

# WELCOME TO



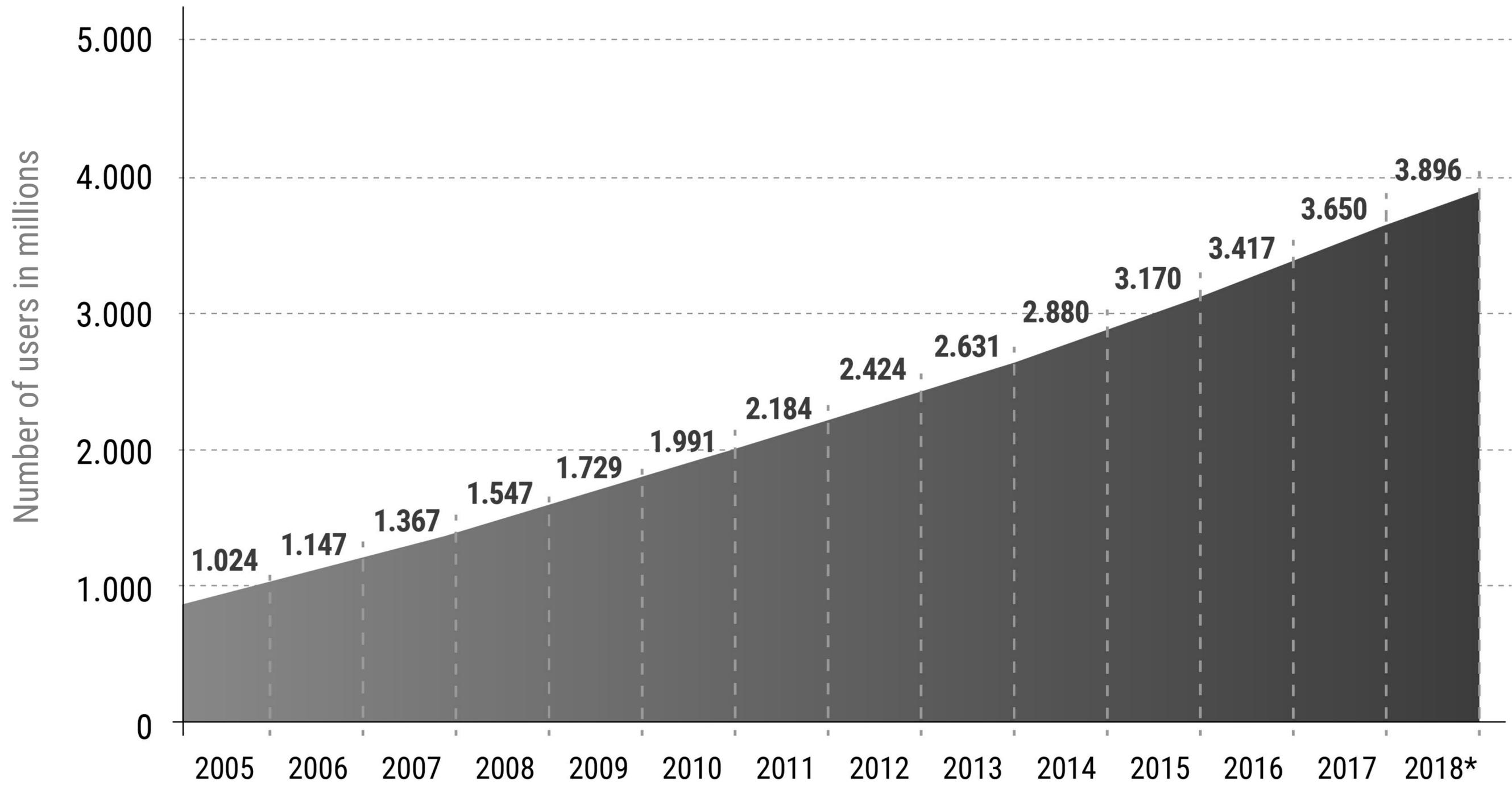
## **HIVEMQ** webinar

**LIGHTWEIGHT & SCALABLE IOT MESSAGING  
WITH MQTT**

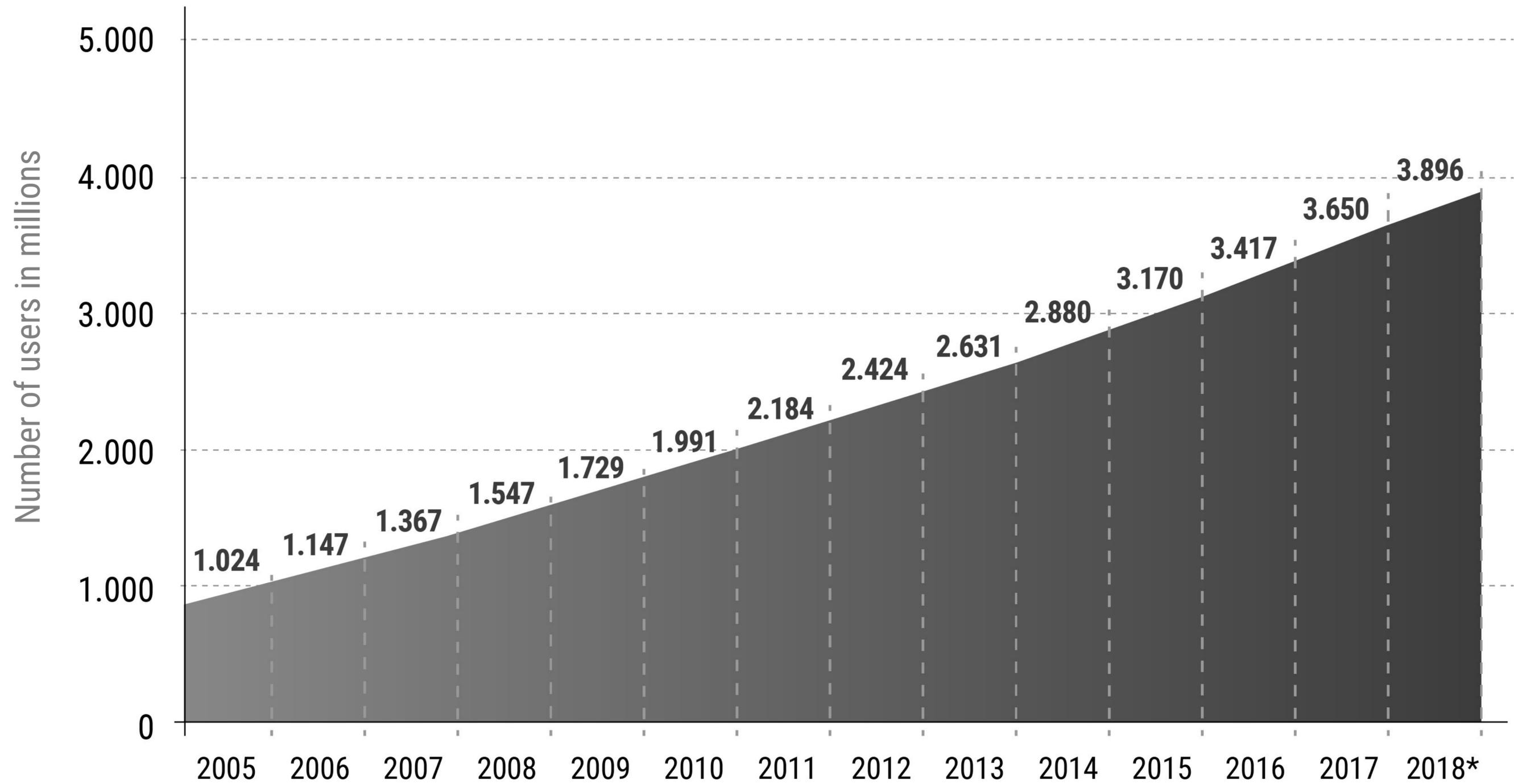
presented by HiveMQ CTO Dominik Obermaier



