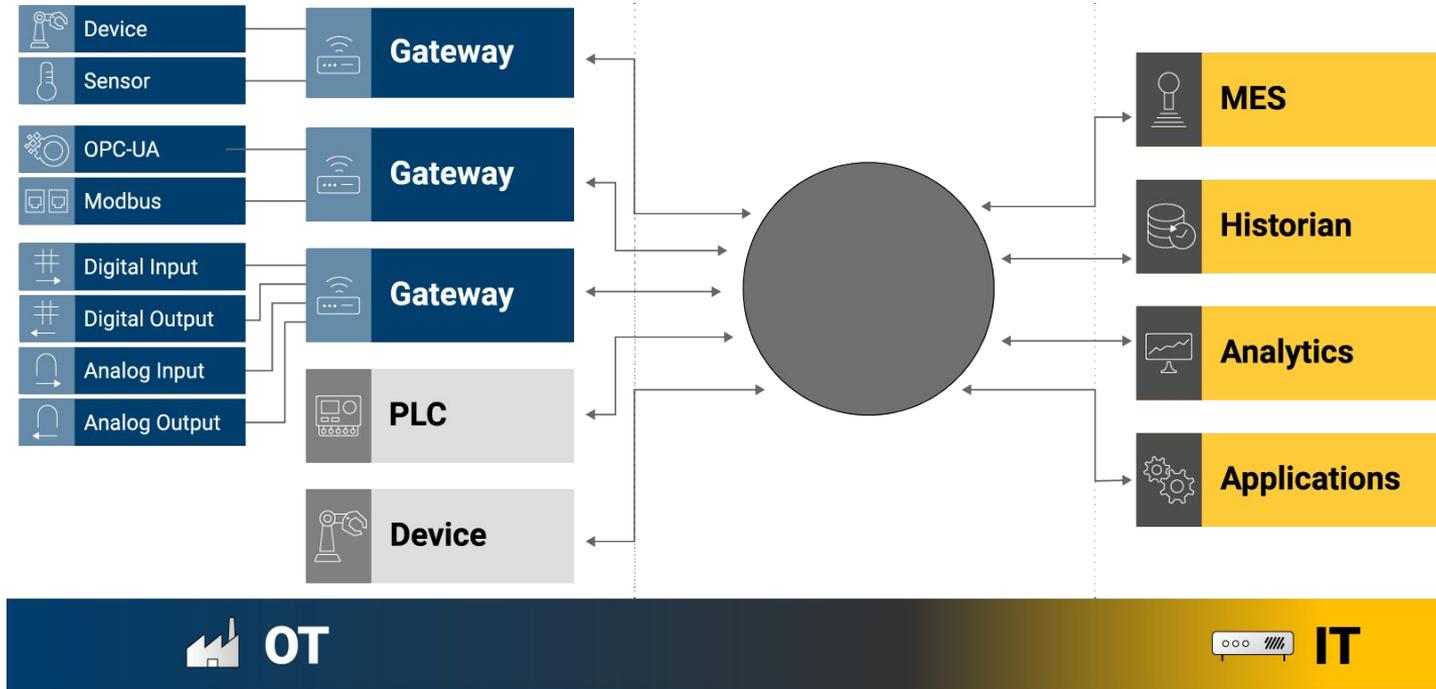
# Goals for Modernization



- More agile software delivery into factories
- Faster mean time to recover
- Enable centralized command and control
- Enable visualization of overall manufacturing process
- Consistent and flexible software architecture



