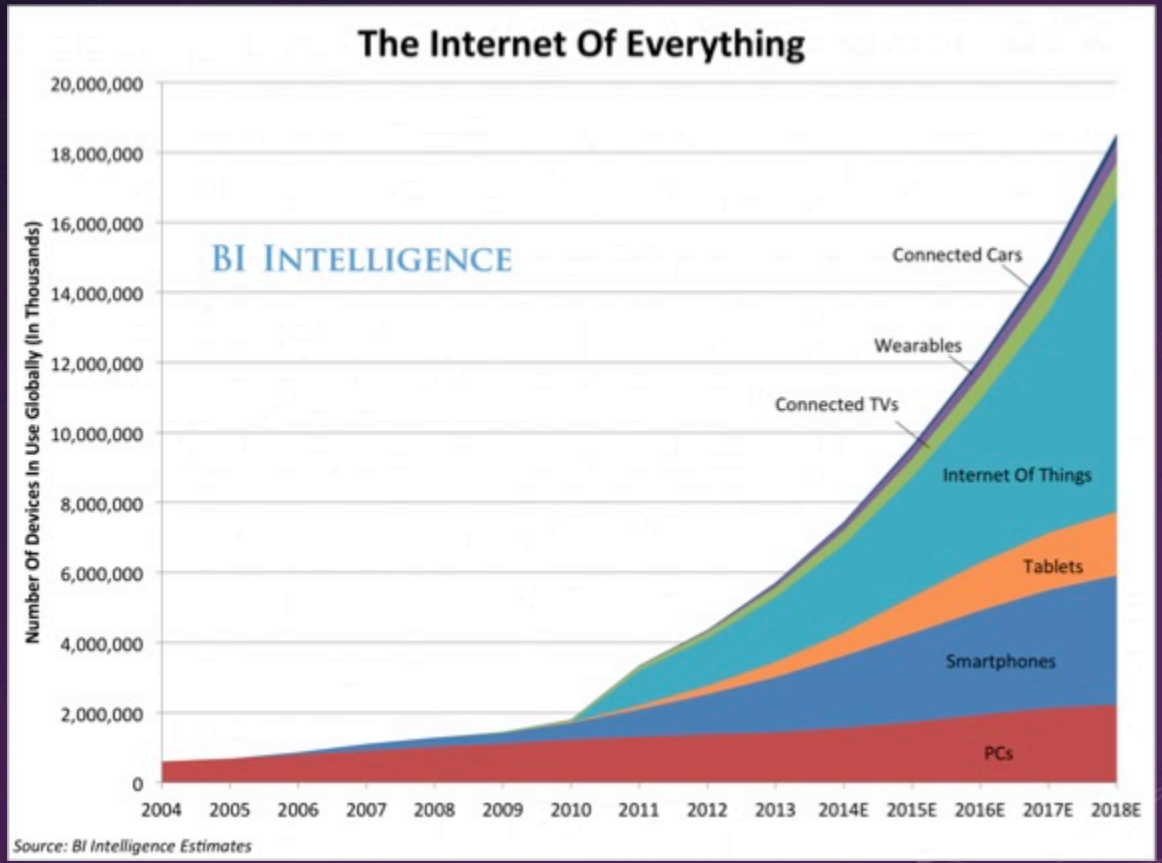
Building an open Internet of Things with Eclipse IoT

