SNS COLLEGE OF ENGINEERING

Kurumbapalayam(Po), Coimbatore – 641 107
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Department of Information Technology

Course Name – Internet of Things & AI

III Year / V Semester

Unit 1 – IoT INTRODUCTION AND APPLICATIONS

Topic 4- Physical Design of IoT

Physical Design of IoT

Things of IoT

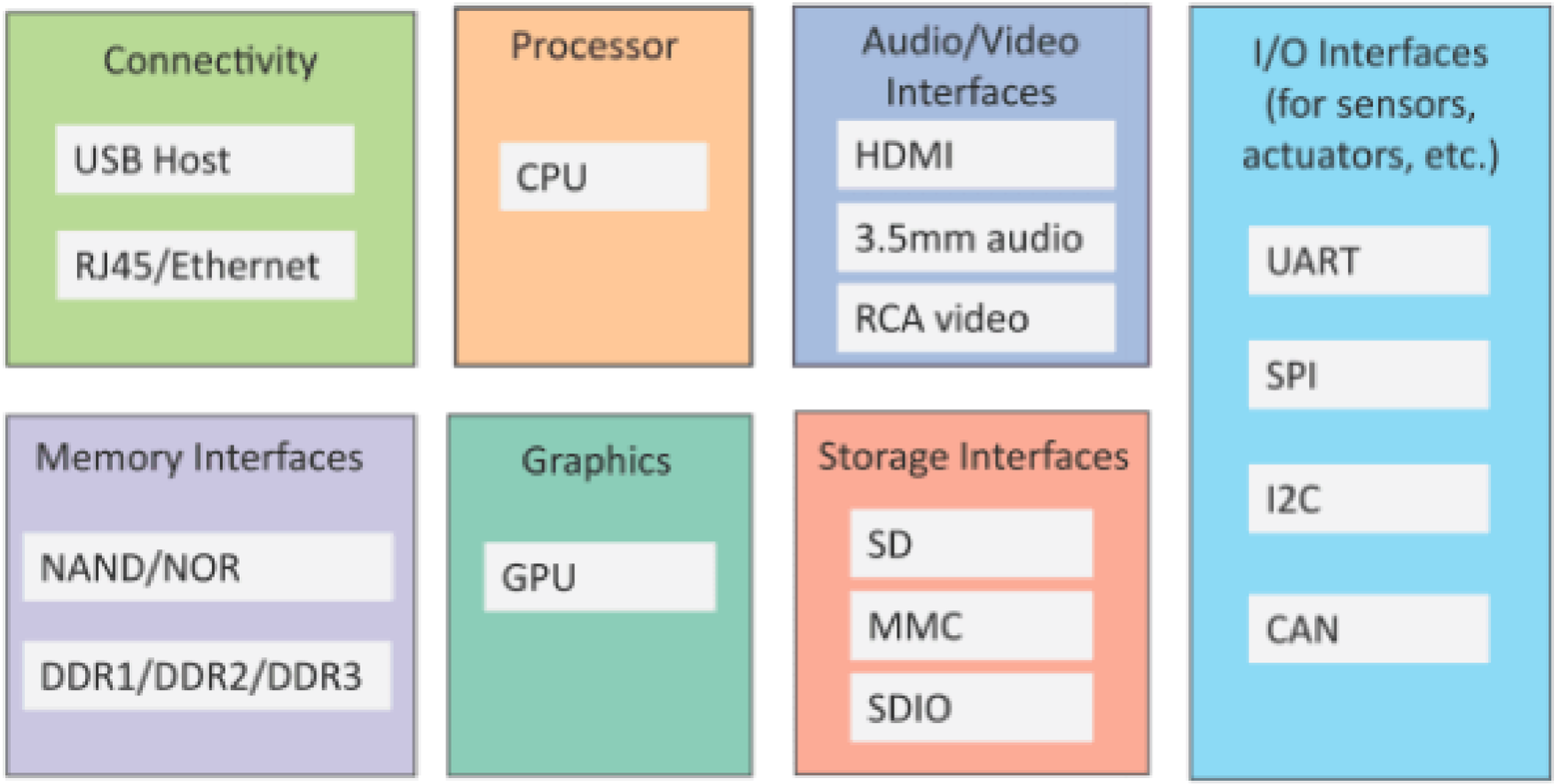
- The “Things” in IoT usually refers to IoT devices which have unique identities and can perform remote sensing, Actuating and monitoring capabilities.

