Open sourcing the IoT

The **"I"** part in your hands

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Who am I ?

@ppatierno

- Principal Software Engineer @ Red Hat
  - Messaging & IoT team
- Lead/Committer @ Eclipse Foundation
  - Hono, Paho and Vert.x projects
- Microsoft MVP Azure/IoT
- Valentino Rossi's fan ! (I don't like Marc Marquez)
- Try to be a runner ...

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What is messaging?

- It's about *messages* exchange
  - **Internally** in distributed systems
  - **Externally** between systems
- Communication at the ***application*** level
- Messages go from ***sender/producer/publisher*** to ***receiver/consumer/subscriber***
  - **Asynchronously**
  - Time **decoupling**
  - … or **directly** and **synchronously**

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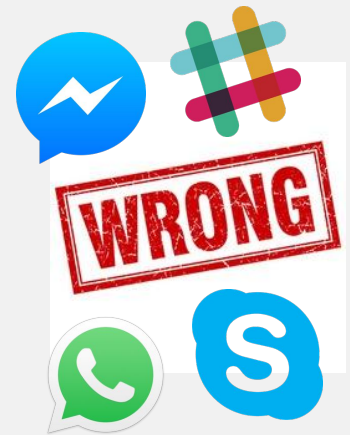
Why messaging ?

IoT : messaging vengeance

- … maybe in the past …
- … **messaging** was not so cool for developers …
- … but today with **IoT** this is changed because …
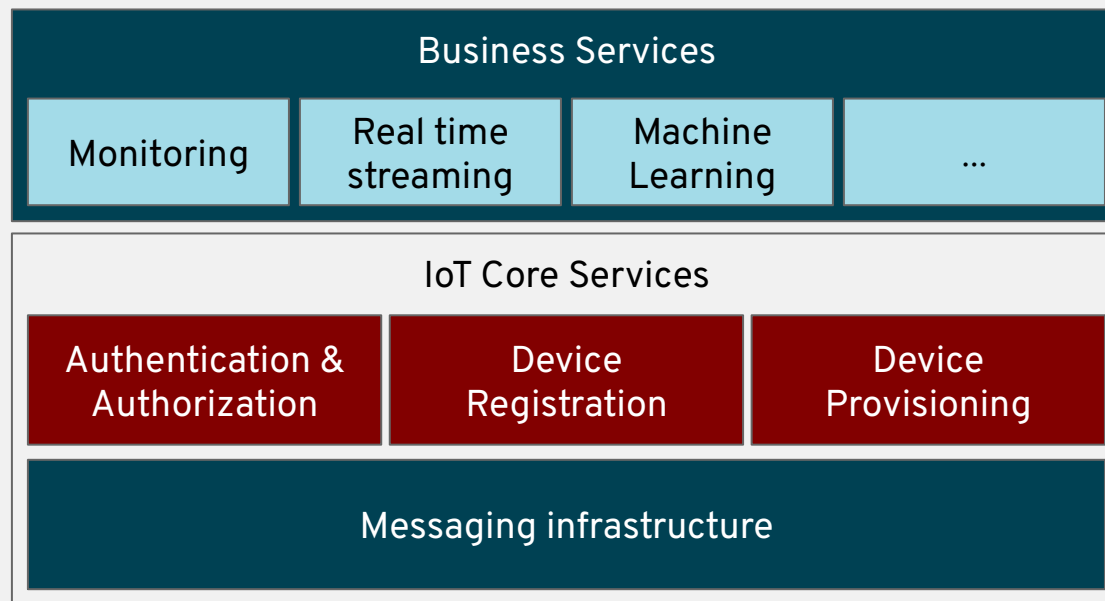- … **IoT is all about messaging** so …

"Messaging vengeance" !