# Decoupled Architecture

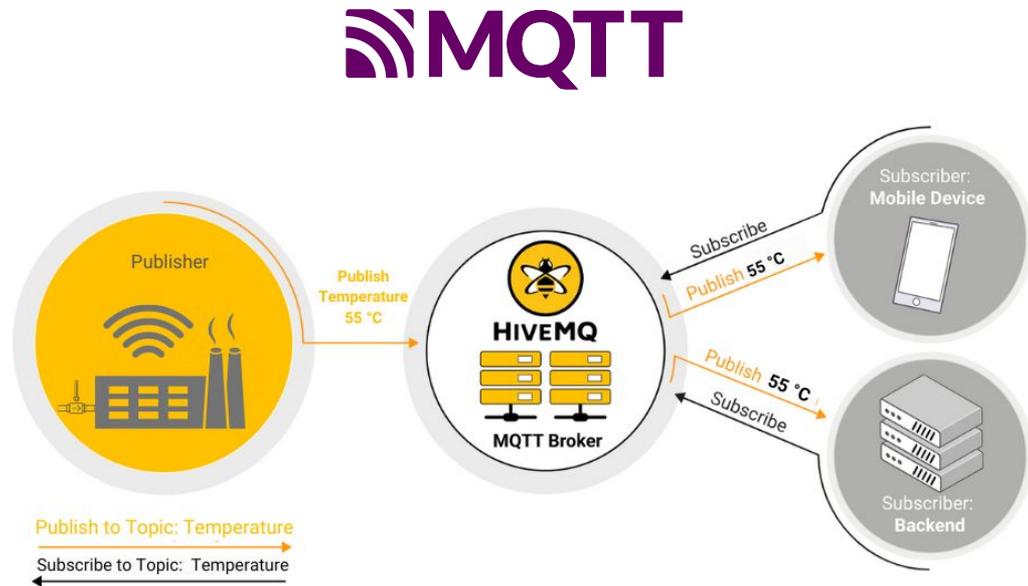


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# What is MQTT?

- 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?



# 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

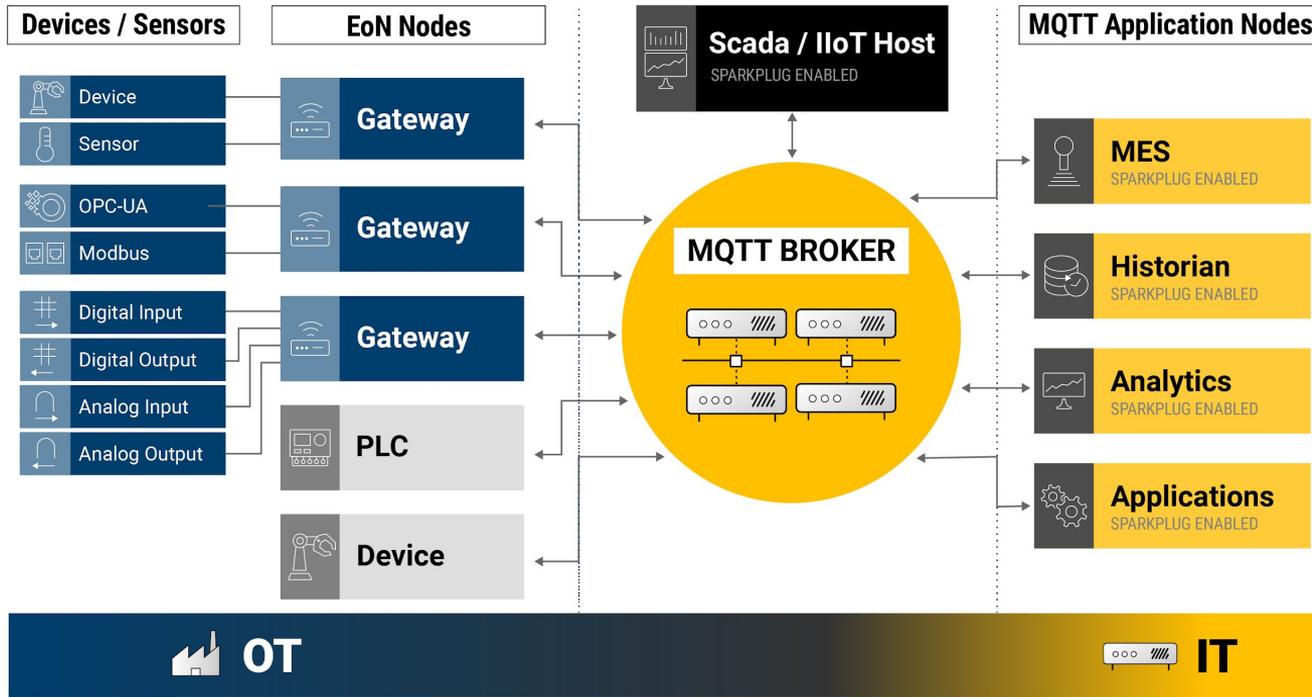


Sparkplug

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



# MQTT Sparkplug Architecture



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# 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

