Webinar

Unleashing the Power of IoT and MQTT in Transportation and Logistics Industry

Presented by HIVEMQ

Speaker

Ravi Subramanyan

Director of Industry Solutions Manufacturing, HiveMQ

Ravi.subramanyan@hivemq.com

linkedin.com/in/ravisubra/

Ravi Subramanyan is Director of Industry Solutions, Manufacturing, at HiveMQ. He is a Product Marketing and 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. Mr. Subramanyan has successfully launched products, established branding, and created product advertisements and marketing campaigns for global and regional business teams.

AGENDA

- Smart Transportation
- Key Transportation use cases for IoT
- Data Connectivity and Availability
- How MQTT based data broker can help
- Digital Reference Architecture
- Introduction to HiveMQ
- Our customers

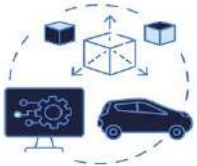
Smart Transportation

Global Trends Challenges in Transportation and Logistics

- **Speed and accurate** estimated times of delivery
- **Global Supply Chains** are more fragile than imagined
- Difficulty to Cut **Transport Costs**
- **Rising Fuel Prices &** Impact on the Economy
- Shortage of **skilled drivers**
- Complex **Government Regulations**
- Growing Need for **Sustainable Logistics Operations**

Digital Technologies in Smart Transportation and Logistics

Cloud Technologies



Digital Twins

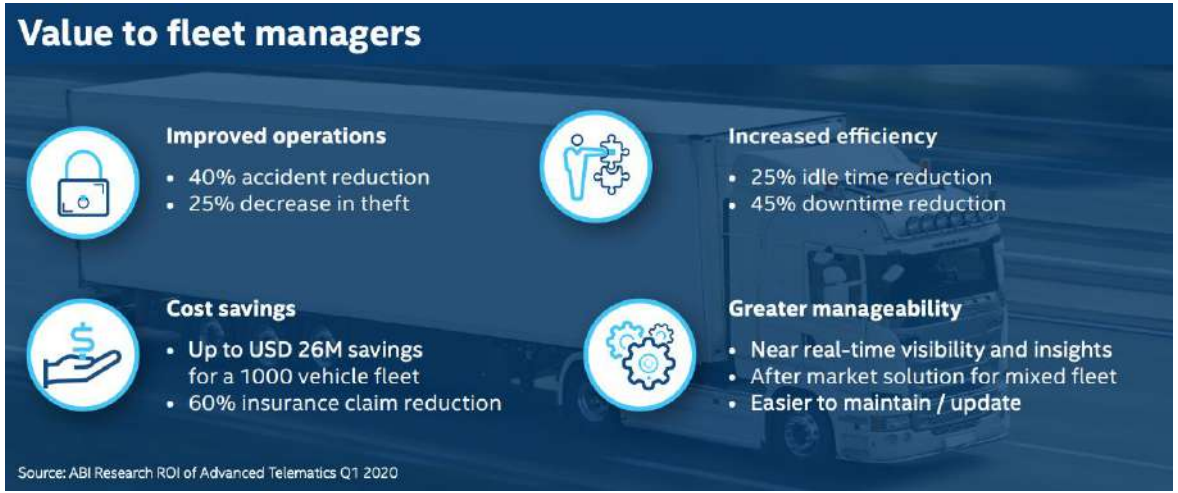
AI/ML

Smart Sensors

Advanced Analytics

Electric Vehicles

Power of Smart Transportation through I4.0, IIoT & AI



IIoT enables fleet managers to reduce fuel usage, reduce downtime, automate maintenance planning and improving safety

Source : [Empowering the Mobility Fleet of Tomorrow]

Short & Long Term Impact on Business

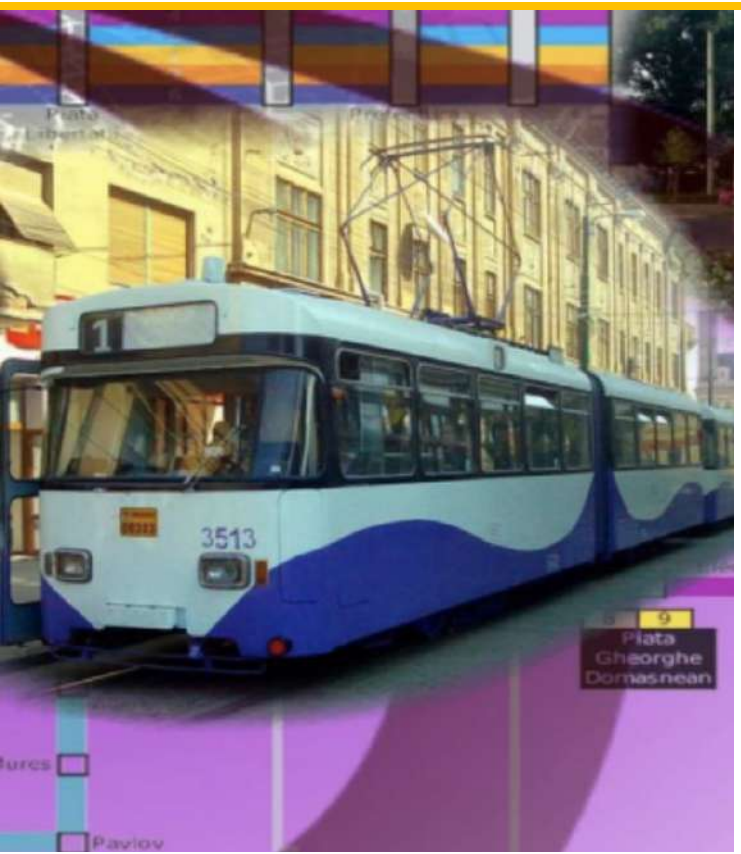
- **Improved regulatory compliance** by tracking hours of service and ensure personnel don't exceed mandated hours of work
- **Improve operational efficiency** by providing a comprehensive, real-time view of the entire Transportation infrastructure
- **Enhanced customer service** by knowing the location and condition of every vehicle
- **Reduced mileage and transport costs** by optimized routes
- **Mitigating risks along the supply chain** by tracking information and sharing information with all stakeholders
- **Reduced emissions** and ability to calculate and report all emissions, specifically CO2 and nitrogen

