EUROTECH
Imagine. Build. Succeed.

OSGi: Simplifying the IoT Gateway

Walt Bowers

Technical Solutions Architect - Eurotech

Nov 5, 2015

Outline – Where we are headed

- Eurotech Overview
- IoT Gateway Complexity
- Making IoT Gateway's Simple
- Use Case – Cold Chain
- How OSGi is leveraged
- Demo

Eurotech Overview

Eurotech‘s Essence

- One of the world top players in the Embedded Computers market
- 20+ Years of experience in “M2M” and distributed systems
- Behind the products of more than 20 Global 500 companies
- Strong vertical market competences:
  - Industrial & Logistics
  - Transportation
  - Defense & Security
  - Healthcare & Medical

Eurotech Overview

Our Activity

- **Active in Eclipse IoT**
  - One of founding member companies

- **Contributors to Kura**
  - Contributed the original code from ESF
  - https://www.eclipse.org/kura/

- **OSGi Alliance**
  - Long time adopters/New Members
  - IoT Expert Group
  - http://osgi.org

The Eurotech IoT Approach

Overview

Application Layer

ACTUATE The BIRT Company · NEGENTIS · ORACLE · redhat. · intel · Microsoft · IBM · bonitasoft · HITACHI Inspire the Next · LIFERAY

Analytics | Mining | ERP | CRM | ….

Enterprise Applications | Databases | CEP

aPaaS | SaaS | Enterprise IT | Big Data

Application Integration Layer

M2M / IoT Integration Platform

M2M Integration / IoT Application Enablement / Device and Data Management Platform