- IoT devices can exchange data with other connected devices and applications (directly or indirectly), or

- Collect data from other devices and process the data locally or send the data to Centralized servers or cloud based applications back ends for processing the data.

- An IoT device may consist of several interfaces connections to other devices, both wired and wireless. These include
  - I) IoT interfaces for sensors
  - II) interfaces for internet connectivity
  - III) memory and storage interfaces
  - IV) audio video interfaces.
- An IoT Device can collect various types of data from the the onboard or attached sensors, such as temperature , humidity, light intensity.

Physical Design of IoT



Generic block diagram of an IoT Device

Physical Design of IoT

IoT Protocols

Link Layer

- 802.3 – Ethernet
- 802.11 – WiFi
- 802.16 – WiMax
- 802.15.4 – LR-WPAN
- 2G/3G/4G

Network/Internet Layer

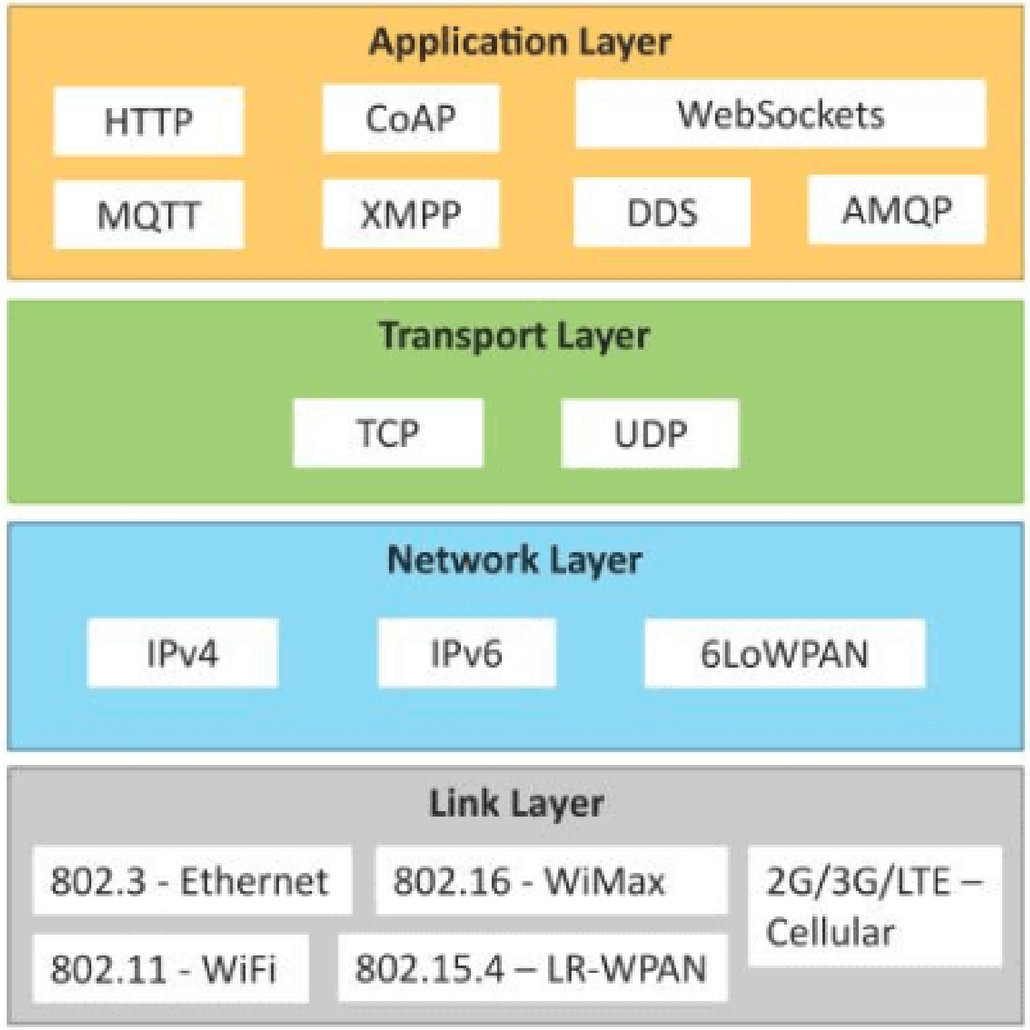
- IPv4
- IPv6
- 6LoWPAN

Transport Layer

- TCP
- UDP

Application Layer

- HTTP
- CoAP
- WebSocket
- MQTT
- XMPP
- DDS
- AMQP



Physical Design of IoT

IoT Protocols

Link Layer

IEEE 802.3 – Ethernet is a wired standard

- 802.3 – 10BASE 5, Coaxial cable
- 802.3i – 10BASE-T, Twisted pair
- 802.3j – 10BASE-F, Fiber connection
- 802.3ae – 10 Gigabit Ethernet, Fiber connection
- Data Rate: 10 Mbps to 40 Gbps

802.11 – WiFi (WLAN)

- 802.11a – 5 GHz,
- 802.11b & 802.11g – 2.4/5 GHz,
- 802.11n - 2.4/5 GHz,
- 802.11ac – 5 GHz
- 802.11ad – 60 GHz
- 1 Mbps to 6.75 Gbps

802.16 – WiMax (Wireless Broadband)

- Worldwide Interoperability for Microwave Access
- WirelessMAN
- 1.5 Mbps to 1 Gbps
- 802.16.1a, 802.16.1b, 802.16.n, 802.16.p, 802.16-2017

