A Guided Tour of Eclipse IoT: 3 Software Stacks for IoT

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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

IoT Cloud

IoT Dev Tools
The 3 IoT Software Stacks

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

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

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

**Tools & SDKs**
- ONTOLOGIES
  - Data Management & Messaging
  - Connectivity
  - Remote Management
- SECURITY
- TOOLS & SDKs
Characteristics of Open IoT Stacks

- loosely coupled
- modular
- platform-independent
- based on open standards
- API
Eclipse IoT...

from building blocks ... to stacks
The 3 IoT Software Stacks

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

**GATEWAYS AND SMART DEVICES**
- Remote Management
- Communication
  - Field protocols
  - IoT protocols
- Network Management
- Application Runtime
  - OS / RTOS

**IOT CLOUD PLATFORM**
- Remote Management
- Connectivity
  - IoT protocols
  - Network Management
- Application Enablement
  - Event Management, Analytics & UI
  - Data Management
  - Device Management
  - Device Registry
- OS / PaaS
C implementation of OMA LWM2M
Portable on any POSIX-compliant system

C implementation of MQTT 3.1.1
< 2,000 lines of C ANSI code

JAVA API for MCUs
“Android for IoT”
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

Data Management & Messaging
Connectivity
Field protocols
IoT protocols
Network Management
Application Runtime
OS / RTOS

GATEWAYS AND SMART DEVICES
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 Rollout Management
- Direct Device Integration API
- Device Management Federation API
- Device Managements
  - OMA-DM
  - LWM2M
  - Custom

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OS Stack for IoT Cloud Platform

Kapua

An Integration Platform for IoT Services

REST API / Digital Twin

Abstract the actual communication protocols via "protocol adapters"

NoSQL data store

Deploy on:

IOT CLOUD PLATFORM

CLOUD FOUNDARY

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Eclipse hono

- Things: many existing protocols (HTTP, MQTT, CoAP, etc.)
- Telemetry: optimized for throughput, scale-out with messages
- Command & Control: optimized for reliability, scale-out with devices
- Cloud: arbitrary providers & deployment options

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Eclipse IoT Adoption

The Bosch IoT Suite Toolbox in the cloud for IoT developers

1. Bosch IoT Hub
2. Bosch IoT Things
3. Bosch IoT Cloud
4. Bosch IoT Remote Storage
5. Bosch IoT Analytics
6. Bosch IoT Permissions
Eclipse IoT Programs

Virtual IoT

Open IoT Challenge

IoT Marketplace

Testbeds
Join us!

https://iot.eclipse.org

2.4 million lines of code

30* projects

280+ developers

140K monthly visitors

* and counting!
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  - 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!
IoT Developer Survey

https://www.surveymonkey.com/r/fosdemiot
Thank you!

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