System Infrastructure

Public Cloud | Private Cloud | Aggregators & On-Premise Platforms

Communication Infrastructure

SIM Management & Communication Infrastructure

Optimum M2M / IoT Protocols

MQTT

Field Infrastructure

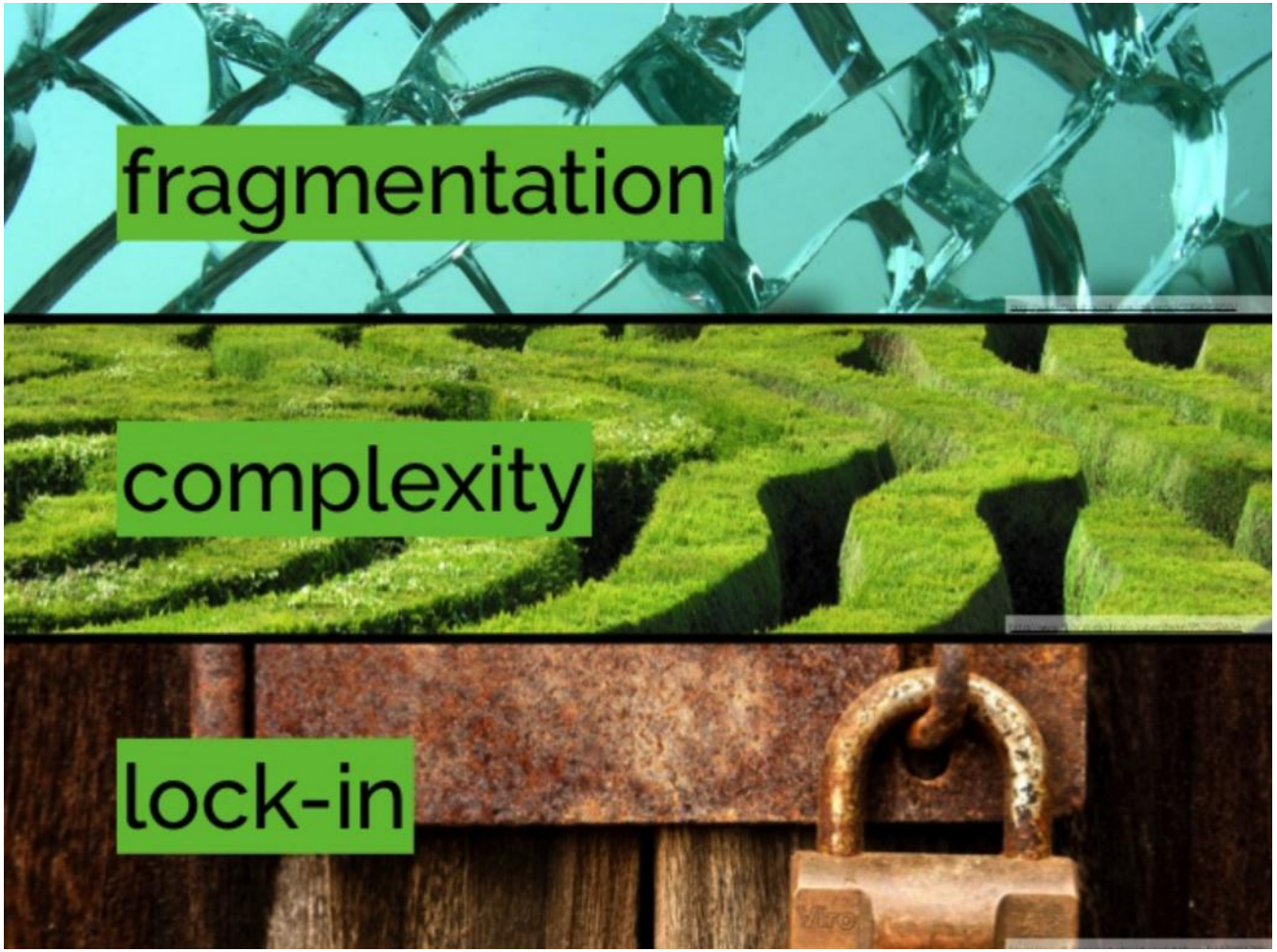
ESF · kura

Device HW

Gateway, OS, Security
Gateway Application Framework
Certifications, Device Connections

Sensors, HMIs, Actuators, etc.

IoT Gateway Software Development
Why is it so difficult?



Fragmentation

Sensor Protocols

- ZigBee
- Z-Wave
- CANBus
- MODBus
- Bluetooth
- BLE
- DECT

Hardware

- ARM
- Intel

Standards

- oneM2M
- Thread
- AllSeen
- Industrial Internet Consortium
- IEEE

Protocols to Cloud

- MQTT
- LWM2M
- CoAP
- AllSeen

Complexity

Security
- Sensors
- Data
- Network

Reliability
- Store and forward
- Best Effort
- Guaranteed

Network Management
- LAN
- WAN
- Cell
- Always on
- On Demand
- Usage

Lifecycle Management
- Deployment/Install
- Upgrade
- Provisioning/Configuration

Lock-in

Hardware

Sensor(s)

Protocol(s)

Vertical Market

How to make it simple?

