IOT - [UNIT-2]

RaspBerry

- Board components
- Linux on RSPi
- RSPi Interfaces
- Programming RSPi using Python
- Arduino Uno platform
- Interfacing with Uno.

→ Raspberry Pi is a series of small single-board components

Uses of Raspberry Pi

1. office
2. programming
3. Game console
4. web server
5. Home Theater PC (HTPC)
6. Bird House
7. Super computer
8. clock.

* components

1. 5V micro USB controller
2. Connectivity - GPIO
   - USB ports
   - Ethernet
3. Internals - DSI (display interface)
   - LAN controller
   - CSI (camera interface)
   - SoC (system on a chip)

responsibility for
delivery of
function at

Block Diagram of IoT Device

connectivity	Processor	Graphics	Audio&Vide
Ethernet	CPU	GPU	HDMI
USB Ports			3mm audio
			RCA vedio

Interconnect

Interfaces	Storage interface	memory interface
UART	SD	NAD/Nor
SPI	MMC	DDRI/DDR2/DDR3
I2C	SDIO	
CAN		
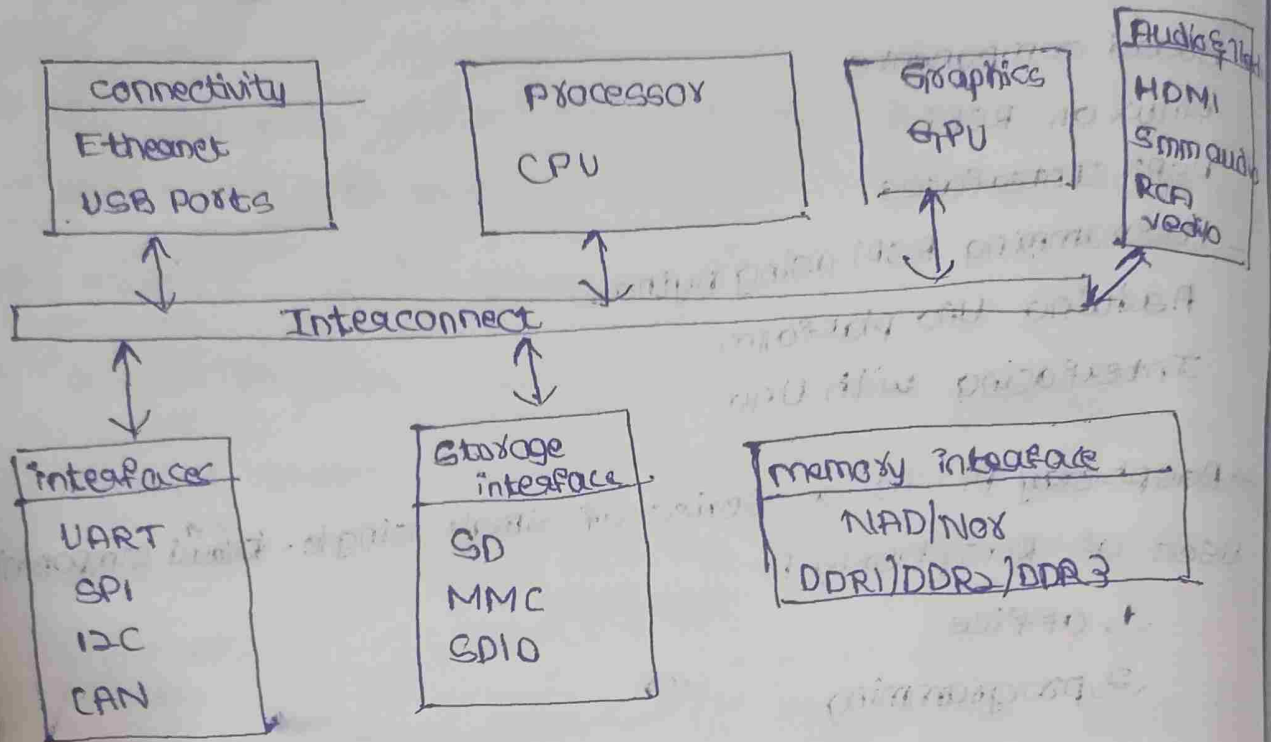
* Rasp Berry Pi Interfaces

