Easy IoT/Robotic integration with Eclipse Zenoh

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Which middleware?
Which middleware for IoT?

MQTT:

- Used for Consumer IoT and IIoT
- Publish / Subscribe
- Brokered
- Large ecosystem including bridges for IoT protocols (zigbee2mqtt, ZWave-JS-UI...)
- Open source implementations:
  - Eclipse Mosquito (broker)
  - Eclipse Paho (client)
Which middleware for Robotic?

**DDS (used by ROS2):**

- Publish / Subscribe
- Peer-to-peer
- Low latency, high throughput
- Open source implementations:
  - Eclipse CycloneDDS

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**Legend:**
- Publisher node
- Subscriber node
- DDS /topic
Eclipse Zenoh ?
Pub / Sub... but not only!

- Pub / Sub (push)
  - Peer declare_subscriber (/temp).mode(Pull)
  - Peer get(elec_consumption)
  - Peer put(room/1/temp, 19)
  - Peer declare_subscriber (room/1/temp)
  - Peer pull()

- Pub / Sub (pull)
  - Peer declare_subscriber (**/temp).mode(Pull)

- Pub / Store / Get
  - Peer put(room/2/hum, 42)
  - Peer get(room/**/hum)

- Get / Reply
  - Peer get(elec_consumption)
  - Peer declare_queryable (elec_consumption)
Any topology

Peer-to-peer
Clique and mesh topologies

Brokered
Clients communicate through a router or a peer

Routed
Routers forward data to and from peers and clients
Runs Everywhere

Written in Rust for security, safety and performance

Native libraries and API bindings for many programming languages, e.g., Rust, C/C++, Python, REST, C# Kotlin

Supports network technologies from transport layer down-to the data link

Available on embedded and extremely constrained devices and networks – 5 bytes minimal overhead
Zenoh vs. MQTT & Kafka

Zenoh can deliver ~60Gbps which is 15x higher throughput than Kafka and up to 32x than MQTT for 8Kbyte payloads.

Zenoh delivers over 60x or higher throughput than MQTT for payload larger than 32Kbytes.

Zenoh’s latency 10usec compared to 25usec for MQTT and 75usec for Kafka.
## Feature Matrix

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<th>Zenoh</th>
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Extensible

Enhance zenoh with plugins
Interact with other technologies
Plugin or standalone?

**Plugin:**
- Dynamic library (in Rust)
- Loaded by a Zenoh router (at startup or at runtime)
- Shares the Zenoh Runtime with the router
  ➞ direct method calls to the router

**Standalone:**
- Same plugin but statically linked!
- Just a main() starting a Zenoh Runtime and 1 or more plugins
- Can be a Zenoh peer or a Zenoh client
🙌 Hands-on !
Robot + IoT integration

Zenoh Bridge DDS
- pub: simu/rt/scan
- sub: simu/rt/cmd_vel

Zenoh Bridge MQTT
- pub: zigbee2mqtt/device/button
- sub: zigbee2mqtt/device/bulb/set

REST Plugin

Zenoh Router

demo.zenoh.io

ROS2 DDS

MQTT

Zigbee

HTTP

zenoh-bridge-dds

zenoh-bridge-mqtt

http://demo.zenoh.io
Don’t forget to visit Zenoh’s website...

... our Webinars series on Youtube ...

... and to join Zenoh’s Discord server!

https://zenoh.io/

https://www.youtube.com/@zettascaletech/playlists

https://discord.gg/2GJ958VuHs
Thank You

Patience, persistence and perspiration make an unbeatable combination for success.