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IoT : messaging as a "lever"

"give me a **scalable messaging platform**, and I shall move the **Internet of Things** world" (Archimedes)

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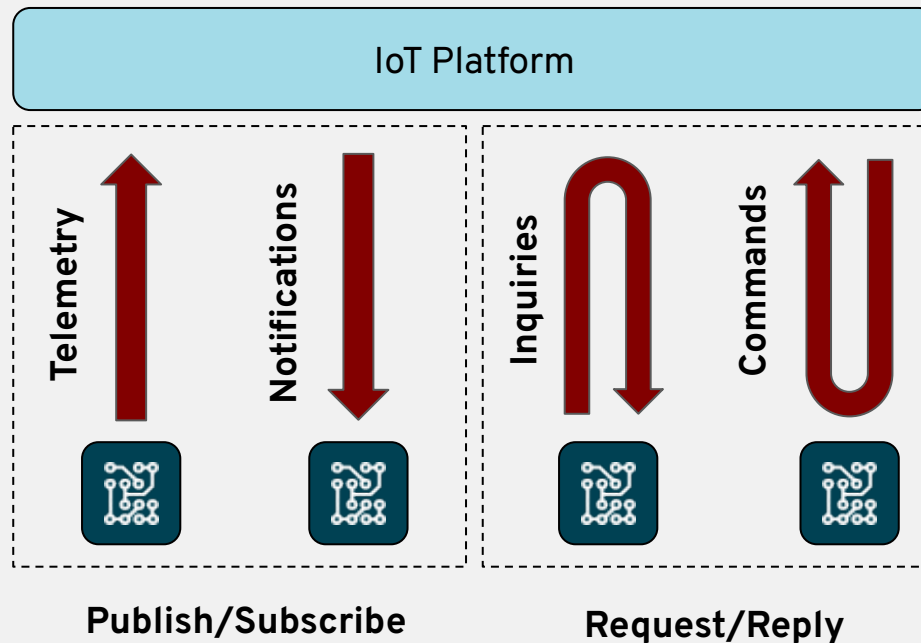
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What makes an IoT platform ?

Business Services			
Monitoring	Real time streaming	Machine Learning	...

IoT Core Services		
Authentication & Authorization	Device Registration	Device Provisioning
Messaging infrastructure		

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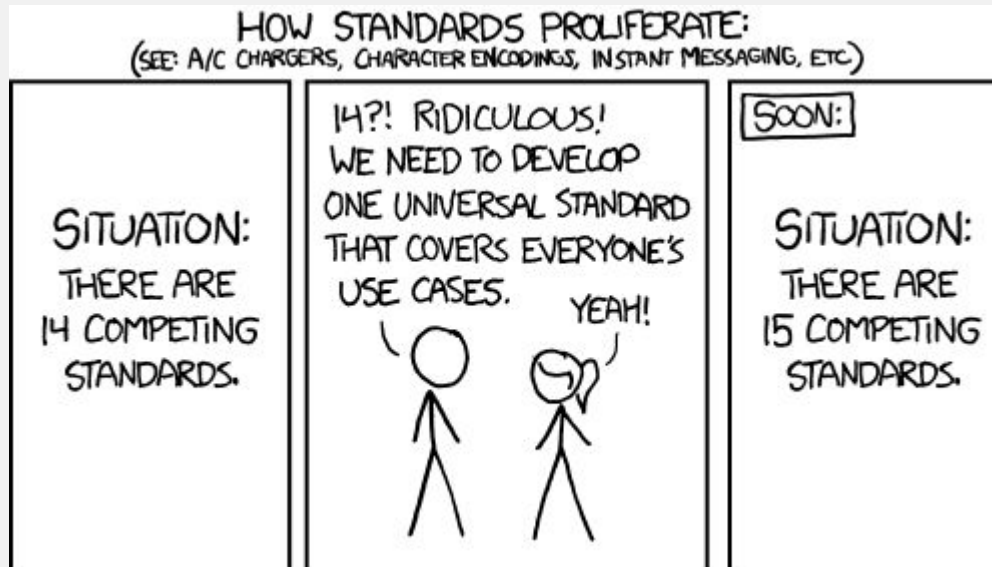# IoT : communication patterns

How messaging fits

IoT : interoperability

Open standards

AMQP 1.0

HTTP

STOMP

MQTT

CoAP

XMPP

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Messaging & IoT in the cloud

Cloud provider limitations

- They are not open source !
- Freedom of choice
  - On-premise or in the cloud
  - Ability to choose which cloud
  - Open Standards protocols allows users to choose client freely
- Migrating from one to the other can be complex

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EnMasse

Messaging-as-a-Service

- Open source messaging platform running on Kubernetes and OpenShift
- enmasse.io
- github.com/enmasseproject/enmasse
- **@enmasseio**

