Challenges for the Connected World

The world is undergoing a dramatic transformation from isolated systems to Internet-enabled devices capable of generating data that can be analyzed to extract valuable information. This vision is manifested by the Internet of Things (IoT) and machine-to-machine (M2M) solutions, which enable devices, both old and new, to interact with cloud and enterprise infrastructure. The shift is generating unprecedented opportunities for companies to develop new services, enhance productivity and efficiency, improve real-time decision making, solve critical problems, and develop new and innovative user experiences.

Two major challenges in achieving these benefits are connecting legacy devices to the Internet, and ensuring all IoT and M2M communications are seamless and secure.

Connecting Gateways to Back Office Systems

Organizations can quickly connect devices of all types to cloud infrastructure using systems developed by Intel and IBM that work seamlessly 'out of the box', as shown in Figure 1. The solution combines an IBM messaging appliance and an Intel gateway that communicate via the MQTT protocol, which is much smaller and faster than HTTP. MQTT is an open-source messaging protocol designed for wireless networks and resource-constrained embedded devices where conserving device battery life, reducing network traffic, and delivering messages reliably are key.

Figure 1. Connecting a Sensor Network to the Cloud
• **IBM MessageSight** is a full-featured messaging appliance designed for M2M and mobile environments. Handling up to 13 million messages per second, it processes large volumes of events in near real time to deliver the performance, value, and simplicity needed to service the growing number of mobile devices and sensors. The solution provides security-rich, bidirectional messaging that helps enable smarter decision-making.

• **Intel® Gateway Solutions for the Internet of Things (Intel® Gateway Solutions for the IoT)** is designed to provide Internet connectivity for the 85 percent of all legacy and existing devices that today are isolated and unconnected. The gateway aggregates, filters, processes, and secures sensor network data before sending it to the cloud or an enterprise. The gateway integrates technologies and protocols for networking, embedded control, enterprise-grade security, and manageability.

**Communications in Minutes**

After these systems are set up, it is possible to get them to communicate with each other in less than five minutes using a simple command line interface (CLI). The following command enables the Intel Gateway Solutions for the IoT to send temperature data to an IBM MessageSight appliance.

```
mosquitto_pub -h 159.253.140.6 -t sensors/temp -m 30
```

Note: 159.253.140.6 is the IBM MessageSight server running MQTT Broker

**Building a Solution**

The following is a step by step guide for building the solution. It explains how to build an MQTT client on the Intel Gateway Solutions for the IoT using a sample Python module. For details on programming MQTT in Python, see [http://www.eclipse.org/paho/clients/python](http://www.eclipse.org/paho/clients/python).

1. Download the paho-mqtt-0.9.tar.gz (md5) from [https://pypi.python.org/pypi/paho-mqtt](https://pypi.python.org/pypi/paho-mqtt) (bottom of this web page) and copy it to the Intel gateway platform. Unzip and run the following command "python setup.py install" under paho-mqtt-0.9. Please refer to Meshcentral_solution_brief on meshcentral.com an alternate way to transfer files to the gateway platform.

2. Create a new python script with the vi editor as shown in following box. Save the following script as mqtt-client.py.

```python
DESCRIPTION = "This package contains the simple Hello World program."
import paho.mqtt.client as paho
client = paho.Client("test-client")
client.connect (159.253.140.6 )

#client.connect("127.0.0.1")
client.publish("sample/test", "hello world", 1)
client.disconnect ( )
```
3. The IP address of the IBM MessageSight test server is: 159.253.140.6 port 1883.

4. Install the GUI-based Paho MQTT utility (mqtt-utility-0.4.1-20130821.133642-1.jar) from https://repo.eclipse.org/content/repositories/paho-snapshots/org/eclipse/paho/mqtt-utility/0.4.1-SNAPSHOT on a Windows* or Linux* box and run (open) with Java run time binaries (OpenJDK or Java Platform SE binary). It may be necessary to set the permission as executable under properties of the *.jar file.

A GUI-based app will pop open. Enter the IBM MessageSight test server address in “Broker TCP/IP address” and port information.

Subscribe to topic to receive messages published on that particular topic; for this example, enter "/sample/test" under Subscribe topic.

5. Run python mqtt-client.py on command line interface (CLI), and a message will appear on the GUI window. The gateway will send an MQTT message to the IBM MessageSight server, which will then broadcast the message to all the topic subscribers, including the GUI client.


Other Features

Intel Gateway Solutions for the IoT is a MQTT V3.1 client and is OpenSSL*-compliant. It supports several programming languages, including C, Java*, JavaScript*, Python*, LUA and OSGI-based applications for broker communication.

IBM MessageSight supports MQTT clients and libraries for Intel Gateway Solutions for the IoT (C and Java-based APIs). Some other features are supported for JavaScript API for HTML5-based applications, MQTT quality of service (QoS) 0, 1, and 2 (best effort), and messaging protocols that enable authentication through a local user store or LDAP servers. Support for SSL V3 and TLS 1.0, 1.1 and 1.2 are standard with a FIPS 140-2 level 1 certified cryptographic module.


For more information about Intel solutions for the Internet of Things, visit www.intel.com/iot.