

**WEBINAR**

# **Best Practices for Streaming Connected Car Data with MQTT & Kafka**



**HIVEMQ**



# WELCOME



**Florian Raschbichler**

Head of Support at HiveMQ

 @fraschbi  
 [linkedin.com/in/fraschbi/](https://www.linkedin.com/in/fraschbi/)

- **HiveMQ – Founded in 2012, based outside of Munich**
- **130+ customers** with production IoT applications
- Awarded with **Deloitte Fast 50, 10 most innovative IoT companies to watch** in 2018, **Focus Growth Champions 2020** and others

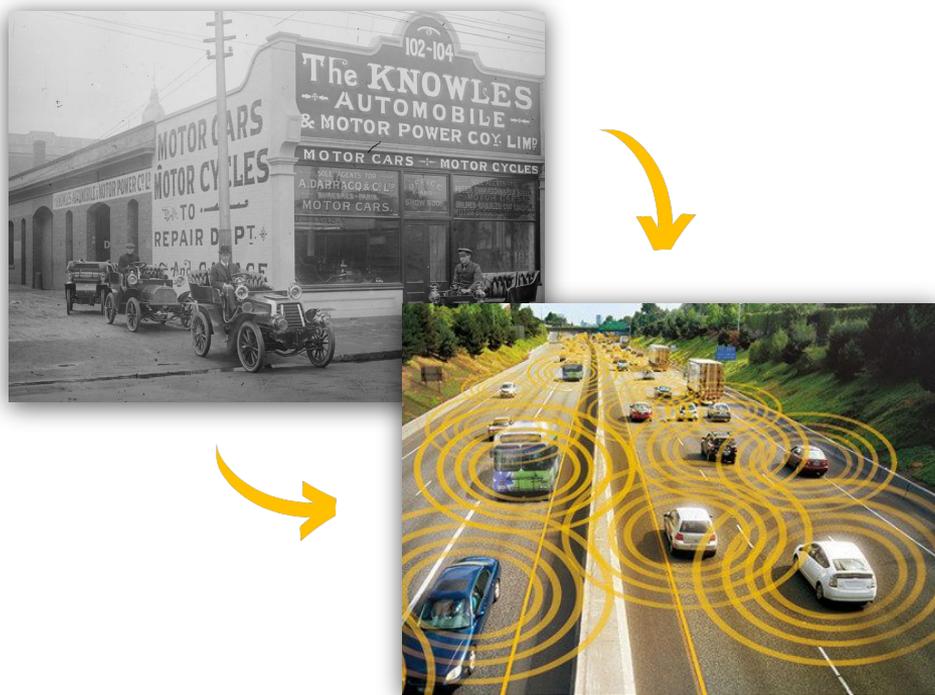


# AGENDA

- **Use Cases**
- Architecture
- Live Demo
- Best Practices
- Next Steps



# Global Automotive Company Builds Connected Car Infrastructure



## USE CASES:

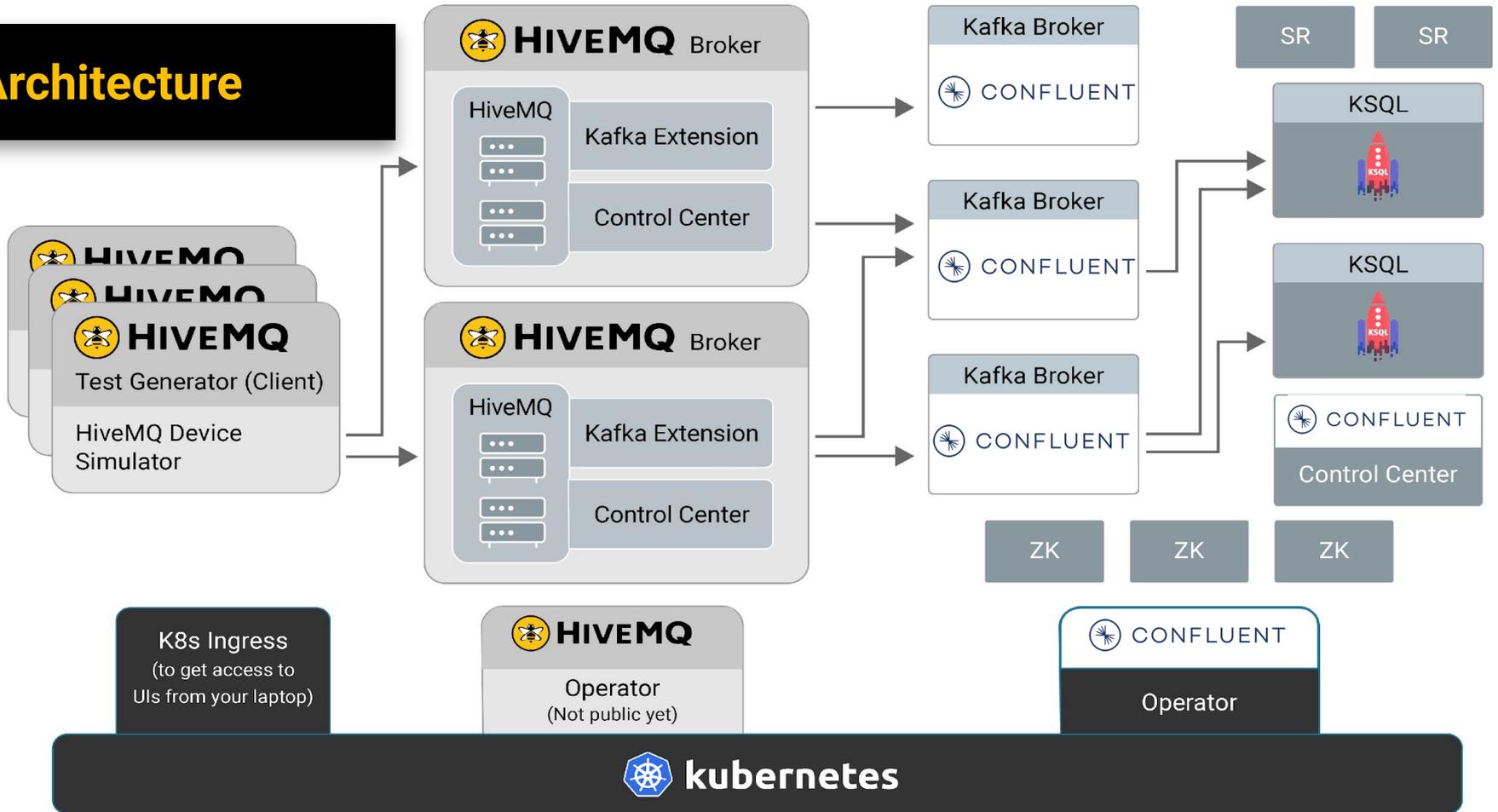
- Connected Car Infrastructure (Cars, Traffic Lights, Cloud Services, etc.)
- Real Time Analytics (Predictive Maintenance, etc.)
- Continuous Services / Sales
- Partner Integration (Car workshop, gas station, food market, etc.)
- And many more ...

# AGENDA

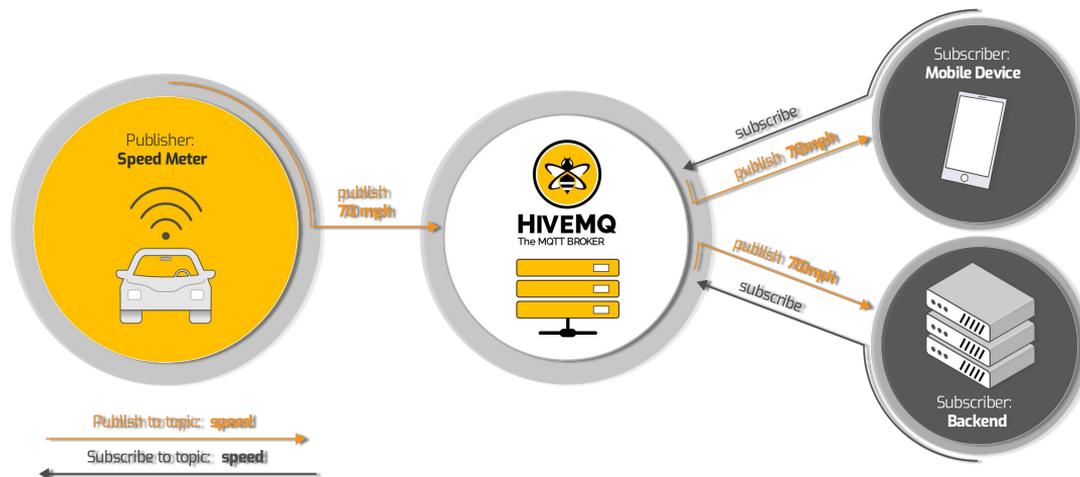
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# Architecture



# MQTT - Publish / Subscribe Messaging Protocol



- Built on top of TCP/IP for constrained devices and unreliable networks
- Many (open source) broker implementations
- Many (open source) client libraries