OSGi

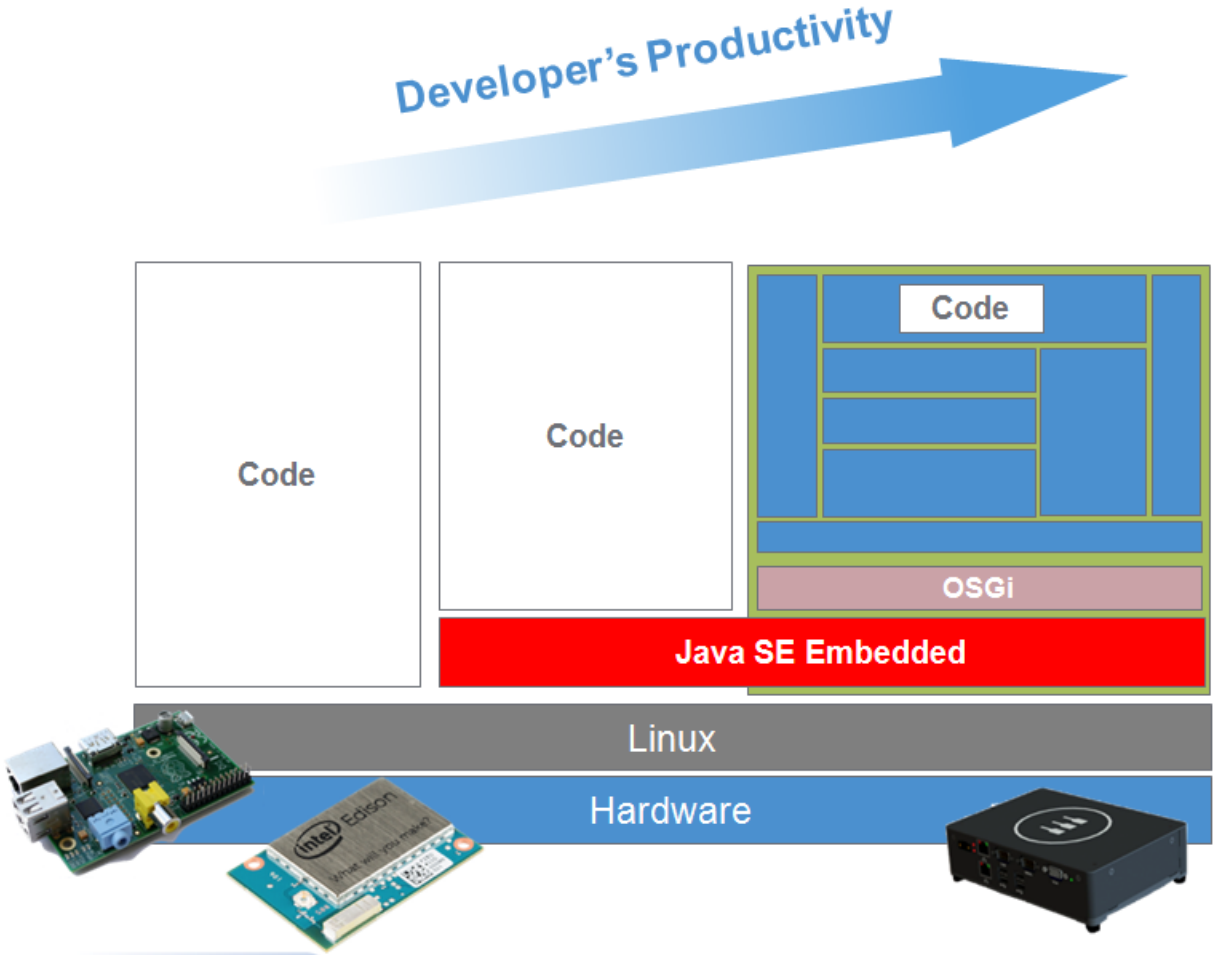
+

Open Source

Why an OSGi IoT Gateway Stack?

Increase productivity

- Modular
- Services – Reusable and discoverable
- Easier integration into complex systems
- Isolation from Fragments



OSGi™ Alliance

Why Open Source IoT Gateway Stack?

IoT Gateway Challenges:

- Pressure to add value in shrinking timeframes
- Velocity of technology changes outstrips staffing
- Interoperability trumps exclusive differentiation
- Quest for quality w/o lock-in

Open Source is the Answer!