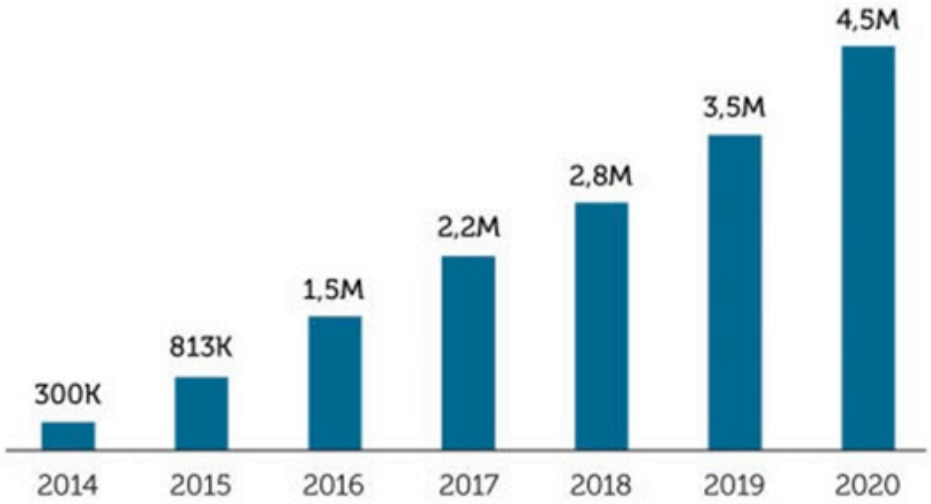
Benjamin Cabé – Eclipse Foundation

Eclipse IoT Day Grenoble - March 30, 2015

IoT is Big


The Internet Of Everything
BI INTELLIGENCE
Number Of Devices In Use Globally (In Thousands)
20,000,000
18,000,000
16,000,000
14,000,000
12,000,000
10,000,000
8,000,000
6,000,000
4,000,000
2,000,000
0
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014E
2015E
2016E
2017E
2018E
Connected Cars
Wearables
Connected TVs
Internet Of Things
Tablets
Smartphones
PCs
Source: BI Intelligence Estimates

THE NUMBER OF IOT DEVELOPERS 2014-2020

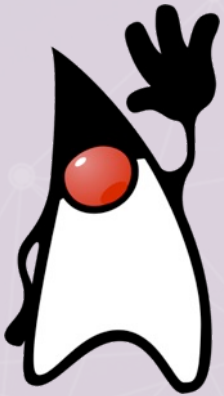


Source: VisionMobile estimates, 2014

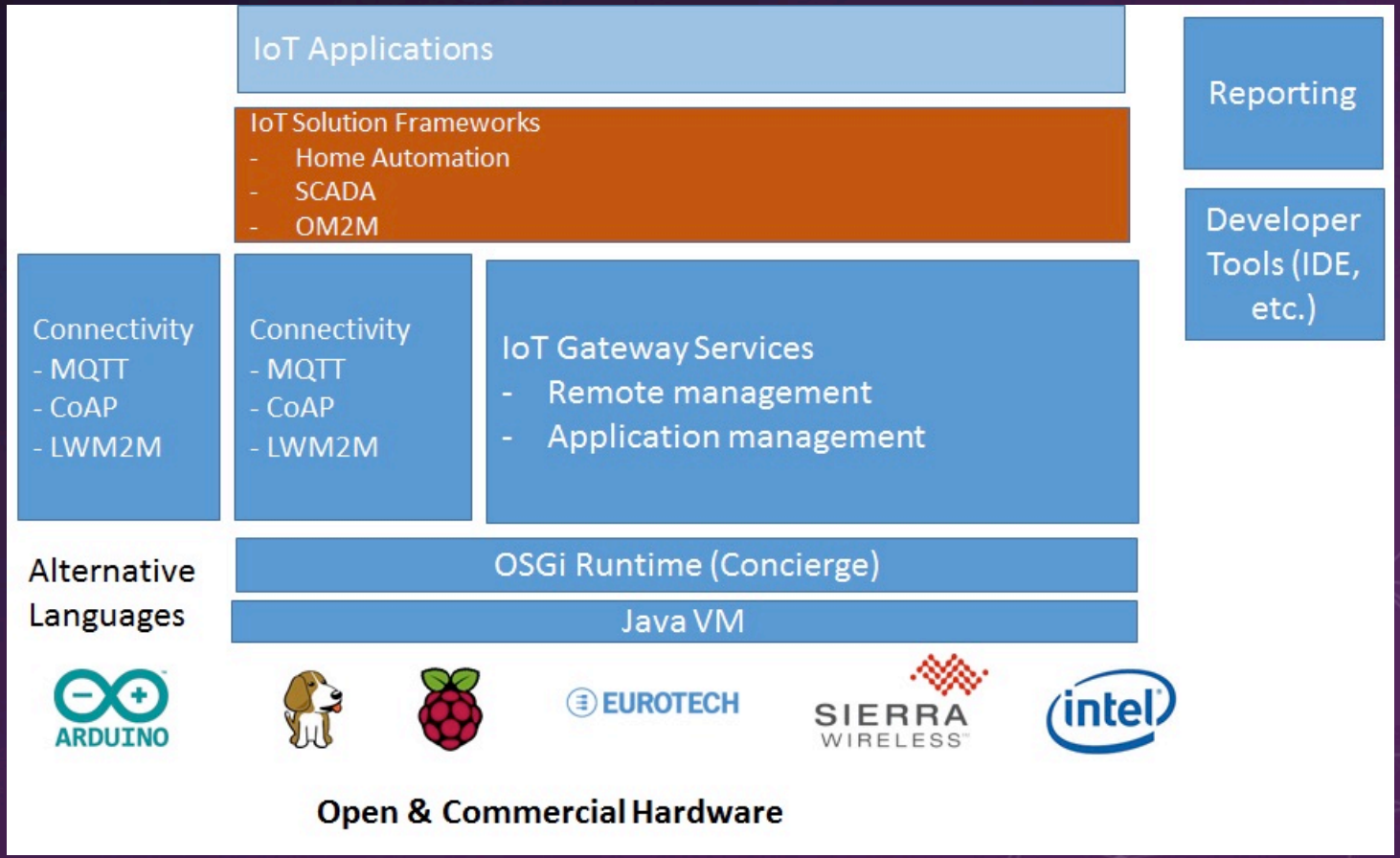
Report: IoT: Breaking Free From Internet And Things | vmob.me/IoT