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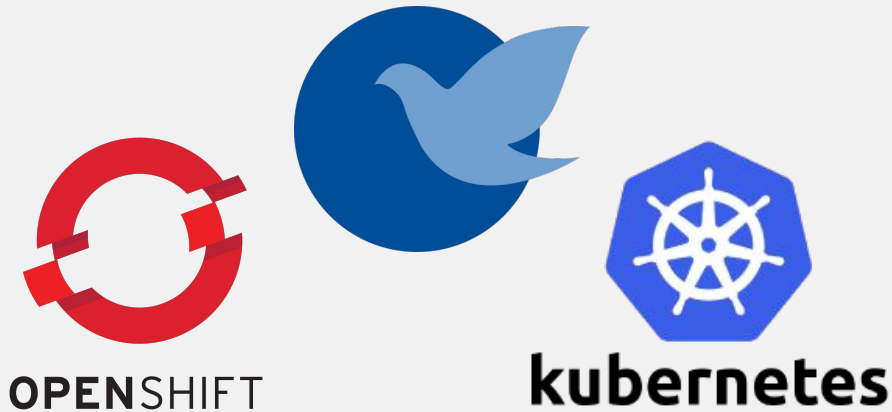
EnMasse

Features

- Multiple communication patterns: **request/response**, **publish/subscribe** and **competing consumers**
- Support for **"store and forward"** and **direct** messaging mechanisms
- **Scale** and **elasticity** of message brokers
- **AMQP 1.0** and **MQTT** support
- Simple **setup**, **management** and **monitoring**
- **Multitenancy**: manage multiple independent instances
- Deploy **"on premise"** or in the **cloud**

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Architecture
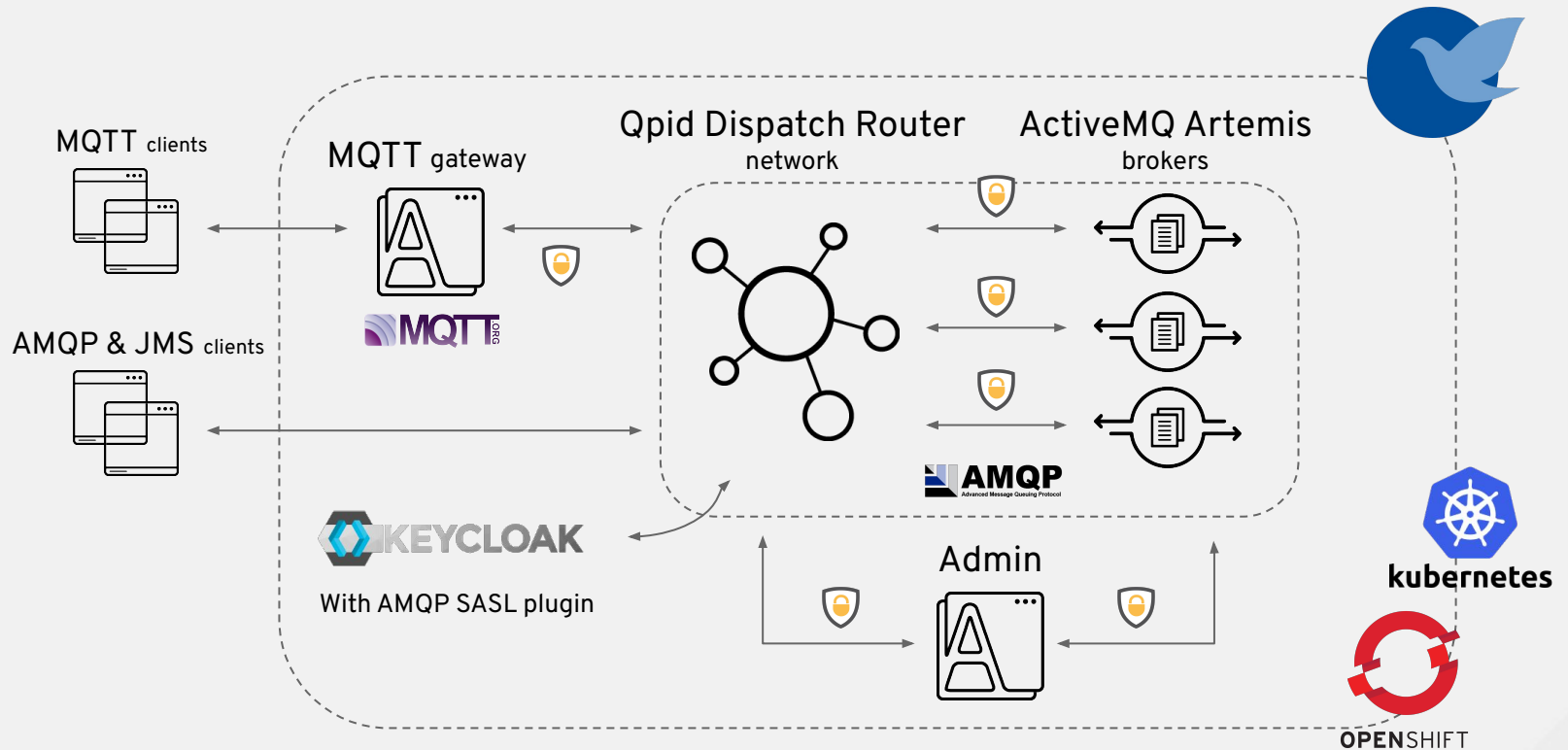
MQTT over AMQP