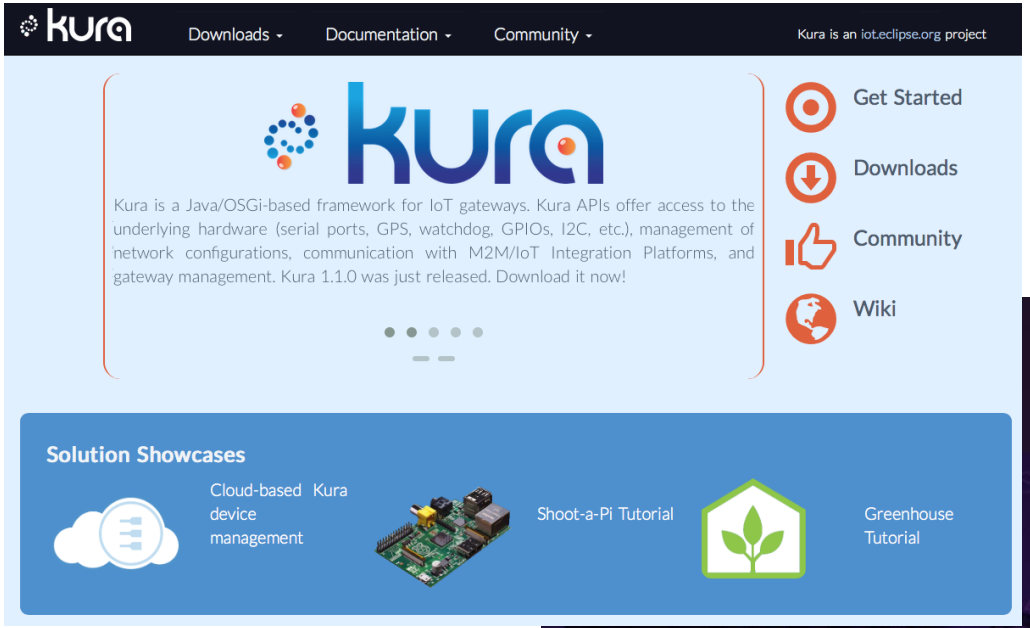
Founded in 2012 by

- **Now …**
  - 23 Members
  - 15+ new projects
  - 1M+ lines of source code
  - The fastest growing Eclipse workgroup