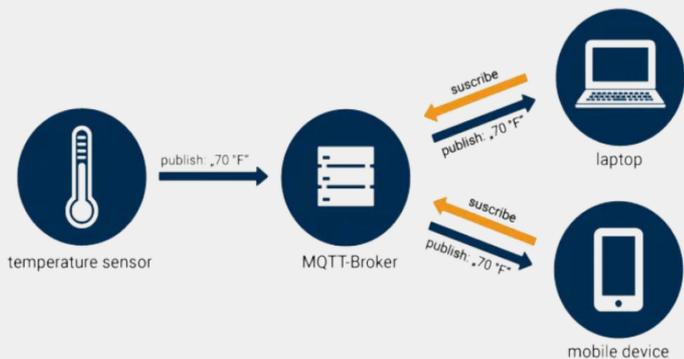
## MQTT APPLICATION NODES



- 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

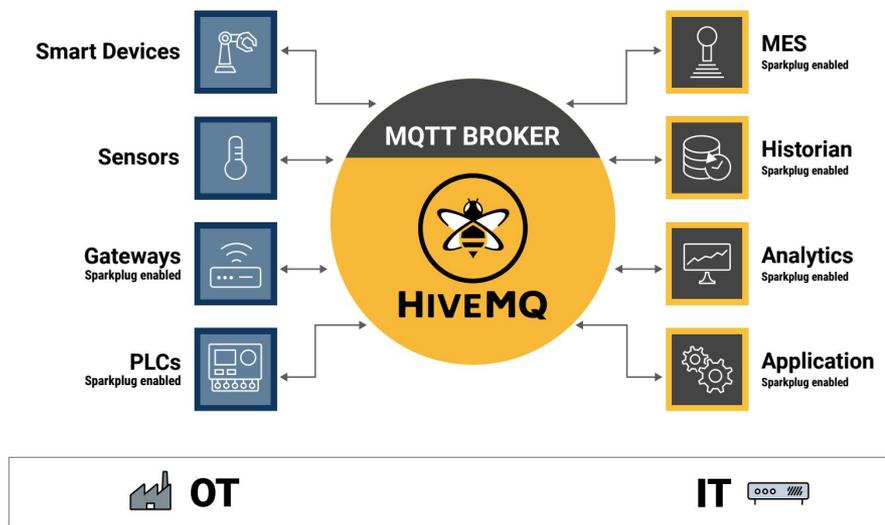
# The MQTT Broker

## MQTT BROKER



- 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

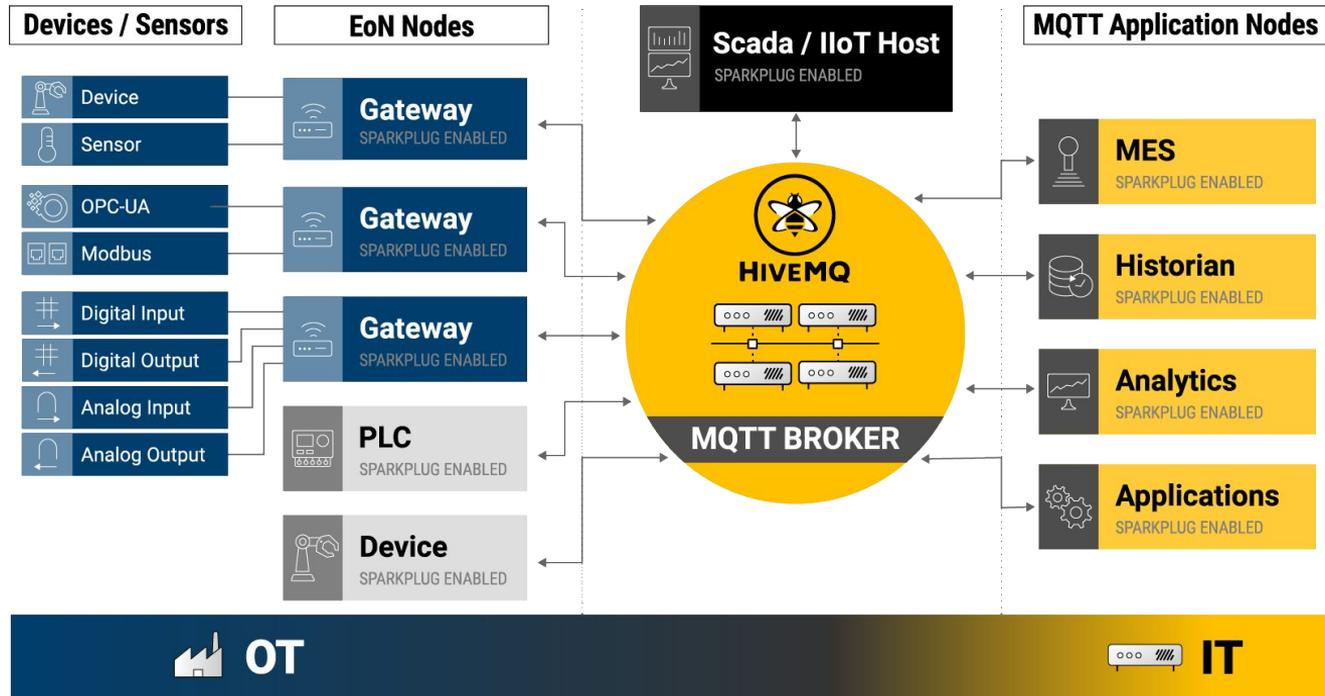
# HiveMQ MQTT Platform



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



# MQTT with Sparkplug Architecture

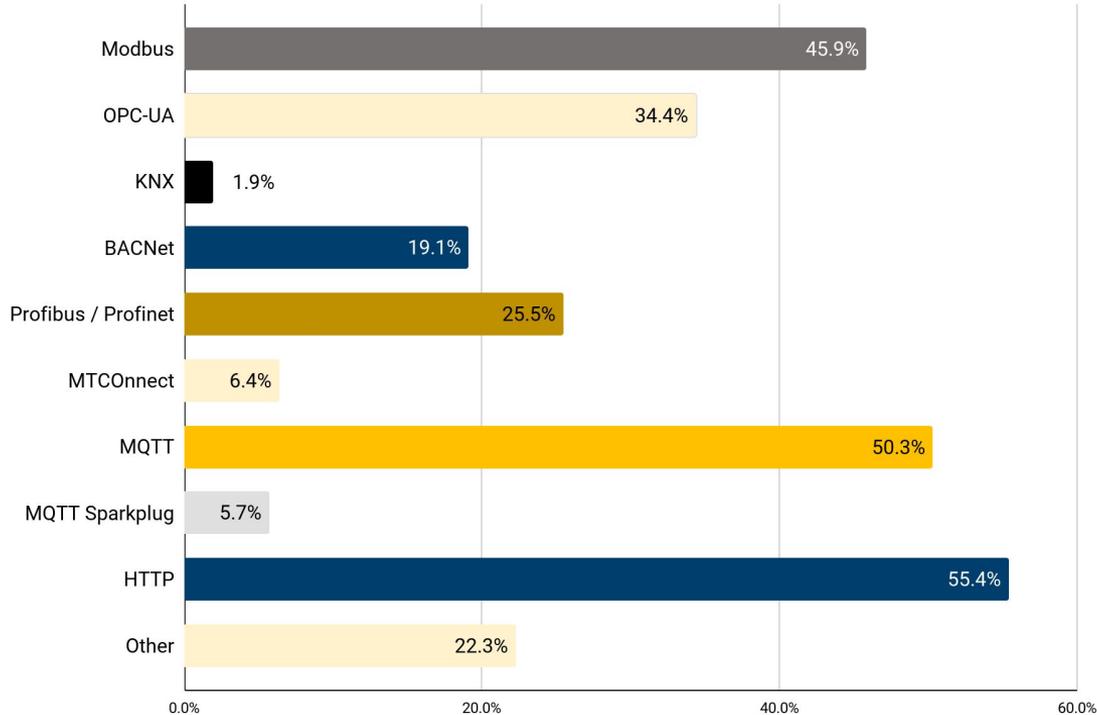


