The Internet of Things

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Agenda

- The Internet of Things
- The IBM IoT
  - On-Prem
  - Cloud
- Sample IoT Application
The Internet of Things

Definition
The Internet of Things refers to the use of sensors, actuators, and data communications technology built into physical objects - from roadways to pacemakers - that enable those objects to be tracked, coordinated, or controlled across a data network or the Internet.

There are three steps in Internet of Things applications:

- Capturing data from the object (for example, simple location data or more complex information),
- Aggregating that information across a data network, and
- Acting on that information - taking immediate action or collecting data over time to design process improvements.

Source: 1. Disruptive Technologies, McKinsey Global Institute, May 2013
IDC – Forecast
2020 View

➤ 212B Installed Things
➤ 30B autonomously connected things
➤ Public Sector, Distribution & Services, Manufacturing & Resources, and Consumers Lead Segment Growth Rates
➤ Approximately 3 Million Peta Bytes Of Embedded Systems Data (Excludes Streaming, Surveillance Type Data)
➤ $8.9 Trillion Of Business Value

Source: IDC, December 2013
GSMA “Connected Life” forecast $4.5T in 2020

Connected Life is everything that is connected and how they interact: cars, mobile devices, buildings, sensors and people

Top Ten in 2020

1. Connected Car $600 billion
2. Clinical Remote Monitoring $350 billion
3. Assisted Living $270 billion
4. Home and Building Security $250 billion
5. Pay-As-You-Drive Car Insurance $245 billion
6. New Business Models for Car Usage $225 billion
7. Smart Meters $105 billion
8. Traffic Management $100 billion
9. Electric Vehicle Charging $75 billion
10. Building Automation $40 billion

The Internet of Things instruments our entire world
Healthcare Examples – *Smart Health*

- **Tracking of drugs from manufacture to patient**
- **Remote monitoring of patient vital signs for chronic conditions and implantable devices**
- **Tracking of hospital equipment and instruments**
- **Coordinated patient care with family and carer alerts**
- **Lifestyle and fitness monitoring as part of wellness program**
- **Staff access and cross infection controls**
- **Advance telemetry of inbound patient clinical data to hospital**
Energy & Utilities Examples – Smart Energy

Smart Meter Data Integration
- Integrate data into your organisation and customer relationship management
- Improve operational efficiency
- Improve customer loyalty
- Give customers better advice
- Customers can understand bills easier
- Customers can change supplier easier

Automatic Pipe Leak Repair Service
1. Smart Water Meter can publish data to the cloud up to every 30 seconds
2. Analytics in the cloud can be used to detect anomalies which may indicate a leak
3. If a leak is detected, the Homeowner is notified and a time is requested for repair
4. Repair crew is notified

Pipeline Leak Detection
1. Sensors publish pressure and flow readings to the cloud
2. Real-time analytics is used to detect anomalies, variations in flow and validation of false alarms
3. The location of the leak is alerted to the maintenance crew enabling near real time leak detection

Remote Control of Smart Home
- Customers can control their white goods and central heating from their mobile
IBM and IoT
All Internet of Things Use Cases have a Common Set of Fundamental Requirements

- Easily on-board any connected “thing”
- Create a real-time communication channel with the “thing”
- Begin capturing data from the “thing” and store it in a historian DB
- Provide access to the collected data
- Manage the “things” and the connectivity to them

Extended Requirements:
- Provide a layer of analytics on the data in both real-time and on historical trend data
- Trigger events based on specific data conditions
- Interact with the “thing” from business apps and/or from mobile devices
IBM Products used in IoT Solutions

- **Sensors in the home**
- **Gateways for data consolidation**
- **Collection of data for all sensors**
  - Informix TimeSeries Service
    - NoSQL, Relational, Timeseries & Spatial storage & analytics
  - Informix Warehouse Accelerator
    - In-memory analytics
  - MessageSight / MQTT
    - Publish / Subscribe (no gateway)
  - Infosphere Streams
    - Real-time analytics
  - BigInsights
    - Hadoop
  - SoftLayer / BlueMix
    - Cloud infrastructure
  - SPSS/Cognos
    - Predictive analytics and dashboard
  - Consumer / Business

- **Data from other kinds of sensors**
MQTT - Open Connectivity for Mobile, M2M and IoT

A lightweight publish/subscribe protocol with predictable bi-directional message delivery