http://www.slideshare.net/blackducksoftware/io-t-and-open-source

Eclipse Kura

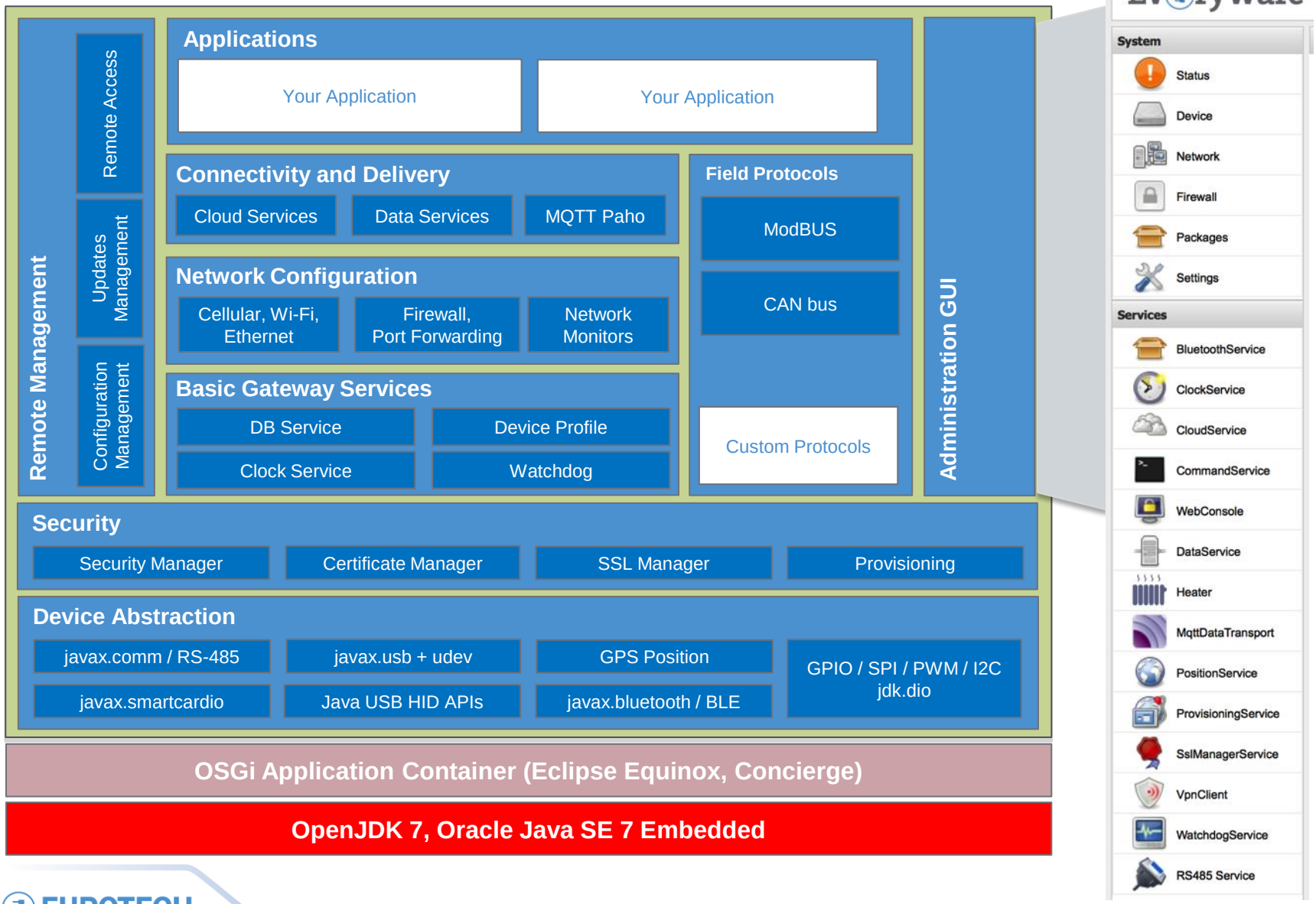
Open OSGi Framework for IoT Gateways



https://www.eclipse.org/kura/

https://iot.eclipse.org/java/

Kura Under the Covers



Developer’s Experience

Emulate on PC	Deploy on Target	Cloud Managed
		
Start developing your IoT /M2M application in the comfort of your PC. • Full Eclipse Integration • Target Platform Definition • Emulated Services • Run/Debug from Eclipse • Support Mac/Linux Hosts	When you are ready, deploy your application on the gateway. • One-click Deployment • Eclipse Plugin • Remote Debugging	Provision and manage your applications in field devices from the Cloud. • Remote OSGi Management via MQTT • Web-based Console

From Prototype to Production

Efficient Development & Investment Protection

Software portability
across HW Platforms

Industrial
M2M/IoT
Gateways

ESF

kura

OSGi™ Alliance

Open Hardware

Vertical Market Example Use Case

Use Case: Cool Chain Monitoring

Application:

The customer, a mid size company growing and selling vegetables required a monitoring solution for their green houses (temperature, light, humidity) and for their delivery trucks (temperature, cool chain monitoring).

The monitoring of both the green houses as well as the trucks is mainly to protect the investments in terms of “goods”. The truck solution was especially appealing because of the ability to react when a cooling system fails before the load is lost.

Product:

ReliaGATE 10-20
ReliaCELL 10-20

Key Success Factors:

- Short time to market due to EDC approach
- ESF
- Simple dashboards provided by Eurotech
- Alarms sent when reaching temperature thresholds
- Flexible hardware platform

Cool Chain Monitoring

Cold Chain Demo
Products involved:

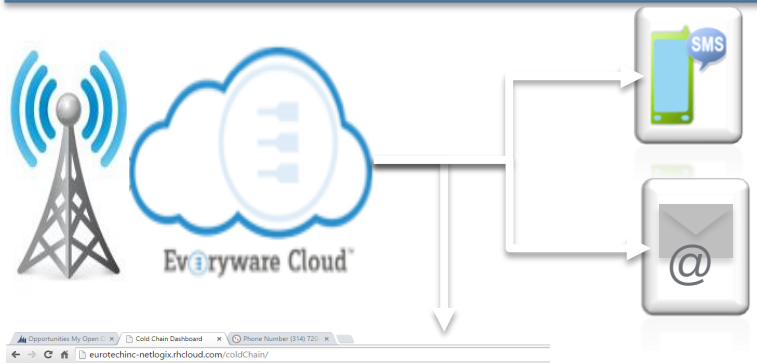
- Small AC powered cooler
- Monnit Wireless Sensors & USB Gateway
- ReliaGATE 10-20 (or other)
- ReliaCELL for cellular connection
- ESF & EC
- Dashboard – should display via PC browser and mobile browser

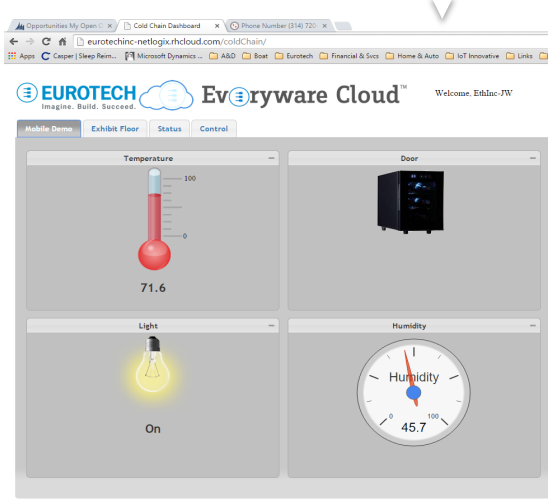
Wireless
Open/Closed Sensor
Transmit when door is opened and closed.
Show door status on web / mobile app