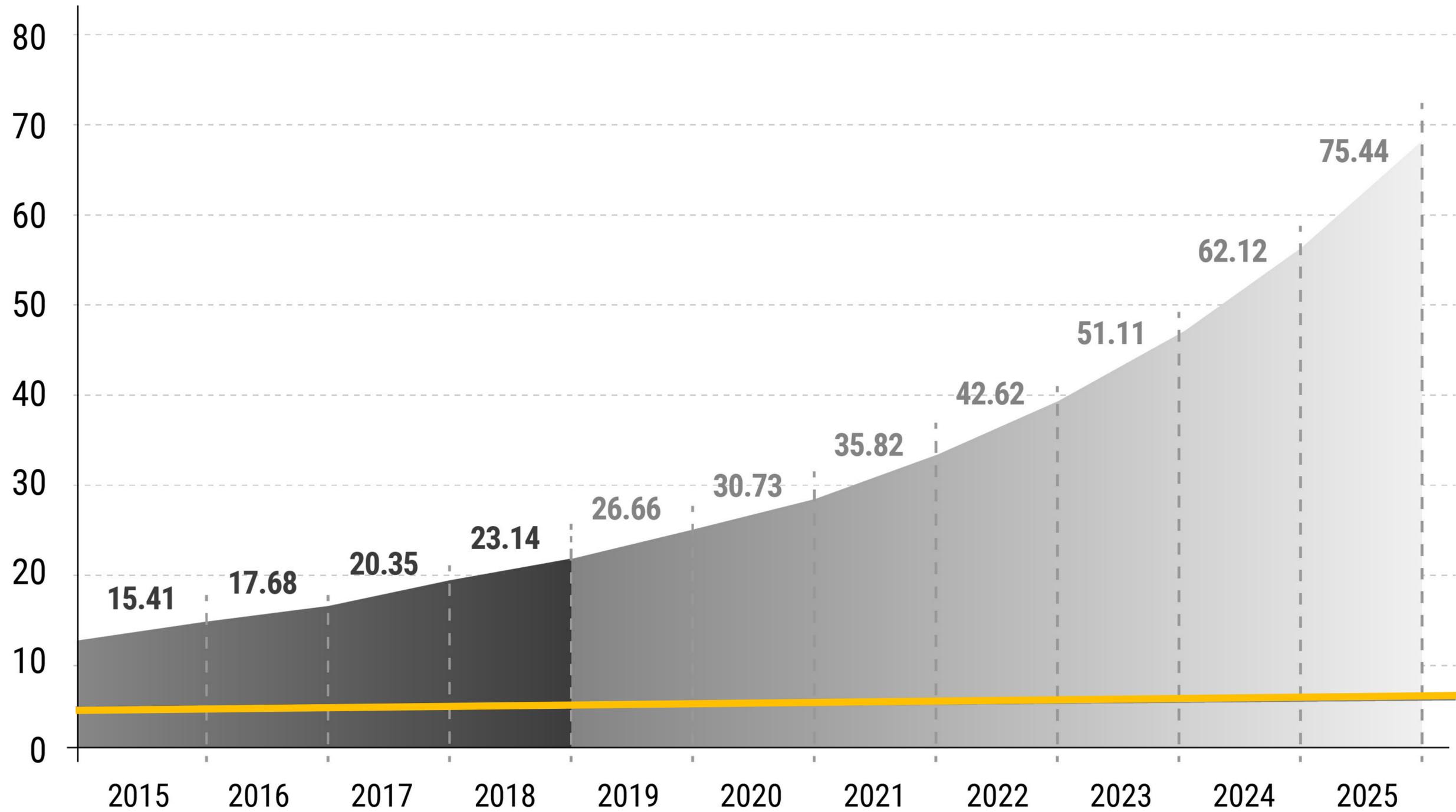
## We will start the session shortly



# PEOPLE ON THE INTERNET



# DEVICES ON THE INTERNET



# Key Industry Trend: IoT & Connectivity



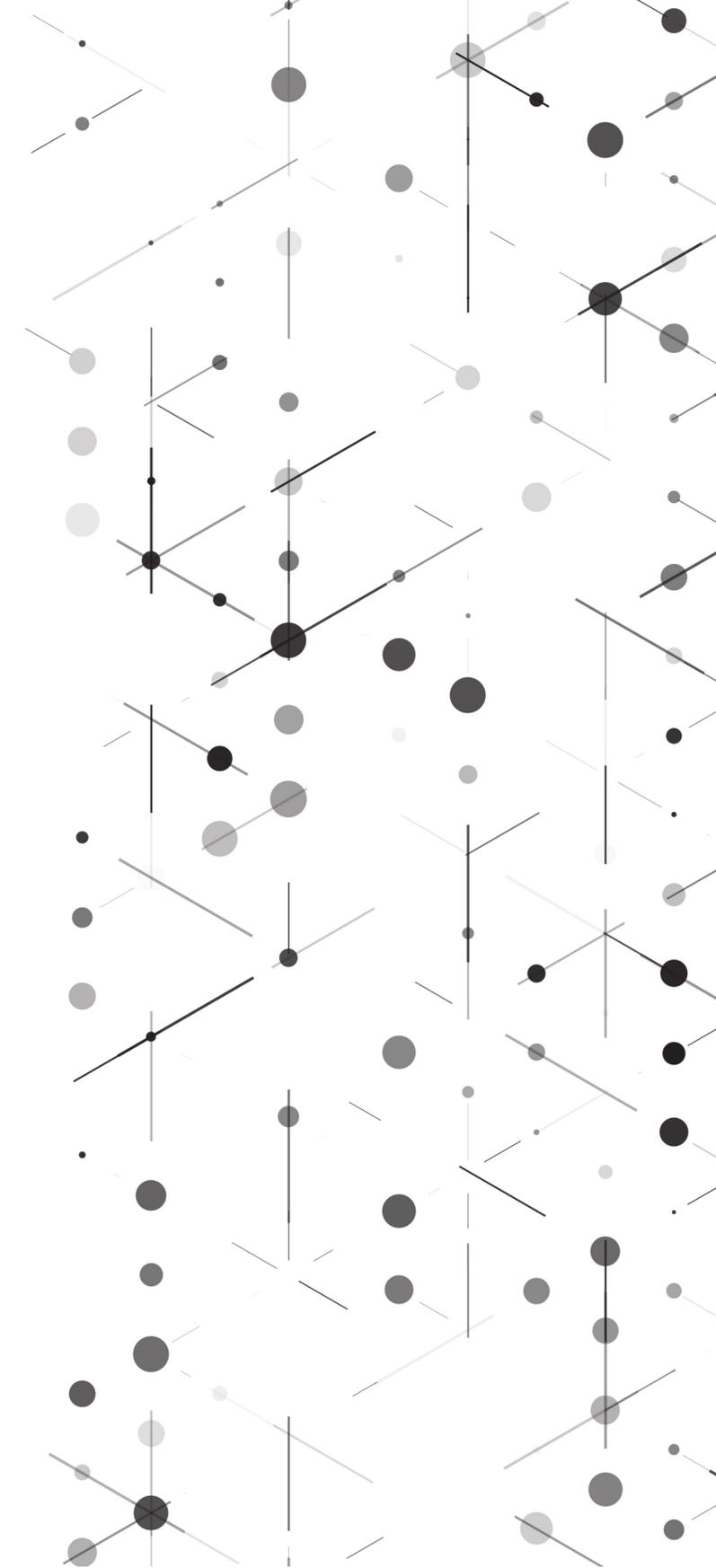
# Introduction



**Dominik  
Obermaier**

 @dobermai

- HiveMQ CTO
- Strong background in distributed and large scale systems architecture
- OASIS MQTT TC Member
- Author of “The Technical Foundations of IoT”
- Conference Speaker
- Program committee member for German and international IoT conferences





Web Technologies are

**NOT**

suitable for IoT

## Security

# Dishwasher has directory traversal bug

Thanks a Miele-on for making everything dangerous, Internet of Things firmware slackers

By Richard Chirgwin 26 Mar 2017 at 23:08

192



Don't say you weren't warned: Miele went full Internet-of-Things with a network-connected dishwasher, gave it a web server, and now finds itself on the wrong end of a security bug report – *and* it's accused of ignoring the warning.

The utterly predictable [vulnerability advisory](#) on the Full Disclosure mailing list details CVE-2017-7240 – aka "Miele Professional PG 8528 - Web Server Directory Traversal." This is the builtin web server that's used to remotely control the glassware-cleaning machine from a browser.

"The corresponding embedded Web server 'PST10 WebServer' typically listens to port 80 and is prone to a directory traversal attack, therefore an unauthenticated attacker may be able to exploit this issue to access sensitive information to aide in subsequent attacks," reads the notice,

## Most read



Apple hardware priced so high that no one wants to buy it? It's 1983 all over again



Ooh, my machine is SO much faster than yours... Oh, wait, that might be a bit of a problem...



Holy crappuccino. There's a latte trouble brewing... Bio-boffins reckon 60%+ of coffee species may be doomed



French data watchdog dishes out largest GDPR fine yet: Google ordered to hand over €50m



The lighter side of HMRC: We want your money, but we also want to make you laugh



# IOT CHALLENGES

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- Unreliable communication channels (e.g. mobile)
- Constrained Devices
- Low Bandwidth and High Latency environments
- Bi-directional communication required
- Security
- Instantaneous data exchange



# HTTP?

- Most popular web protocol
- Designed for the human web
- Request / Response based
- Document centric
- No Quality of service
- Stateless
- Text based (binary with HTTP/2)
- No Push capabilities
- Not possible to get notified when a client is offline