- IoT-specific features for bad network / connectivity
- Widely used (mostly IoT, but also web and mobile apps via MQTT over WebSocket)

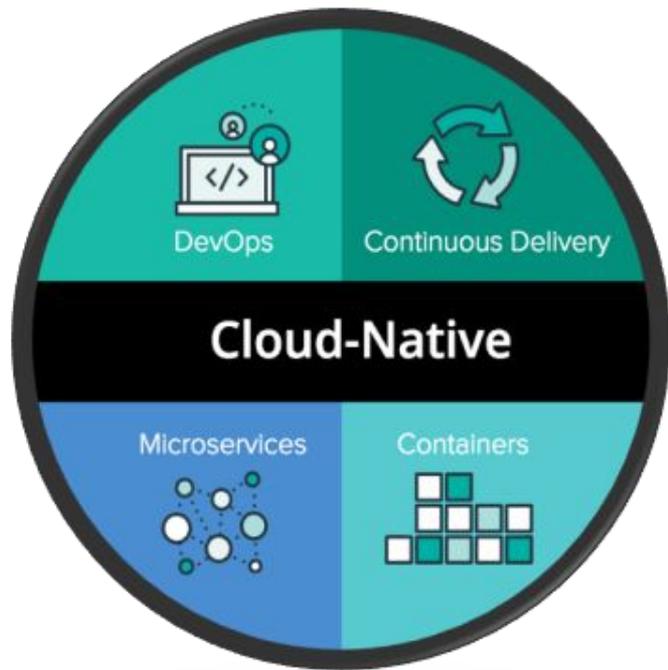
# HiveMQ Broker



# HIVEMQ

- Clustering for High Availability
- Scalability to support high throughput and connections
- Security integration with existing authentication and authorization systems
- Observability through HiveMQ Control Center
- Support for MQTT 5





## **BENEFITS:**

- Scalable
- Flexible
- Agile
- Elastic
- Automated
- Etc.

# MQTT Trade-Offs

## ✓ PROs

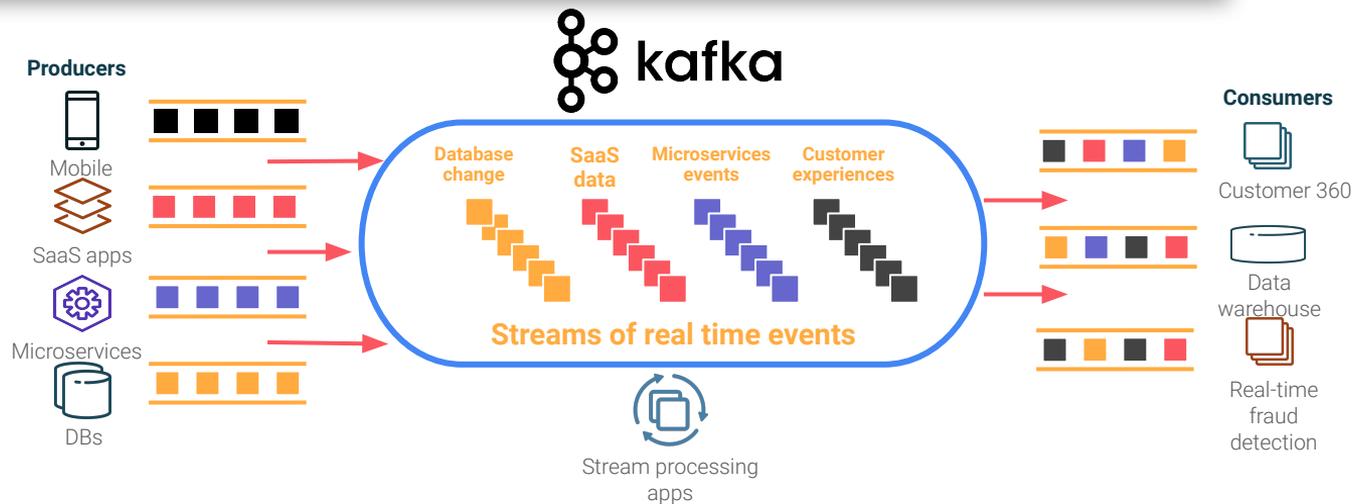
- Lightweight
- All programming languages supported
- Built for poor connectivity / high latency scenarios (e.g. mobile networks!)
- High scalability and availability \*
- ISO Standard
- Most popular IoT protocol