802.15.4 LR-WPAN

- Low Rate WPAN
- 40 kbps to 250 kbps
- Suitable for low cost low rate

2G/3G/4G (Mobile Communication)

- 2G – GSM / CDMA, GPRS, EDGE 9.6 kbps to 384 kbps
- 3G – UMTS / CDMA2000, 2 Mbps
- 4G – LTE – 100 Mbps
- Used through cellular networks

Physical Design of IoT

Network / Internet Layer

The network layer are responsible for sending of IP datagrams from the source network to the destination network.

IPv4

- Low address space. 2^32 address space. 32 bit address

IPv6

- Large address space, 2^128 address space, 128 bit address

6LoWPAN

- IPv6 over low power wireless personal area networks
- low power device which have limited processing capability
- it operate in the 2.4 GHz frequency range
- data transfer rate off to 50 kbps.

Transport layer

The Transport layer protocols provides end-to-end message transfer capability independent of the underlying network.

TCP

- Connection oriented, Reliable
- Order of delivery, Retransmission
- Duplicate avoidance

UDP

- Conncetionless, Unreliable
- No order of delivery and retransmission
- Packet loss

Physical Design of IoT

Application Layer

- HTTP – Used in Web browsers, basis for WWW
- CoAP - Constrained application protocol, used in M2M, Uses UDP
- WebSocket - full duplex communication over a single socket connections, sending message between client and server, Uses TCP
- MQTT - Message Queue Telemetry Transport, message protocol based on public -subscribe model
- XMPP - Extensible Messaging and Presence Protocol, real-time communication and streaming XML data between network entities
- DDS - Data distribution service, device-to-device machine to machine communication.
- AMQP - Advanced Message Queuing protocols

THANK YOU