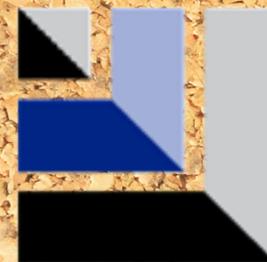


**XMPP**



**MQTT**.ORG

**CoAP**



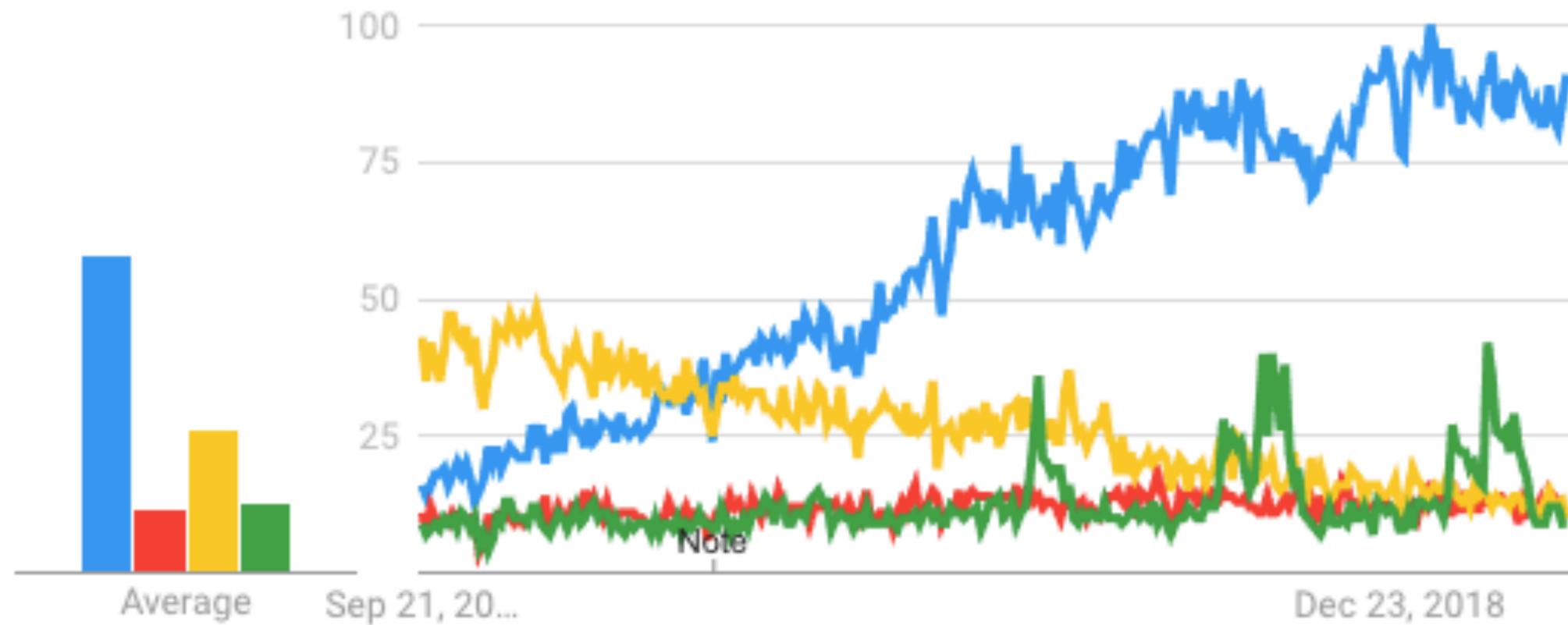
**AMQP**

Advanced Message Queuing Protocol

## Interest over time

Google Trends

● mqtt ● amqp ● xmpp ● coap



Worldwide. Past 5 years. Web Search.

The MQTT logo features a square icon on the left with rounded corners, containing a purple-to-blue gradient and a white circular pattern. To the right of the icon, the text "MQTT" is written in a large, bold, dark purple sans-serif font. The ".ORG" part of the domain is written in a smaller, dark purple sans-serif font, positioned vertically to the right of the "T" in "MQTT".

**MQTT**.ORG



# WHAT IS MQTT?

.....

- IoT Messaging Protocol
- Minimal Overhead
- Publish / Subscribe
- Easy
- Binary
- Data Agnostic
- Designed for reliable communication over unreliable channels



# USE CASES

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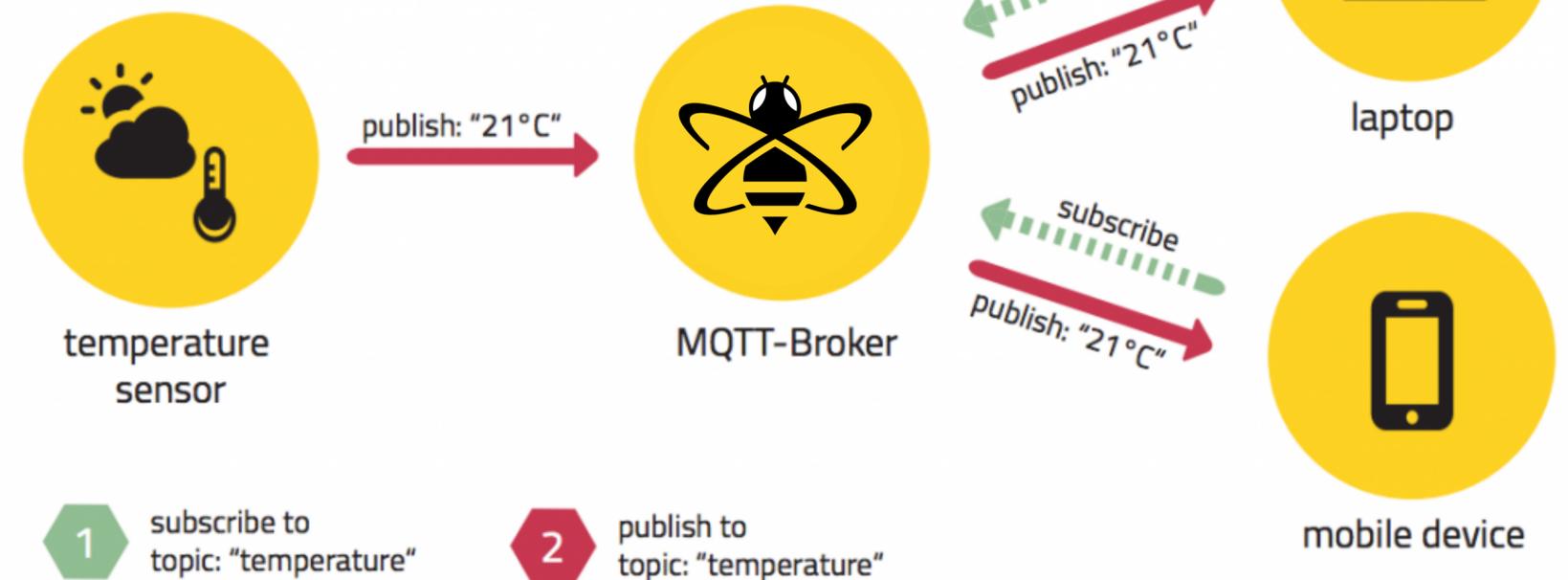
- Push Communication
- Unreliable communication channels (e.g. mobile)
- Constrained Devices
- Low Bandwidth and High Latency environments
- Communication from backend to IoT device
- Lightweight backen communication

# Publish / Subscribe



# MQTT

- lightweight protocol on top of TCP/IP
- de-facto standard for IoT
- Pub/Sub pattern
- de-coupling of sender and receiver
- central component: the broker



Make sure to use MQTT 5 for new projects!!!



Tools

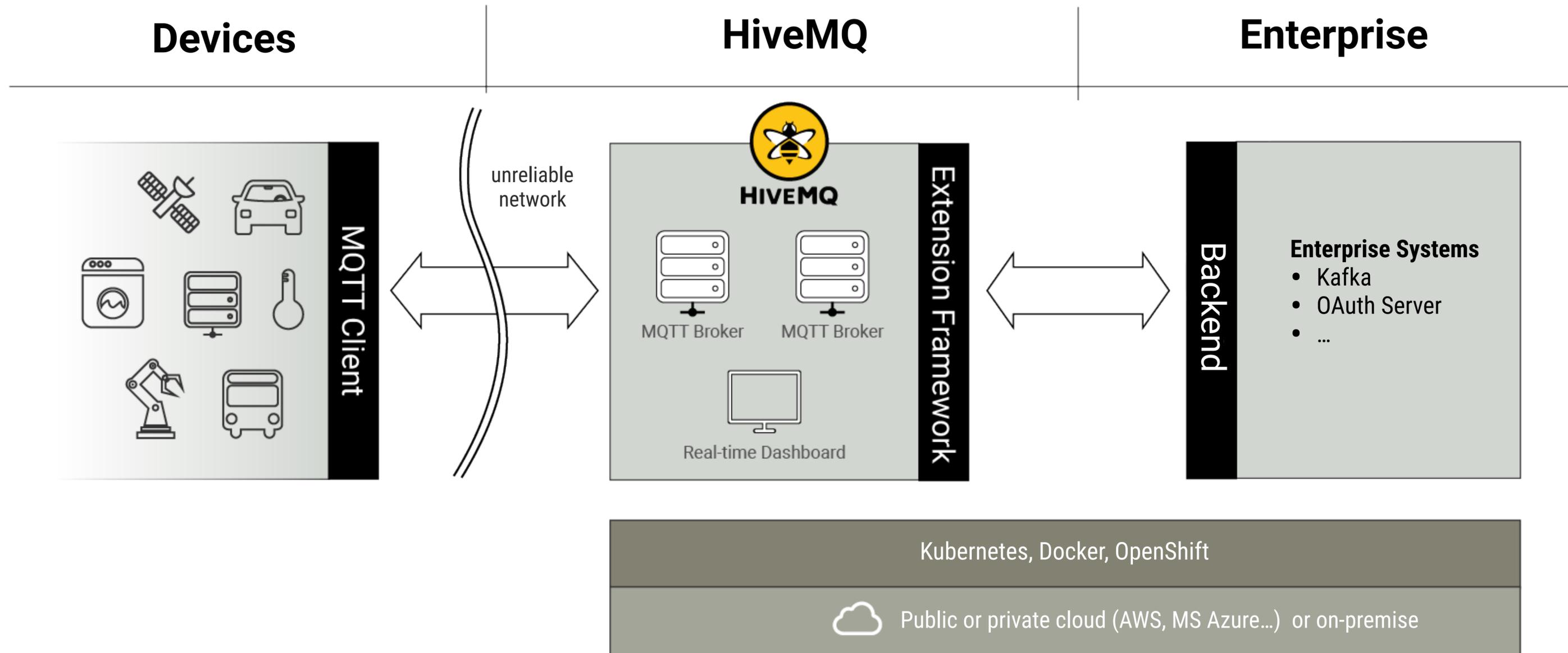
# HiveMQ



**HIVEMQ**  
ENTERPRISE MQTT BROKER

- MQTT broker built for enterprise applications
- Powerful Extension System
- Scales to > 10 million of concurrent connections
- OSS Community Edition available
- Built for High Availability and used by 150+ of the largest IoT deployments in the world

# Enterprise MQTT



# HiveMQ Community Edition



- Full-featured and lightweight Java MQTT Broker
- Extensive plugin system
- Ideal for Edge Devices and Java Applications
- Apache 2 License
- Foundation of HiveMQ Enterprise

<https://github.com/hivemq/hivemq-community-edition/>

# Extension System

- Allows developers to integrate any system
- Implement custom authentication and authorization behavior
- Data forwarding to other backend services
- Direct device communication possible for other systems
- Modify MQTT packets and and protocol behavior
- Hot Reload of Extensions possible