Java for IoT?

- 9+ million Java developers
- Java 8 & embedded are fun
- Lots of IoT devices running on ARM
- Tooling



Open IoT Stack for Java



End-to-end IoT with Java?

Actuators/Sensors

+

Gateway

+

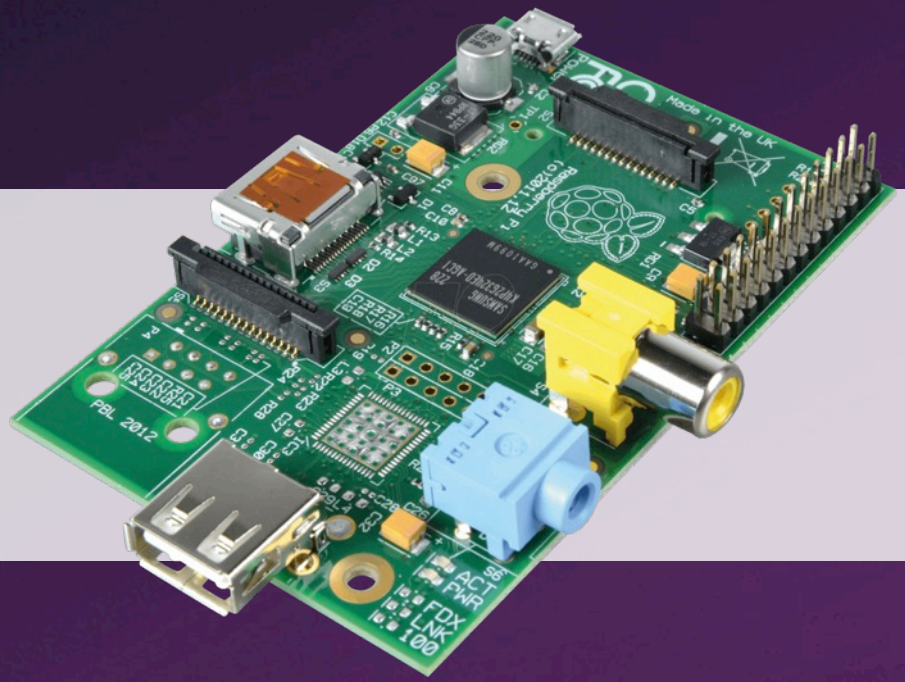
[Cloud]

+

User front-end

Gateway

Gateway



Gateway

Gateway

Connect
sensors to the world

Manage the hardware and software running at the edge

Connect?