- **MQTT gateway**
  - Handles connections with remote MQTT clients
  - Bridges MQTT - AMQP protocols
- **MQTT lwt**
  - Provides the "will testament" feature
  - In charge to recover & send the "will" if client dies
- It brings **MQTT features over AMQP** so …
  - … "will testament" works for AMQP clients as well

Direct & Store-and-Forward

Direct messaging

producer

routers network
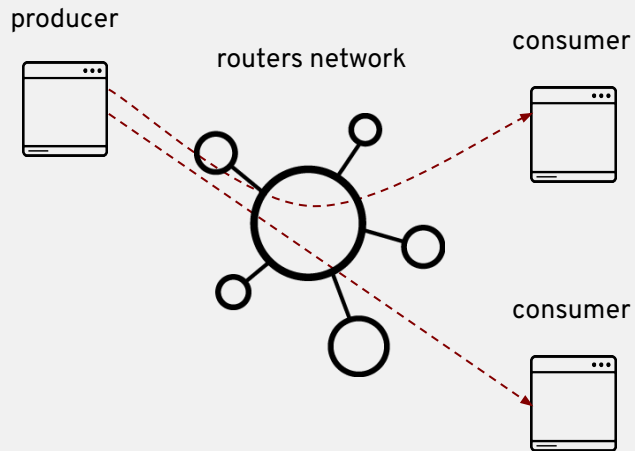
consumer

consumer

- Telemetry
  - Data ingestion is possible only when consumers are online
- Command & Control
  - Sending a command only if the device is connected
- The "sender" always knows that message has reached the final destination