## ✗ CONs

- Only pub/sub, not stream processing
- No reprocessing of events

# A Streaming Platform is the Underpinning of an Event-driven Architecture



## Ubiquitous connectivity

Globally scalable platform for all event producers and consumers

## Immediate data access

Data accessible to all consumers in real time

## Single system of record

Persistent storage to enable reprocessing of past events

## Continuous queries

Stream processing capabilities for in-line data transformation

Source: © Confluent

# Kafka Trade-Offs (from IoT perspective)

## ✓ PROs

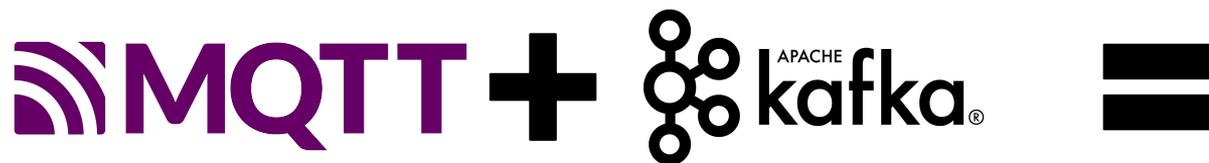
- Stream processing, not just pub/sub
- High throughput
- Large scale
- High availability
- Long term storage and buffering
- Reprocessing of events
- Good integration to rest of the enterprise



## ✗ CONs

- Not built for tens of thousands connections
- Requires stable network and good infrastructure
- No IoT-specific features like keep alive, last will or testament