Monnit 900 MHz USB Wireless Gateway – Inserted into ReliaGATE 10-20 USB port.
Application bundle(s) running locally – sensor reporting intervals configured via ESF

Wireless Temperature Sensor
Show interior cooler temperature
Correlate to dashboard at defined demo interval

Wireless Humidity Sensor
Show interior cooler humidity level
Correlate to dashboard at defined demo interval





http://www.monnit.com

Process

- Install Kura on Raspberry Pi

- Hook up USB Dongle
- Use Kura USB services to access Monnit APN

- Use Kura Cloud service to publish

- Use Kura Configuration service for configuration

- In less than 2 days, publishing Temperature to the cloud.

What was the slowest part:

- **Decoding bytes from the APN.**

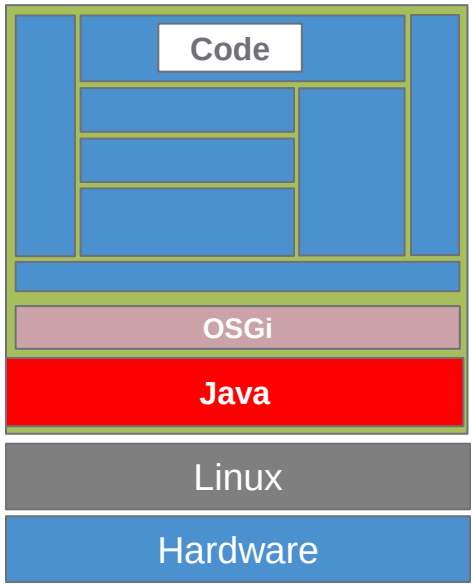
Frame=[c5,0e,04,55,24,f6,00,00,e2,e2,90,02,00,10,09,01,5c]
RSP=[55, 24, f6, 00, 00, e2, e2, 90, 02, 00, 10, 09, 01]

apRSSI:226
DeviceID:63012
sensorType:2
temperature:79.0
voltage:2.0

- **Learning the instruction sequence**
- **Main gateway functions already provided.**

OSGi Enablement:

The secret sauce



- **OSGi is the key that makes this so easy**
  - Modularity
  - Services

- **Some key OSGi services leveraged by Kura**
  - Declarative Services
  - Metatype Service
  - Configuration Admin Service
  - Deployment Admin Service

Declarative Services - CloudService

```
<scr:component xmlns:scr="http://www.osgi.org/xmlns/scr/v1.1.0"
    name="org.eclipse.kura.monnit.MonnitGateway"
    activate="activate"
    deactivate="deactivate"
    modified="updated"
    enabled="true"
    immediate="true"
    configuration-policy="require">
<implementation class="org.eclipse.kura.monnit.MonnitGateway"/>

<property name="service.pid" type="String" value="org.eclipse.kura.monnit.MonnitGateway"/>
  <service>
     <provide interface="org.eclipse.kura.monnit.MonnitGateway"/>
  </service>

  <reference name="CloudService"
          policy="static"
          bind="setCloudService"
          unbind="unsetCloudService"
          cardinality="1..1"
          interface="org.eclipse.kura.cloud.CloudService"/>
```



```
</scr:component>
```

Declarative Services - CloudService

```
public class MonnitGateway implements ConfigurableComponent, CloudClientListener
{
…
        public void setCloudService(CloudService cloudService) {
                m_cloudService = cloudService;
                …
                 m_cloudClient = m_cloudService.newCloudClient(APP_ID);
        }

        public void unsetCloudService(CloudService cloudService) {
                m_cloudService = null;
      }

        public void doPublish()
        {
                // Publish the message
                try {
                //m_cloudClient.publish(topic, payload, qos, retain);
                m_cloudClient.publish(pubTopic, payload, qos, retain);
                s_logger.info("Published to {} message: {}", pubTopic, payload);
                }
                catch (Exception e) {
                s_logger.error("Cannot publish topic: "+ pubTopic, e);
                }
        }
…
}
```