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Direct & Store-and-Forward

Store-and-forward

- Telemetry
  - Ingestion possible if no consumers are online
  - Data are stored to be consumed later
- Command & Control
  - Sending a command even if the device isn't connected
  - Command is stored but TTL helps for stale commands
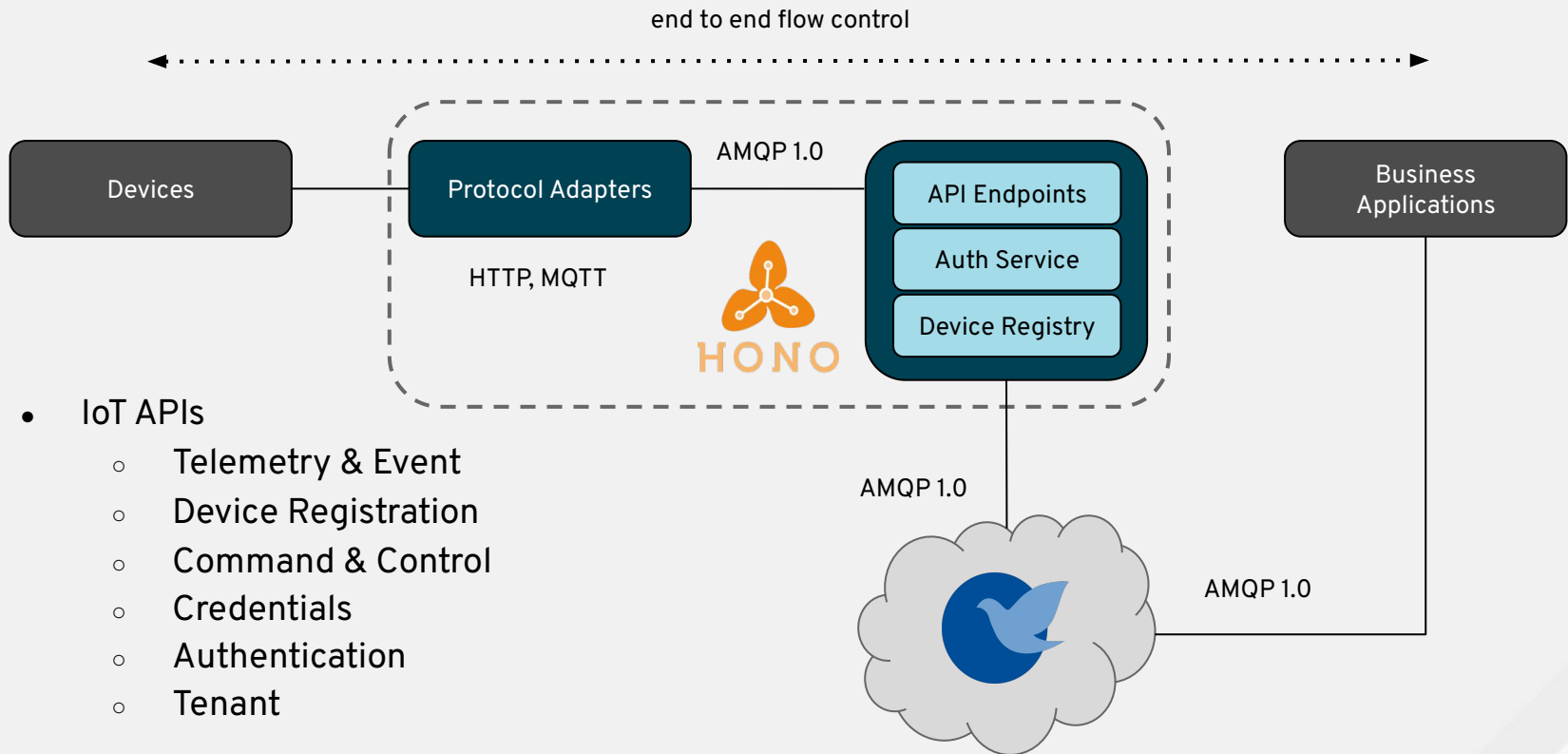- The "senders" only knows that message has reached the intermediary, not final destination

producer

routers network

consumer

consumer

brokers

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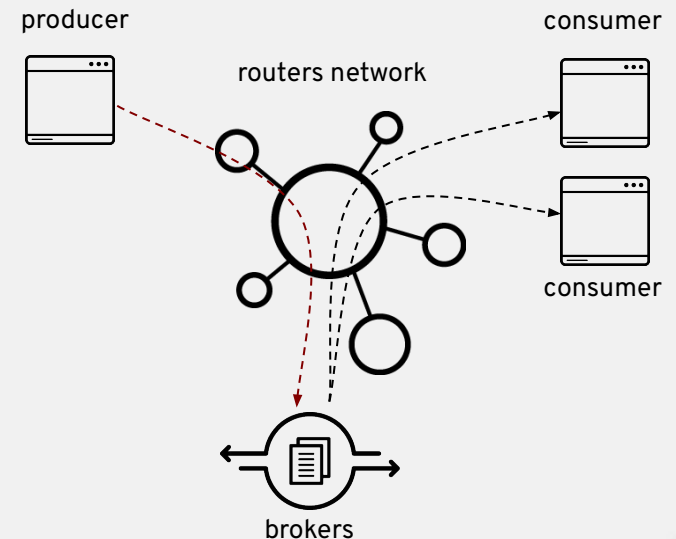
IoT : how to deploy ?