1, Serial - The serial interface on Rs Pi has recieve and transmit pins for communication with serial Peripherals

2, SPI :- synchronous serial data protocol used for communicating with one or more peripheral devices

3, I2C :- Pins allows to connect hardware modules

● I2C interface allows synchronous data transfer with just 2 pins - SDL (data lines)
  SCL (clock lines)

*Arduino:- open-source electronic platform based on easy to use hardware and software

*open flow:- It is a protocol that shows standardized communication b/w the switch and controller

It is used b/w 1. switches
2. routers

* Analog and Digital

→ └→ Quantity can take any value blw its minimum value and maximum value (square wave)

sine

→ Quantity can take specific levels of values (sine wave)

square

Arduino Uno codes

Serial mode

```
void setup() {
    Serial. begin (9600);
}
void loop() {
    Serial. println ("Hello world");    } any C code ☆
    delay (1000);
}
```

* Advantages of Auadino.

1) open source

2) portable

3) Low power consumption

4) user-friendly programming language

* Popular aaduino boards

1) aaduino UNO
2) aaduino Mega
3) aaduino Micao
4) aaduino Due

* Applications of aaduino

1) Home automation
2) Robotics
3) Zigbee
4) Bluetooth
5) Ethearnet

* aaduino vs othea environments

1. supports analog input
2. Limited memory
3. open souce
4. compaoatively cheap

Part-2

Architecture for IOT   Ⅱ
Using mobile Devices
Mobile Technologies
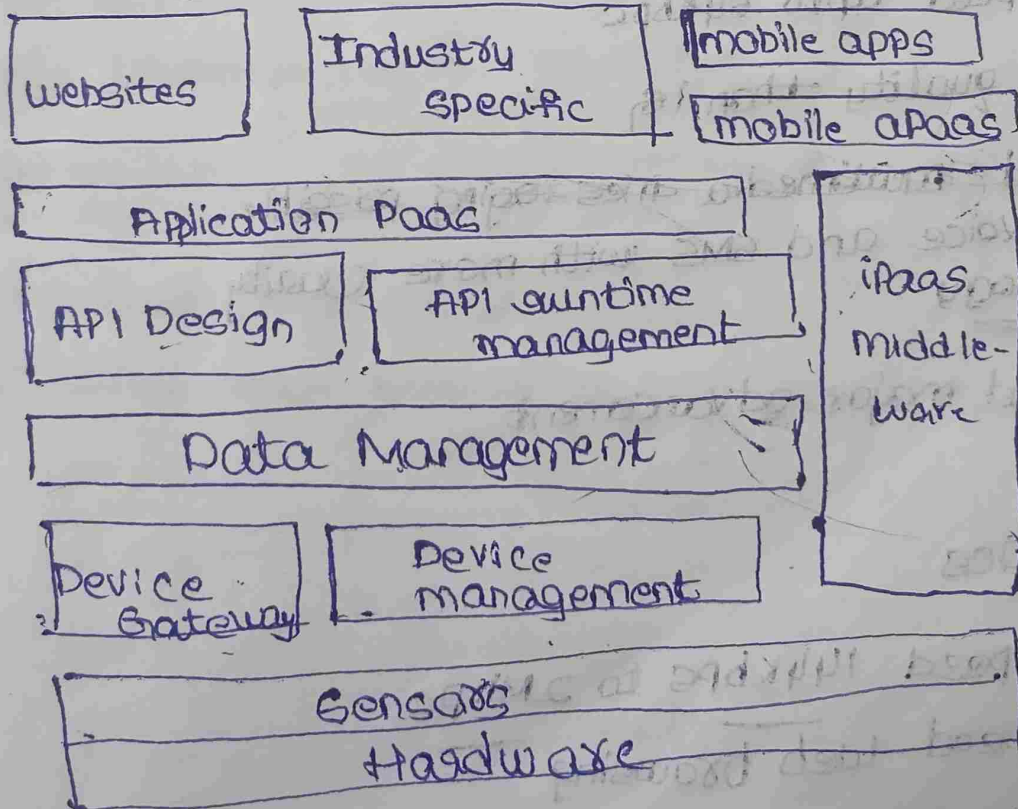5G
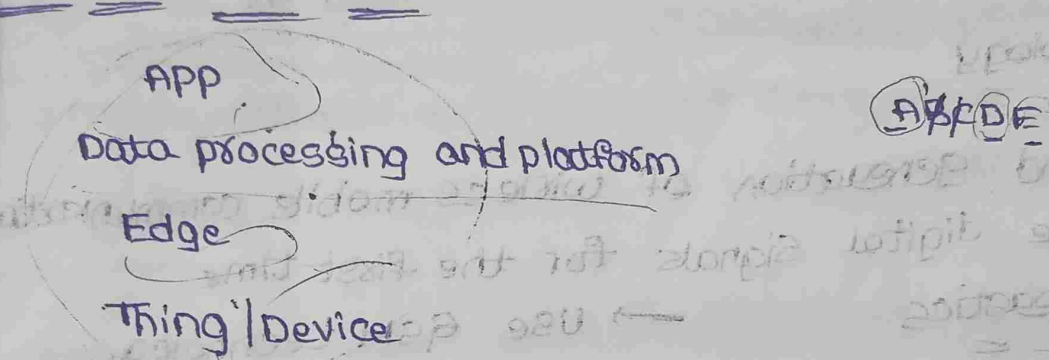Software-defined networking
Ultra wide band technology
Near Field communication technology
Low power wide area Networking Technologies -
                    Sigfox, Wightless, LORa