# Marketplace

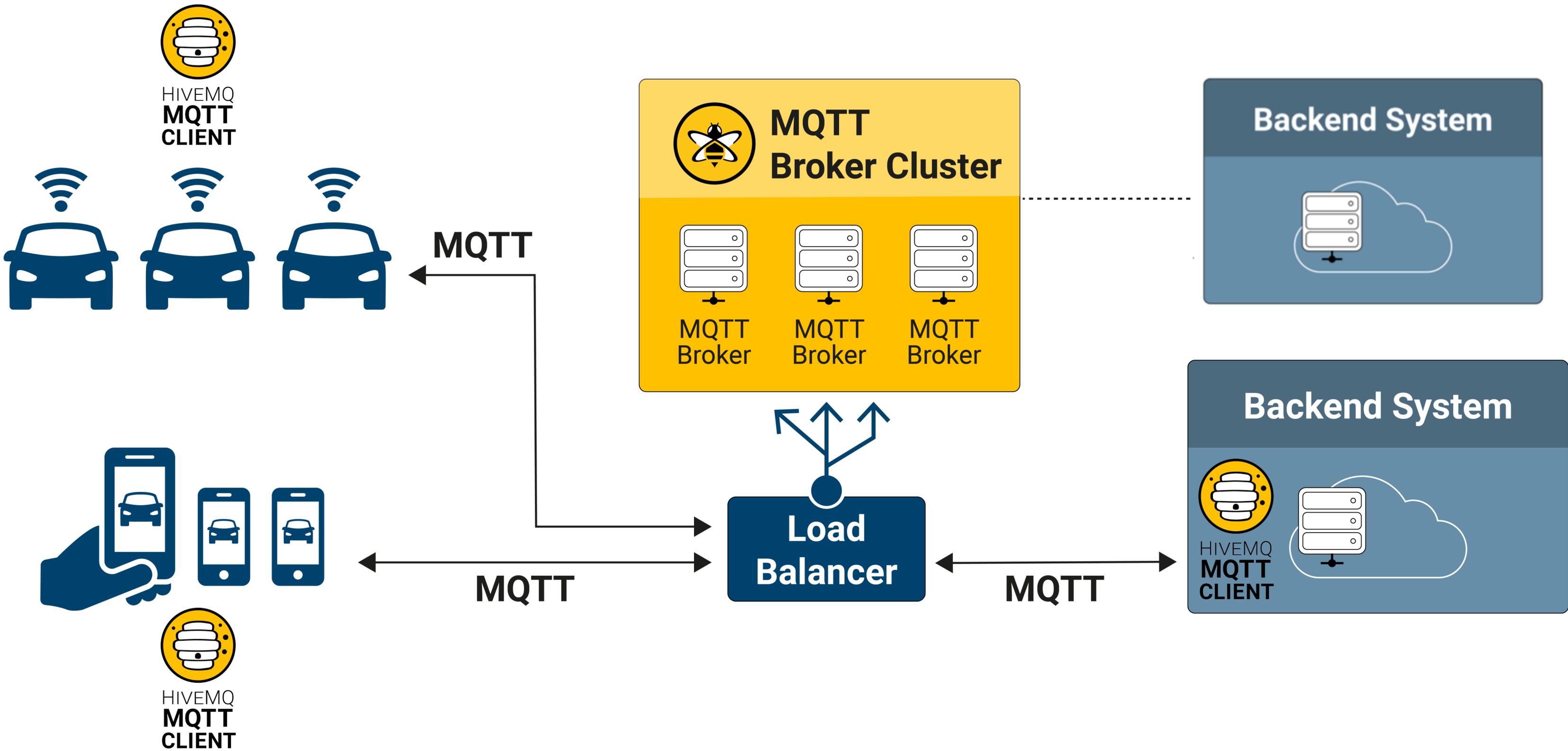


- Pre-built Extensions for integration with popular technologies like Kafka and Security Systems
- Open Source Extensions available
- Commercial Extensions available

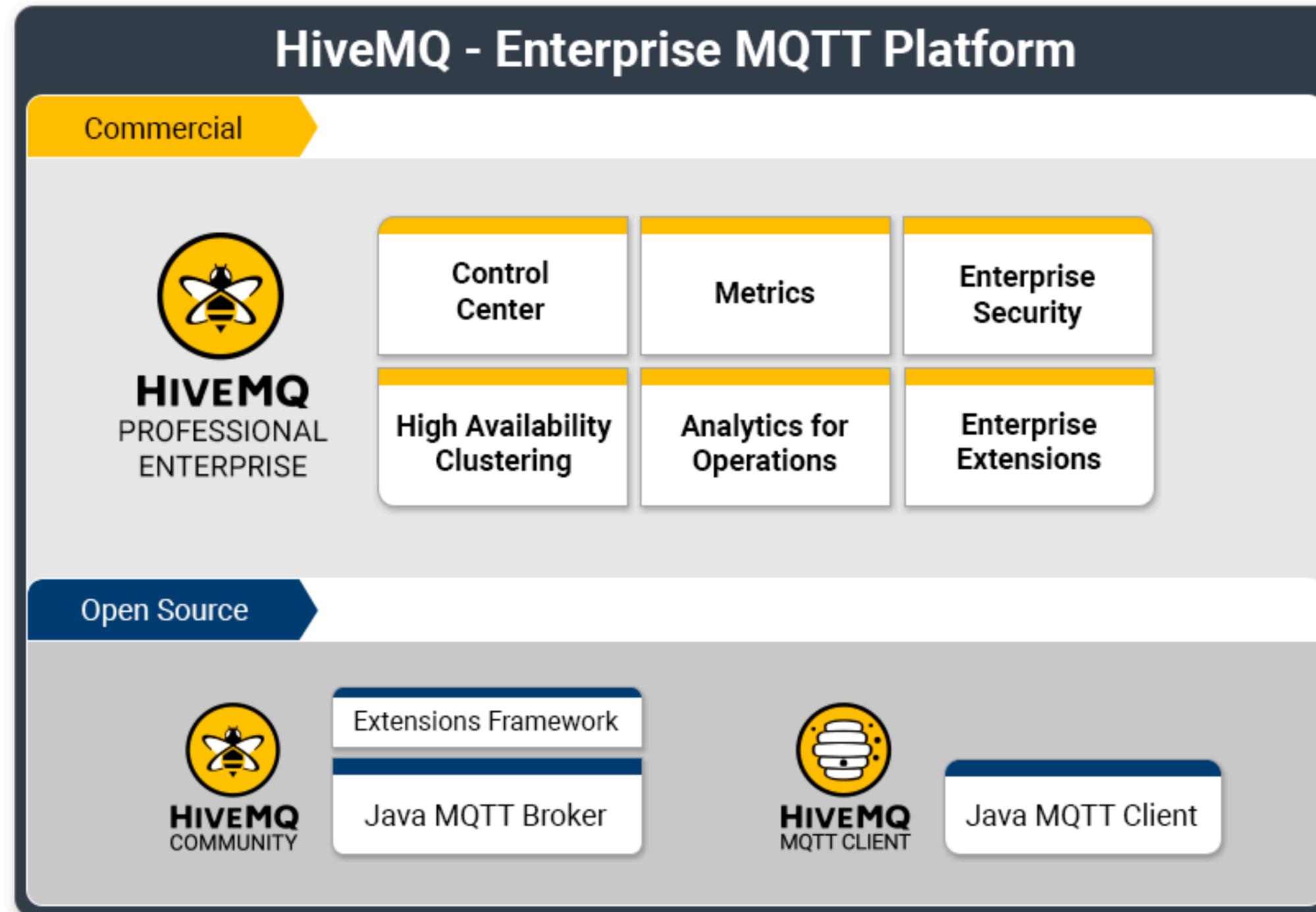
# HiveMQ MQTT Client



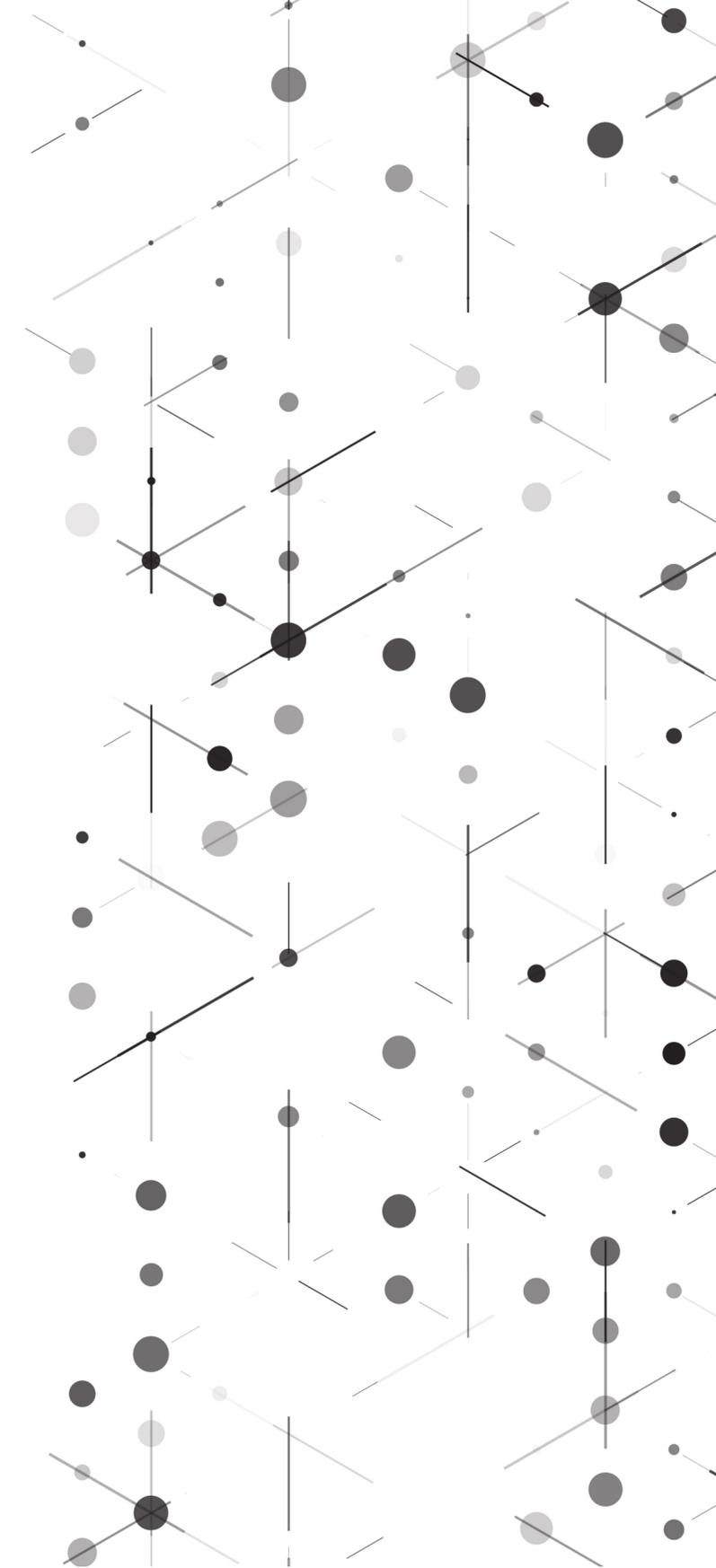
- Java based MQTT library
- Developed by HiveMQ and BMW Car-IT
- Built for devices and backends
- Open Source (Apache 2)
- Extremely fast and low overhead