# (De facto) Standards for Processing IoT Data



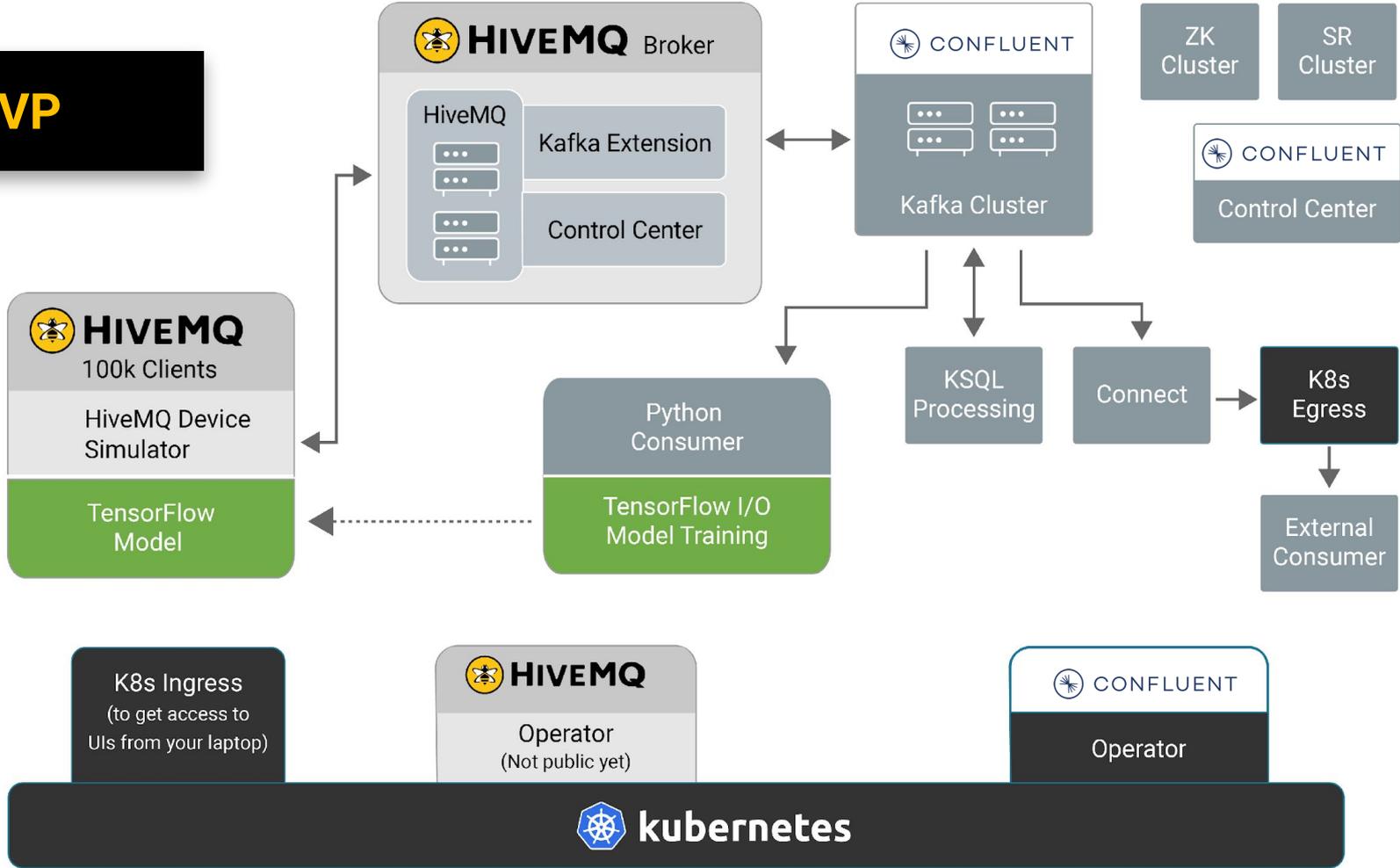
A Match Made in Heaven

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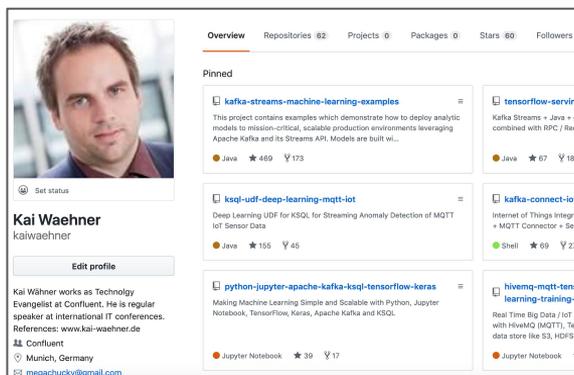
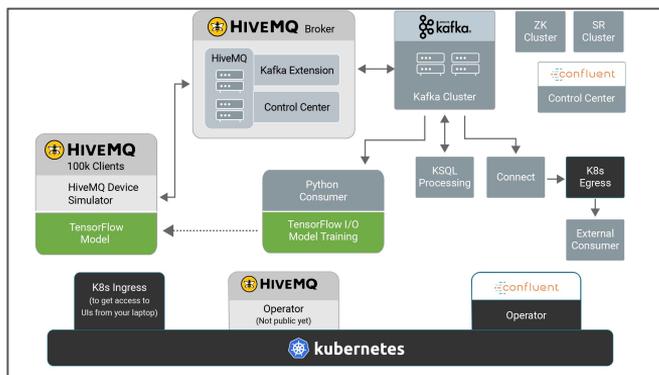


# MVP



# Demo 100.000 Connected Cars

(Kafka + MQTT + TensorFlow)



<https://github.com/kaiwaechner/hivemq-mqtt-tensorflow-kafka-realtime-iot-machine-learning-training-inference>

or

<http://bit.ly/kafka-mqtt-ml-demo>

