Cloud deployment of M2M applications
OpenHAB, RabbitMQ and Storm use case

February 19, 2014

Eclipse IoT day - Grenoble

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Summary

- M2M "ubilitytics" big picture
- Deployment issues
- A processing chain
- Roboconf dynamic (re)configuration
- Demo scenario
M2M "ubilytics" big picture

Send selected sensors measurements

Message Broker or MaaS or PSaaS
Mosquitto, RabbitMQ, …
Protocols: MQTT, AMQP, STOMP, XMPP, CoAP …

In elastic Cloud

NoSQL Store
MongoDB, Cassandra, HDFS

MapReduce
Hadoop

Realtime ESP
Storm, Samza, S4, Spark Streaming, …
topologies

Computed prediction model

ESP Monitoring
Placement (static, dynamic)

Storing aggregates

Predictions Trends, …

Deployment & (Re)Configuration (Roboconf)

Sensors data messages:
energy Consumption, temperature, …

In elastic Cloud

Send selected sensors measurements

Embedded boards:
smartphones by millions

M2M Gateway
@ Home, Office, Warehouse
(OpenHAB, IoT Sys)

M2M Gateway
@ Home, Office, Warehouse

In elastic Cloud

Sent sensors measurements

Report, Dashboard, … (history charts, …)
Deployment issues

- **Multi-scale**
  - From embedded (box, sensor, card...) to cloud / IaaS
  - More and more devices while IoT emerges

- **Elastic & adaptative**
  - Add/remove components (eg. according to load patterns)
  - Adapt data flow (eg. load balancing)
  - Optimize (eg. co-locate)

- **Dependencies to be resolved at runtime**
  - Location of components (eg. where to send data)
  - Configuration information (eg. database credentials)
A processing chain

Example:
energy consumption forecast, based on Storm.

Dynamic elasticity (eg. on IaaS)

Bottleneck detection
Insert additional node(s) + reconfigure

Shrink when possible (lower flow)
Remove useless node(s) + reconfigure
Roboconf dynamic (re)configuration

• **Application model**
  • Graph of components (eg. VMs or software packages) with dependencies (export/import of configuration variables)
  • Initial deployment description (set of instances, deployed on VMs)

• **Deployment manager (DM)**
  • Creates VMs on IaaS when necessary
  • Deploys the model (including software packages) on VMs

• **Agent**
  • Present on each VM
  • Cross-instances communication (exchange of variables import/export)
  • Admin communication with DM
  • Lifecycle of software deployed on the VM (setup, start, stop...) according to dependency resolution

• **Asynchronous communication**
  • Based on RabbitMQ
RoboConf in details

MQ / JMS

Exchange / resolve imports / exports

Propagate model

Roboconf Deployment Manager

VMbeagle {
  alias: Beagle board;
  installer: iaas;
  children: openhab;
}

VMaws {
  alias: Virtual machine;
  installer: iaas;
  children: mqtt;
}

openhab {
  installer: bash;
  exports: httpPort;
  imports: mqtt.ip;
}

mqtt {
  installer: bash;
  exports: ip;
}

instanceof VMbeagle {
  name: Beagle1;
  children: openhab;
}

instanceof openhab {
  name: openhab1;
  httpPort: 8080;
}

instanceof VMaws {
  name: VM_MQTT1;
  children: mqtt;
}

instanceof mqtt {
  name: MQTT1;
}

Agent

variables import / export

lifecycle

Configurable software

+ dependencies (RPMs...)

VM (EC2...) or any device

Agent

variables import / export

lifecycle

Configurable software

+ dependencies (RPMs...)

VM (Beagle board...) or any device
Demo scenario (1)

Replay load and work from CSV data file of house #0

OpenHAB House #0

OpenHAB House #1

VMo2

Mosquito MQTT broker

MQTT Connection Port 1883

VM AmazonWS

"VM" BeagleBone

RoboConf deployment & (re)configuration
Demo scenario (2)

1. Deploy MQTT server on new VM
2. No dependency = ready to start
3. Export IP address of MQTT server
4. Publish sensor data on MQTT
5. Data analysis

Roboconf = DM (webapp) + messaging server
That's all, Folks!

Any question?
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