Key Transportation Use Cases for IoT

Fleet Management

- Make better business decisions in real time
  - Reduce TCO
  - Maximize vehicle utilization
  - Monitoring vehicle health to ensure no undetected issues go unaddressed
- Improved Logistics planning
  - Knowing location of vehicles
  - Capacity planning.
  - Help companies comply with health and safety regulations, while fuel consumption and route optimization help meet environmental goals.

Public Transit Management



- Munich Transit System (Stadtwerke München) uses HiveMQ for their digital sign system which provides detailed information to passengers using more than 1000 screens throughout the city, including:
  - Timetable data for busses, trains, subways, suburban trains
  - Actual arrival and departure times
  - General news and information
  - Passenger-journey related information
  - Current service disruption alerts

HiveMQ Case Study: SWM deploys real-time passenger information

Smart Inventory Management / Smart Supply Chain

- Allows automated Inventory tracking using IoT Sensors
  - Enables more economical inventory control,
  - Better inventory distribution
  - Better customer service for e-commerce
  - Eliminates manual scans/reduce shrinkage
  - Helps reduce shrinkage
- Smart Supply Chain by combining Inventory management, weather, traffic patterns, user preferences and more data
- Automatically respond to events in real-time
  - Leaner manufacturing by avoiding waste from overproduction, inventory shortage due to demand spikes

Reference Architecture for Autonomous Guided Vehicles using HiveMQ

Optimal Asset Utilization

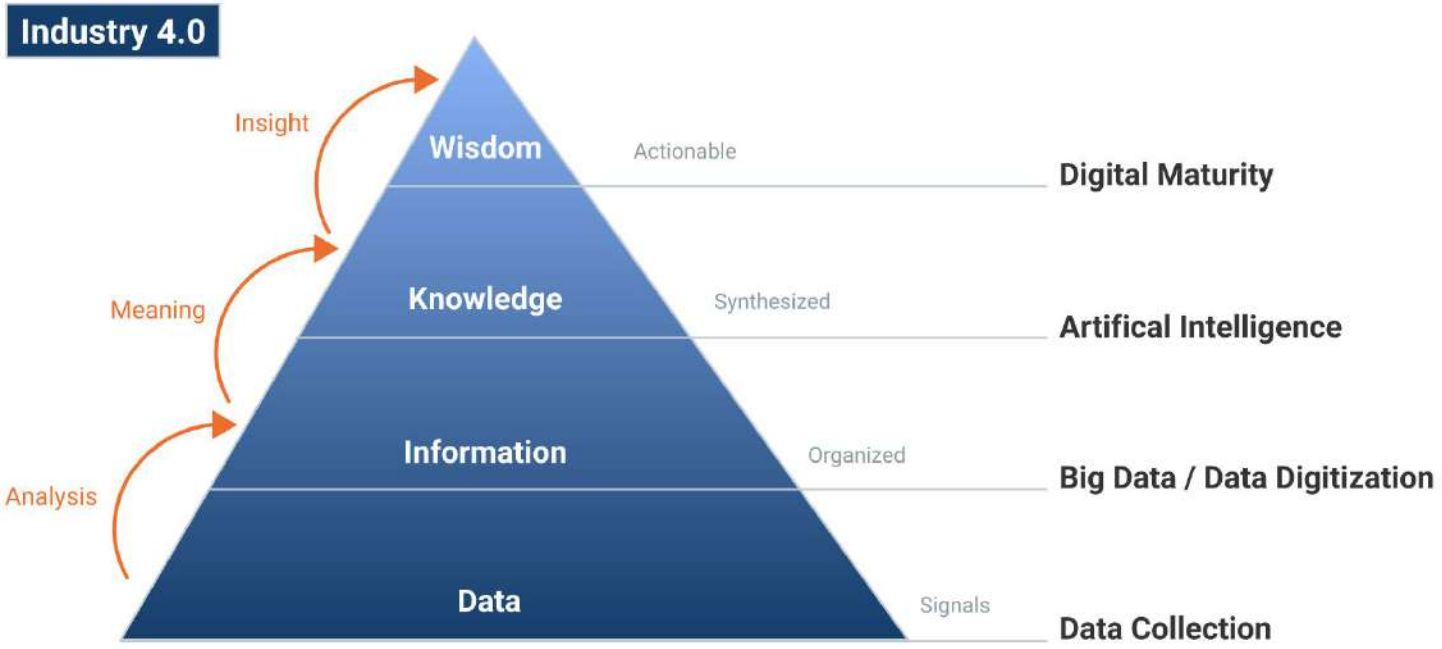
- To lower TCO, vehicle use should be maximized to allow:
  - Full shipments as they are more profitable
  - Putting right number of vehicles on the road at any given time which will improve customer service while reducing overall cost per ride
- By feeding data from IoT sensors into back-end systems, organizations can :
  - Track real-time location of their vehicles
  - Current load and potential capacity
  - Enable fleet operators to better decide which vehicles should be dispatched and when, and respond to changing conditions in realtime.

