Eclipse IoT
State of the Union

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Typical IoT Architecture

- **Devices** (sensors & actuators)
- **Gateways**
- **IoT Cloud Platform**
- **Applications**
In reality...
In reality...

Internet of... Silos!
Eclipse IoT Community

- 2.4 million lines of code
- 30* projects
- 250+ developers
- 140K monthly visitors
The 3 IoT Software Stacks

**Constrained Devices**
- Hardware Abstraction Layer (HAL)
- OS / RTOS
- Communication
  - Field protocols
  - IoT protocols
- Remote Management

**Gateways and Smart Devices**
- OS / RTOS
- Application Runtime
- Communication
  - Field protocols
  - IoT protocols
  - Network Management
- Remote Management

**IoT Cloud Platform**
- Remote Management
- Connectivity
- Message Routing
- Application Enablement
  - Event Management, Analytics & UI
  - Data Management
  - Device Management
  - Device Registry
- OS / PaaS

**Security**
- Tools & SDKs
- Ontologies
- Remote Management
OS Stack for IoT Devices

- Hardware Abstraction Layer (HAL)
- OS / RTOS
- Communication
  - Field protocols
  - IoT protocols
- Remote Management
- CONSTRAINED DEVICES

JAVA API for MCUs
“Android for IoT”

High performance JVM
Fast, small, ... open source!
GPU acceleration

CONSTRAINED DEVICES
Daytrader 3 Benchmark

OpenJ9 vs. OpenJDK

- 60% less footprint after startup
- 40% less footprint during ramp up
- 2× faster startup time
- Comparable throughput

See https://www.eclipse.org/openj9/oj9_performance.html
OS Stack for IoT Gateways

- Native support for MQTT
- Serial, RS-485, BLE, MODBUS, OPC-UA, CAN Bus, ...
- NAT, firewall, modem configuration, ...
- Remote Management over MQTT
- OSGi implementation

Remote Management

Data Management & Messaging

Connectivity
- Field protocols
- IoT protocols
- Network Management

Application Runtime

OS / RTOS

GATEWAYS AND SMART DEVICES
Eclipse Kura

Operation & Management

Connectivity and Delivery

Network Management

Gateway Basic Services

Field Protocols

Device Abstraction

OSGi Application Container

Java VM

Linux

Hardware

Applications

App 1  App 2  . . .  App n
OS Stack for Home Automation

Rule engine to orchestrate “things”

Home automation protocols such as Belkin WeMo, LIFX, Philips Hue, …

Remote firmware update through the GW

Web UI and API for remote control

OSGi implementation
OS Stack for IoT Cloud

OMA LWM2M implementation in Java built on top of Eclipse Californium (CoAP)

Manage software upgrade campaigns independently of the actual DM protocol
Eclipse hawkBit

IoT Business Solutions

Graphical User Interface

Management API

hawkBit – Update Server

- Device and Software Repository
- Artifact Content Delivery
- Software Update and Roll out Management

Direct Device Integration API

Device Management Federation API

Device Managements

OMA-DM | LWM2M | Custom
OS Stack for IoT Cloud Platform

Kapua
An Integration Platform for IoT Services

REST API / Digital Twin
ditto

Abstract the actual communication protocols via “protocol adapters”

NoSQL data store

Deploy on:

IOT CLOUD PLATFORM

OS / PaaS

Event Management, Analytics & UI

Data Management

Device Management

Device Registry

Application Enablement

Connectivity

Message Routing

OS Stack for IoT Cloud Platform

Abstract the actual communication protocols via “protocol adapters”

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Connectivity

Message Routing
Eclipse hono

Optimized for throughput scale-out with messages

Telemetry

Things

many existing protocols
HTTP, MQTT, CoAP etc

Command & Control

optimized for reliability scale-out with devices

Cloud

arbitrary providers & deployment options

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Eclipse IoT Adoption
Eclipse IoT Programs

Virtual IoT

Open IoT Challenge

IoT Marketplace

Testbeds
Asset Tracking

Track condition and location of cargo and goods in real time

Optimize the transport and delivery of inventory and goods

Reduce product spoilage, damage, delay, and theft
The solution

IoT Devices
- e.g. TI Sensor Tag

IoT Gateways
- ARTIK
- M2M

IoT Cloud
- Eclipse Che

IoT Dev Tools
- Eclipse Che
What is available?

- [https://iot.eclipse.org/testbeds/asset-tracking](https://iot.eclipse.org/testbeds/asset-tracking)
  - Webpage describing the solution (architecture, partners’ contributions)
  - Source code (EPL)
    - Gateway code (Eclipse Kura)
    - Web dashboard (AngularJS app using Kapua API, running on OpenShift)
    - Data Simulator
    - [https://github.com/eclipselabs/eclipseiot-testbed-assettracking](https://github.com/eclipselabs/eclipseiot-testbed-assettracking)
  - Live demo system
    - [https://iot.eclipse.org/testbeds/asset-tracking/demo](https://iot.eclipse.org/testbeds/asset-tracking/demo)
Integration?

Integration!
One more thing...
Join the discussion at ee4j-community@eclipse.org
Eclipse Enterprise for Java (EE4J)
Project Overview

- Open process
- Collaboration: community, vendors, Eclipse
- Transition to EE4J in CY2018
  - GlassFish 5.0/Java EE 8 RIs, TCKs, product docs
  - Process for existing and new specs
  - Compatibility process
- Technology evolution, MicroProfile integration
- Oracle Java EE Support through Java EE 8
  - Continuity for Java EE community

Enterprise for Java

✓ Agile
✓ Flexible
✓ Open
✓ Compatible
Eclipse Deeplearning4j

- Java-based Machine Learning Framework
  - Toolkit for building, training and deploying Neural Networks
- Distributed training
  - GPU or Hadoop/Spark
- Use cases:
  - network intrusion detection, predictive maintenance, recommender systems in e-commerce, image recognition, …
Join us!

https://iot.eclipse.org

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* and counting!
Join us!

- Check out the projects
  - Contribute ideas, bug fixes, use cases...
- Participate on the mailing lists
- Virtual IoT Meetup
  - [https://www.meetup.com/virtual-iot](https://www.meetup.com/virtual-iot)
- Propose your project!
Thank you!

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