SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

19ECE308- WIRELESS TECHNOLOGIES FOR IOT

III ECE / VI SEMESTER

UNIT 1 – OVERVIEW OF INTERNET OF THINGS

TOPIC 3 –Technology Behind IoT

IoT

● Hardware (Arduino Raspberry Pi, Intel Galileo, Intel Edison, ARM mBed, Bosch XDK110, Beagle Bone Black and Wireless SoC)

● Integrated Development Environment (IDE) for developing device software, firmware and APIs

● Protocols [RPL, CoAP, RESTful HTTP, MQTT, XMPP]

● Communication (Powerline Ethernet, RFID, NFC, 6LowPAN, UWB, ZigBee, Bluetooth, WiFi, WiMax, 2G/3G/4G)

● Network backbone (IPv4, IPv6, UDP and 6LowPAN)

IoT

● Software (RIOT OS, Contiki OS, Thingsquare Mist firmware, Eclipse IoT)

● Internetwork Cloud Platforms/Data Centre (Sense, ThingWorx, Nimbits, Xively,openHAB, AWS IoT, IBM BlueMix, CISCO IoT, IOx and Fog, EvryThng, Azure, TCSCUP)

● Machine learning algorithms and software. An example of machine-learning software is GROK from Numenta Inc. that uses machine intelligence to analyse the streaming data from clouds and uncover anomalies, has the ability to learn continuously from data and ability to drive action from the output of GROK's data models and perform high level of automation for analysing streaming data.

1.Hardware

- Embedded Devices

- Embedded hardware/software with Sensors/Actuators

- Hardware (Arduino Raspberry Pi, Intel Edison, mBed, Beagle Bone Black and Wireless SoC, …..)

2. Integrated development environment (IDE) and Software

- Enables developing device software, firmware and APIs

- Eclipse IoT Stack, Sense, ThingWorx, EvryThng,

- Software (RIOT OS, Thingsquare Mist firmware, Eclipse IoT)

Eclipse IoT Stack and Sense are well-suited for open-source IoT development projects, ThingWorx and EvryThng are designed for commercial IoT applications that require more robust tools and services.

RIOT OS is well-suited for use in resource-constrained devices, Thingsquare Mist is designed for use in wireless mesh networks.
Eclipse IoT provides a range of tools and frameworks for developing IoT applications, including support for a wide range of communication protocols and device management platforms

3a. Embedded Devices/M2M Communication Protocols

- CoAP, RESTful HTTP, MQTT, XMPP

- Communication (RFID, NFC, 6LowPAN, UWB, ZigBee, Bluetooth LE, Power-line Ethernet, LPWAN)

CoAP and MQTT are well-suited for use in resource-constrained devices, RESTful HTTP is widely used for web services and XMPP is commonly used for instant messaging applications.

Communication technologies used in IoT applications
RFID and NFC are well-suited for applications that require short-range, high-frequency communication, while LPWAN is designed for long-range communication over low-power devices.

3b. Network Protocols

- ZigBeeIP, RPL, IPv4, IPv6, UDP
- WiFi, WiMax, 2G/3G/4G/5G)

**ZigBeeIP is used to enable IP-based communication between ZigBee devices,
RPL is used to route data in low-power and lossy networks.
IPv4 and IPv6 are used to identify devices and route data across the internet, and
UDP is used to send datagrams over IP networks.**

**WiFi may be preferred for high-bandwidth data transfer
WiMax is a wireless broadband technology that provides high-speed internet access over long distances.
2G, 3G, 4G, and 5G are all generations of cellular network technology.**

4. Software Platforms

- Internetwork Cloud Platforms (Xively, Nimbits, TCS Connected Universe Platform, openHAB, AWS IoT, IBM BlueMix, CISCO IoT, IOx and Fog, EvryThng)

- Serve

Xively, Nimbits, TCS Connected Universe Platform– IoT platform that provides a cloud-based infrastructure for building and deploying IoT applications.

openHAB is an open-source IoT framework that provides a platform for building and deploying smart home and building automation applications.

AWS IoT is a cloud-based IoT platform provided by Amazon Web Services

IBM BlueMix is an IoT platform provided by IBM that provides a cloud-based infrastructure for building and deploying IoT applications.

CISCO IoT provides a range of IoT solutions including software, hardware, and cloud services.

EvryThng is an IoT platform that provides a cloud-based infrastructure for building and deploying IoT applications

5a. Analyzing and Visualising

- Analyzing data, streaming data, events streaming data
- Descriptive, Prescriptive and Predictive Analytics
- Data Visualisation

5b. Analytics & Machine Learning

- Learning ability to learn continuously from data, and the ability to drive actions/Applications/Business Processes
- Machine learning algorithms, for example, GROK from Numenta Inc.

GROK platform is designed to make it easier for developers to build machine learning applications that can learn from and process complex, real-world data.

Steps behind the IoTs

1. Device platform consisting of device hardware and software.

2. Microcontrollers (or custom chips)

3. Software for device APIs and web applications

4. Device platform consisting of device hardware and software.

5. Microcontrollers (or custom chips)

6. Software for device APIs and web applications

Summary

We need Five Technologies for the IoT

(i) Device platform

(ii) Device hardware and software Technology

(iii) Connecting Network Technology

(iv) Cloud Platform or Server

(iv) Analytics, data visualization, Machine Learning