Geo-fencing

- Optimized asset tracking and staffing plans
  - Virtual boundaries around specific locations such as warehouses, distribution centers, and delivery destinations
  - Automated push-notifications based on events
  - Better ETAs, as well as delivery notifications
  - Ensure assets or cargo doesn’t leave specific areas, reducing theft or equipment abuse, reducing response times and increasing chances of recovery.
  - Automated notice to warehouse when high-value, time sensitive shipment is arriving, ensuring the right staff , other assets, such as forklifts or refrigerated areas, are ready to process shipment on time

Data Connectivity and availability

Data Maturity Model for Industry 4.0



Data Collection Value Creation Loop

Gather

Gather data and signals from the field

Analyze

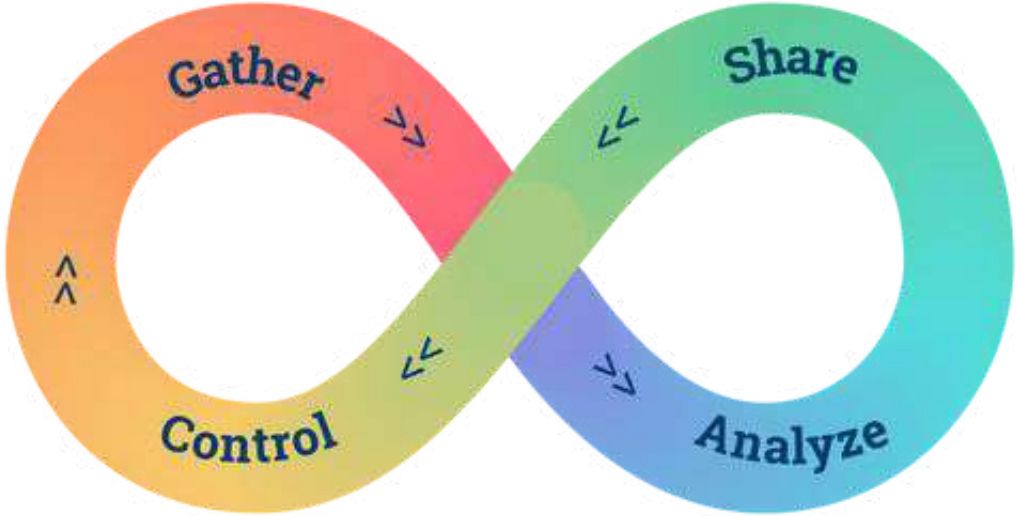
Analyze on Edge or Cloud

Share

Share with enterprise systems

Control

Control and manage the endpoints in the field



Technical Challenges with Connectivity

- Unreliable cellular networks
  - As vehicles move throughout the coverage area, they hit areas of congestion or network blind spots
  - Connection between client and enterprise could drop or have high latency causing lost messages or slow response times.

Technical Challenges with Connectivity

- Difficulty sending commands/data between a fleet of clients and back-end systems
  - Web technologies such as HTTP are unidirectional and were architected for the Internet of Humans
  - Broadcasting messages to or from many many clients or a group of clients based on geofence data is challenging to do in real-time.

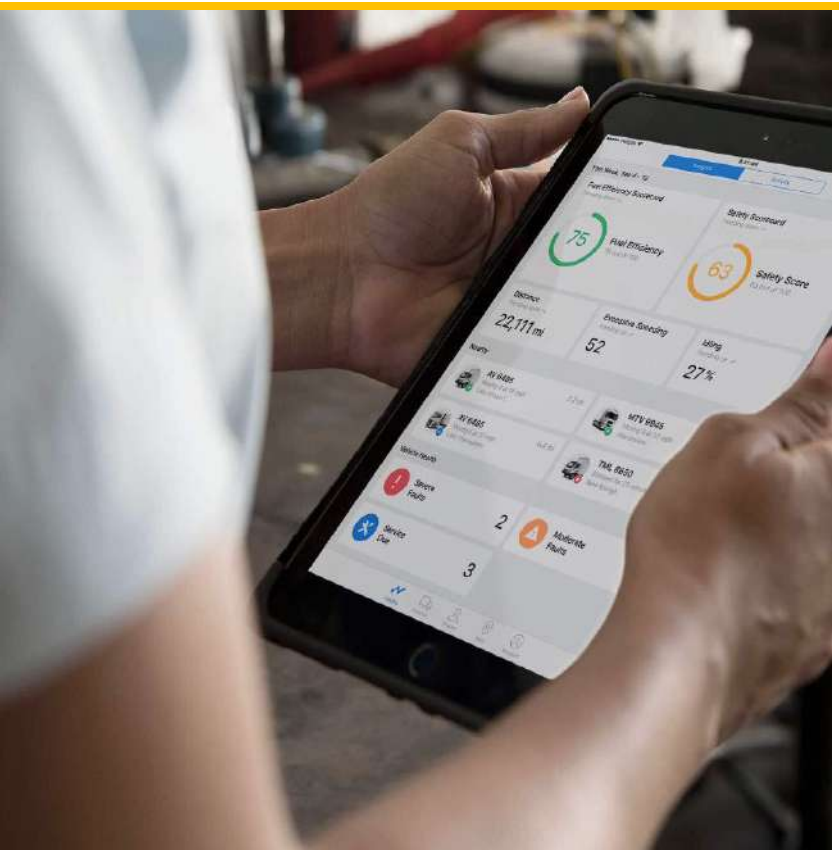
Technical Challenges with Connectivity

- Scalability to meet system to meet demand spikes
  - Hard to scale up or down a system to meet demand spikes (e.g., holiday seasons for trucks and airlines or rush hours for public transit)
  - Maintaining all connections in a reliable manner.

Technical Challenges with Connectivity

- Fleet security is a concern
  - Connected vehicles need to operate in a trusted environment.
  - Bad actors shouldn’t be able to gain control of any vehicle or its contents.

Technical Challenges with Connectivity



- Monitoring and troubleshooting individual fleet clients while they are in service
  - Fleets with hundreds or thousands of vehicles in service may have one vehicle that is not connecting properly.
  - Understanding how to find, diagnose and rectify the client issue is something that needs to be considered in advance.