Try it out in 30 minutes!

# Live Demo



End-to-End Integration and Data  
Processing for 100,000 Connected Cars

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# Start Small, but Prepare for Scalability from Beginning



## 1. Use cloud native and scalable components

- Confluent Platform is cloud native and built for scale
- HiveMQ is cloud native and built for scale

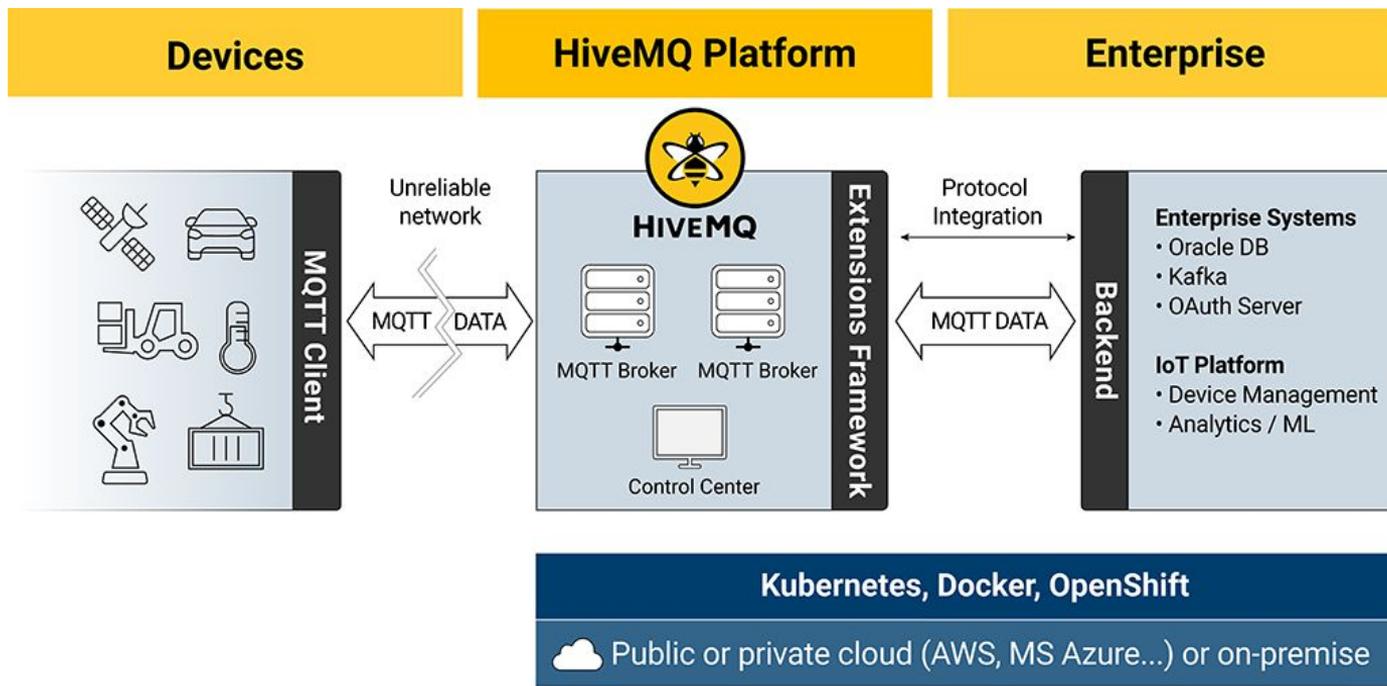
## 2. Don't deep dive too much in the beginning – but understand options