In the era of a Smarter Planet, open source and standards are essential

1999 Invented by Dr. Andy Stanford-Clark (IBM), Arlen Nipper (now Cirrus Link Solutions)

2004 MQTT.org open community

2011 - Eclipse PAHO MQTT open source project

2013 – MQTT Technical Committee formed

Cimetrics, Cisco, Eclipse, dc-Square, Eurotech, IBM, INETCO Landis & Gyr, LSI, Kaazing, M2Mi, Red Hat, Solace, Telit Comms, Software AG, TIBCO, WSO2

Evolution of an open technology
# Eclipse paho clients

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<tr>
<th>Component</th>
<th>Repository</th>
<th>Download</th>
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<td>MQTT Python Client</td>
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IBM MessageSight

- A secure, easy to deploy appliance-based messaging server that is optimized to address the massive scale requirements of the machine to machine (m2m) and mobile use cases.
- A million connections, and millions of messages per second
- It is designed to sit at the edge of the enterprise and can extend your existing messaging infrastructure or be used standalone
IBM Bluemix
Delivering a Composable Services development environment

Run Your Apps
The developer can choose any language runtime or bring their own. Just upload your code and go.

DevOps
Development, monitoring, deployment and logging tools allow the developer to run the entire application.

APIs and Services
A catalog of open source, IBM and third party APIs services allow a developer to stitch together an application in minutes.

Cloud Integration
Build hybrid environments. Connect to on-premises systems of record plus other public and private clouds. Expose your own APIs to your developers.

Built on IBM SoftLayer
Runs automatically on top of IBM’s leading infrastructure as a service. No need to worry about provisioning or managing infrastructure.
Sign Up for the Beta Today!

Register at www.bluemix.net

Visit our developer community at www.ibmdw.net/bluemix
IBM Internet of Things Cloud Quickstart

- **Connect** – Easily Register and connect “things” through a UI or APIs
- **Collect** – Collect and manage a time series view of data from “things”
- **Assemble** – Visually assemble events from things into logic flows
- **Manage** – Manage “thing” connections and subscriptions
- **Build** – Create applications that directly interact with connected “things”
Internet of Things Cloud QuickStart ...

Are you ready to connect your device to our Internet of Things Quickstart?
Just enter your device ID and click Go.

Do you need to set up your device?
Follow our simple recipes to configure, connect and visualize.

Take the next step
Build an app using Internet of Things data with our BlueMix application development platform.

www.internetofthings.ibmcloud.com
Device Recipes

Device Recipes
Pick from the recipes below to connect a real physical device to the Internet of Things. We'll be adding new device recipes over time, but if you've got your own device there's nothing to stop you improvising your own recipe!

- Intel Galileo
- Texas Instruments SensorTag + Grove Boiler
- ARM mbed
- Raspberry Pi Model B
- Improvise my own device

Don't want to use a physical device?
Anything that can connect to the internet and send some data can be part of the Internet of Things.

- Simulate a Device

Ready to create an app?
If you're more interested in developing applications and insights from your data, check out our guide to using IoT within the IBM "BlueMix" cloud.

- Node-RED IoT App
Internet of Things is part of our Bluemix Platform
Node-RED in Bluemix
Demo - Sample IoT application
Sample Application

► Collect sensor reading from a device
  • Use an IoT Sensor instead of a physical device

► Use the IoT Boilerplate on BlueMix to read the data, process it and take an action

► Detect when the temperature sensor exceeds/drops below a given threshold

► Send an SMS to alert the owner
  • Instead of sending an SMS, we will tweet
IoT Device Simulator

http://iotsensor.ng.bluemix.net/

Note down the device id:
F9:B8:B6:B7:87:56
Internet of Things Boilerplate

Internet of Things Starter

Get started with Internet of Things in BlueMix.

CREATE APPLICATION

Node-RED

A visual tool for wiring the Internet of Things.

View full documentation
Internet of Things Boilerplate
IoT Application
Node-Red flow

- **IoT Node** – enter the IoT sensor device id
- **Twitter node** - add your twitter credentials.
IoT Application in action

- IoT Sensor – reduce the temperature to below 10 C
- Twitter Account – this event is published in your twitter account
Learn more

• Try IBM Internet of Things Cloud Quickstart!

• Play with Node-Red

• Signup for the Bluemix beta
Questions?