Technical Challenges with Connectivity

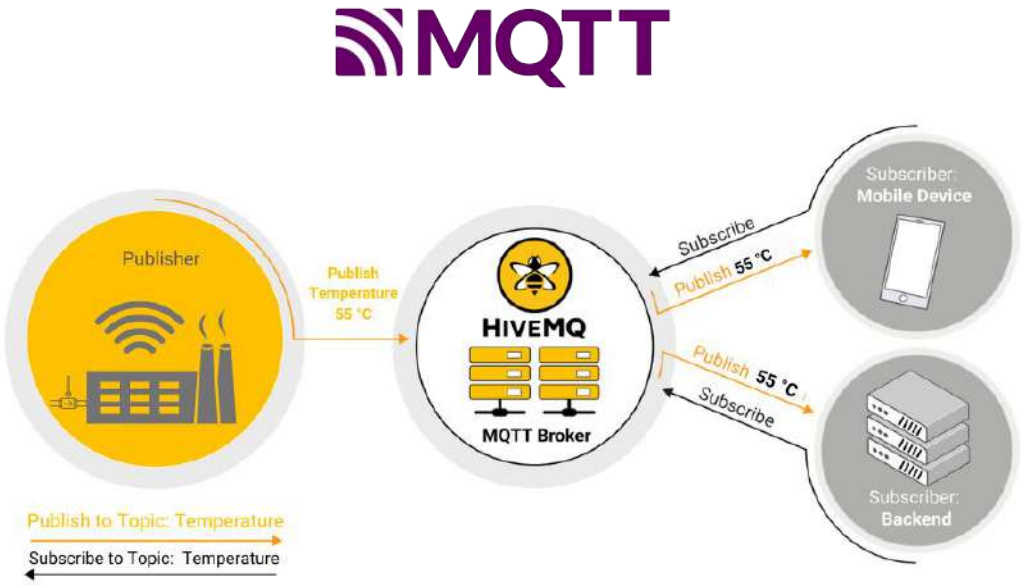
- Networking costs can be expensive
  - Cellular networks can contribute substantial cost to operating connected transportation system.
  - Difficult to keep costs in line with hundreds of connected vehicles in the field, often transiting through multiple carrier networks.

How MQTT-Based Data Broker can help

HIVEMQ

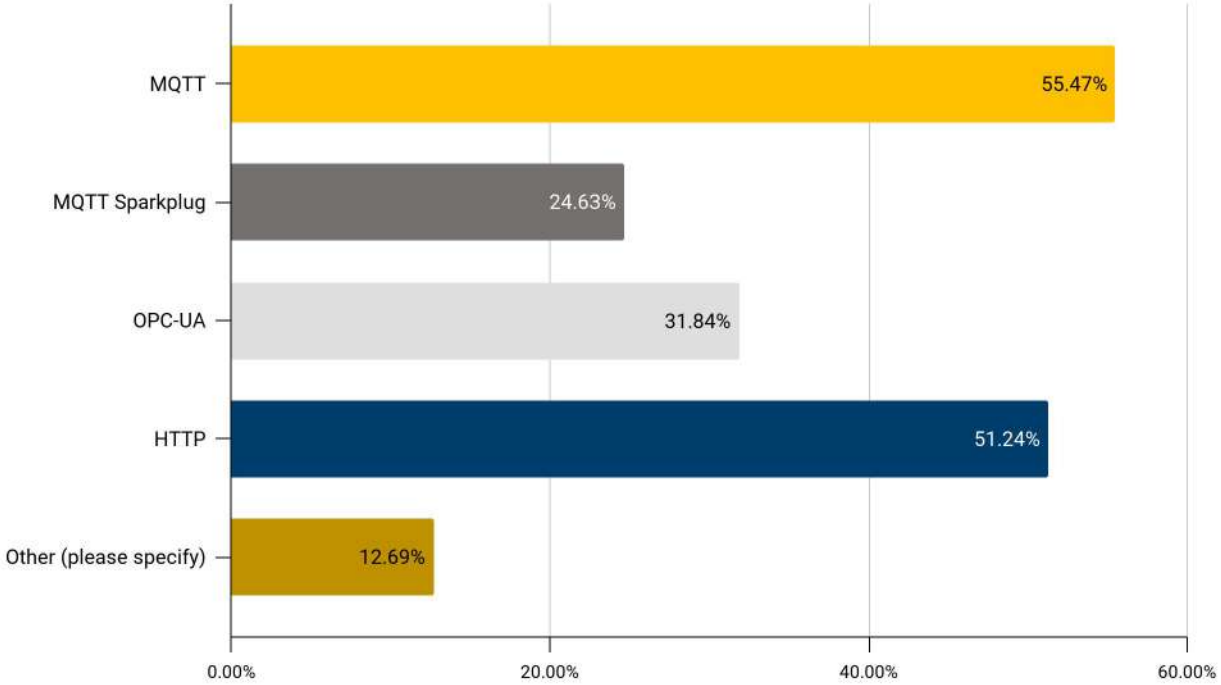
What is MQTT?