- **CoAP**
  - « HTTP over UDP »
  - Expose your device as a resource to the Internet of Things
- **MQTT**
  - Publish/Subscribe model
  - More room for local processing

CoAP: The web-of-things

/walk
/hand/left/raise
/eye/picture

/on
/red
/green
/blue
/mtbf

/on

/on

/buttons
/buttons/1/push
/bat-level

/engine/status
/position
/fuel

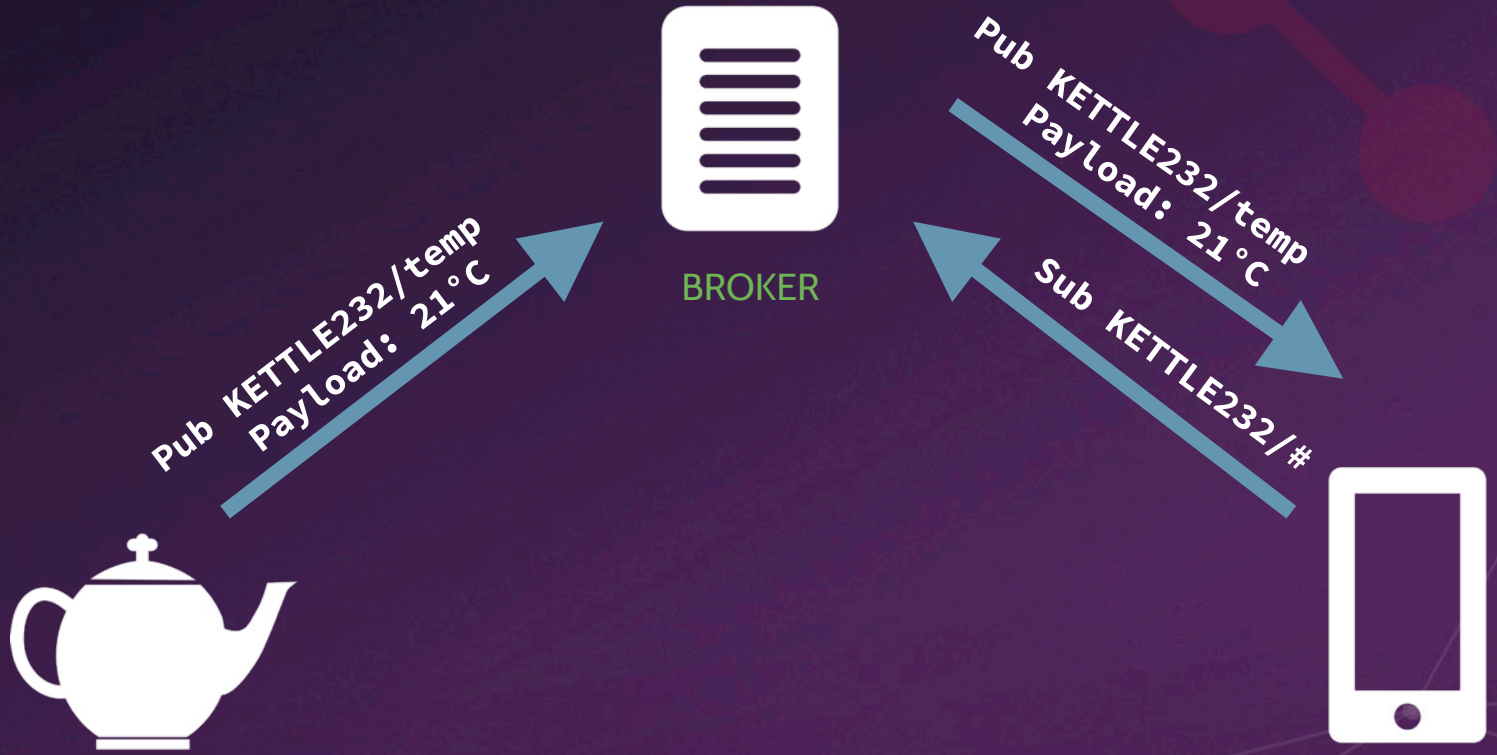
/CO2
/noise
/lights/on

Eclipse Californium

- Focus on scalability and usability
- To be used in IoT cloud servers or M2M/IoT devices running Java
- Includes **DTLS** implementation (Scandium), HTTP/CoAP bridge, Plugtests, …

http://eclipse.org/californium

MQTT: Publish & Subscribe



Eclipse Paho

- Open-source MQTT clients
- Pick your language!
  - Java
  - JavaScript
  - C/C++, Objective C
  - Go, Lua, Python, .NET, WinRT, …

