Enabling Papyrus-RT for the Internet of Things

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Motivation

IoT Middleware
(e.g. Node-RED)

original image source: http://dawnbit.com
• The MQ Telemetry Transport protocol is a lightweight publish/subscribe protocol

• ISO / OASIS standard

• Small code base, energy efficient

• Supported by most major IoT platforms: AWS, Bluemix, Azure IoT Hub…
Topic: office/floor1/temperature

image source: http://hivemq.com
UML-RT In a Nutshell
MQTT Ports

![Diagram showing MQTT ports and protocol connections to IoT]
UML-RT Protocol to MQTT Payload

```
report(2.5).send();

{
   "signal" : "report",
   "params" : [{
      "data" : 2.5
   }]
}
```

Topic

SensorProtocol

MQTT publish
UML-RT Protocol to MQTT Payload

**SensorProtocol**

- **Out messages**:
  - `out report (data : double)`

- **In messages**:
  - `in turnOn ()`
  - `in turnOff ()`

**Topic**

```
{
    "signal": "turnOn"
}
```
Example
Demo

Sensor  Light 1  Controller  Light 2
Papyrus-RT + Node-RED
Distribution
Deployment optimization

- IoT environments are heterogeneous, dynamic, and volatile

- Deployment greatly impact the Quality-of-Service (QoS)

- Deployment optimization: generation of deployment plans that optimize certain QoS goals

- Self-adaptive deployment: dynamically re-deploy components in response to sudden changes in the environment
Thank You!