- 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



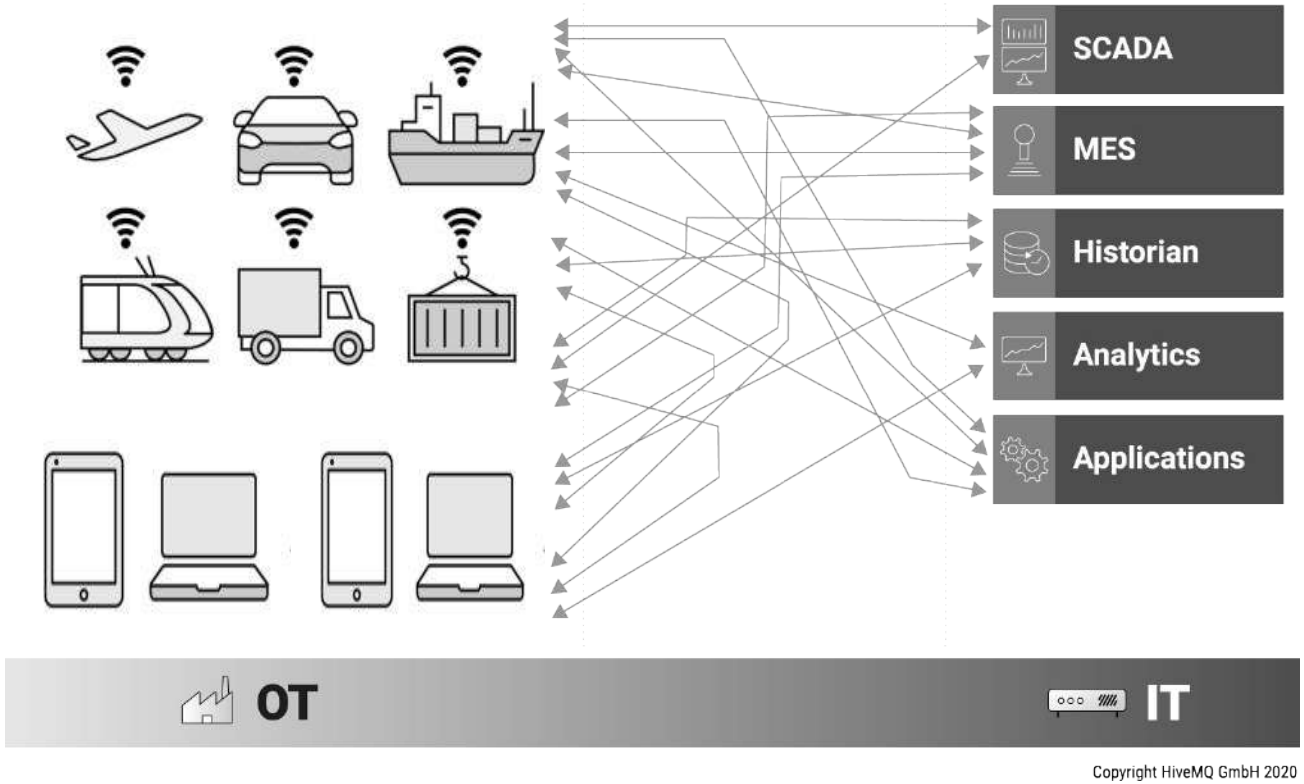
Which of the following protocols do you consider strategic to fulfill your IIoT strategy?