http://eclipse.org/paho

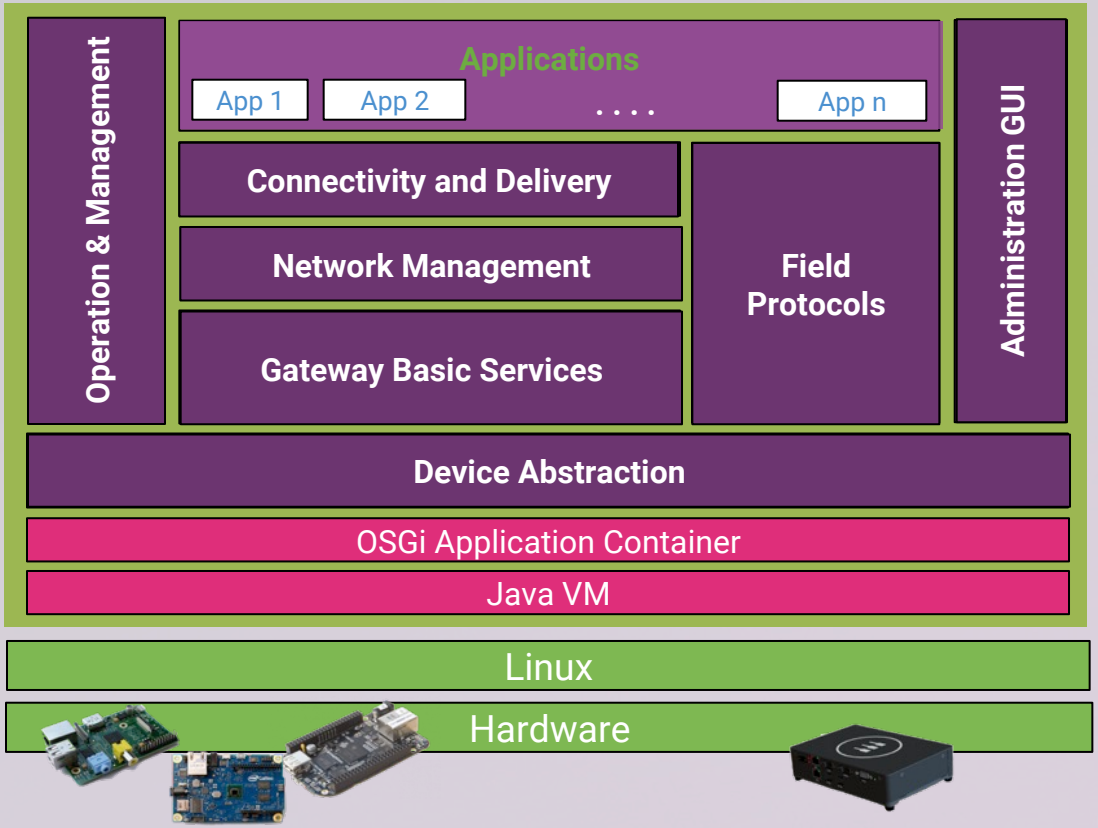
MQTT brokers

- Eclipse **Mosquitto**
  - C implementation
  - Scalable (1000 clients == 3MB RAM)
- Eclipse **Moquette**
  - Java implementation
  - Based on Netty and LMAX disruptor

Manage?

- **Gateway** itself
  - wireless modem, firewall, …
- **Applications**
  - Install/Uninstall software packages
  - Start/Stop applications
- **Sensors**
  - H/W abstraction layer

Eclipse Kura



kura

Installing Kura

```
cd ~

sudo apt-get update

wget https://s3.amazonaws.com/kura_downloads/raspbian/release/ \
                                1.1.0/kura_1.1.0_raspberry-pi_armv6.deb

sudo dpkg -i kura_1.1.0_raspberry-pi_armv6.deb

sudo apt-get install -f

sudo reboot
```

First steps with Kura

- Network management
  - Cellular Modem, WiFi
  - Firewall
  - NAT
- OSGi and system administration
- IoT server communication settings

Kura API

- OSGi services that you can re-use in your own components
  - `ClockService`
  - `DataService`, `CloudService`
  - `CryptoService` (AES, base64, SHA-1)
  - `PositionService` (geolocation)
  - … and many others
- And of course you can leverage a huge ecosystem of Java and OSGi libraries

Demo time!