# HiveMQ Ecosystem

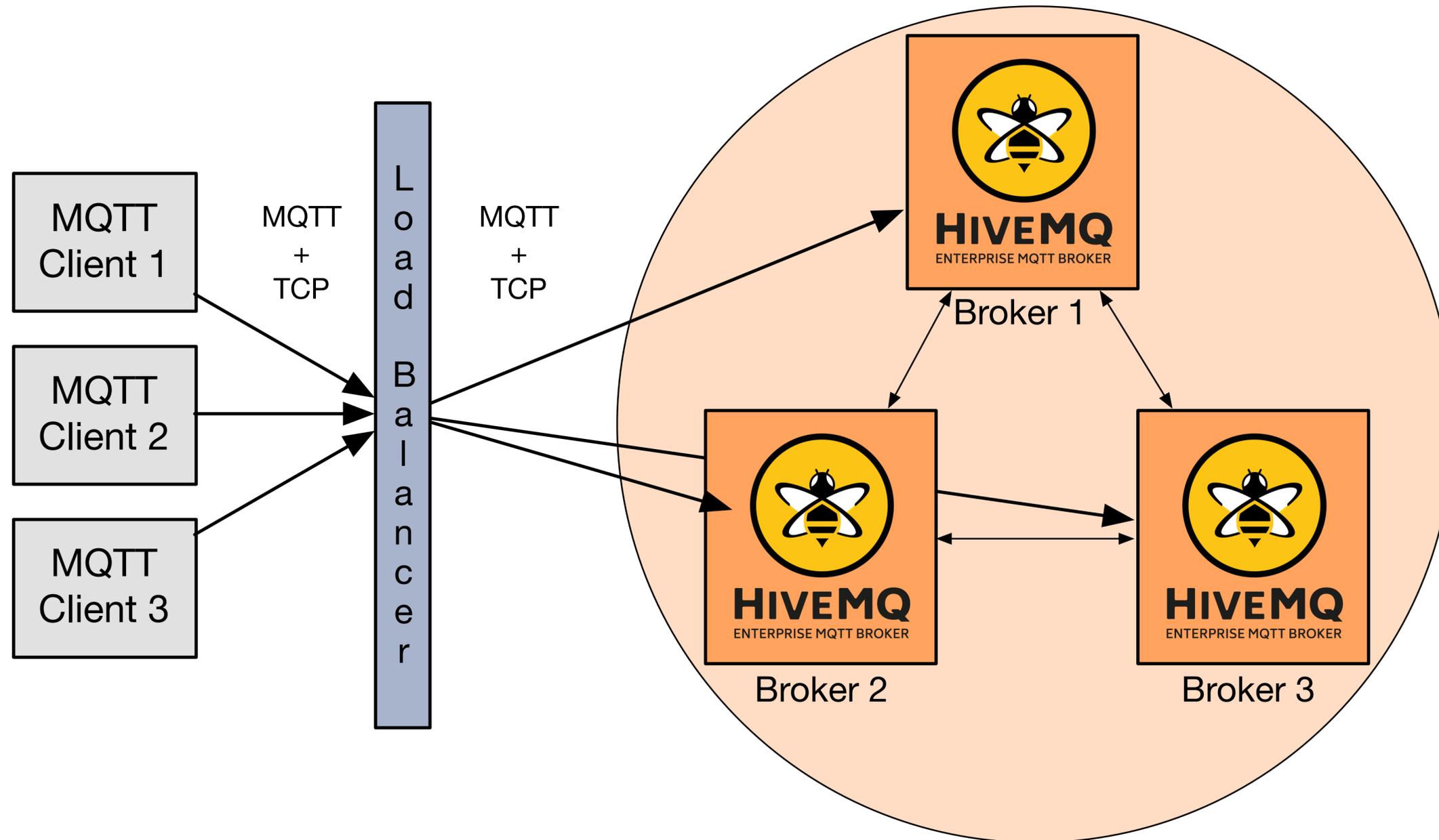


# How to eliminate the single point of failure?



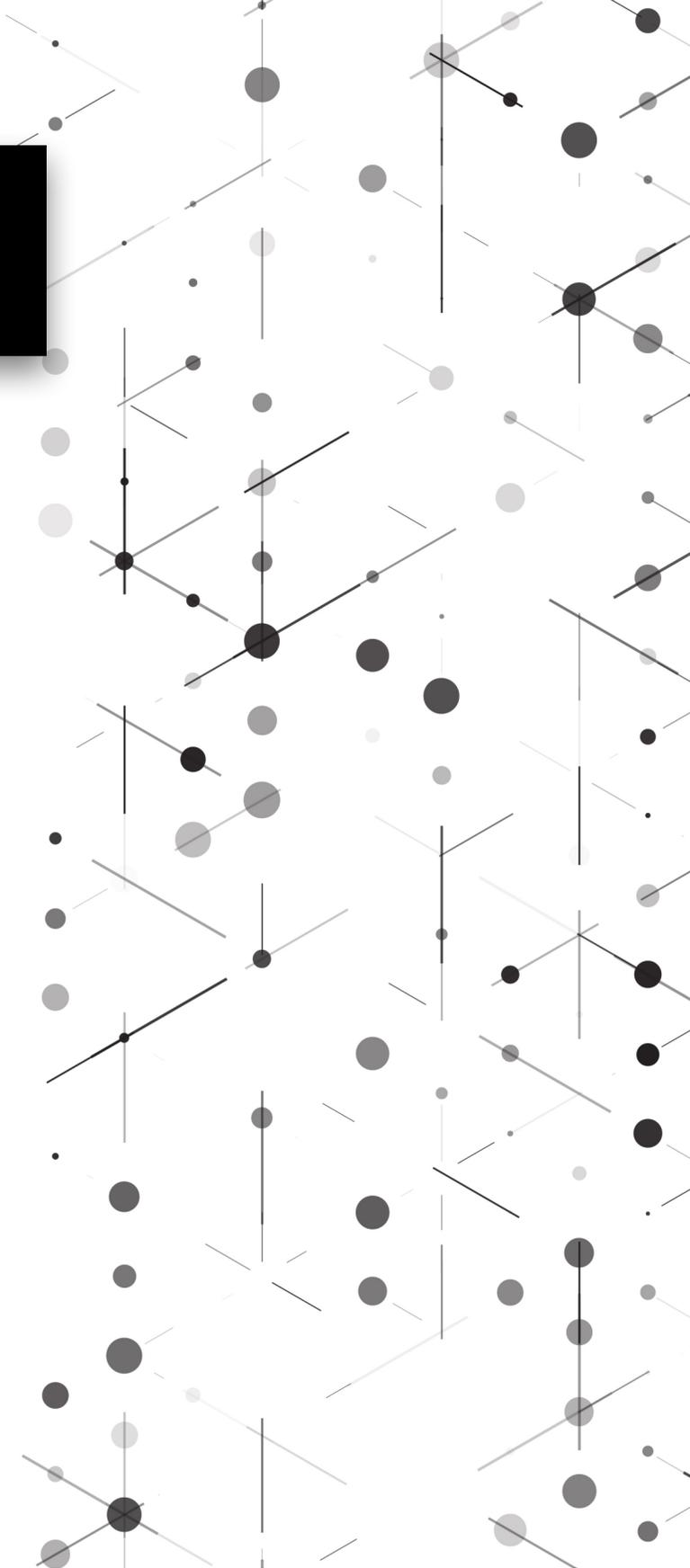
# HiveMQ Cluster with Load Balancer

## Masterless & Active/Active



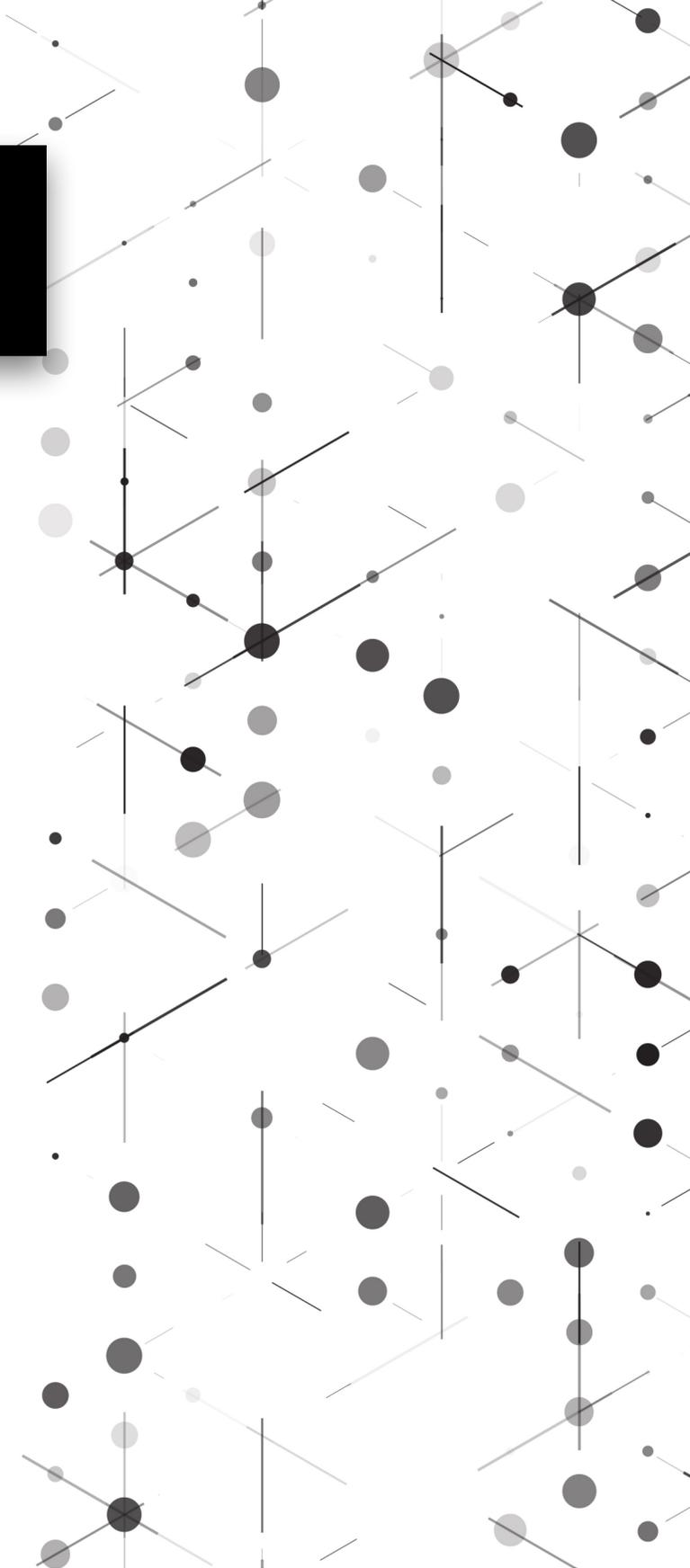
# Clustering - Resilience & HA

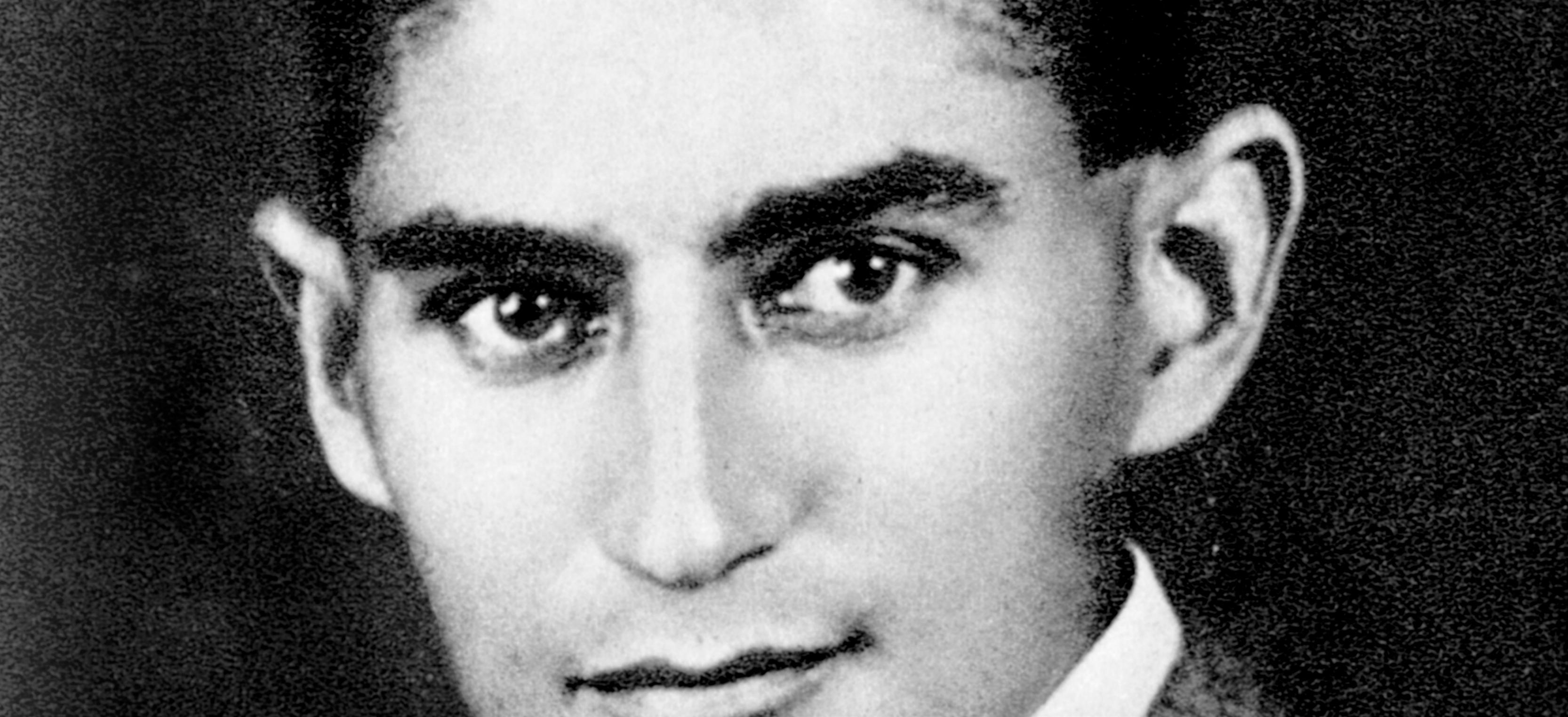
- **Elastic Clustering**
  - Add / remove nodes at runtime
  - No administrative action needed - just spawn and kill new nodes
- **Linearly scales to 10,000,000 connections in a single cluster**
- **Zero Downtime Upgrades**
- **Each cluster node is autarkic and self-contained**
  - No additional software needed