IIoT World Survey October 2022

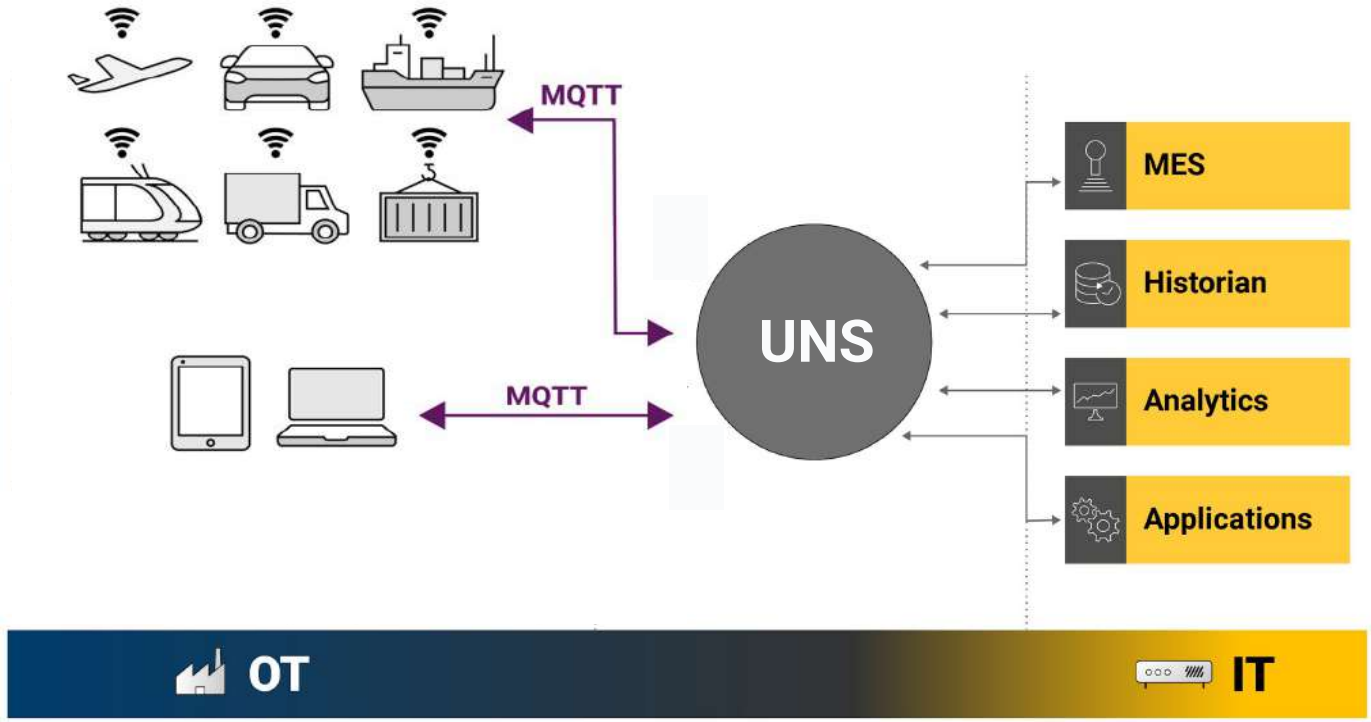


Digital Reference Architecture

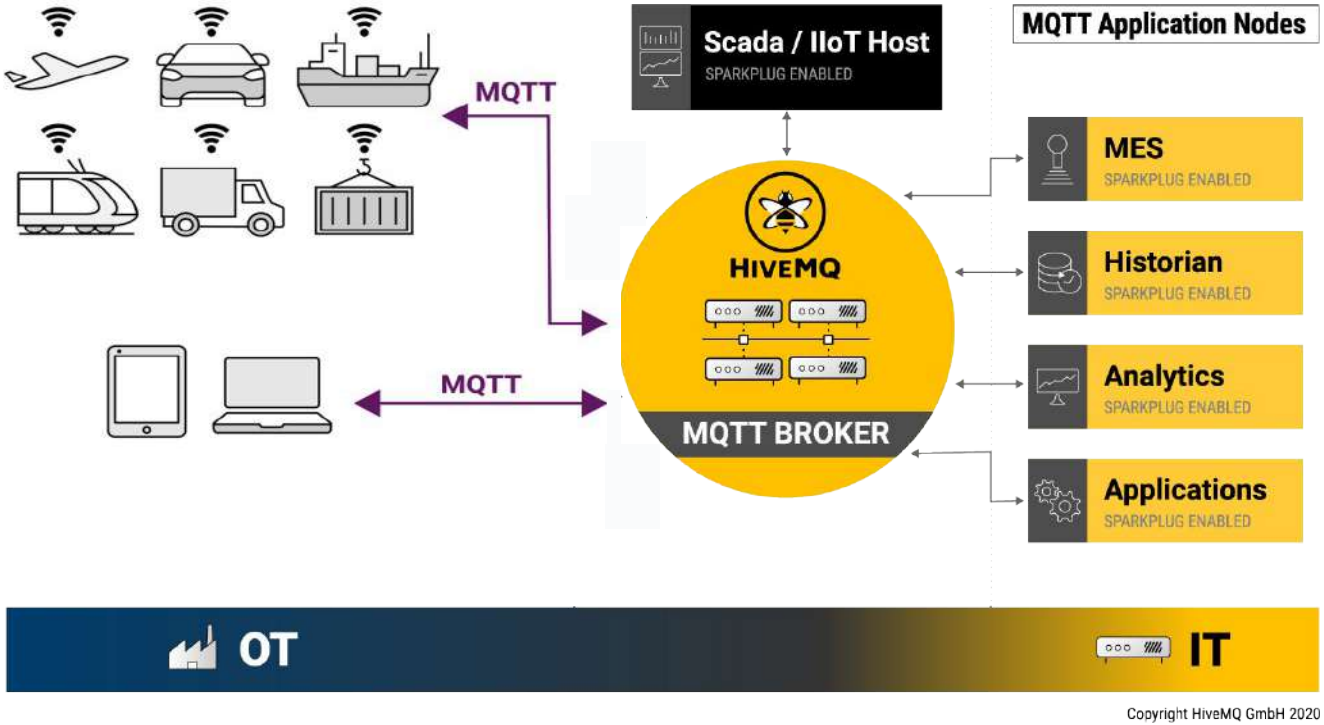
Traditional architecture : Siloed, No Interoperability



Next Generation: Consolidated interoperable Architecture



Reference architecture with MQTT



Introducing HiveMQ

Introduction to HiveMQ

- **Founded in 2012**, based outside of Munich
- HiveMQ helps **move data to and from connected devices** in an **efficient**, **fast** and **reliable** manner
- 160+ employees
- **180+ customers** with production IoT applications