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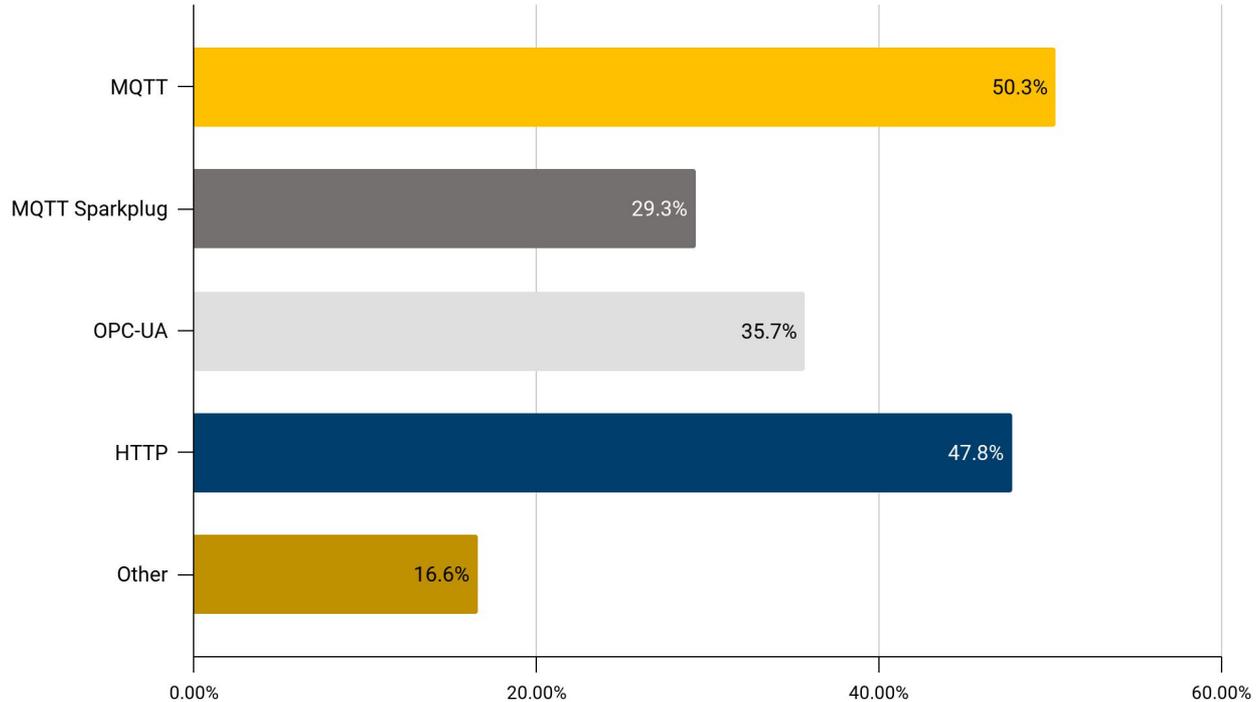
# Which of the following protocols do you use today to connect your equipment?

IIoT World Survey October 2021



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

IIoT World Survey October 2021



# Sparkplug Ecosystem

Edge of Network Nodes					
					
					
SCADA Vendors					
					
MQTT Broker					
MQTT Application Nodes					

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



# Next Steps



[Get a copy of Sparkplug Essentials e-Book](#)



[Book a demo to see how HiveMQ supports the Sparkplug specification](#)



# Resources



Get started with HiveMQ today: <https://www.hivemq.com/downloads/>

Or new to MQTT? Get the MQTT Essentials EBook: <https://www.hivemq.com/download-mqtt-ebook/>



**ANY  
QUESTIONS?**



# THANK YOU

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