Enable Digitization in Hydrocarbon Processing Industry 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

Audi | BMW | /Flughafen München | SiriusXM | SIEMENS | LIBERTY GLOBAL | DAIMLER

Future of Manufacturing

Automation

Cybersecurity

Advanced Analytics

INDUSTRY 4.0

Smart Sensors

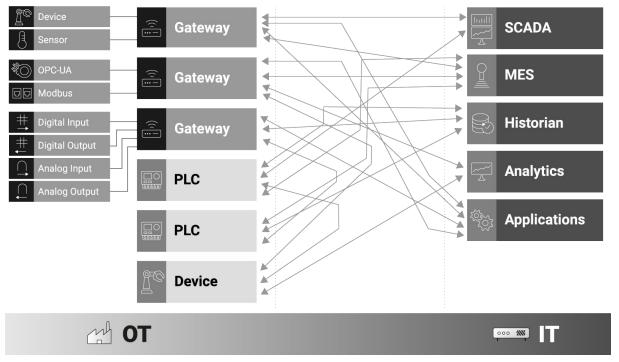Cloud Computing

AI / ML

Business Drivers

- Accelerate digitization of operations

- Promoting sustainability

- Creating a Collaborative Ecosystem

- Increased production throughput and efficiency

- Increase serviceable life of assets

- Remote Performance Monitoring

- Preventative maintenance

Lots of Data Silos

Siloed OT Systems - No Interoperability
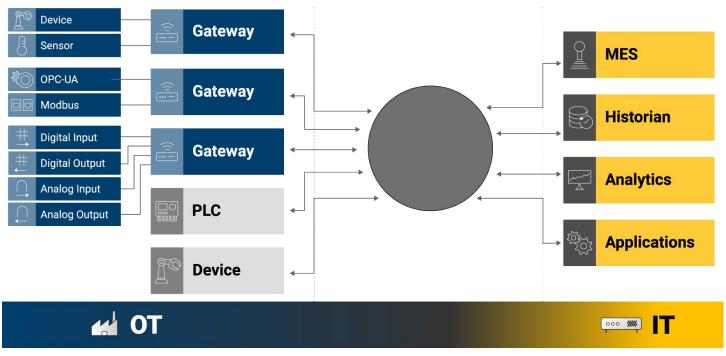
Challenges

- 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 operations

- Faster mean time to recover

- Enable centralized command and control
  - Enable visualization of overall O&G processes

- Consistent and flexible software architecture
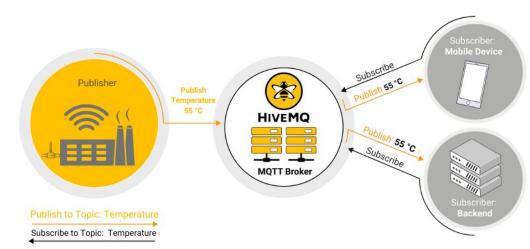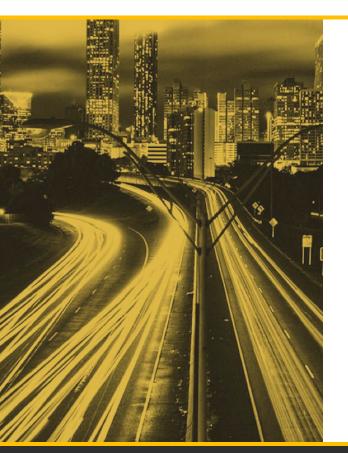
Decoupled Architecture

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
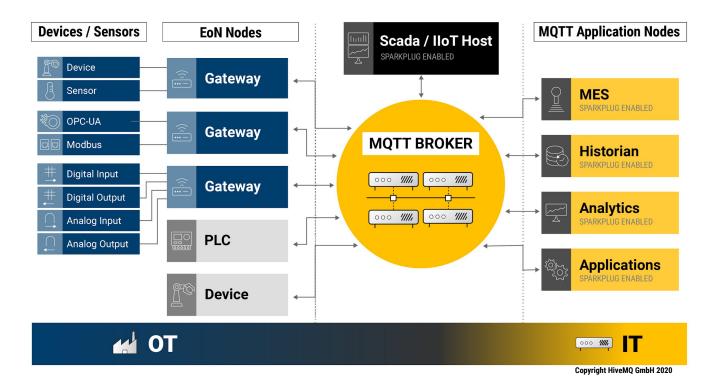
- Defines MQTT state management

What is Sparkplug?

INTRODUCING

Sparkplug

- 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

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

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
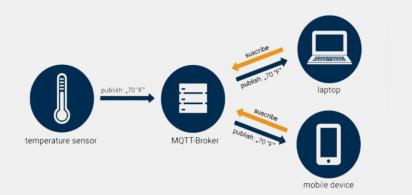
MQTT APPLICATION NODES

- MQTT Application Nodes can produce and consume Sparkplug messages but don't act as a SCADA / IIoT Host.