- HiveMQ Kafka Extension?
- Confluent MQTT connectors?
- Customer Integration?

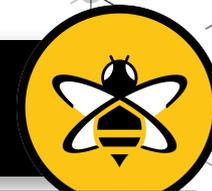
## 3. Plan for Enterprise-readiness

- Security
- Monitoring
- Operations tooling
- Bi-directional communication

# The HiveMQ Platform



# Comparison with other MQTT options



## HiveMQ Extension for Kafka



- Integration through Kafka protocol
- Scalable and performant, can handle large amounts of data from devices
- Supports MQTT 3.x and MQTT 5
- Sophisticated dynamic generation of MQTT messages at runtime
- Supports bidirectionality

## Kafka MQTT Connect



- Integration through MQTT protocol
- Better suited if Kafka cluster and MQTT broker not in the same data center, since it uses MQTT protocol
- Supports MQTT 3.x
- Simple Transformation of messages possible
- Supports bidirectionality through MQTT broker

## Confluent MQTT Proxy



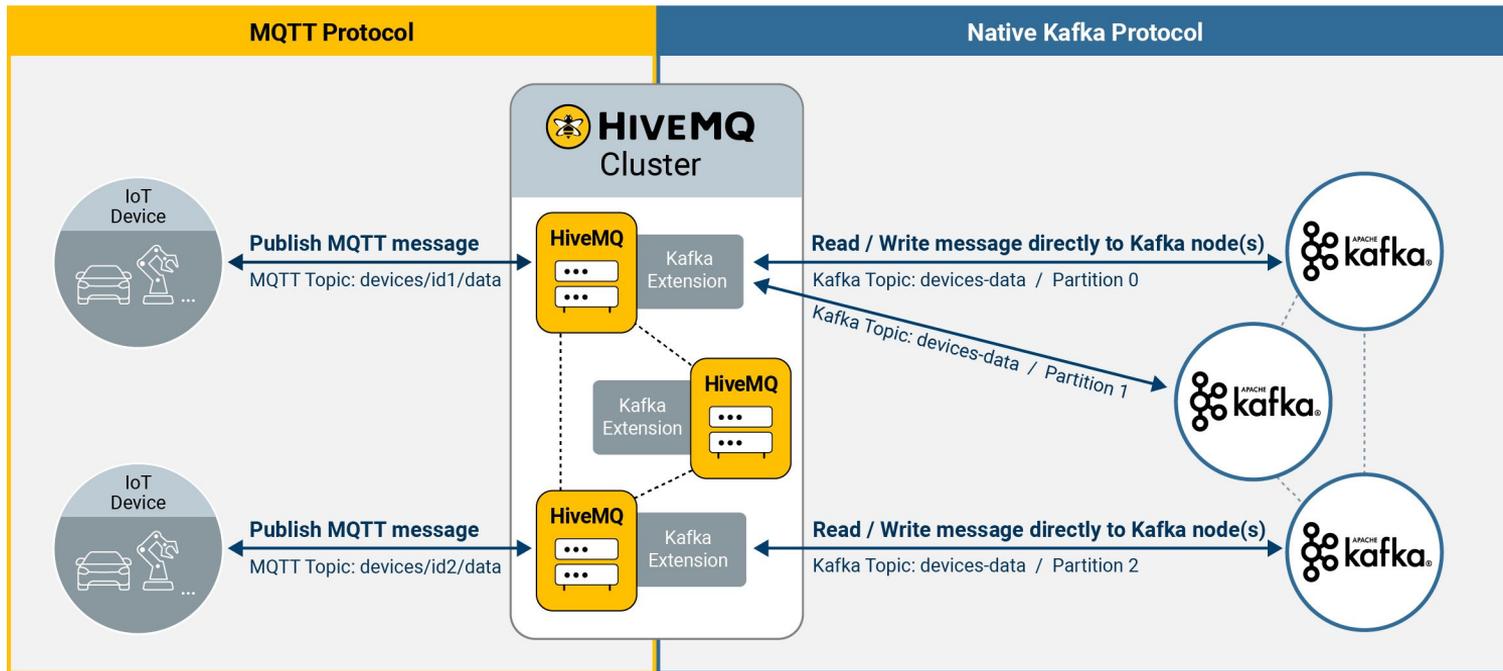
- No MQTT broker required
- Supports subset of MQTT 3.x
- Only support publish of MQTT messages