General IOT stack

APP
Data processing and platform
Edge
Thing|Device

(A/P/D/E)

websites	Industry specific	mobile apps
		mobile apaas

Application Paas		iPaas middle-ware
API Design	API runtime management	
Data Management		
Device Gateway	Device management	
Sensars Hardware		

Evolution of wireless technologies

1G Technology:-

- It is the first generation of wireless mobile communication where analog signals were used to transmit data.

Characteristics → Will support only voice communication

1. poor voice quality   2. Data speed 24 kbps
2. No data security
3. large phones with limited battery life

2G Technology

→ Second generation of wireless mobile communication which use digital signals for the first time

Characteristics → Use GSM technology

1. Data speed upto 64 kbps
2. Better quality than 1G
3. ~~Text and multimedia messaging possible~~
   Digital voice and SMS with more clarity

3G Technology

→ Offered major advancement

Characteristics

- Data speed 144 kbps to 2Mbps
- High speed web browsing
- Fast & easy transfer of audio & vedio files
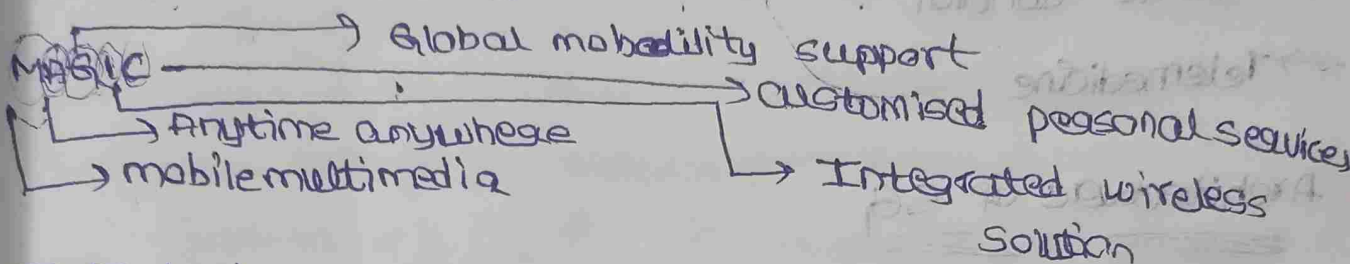- 3D gaming
- Advanced multi-media access

Drawbacks

- Trained person required for infrastructure setup
- Expensive mobile phones

4G Technology

Characteristics

→ Speed 100Mbps to 1GDps
→ Mobile web access
→ cloud computing
→ ID telephony

MAGIC ──────────→ Global mobility support
      └──────────────────────→ customised personal services
      └→ Anytime anywhere
      → mobile multimedia   └→ Integrated wireless solution

