Connect and Manage Devices

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Creating the Open Source Building Blocks for IoT

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Open Wins
Open Wins

W3C

Apache HTTP Server

Linux®
MQTT – Open Wins
Open Hardware Is a Key Enabler
HAVE YOU EVER USED ANY ACCESSIBLE HARDWARE PLATFORMS LIKE RASPBERRY PI, ARDUINO, BEAGLEBONE, ETC.?

- 18% Yes, my company deploys IoT solution using an accessible hardware platform.
- 28% Yes, my company prototypes IoT solutions using an accessible hardware platform.
- 36% Yes, I have experimented with accessible hardware in my spare time.
- 28% No, but I intend to experiment with accessible hardware in the next 6 months.
- 11% Never used open hardware.
Open Source Software Will Be a Key Enabler
Innovation

Open Source enables:

• Permissionless innovation
• Innovation through integration
• Far higher levels of experimentation
Connect and Manage Devices
OS at Eclipse IoT

Mosquitto
An Open Source MQTT v3.1 Broker

diac
paho

kura
eclipse

Wakaama

Vorto

Krikkit

LESHAN

neuSCADA

OM2M
Connecting things
IoT Architectures

New and Existing Devices

IoT Gateways

Network/Wireless Services

Backend Systems
Open Solutions

New and Existing Devices

Open Standards and Open Source to Connect and Manage
Connect and Manage with Open Standards

New and Existing Devices

Many Open Standards
MQTT

- Simple
  Publish/Subscribe protocol
- Small footprint
- Minimal on-the-wire formal and payload

MQTT Client
(MQTT Client
(Java, JS, C, C++, Python, etc.))

MQTT Broker
(Mosquitto
MQTT Broker
(C Code))
MQTT Adoption
What general messaging protocols do you use in your IoT solution?

- HTTP: 63.1%
- MQTT: 53.0%
- CoAP: 21.5%
- In-house: 18.6%
- XMPP: 11.5%
- AMQP: 11.1%
- Proprietary vendor protocol: 8.2%
- Don’t know: 6.8%
- DDS: 5.4%
- None: 1.1%
Constrained Application Protocol (CoAP)

- RESTful protocol designed from scratch
- Transparent mapping to HTTP
- Works over UDP
- DTLS Security

Californium
- CoAP Core
- DTLS
- CoAP Tools
- Java implementations
Lightweight M2M

- Standard for device management
- Based on CoAP
LWM2M Adoption
IoT Gateway Services

IoT Gateways

Java and OSGi
Gateways
IoT Gateways

• Gateway management
  • How to manage remote gateways and keep them up to date
  • How to manage connectivity

• Manage deployed applications
  • Gateways become an application container
  • Remote configuration
  • Remote update
Java VM
OSGi
Application Container
Device Abstraction
Gateway Basic Services
Network Management
Connectivity and Delivery
Protocols
Administration GUI
Operation & Management
Network Configuration
App 1
App 2
App n
Applications
Field Protocols
OSGi Application Container
Java VM
Linux
Hardware
Where we are heading: Open IoT Stack

IoT Applications

IoT Solution Frameworks
- Home Automation
- SCADA
- OM2M

Connectivity
- MQTT
- CoAP
- LWM2M

Security
- DTLS
- DNS-SD
- DNS-SEC

IoT Gateway Services
- Remote management
- Application management

Reporting

Developer Tools

Open & Commercial Hardware
Home Automation

- Flexible Framework
- Based on **Java** and **OSGi**

- Huge number of “bindings”: KNX, Nest, Philips HUE, ...
openHAB
Free and open source solution based on Eclipse SmartHome

QIVICON
Smart Home platform by Deutsche Telekom AG

aleon
Innovation management for your project

YETU
Run your entire home with one simple online platform

ProSyst
Middleware for the Internet of Things

Zoo Automation
One Home, One Control, One Life
Solutions

- Telco Service Providers
  - Implementation of oneM2M: OM2M

- Industrial IoT:
  - Eclipse neoSCADA
    - Support Siemens S7 PLC, IEC 60870-4-105
  - 4DIAC - IEC 61499
  - Rise V2G - IEC 15118
  - OPC-UA

- IoT network management: Krikit
  - Rules engine for IoT devices
  - Powering Cisco’s Data in Motion.
Eclipse IoT is also...

**IoT Server Platform**

- Software provisioning
  - [https://projects.eclipse.org/projects/iot.hawkbit](https://projects.eclipse.org/projects/iot.hawkbit)
- Uniform service interface for Telemetry and Command & Control
  - [https://projects.eclipse.org/projects/iot.hono](https://projects.eclipse.org/projects/iot.hono)
Vorto: IoT device modeling tools

The goal of the Vorto project is to enable a global standardization

- Create representations for different eco-systems
- Create information models
- Standardize the structure of information models
- Manage and provide information models
Open IoT Stack

Open IoT Stack

New and Existing Devices

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Network/Wireless Services

Backend Systems

Eclipse Open IoT Stack
Eclipse IoT Community
Eclipse IoT today

2 MLOC
21 projects
150+ developers
Commercial Ecosystem

Open IoT Stack for Java
80 teams

$20K+ in prizes

http://iot.eclipse.org/open-iot-challenge
Virtual IoT Meetup

Bi-weekly webinars with IoT experts
800 members

http://www.meetup.com/Virtual-IoT
More Info: iot.eclipse.org
Sandbox Servers

MQTT

You can make use of this MQTT server with client code from the Paho project, the Eclipse MQTT view from Paho, or from one of the other client APIs listed on the MQTT.org downloads page.

Access the server using the hostname `iot.eclipse.org` and port `1883`.

Some livestatistics are available via Xively and an HTTP bridge with a list of topics is deployed at `http://eclipse.mqttbridge.com`. This server is running the Open Source Mosquito broker in its version `1.3.1`.

CoAP

A CoAP server exposing test resources is available at: `coap://iot.eclipse.org:5683/`.

It should be used by anyone interested in testing a CoAP client implementation against another endpoint, and more generally by anyone interested in understanding the key concepts of the CoAP protocol.

This server is running Eclipse Californium.

Lightweight M2M (LWM2M)

In order to test LWM2M communication scenarios, we host a LWM2M server.

You can make use of this server with the Wakaama project

The LWM2M server is available at: `coap://iot.eclipse.org:5684/`
A web interface allows to interact with registered LWM2M clients: `http://iot.eclipse.org/lwm2m/`
This server is running the Open Source Leshan server.
Get Involved!

- Open (or fix!) bugs
- Request new features
- Write articles, tutorials
- Participate on the mailing lists
- Share your success stories
- Propose your project!
Questions

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Backup
IoT Solutions – Home Automation
Intranet of Things for Home Automation
IoT Solutions: SCADA

• SCADA (Supervisory Control and Data Acquisition) is defined as the monitoring and control of technical processes by means of a computer system
Hierarchical Architecture

- Local control centers
- Regional control centers
- Global control center

Devices, like Dataloggers, PLCs, Beaglebone, Raspberry PI, ...
Protocols & Interoperability

- Drivers
  - Modbus (master & slave)
  - Siemens S7 PLC
  - IEC 60870-4-105 (master & slave) *
  - OPC DA 2 (client) †
  - OPC UA (client & server) **
  - SNMP †, JDBC, Shell
  - Building blocks for more

Eclipse SCADA
Client and server for Java
Client for .NET using IKVM
Partially: JSON, WebService

† SNMP and OPC from openSCADA
* included in next release 0.2.0
** planned for 0.3.0