# HiveMQ Kafka Advantage



- Bidirectional messaging between IoT devices and Kafka
- Scales to millions of IoT devices
- Full support for MQTT 5 standard
- Reliable connection and messaging for IoT device
- Seamless integration with Confluent Platform/Confluent Cloud
  - Schema Registry
  - RBAC

# HiveMQ Kafka Solution



# Choose the Right Tool Stack and Infrastructure



## Understand Trade-Offs and choose the right options for deployments

- Edge
- On Premise
- Cloud

## Use the best tools for the job

- Confluent Platform for Event Streaming
- HiveMQ for MQTT messaging and connectivity

# Separation of Concerns



1. Devices
2. Gateway
3. Integration
4. Data Streaming
5. Consumer Apps

## Decouple tasks

- Source integration
- Data processing
- Business logic
- Sink integration
- Analytics
- ...



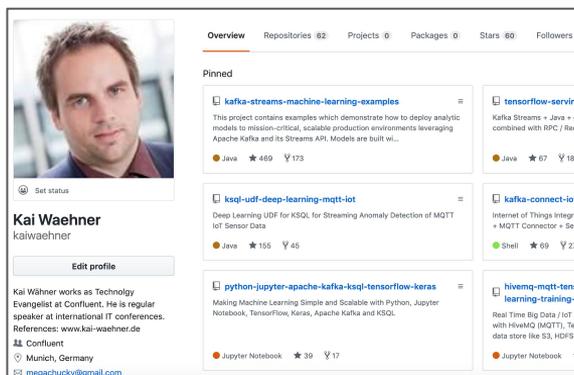
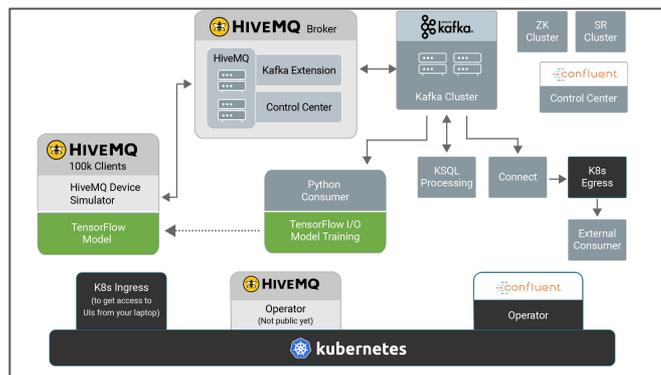
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# Demo 100.000 Connected Cars

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# HiveMQ Enterprise Extension for Kafka