5G Technology

→ complete wireless communication with almost no

limitations

→ high supportable to hulhlh

characteristics

- high speed, high capacity
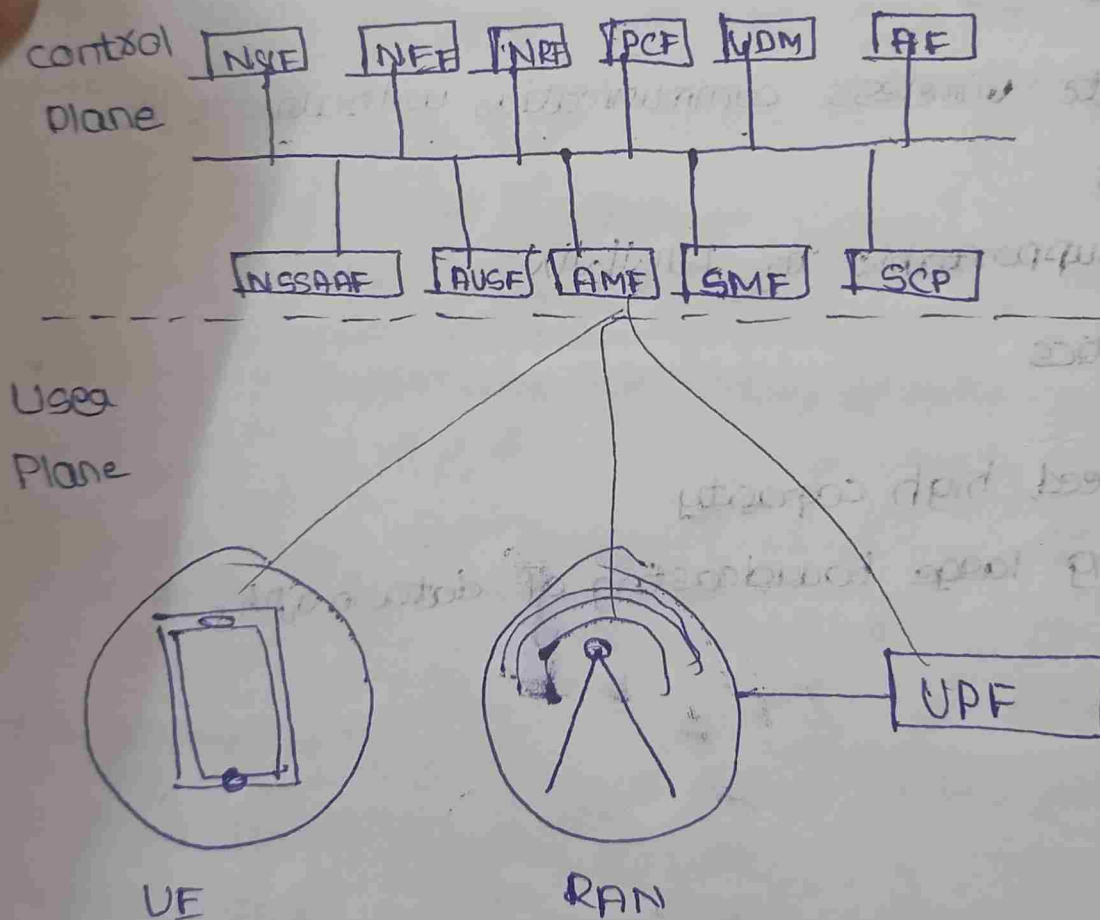- providing large broadcasting of data in Gpbs