- **True masterless node architecture**
  - Distribution happens on client data-level



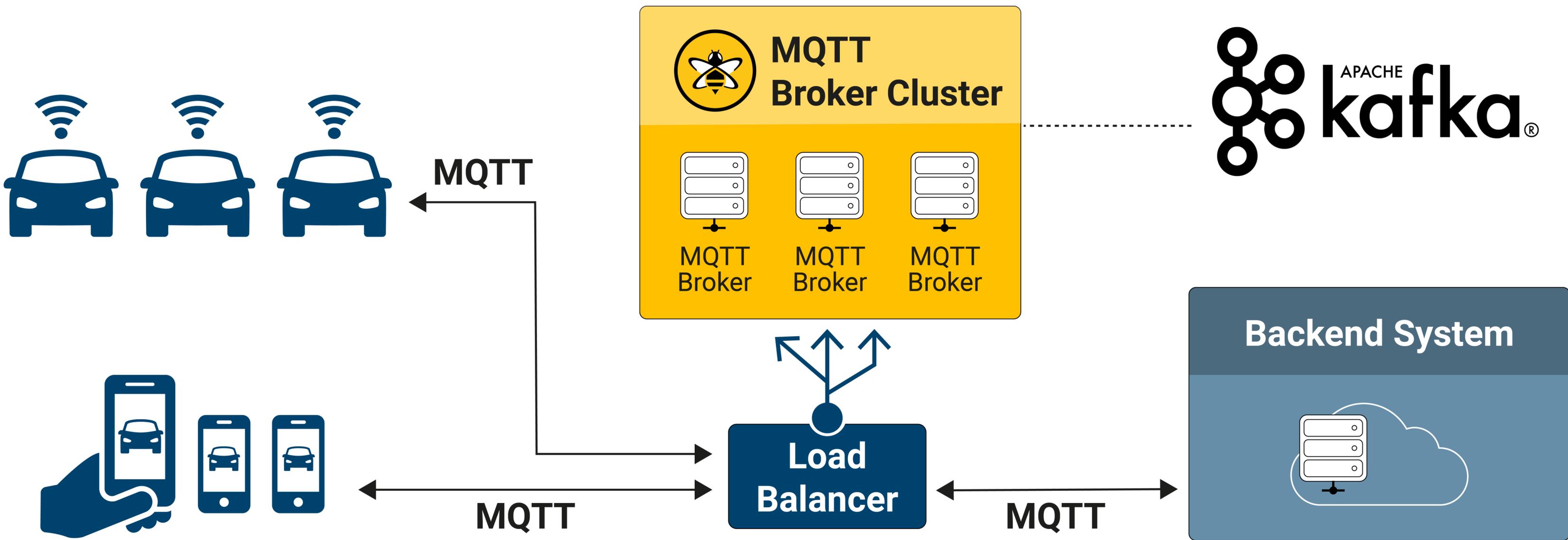
# Clustering - Simplicity is key

- **Easy for clients**
  - No application layer retry mechanisms on client side needed
  - ACK'ed packages mean data is distributed in cluster
  - No knowledge of the backend infrastructure needed on client side
- **No specific infrastructure setup required**
  - Use any load balancing strategy
  - Clients can resume sessions and message flows from ANY node
- **Built for availability**
  - Treats open connections as the most precious resource

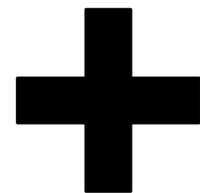




What about Kafka?