**HIVEMQ**  
ENTERPRISE

Connectivity and  
Messaging Platform

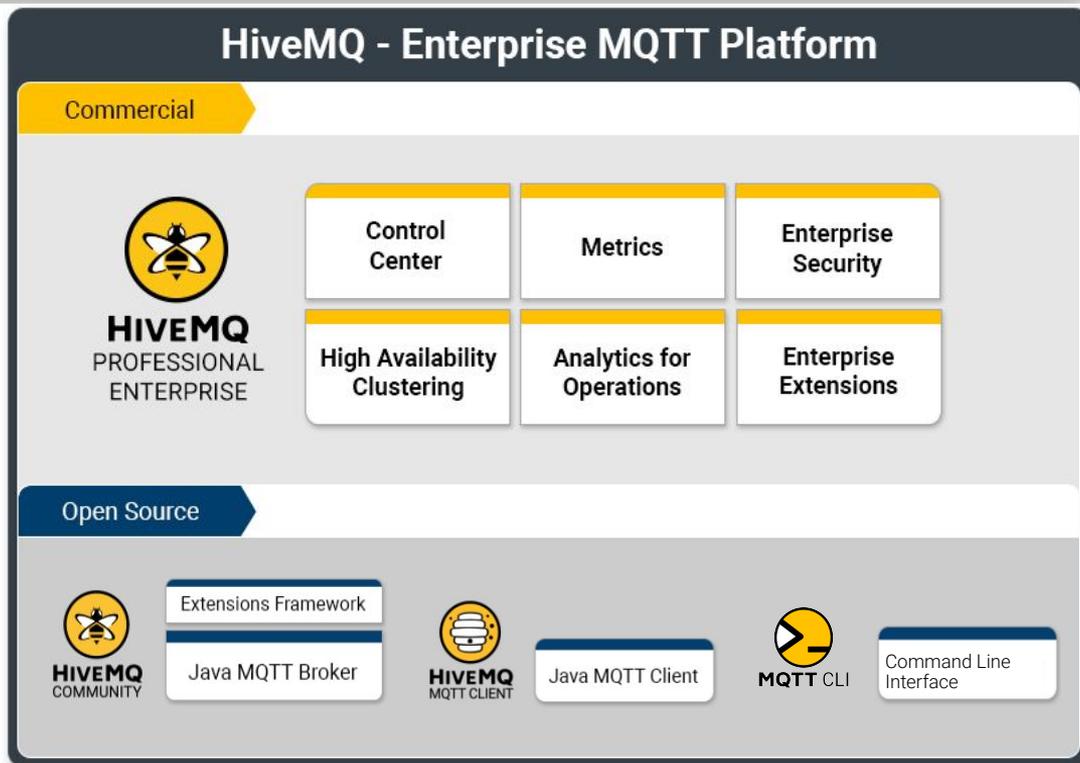


Event and Data  
Streaming Platform



Seamless and scalable  
integration of MQTT data streams  
between millions of IoT devices  
and multiple Kafka clusters

# The HiveMQ Platform – Open Source and Enterprise-grade



# Introducing Confluent Platform

Support, Services, Training & Partners

## Confluent Platform

### Operations and Security

Security plugins | Role-Based Access Control

Control Center | Replicator | Auto Data Balancer | Operator

### Development & Stream Processing

Connectors

Clients | REST Proxy  
MQTT Proxy | Schema Registry

KSQL

### Apache Kafka

Connect

Continuous Commit Log

Streams

Mission-critical  
Reliability

Complete Event  
Streaming Platform

Self-Managed Software

Datcenter

Public Cloud

Fully-Managed Service

Confluent Cloud

Freedom of Choice

Source: © Confluent

# Our Customers Are...

- Building new digital products
- Improving customer experience
- Creating more efficient operations and insights
- Connecting factories



Heraeus

DAIMLER

ECARX  
亿咖通科技



SIEMENS

Honeywell

acer



...and more

# Spend your time on your applications!



Cloud-Native HiveMQ Platform **Fully-Managed MQTT Platform**  
Makes it easy Ingest IoT data into **Confluent Cloud Kafka Clusters**.



Cloud-Native Confluent Platform **Fully-Managed Service**  
Available on the leading public clouds with **mission-critical SLAs** and **consumption-based pricing**.



**Serverless Kafka** characteristics:

Pay-as-you-go, elastic auto-scaling, abstracting infrastructure (topics not brokers)

# Next Steps...

Try out the **demo** in 30 minutes:

<https://github.com/kaiwaehner/hivemq-mqtt-tensorflow-kafka-realtime-iot-machine-learning-training-inference>

<http://bit.ly/kafka-mqtt-ml-demo>

Check out the **documentation and blog posts**:

- HiveMQ and Apache Kafka - Streaming IoT Data and MQTT Messages:  
<https://www.hivemq.com/blog/streaming-iot-data-and-mqtt-messages-to-apache-kafka/>

# THANK YOU

Questions? Feedback?  
**Please contact me!**



**Florian Raschbichler**

*florian@hivemq.com*

*twitter.com/fraschbi*

*linkedin.com/in/fraschbi/*

*www.hivemq.com*



# HIVEMQ