OASIS MQTT TC
Helped standardize IoT Standard

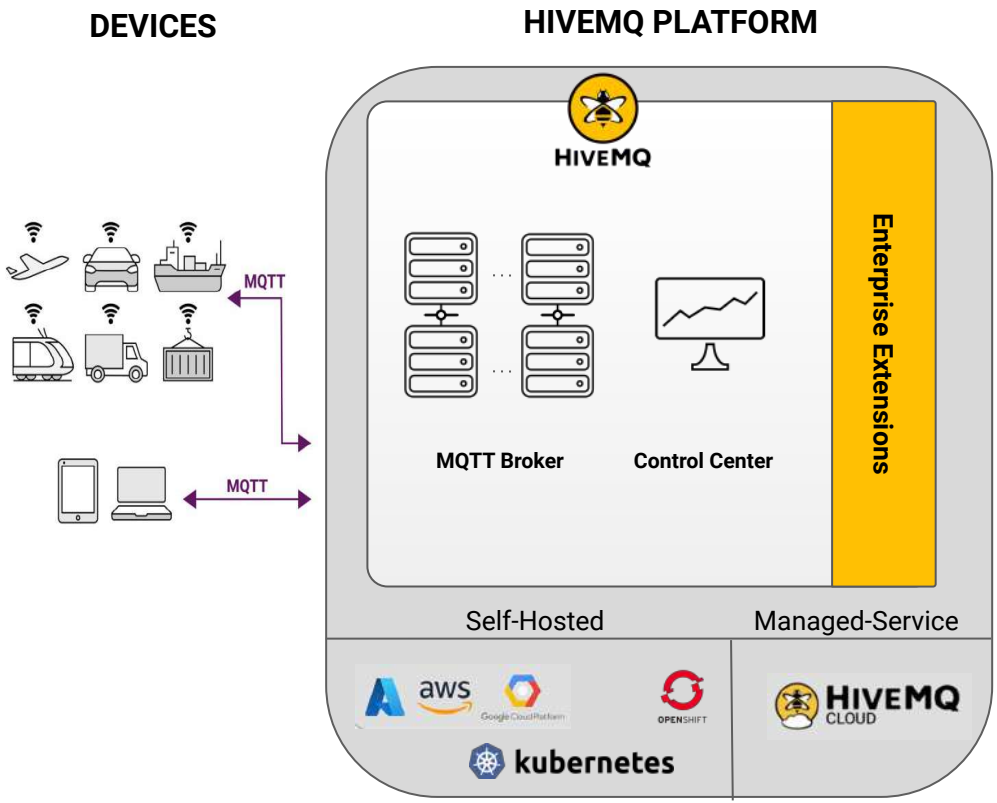
Sparkplug

Eclipse IoT working group
Member

How HiveMQ can help Transportation and Logistics

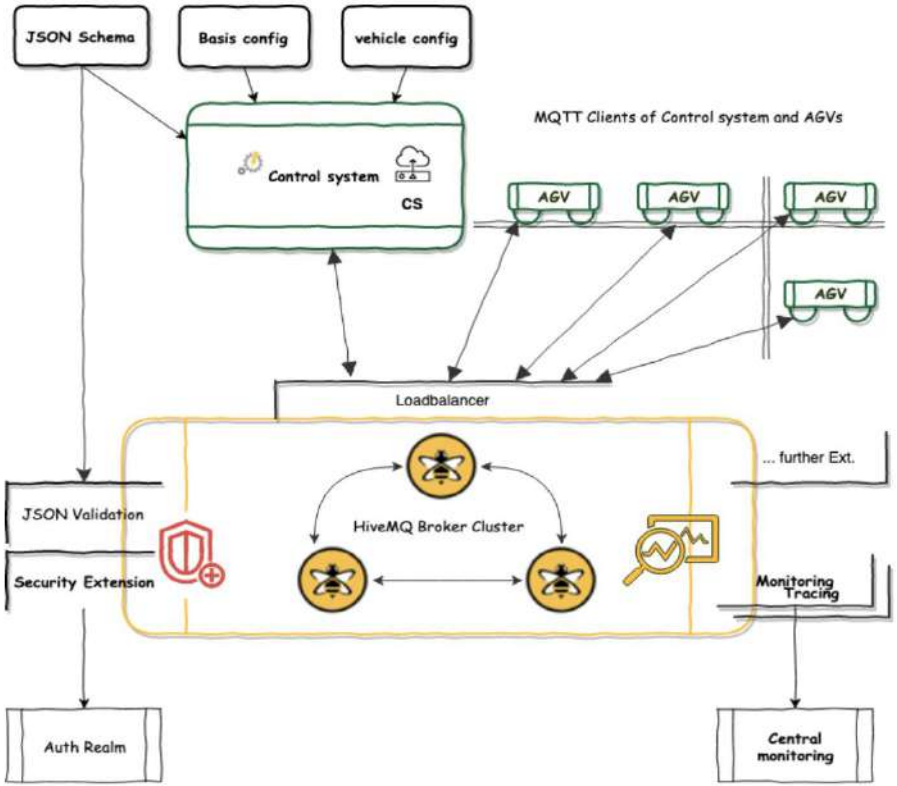
- Maintain persistent always-on connection between vehicle and cloud.
- Guarantee reliable data delivery between vehicle and cloud.
- Enable secure non-addressable clients for vehicles to limit potential of cyber-attack.
- Provide scalable cloud infrastructure that will meet the demands of a growing fleet system.
- Integrate the messaging data with other existing enterprise systems for scheduling, dashboards, supply chain systems, etc.

Enterprise MQTT Platform



- Scalable
- Highly Available
- Reliable
- Robust
- Secure
- Observable
- Interoperable
- Integrates anything
- Runs anywhere

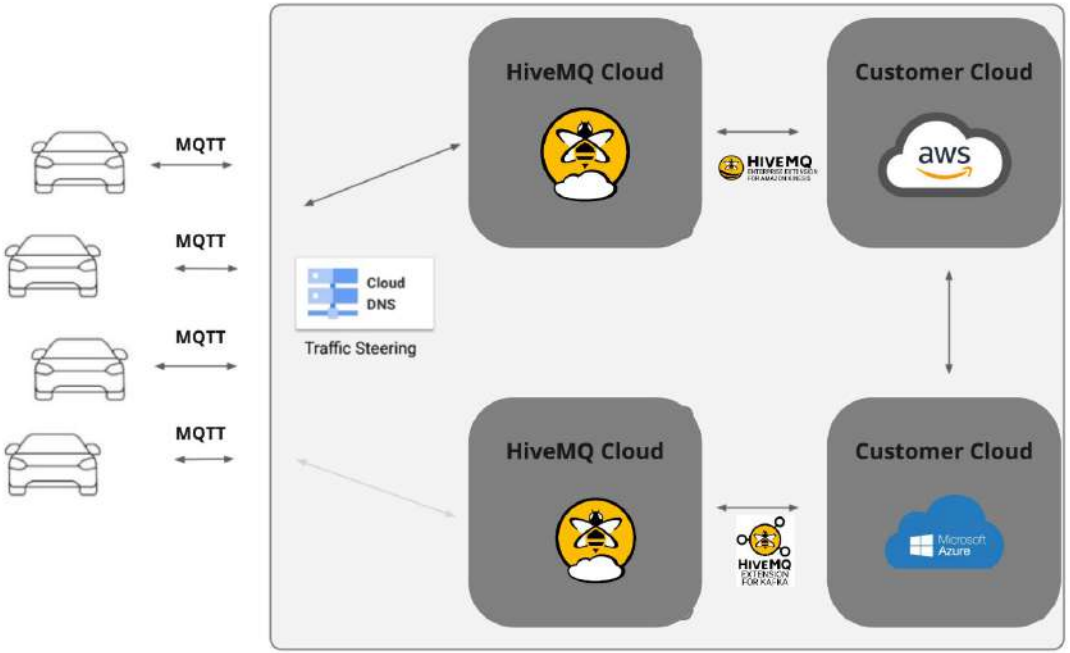
Factory Logistics Communication Reference architecture



- German Association of the Automotive Industry (VDA) and VDMA Materials Handling and Intralogistics Association has created a specification for the communication between autonomous guided vehicles (AGV) and SCADA systems.
- The new VDA 5050 specification for Warehouse Logistics uses HiveMQ MQTT broker to define the topic namespace and the payload format for the messaging communication.