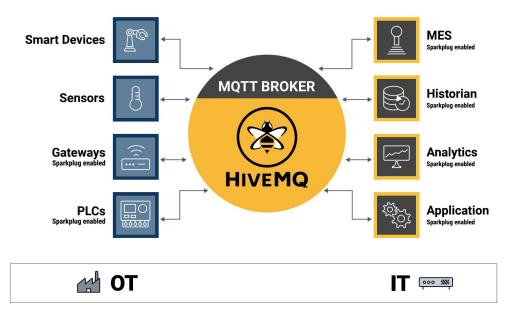- Typically Application Nodes are MES, Historians, Analytics systems
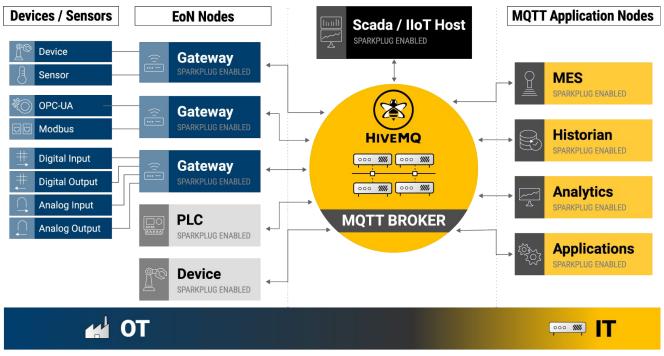
The MQTT Broker

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

Smart Devices

Sensors

Gateways
Sparkplug enabled

PLCs
Sparkplug enabled

MQTT BROKER

HiveMQ

MES
Sparkplug enabled

Historian
Sparkplug enabled

Analytics
Sparkplug enabled
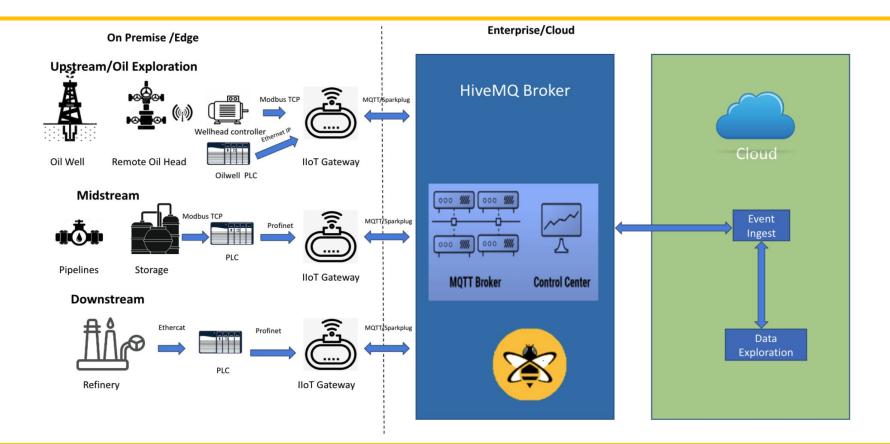
Application
Sparkplug enabled

OT

IT

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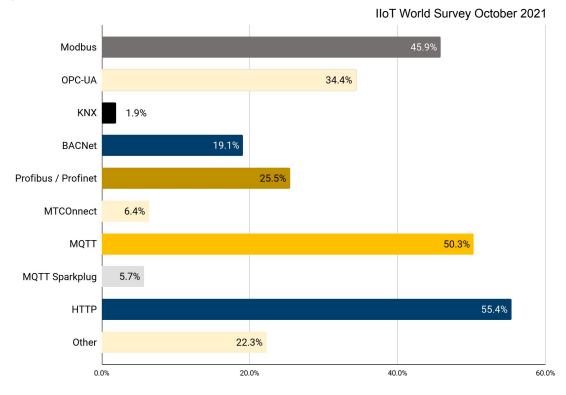
MQTT with Sparkplug Architecture

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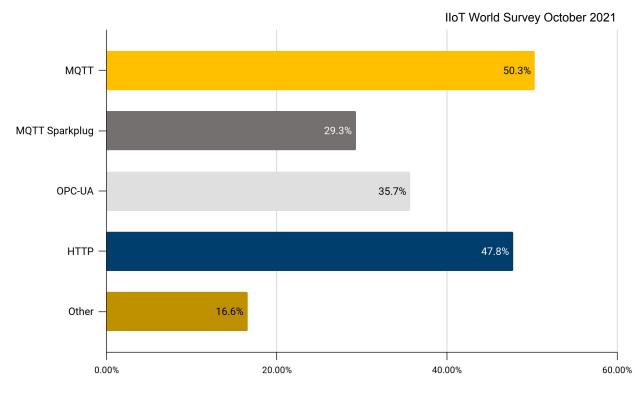
Upstream O&G Use case architecture

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

IIoT World Survey October 2021

Protocol	Percentage
Modbus	45.9%
OPC-UA	34.4%
KNX	1.9%
BACNet	19.1%
Profibus / Profinet	25.5%
MTCOnnect	6.4%
MQTT	50.3%
MQTT Sparkplug	5.7%
HTTP	55.4%
Other	22.3%

IIoT Trends and Technology Adoption

HiveMQ

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

IIoT World Survey October 2021

Protocol	Percentage
MQTT	50.3%
MQTT Sparkplug	29.3%
OPC-UA	35.7%
HTTP	47.8%
Other	16.6%

HiveMQ

Sparkplug Ecosystem

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

Next Steps

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

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

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

Next Steps

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

ANY QUESTIONS?

HiveMQ

THANK YOU