- "On premise" …
  - … maybe for a not so big solution
  - … ingesting few data and handling few devices
- "Cloud" …
  - … needs for more scalability
  - … don't want to manage the infrastructure
- "Hybrid" …
  - … needs for processing at the edge
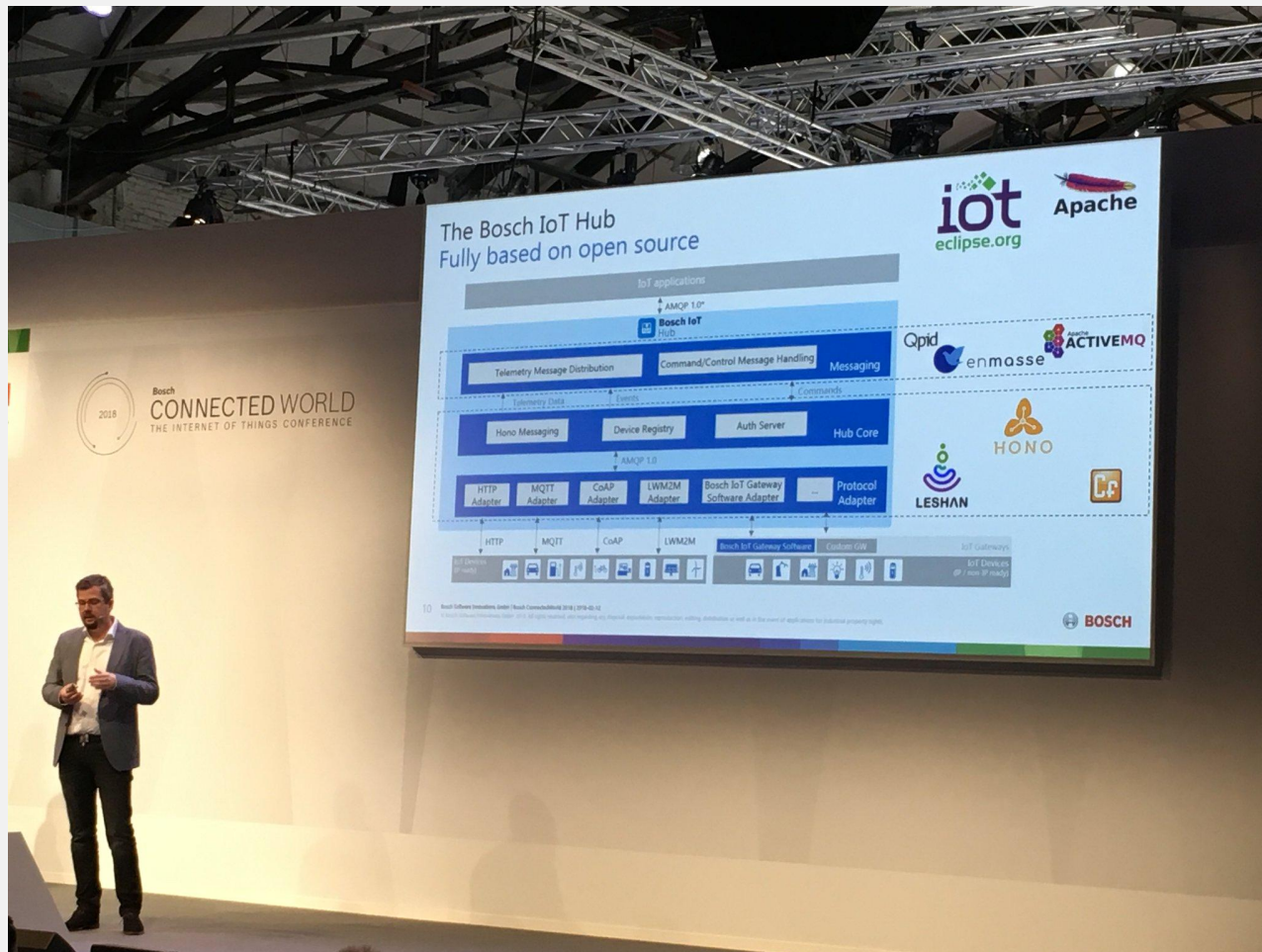 - … needs for not making sensible data public

Eclipse Hono

Architecture

end to end flow control

- IoT APIs
  - Telemetry & Event
  - Device Registration
  - Command & Control
  - Credentials
  - Authentication
  - Tenant

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The Bosch IoT Hub

Resources

- **DZone "Messaging Infrastructure for IoT at Scale" :**
  https://dzone.com/refcardz/messaging-infrastructure-for-iot-at-scale
- **EnMasse** : https://enmasse.io/
- **Qpid Dispatch Router** :
  http://qpid.apache.org/components/dispatch-router/
- **ActiveMQ Artemis** : https://activemq.apache.org/artemis/
- **Eclipse Hono** : https://www.eclipse.org/hono/
- **Eclipse Hono (Virtual IoT meetup)** : https://youtu.be/VEXuz2bFSrE
- **Paolo's blog** : https://paolopatierno.wordpress.com/

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Thank you ! Questions ?

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