Driver Mobile Tools communication Reference Architecture

Customer vehicle fleets with Mobile devices fitted for driver to driver and driver to back office communication



- Large transportation and logistics company needed accurate messages for their drivers to complete their jobs
- Uptime is the biggest need to fulfill orders
- Use cases are text messaging and real time data updates
- After they move to HiveMQ, they increased their uptime and their ability to accurately deliver goods

HiveMQ Extension Overview

Seamlessly integrates MQTT messages into the Kafka messaging flow

Enable crucial security features for safe and secure enterprise IT and OT deployments

A Scalable & Secure solution that bridges a HiveMQ cluster with any other MQTT broker

Seamlessly integrates the HiveMQ platform with Google Cloud, enabling MQTT data transmission at hyper-scale

Trace MQTT data end-to-end, using OpenTelemetry and monitor 1,500+ metrics via your APM solution

Quickly move your MQTT data from the broker directly into AWS via Amazon Kinesis Data Streams

Our Customers in Transportation and Logistics

Transportation

Munich Transit System

- Stadtwerke München (SWM), Munich's municipal utility company, runs multiple instances of HiveMQ
- SWM's smart mobility unit deploys a single-node HiveMQ instance on-premise to supply real-time data to their internally-developed ZuMPA passenger information system.

SWM Stadtwerke München

HiveMQ Solution

- HiveMQ is an enterprise-grade MQTT broker that can deliver the reliability and availability benefits the SWM use case requires.
- HiveMQ was the only broker that fully supports all MQTT 5 features. For the ZuMPA application, the MQTT 5 message expiry feature is particularly important.
- The SWM development team values the fact that HiveMQ allows custom extensions that could be useful for future use cases.

Result

- Successful deployment of 500+ information monitors and 2000+ bus and tram stops
- Real-time information delivery with constant monitoring
- Lower cost of implementation and maintenance

Transportation

FELA Management AG

- FELA Management specializes in smart, scalable solutions for public transportation.
- POIScentral app from FELA which is a timetable planning and tracking tool needed an efficient delivery of accurate GPS-based vehicle tracking data to transportation control

HiveMQ Solution

- The latest generation of POIScentral application implements HiveMQ MQTT broker as a communication channel
- Use of MQTT allowed us to take an event-driven approach that doesn't rely on polling anymore.
- With MQTT and the HiveMQ MQTT broker their application is more performant and leverages modern technology.

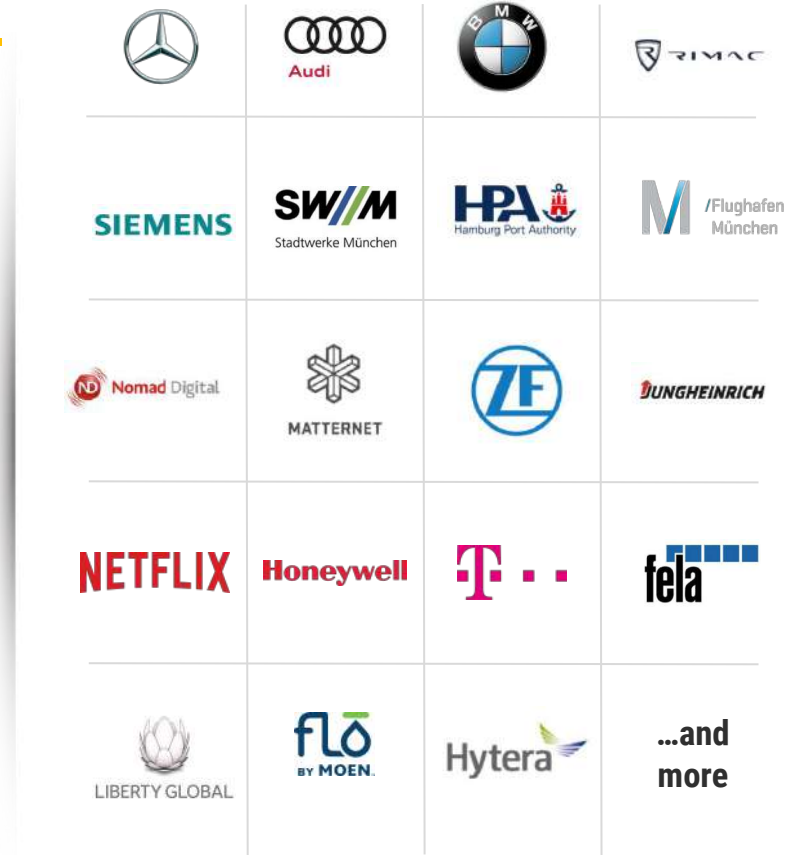
Result

- Targeted event-driven data for greater accuracy and less overhead.
- No longer need to continuously poll data centers to remain up to date.
- Timetable and software versions can be pushed to vehicles as needed for efficient fleet management.

Our Overall Customer

HiveMQ: Trusted by more than 180 Brands

- Building new digital products
- Improving customer experience
- Creating more efficient operations



Q&A

Resources

Transportation [Solution Page]

[Transportation white paper]

Customer case study: [Munich Transit System]

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

THANK YOU

Ravi Subramanyan

Director of Industry Solutions Manufacturing at HiveMQ

Ravi.subramanyan@hivemq.com

linkedin.com/in/ravisubra

HIVEMQ