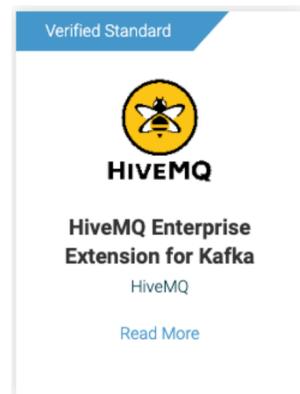
# HiveMQ Enterprise Extension for Kafka



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



Verified standard by Confluent

# HiveMQ+ Kafka

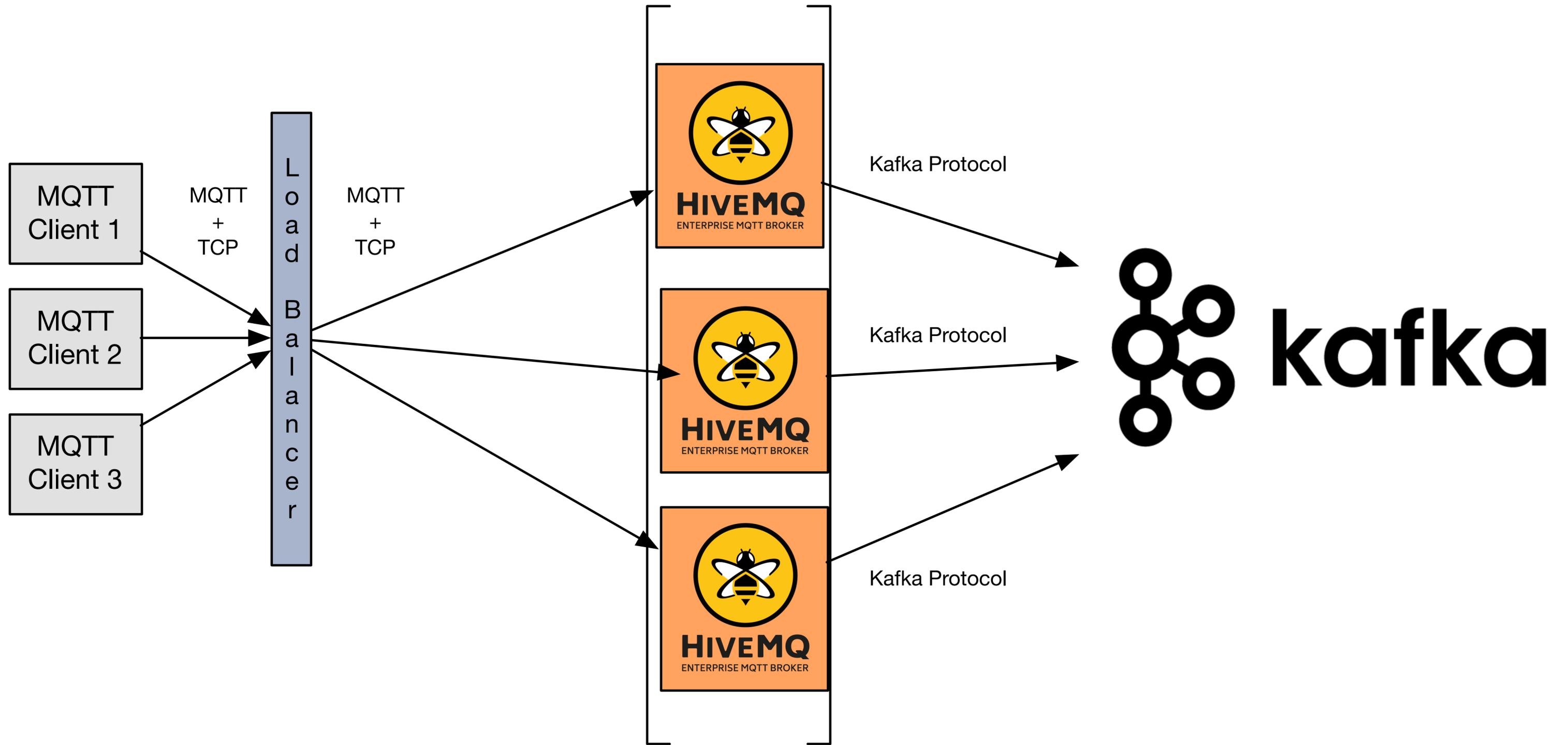


- Standard Extension
- Control Center (+RBAC) Integration
- Extreme Throughput
- Bi-Directional
- Complex Topic Mappings possible
- Kafka Extension Certified by Confluent

# HiveMQ + Kafka = ❤️

- **Live Monitoring of Messages to Kafka**
- **Topic Mappings for combining MQTT topics to Kafka Topics**
- **Advanced backpressure mechanisms for Kafka Integration**
- **HiveMQ Control Center Integration for cluster wide monitoring**
- **Durability guarantees so even when cluster nodes die online messages are not lost**
- **Control Center RBAC Integration**

# HiveMQ Cluster



### MQTT Protocol

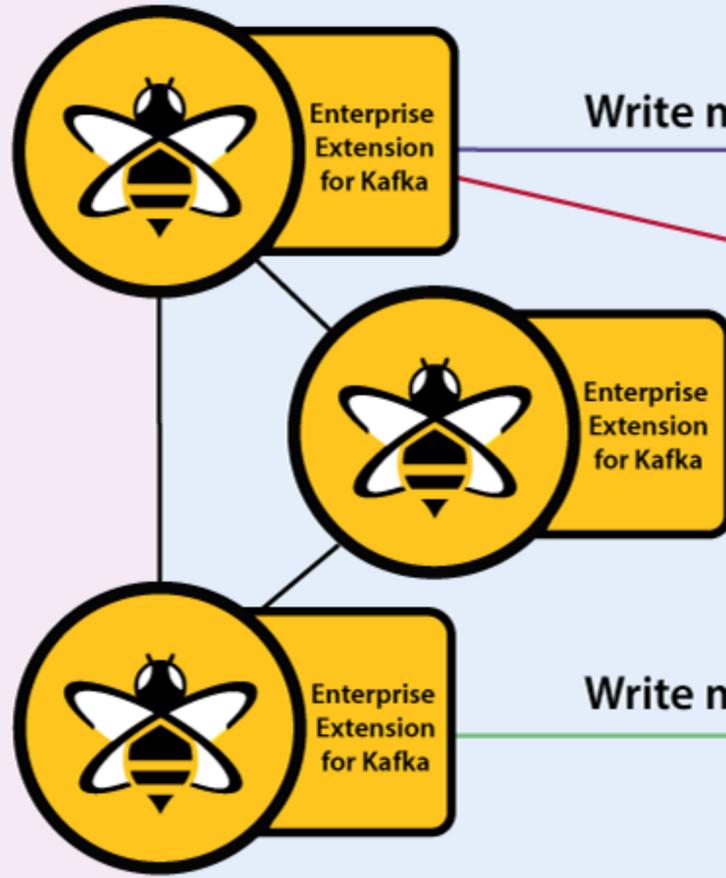
### Native Kafka Protocol



Publish MQTT message  
MQTT Topic: devices/id1/data



Publish MQTT message  
MQTT Topic: devices/id2/data



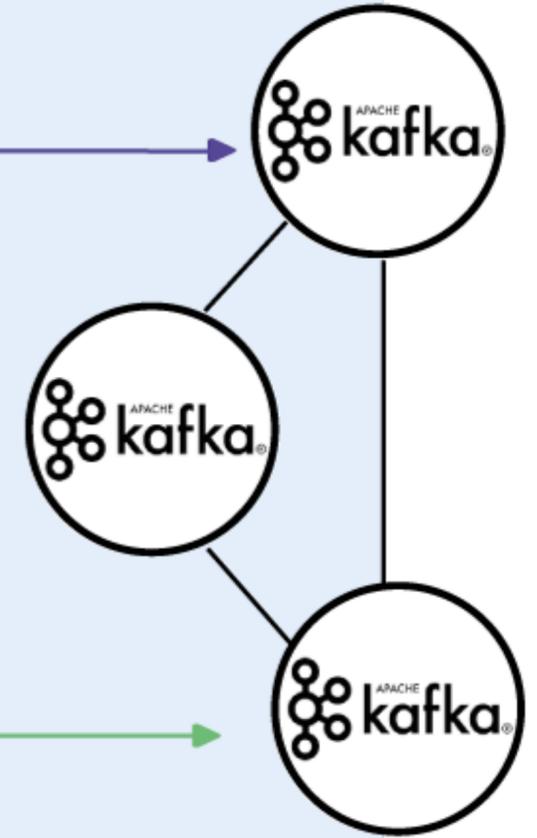
Write message directly to Kafka node(s)

Kafka Topic: device-data  
Partition: 1

*Kafka Topic: device-1-data  
Partition: 1*

Write message directly to Kafka node(s)