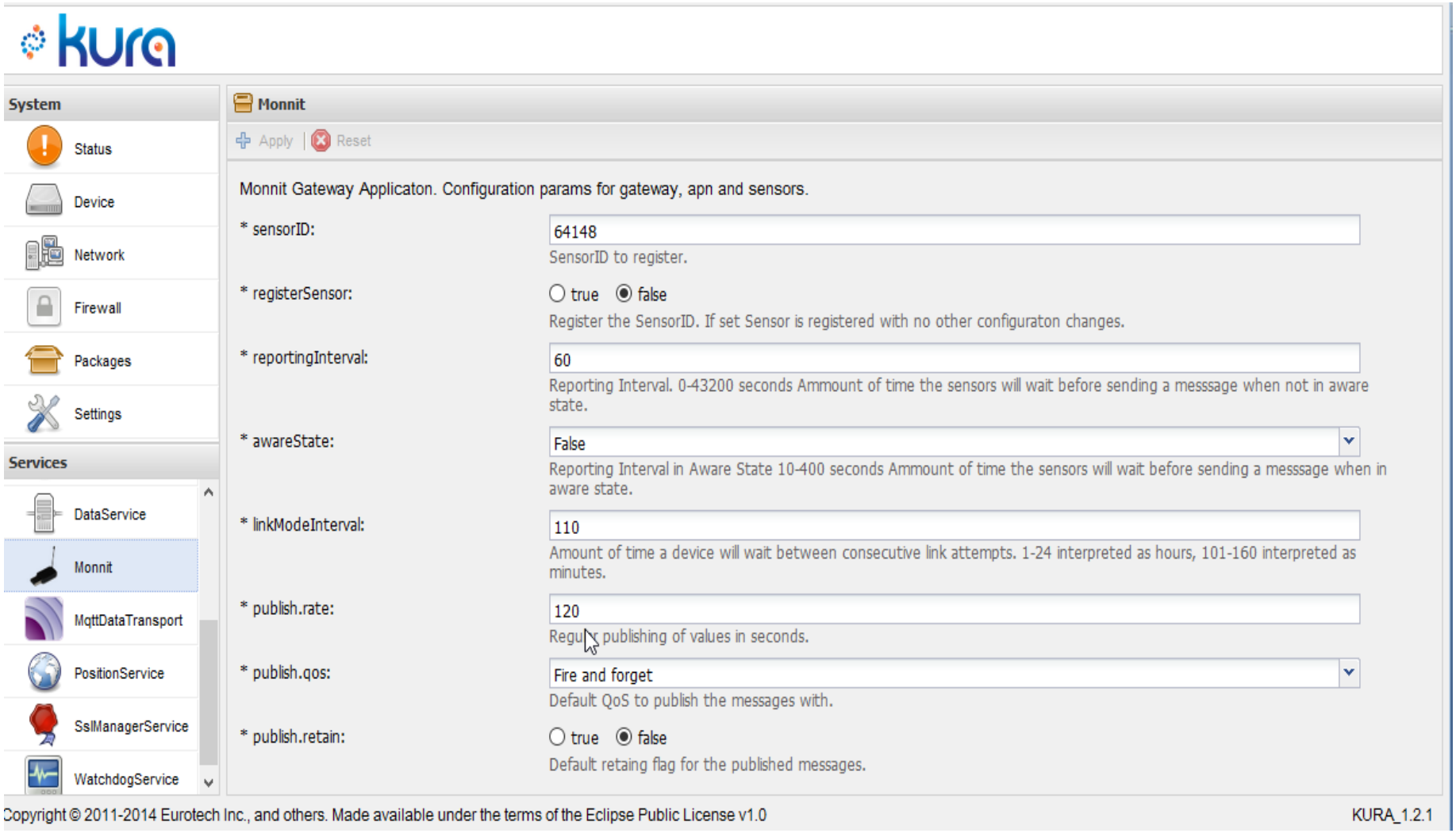
Metatype Service

```
<MetaData xmlns="http://www.osgi.org/xmlns/metatype/v1.2.0" localization="en_us">
   <OCD id="org.eclipse.kura.monnit.MonnitGateway"
        name="Monnit"
        description="Monnit Gateway Application. Configuration params for gateway, apn and
      sensors. ">

       <Icon resource="http://eurotechinc-netlogix.rhcloud.com/images/images/usb.png" size="32"/>

       <AD id="reportingInterval"
           name="reportingInterval"
           type="Integer"
           cardinality="0"
           required="true"
           default="60"
           description="Reporting Interval. 0-43200 seconds Amount of time the sensors will wait
      before sending a message when not in aware state."/>
```