End-user interaction

- JavaFX Charts
- Eclipse BIRT
- Smartphone app (e.g Android)
  - https://www.eclipse.org/paho/clients/android
- MQTT + WebSockets = ♡
  - https://www.eclipse.org/paho/clients/js

If you had to remember only 3 things...

#1

Kura is awesome!
Go download it now!
http://eclipse.org/kura

If you had to remember only 3 things...

#2

Build your own greenhouse &
follow the tutorial

http://iot.eclipse.org/java/tutorial

If you had to remember only 3 things...

#3

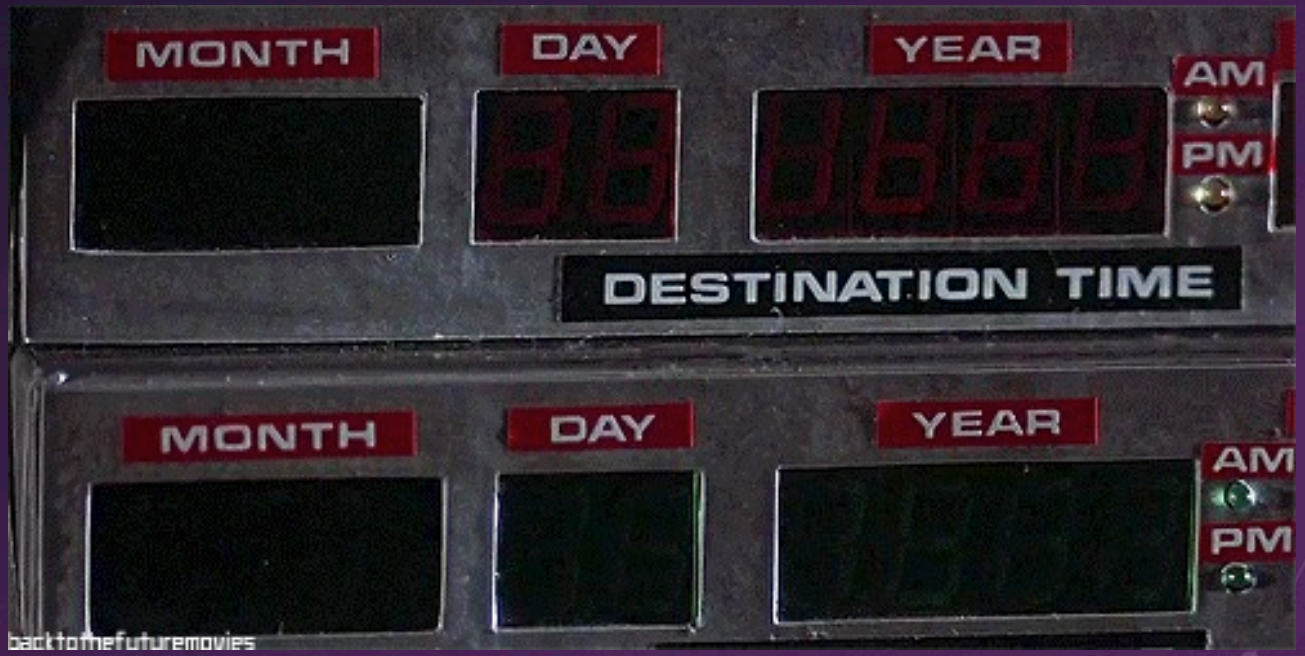
Eclipse IoT is much more than
Kura and Java!

http://iot.eclipse.org/

Get Involved!

- Open bugs / fix bugs
- Request new features
- Write articles, tutorials
- Participate on the mailing lists
- Propose your project!

Coming next?


MONTH
DAY
YEAR
AM
PM
DESTINATION TIME
MONTH
DAY
YEAR
AM
PM
backtothefuturemovies

Coming next?

- **Device Management**
  - LwM2M, LwM2M over MQTT, IPSO Smart Objects
- **Security**
  - TinyDTLS
- Open-source **IoT server**?
  - Several members interested in defining and implementing the OpenStack for IoT

Thank you! Questions?

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http://iot.eclipse.org