Kafka Topic: device-data  
Partition: 2



IoT Devices

HiveMQ cluster

Kafka cluster



**HIVEMQ**  
ENTERPRISE MQTT BROKER

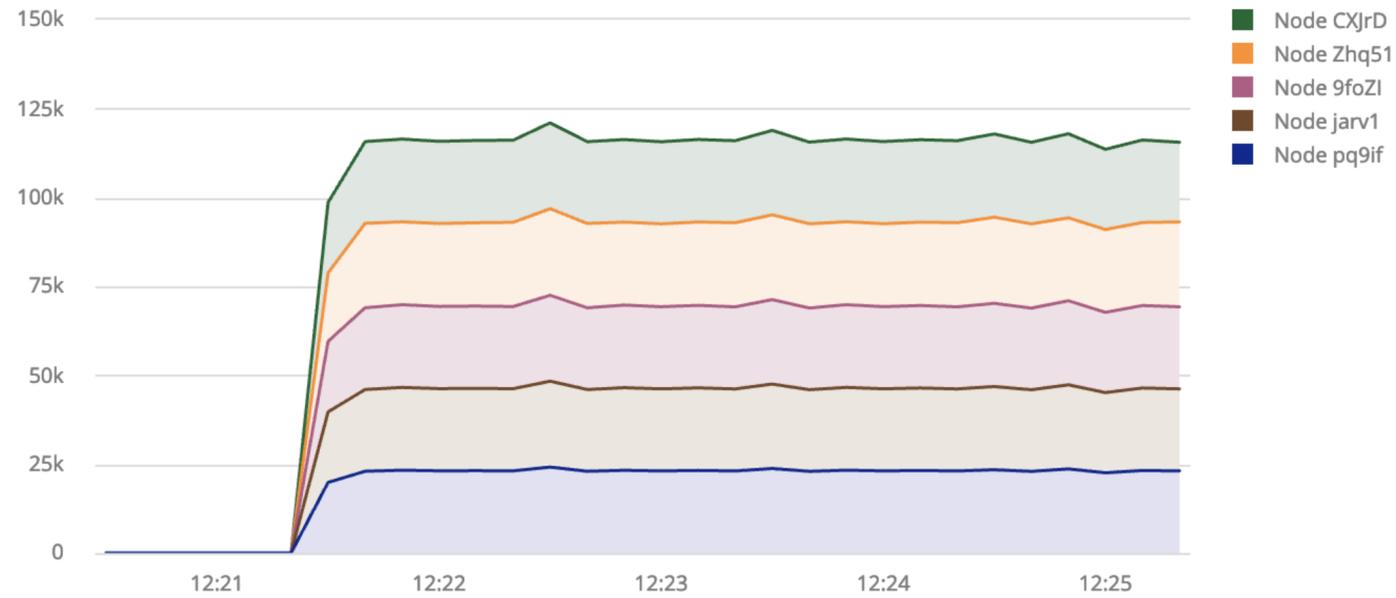
# Dashboard

admin |

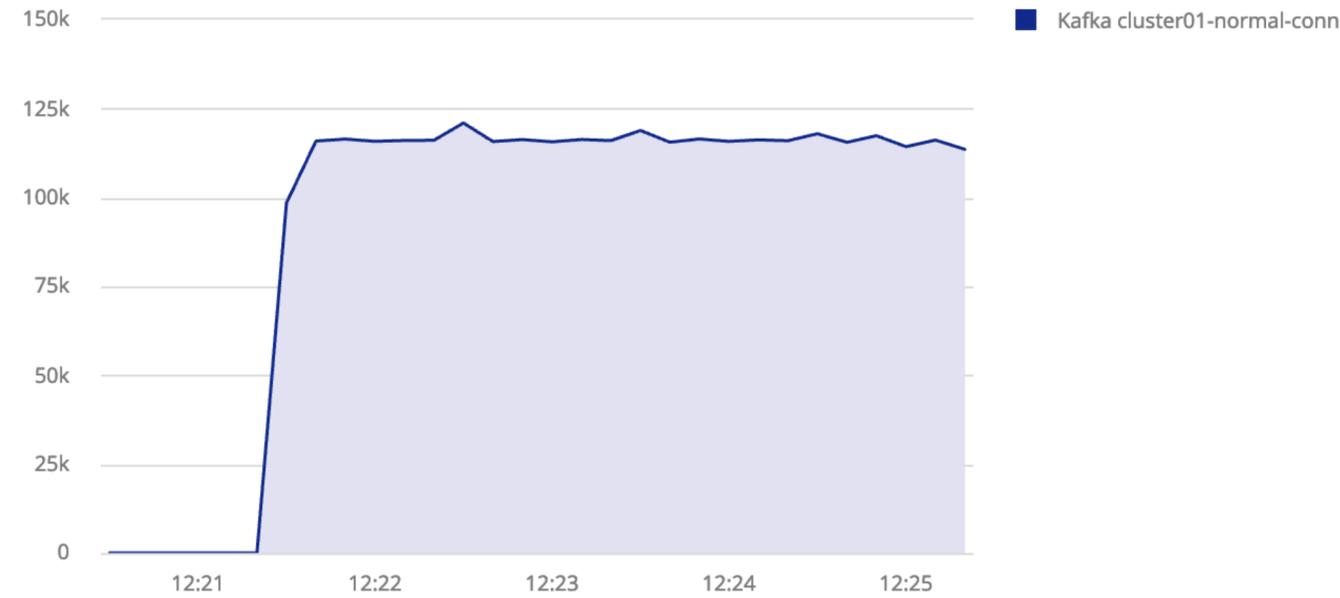
<p>Current Status</p> <p></p> <p>All checks successful</p>	<p>Mapped MQTT Messages</p> <p>116.096 / s</p>	<p>Written To Kafka</p> <p>116.113 / s</p>	<p>Topic Mappings</p> <p>1</p>	<p>Kafka Clusters</p> <p>1</p>	<p>Kafka Brokers</p> <p>10</p>
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- Dashboard
- Clients
- License
- Trace Recordings
- Analytics
  - Dropped Messages
- Kafka
  - Dashboard
- Help

### Mapped MQTT Publish Messages



### Messages Written To Kafka



# MQTT - Next Steps



## HIVEMQ

- **MQTT 5** - Brand new features and why it's required for state-of-the-art messaging
- **Monitoring and observability**: How to find the needle in the haystack for IoT production deployments?
- **Cloud native MQTT**: How to run large scale deployments on Kubernetes and integrate with the cloud native ecosystem
- **Security**: How to integrate existing third-party systems like databases, REST APIs, Active Directory and OAuth?

Reach out to me directly to schedule a conversation: [\*\*dominik@hivemq.com\*\*](mailto:dominik@hivemq.com)

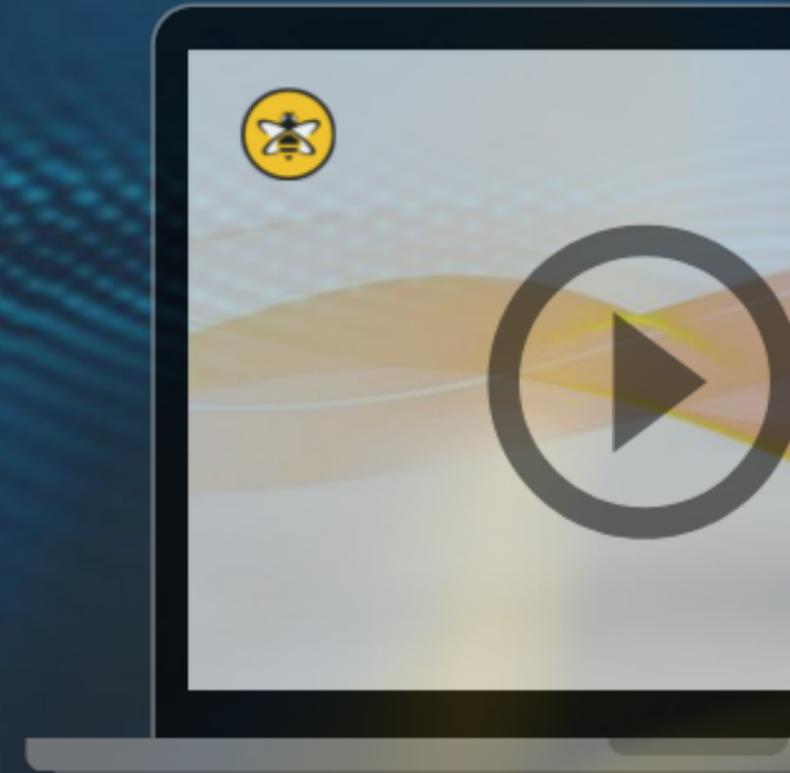
# Any Questions?



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## Ask your questions to Dominik

# Thank you for attending the webinar

We will upload the webinar on our YouTube Channel



Subscribe to our YouTube Channel: [page.video/hivemq](https://page.video/hivemq)

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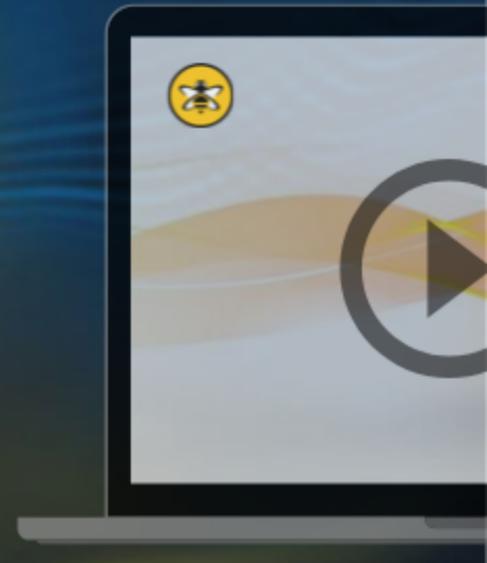


NEXT

## HIVEMQ webinar

MQTT 5: WHY YOU NEED IT AND POTENTIAL PITFALLS

presented by HiveMQ CTO Dominik Obermaier



Register today for the next MQTT Webinar on October 17: [b.link/hivemq](https://b.link/hivemq)