Metatype Services – Automatic Admin GUI



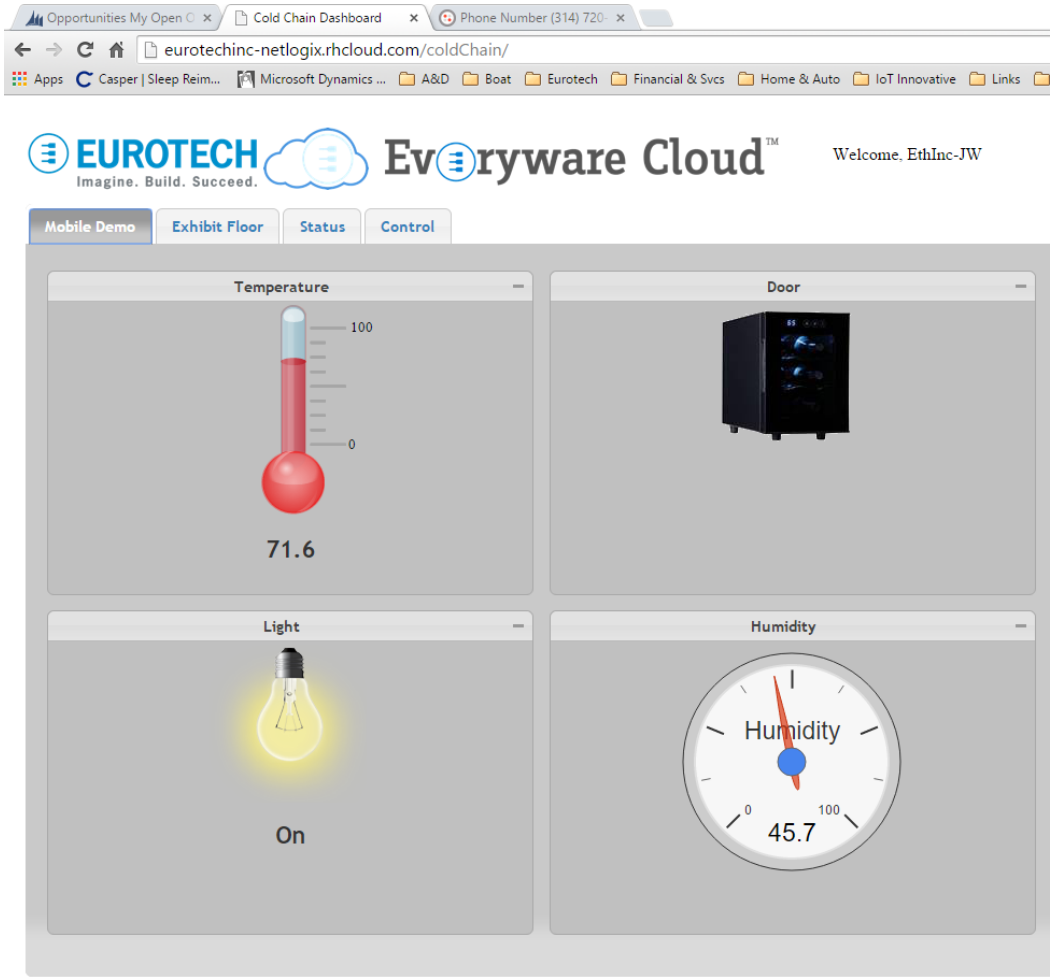
Configuration Admin Service

```
public void updated(Map<String,Object> properties)
{
        s_logger.info("Updated Monnit...");
        System.out.println("Updated Monnit...");
        // store the properties received
        m_properties = properties;
        for (String s : properties.keySet()) {
                s_logger.info("Update - "+s+": "+properties.get(s));
                System.out.println("Update - "+s+": "+properties.get(s));
        }

…
}
```

Demo

Here it is all together



Thank You!

www.eurotech.com


eclipsecon Europe
Ludwigsburg, Germany, 3 - 5 November 2015
Evaluate the sessions at www.eclipsecon.org
+1
0
-1