Applications

3G
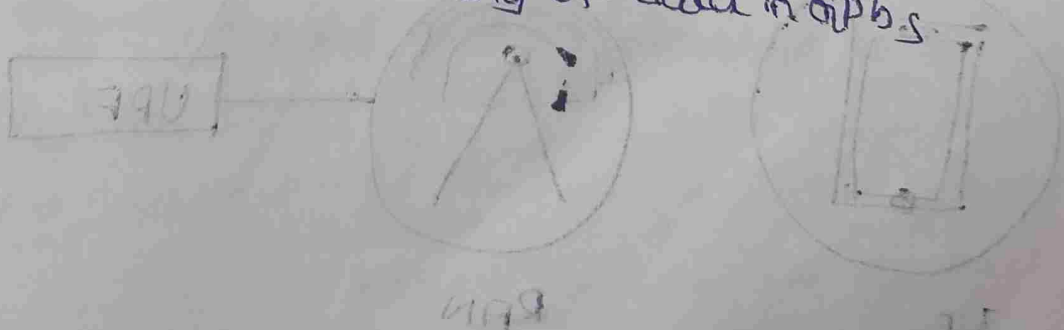
→ Vedio conferencing

→ wirless advertising

→ mobile TV

→ Location - based services

4G

→ Disaster management

→ Traffic control

→ Telemedicine

Architecture of 5G

Control Plane

| NSF | NEF | NRF | PCF | UDM | AF |

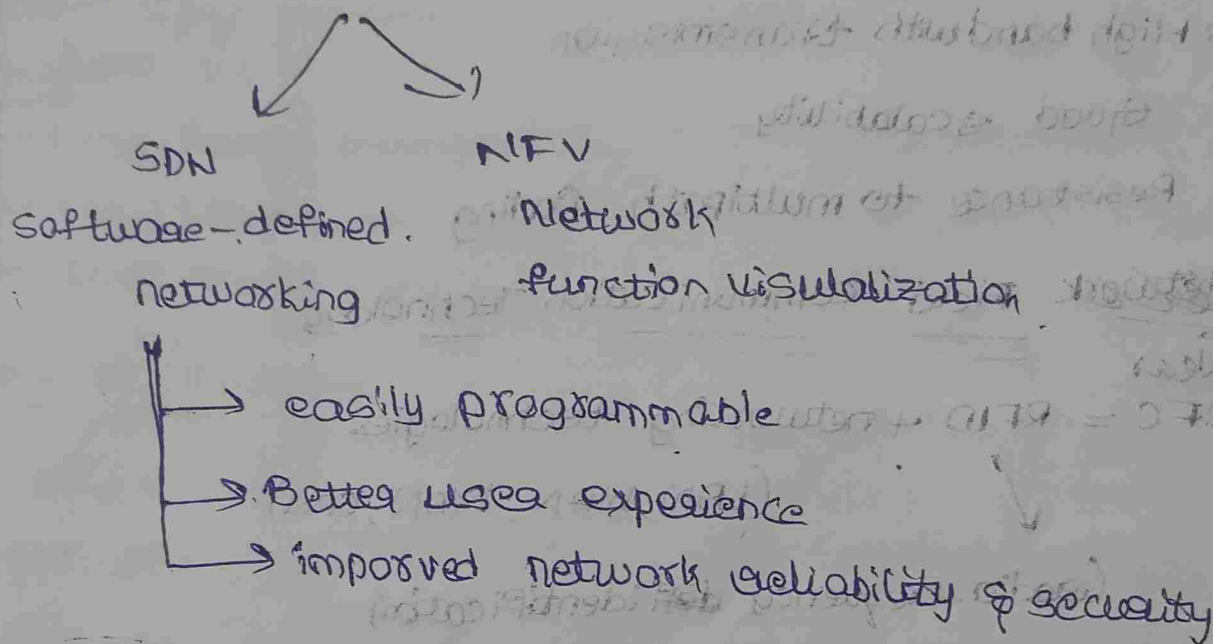| NSSAAF | AUSF | AMF | SMF | SCP |

User Plane

UE   RAN   UPF

Advantages of 5G Technology

1. supports massive number of devices
2. supports high data rate
3. provide consistent Quality of experience
4. Reduce latency b/w end-to-end devices
5. Reduce captial and operation cost

* key features of 5G Network

SDN   NFV
software-defined.   Network
networking   function visulalization

→ easily programmable
→ Better user experience
→ imporved network reliability & security

* SDN:- The physical separation b/w control plane from the forwarding plane,

Control plant-logic for controlling forwarding behaviour

Data plane:- Forward traffic according to control plane logic

* ~~ULtt~~ Ultra Wide Band Technology

→ Radio technology

→ Used for communication among low-power and low-range ~~seq~~ sensors

→ mobile devices that acquire low-power & high-bandwidth

Features
=

→ Low-Power consumption

→ High bandwith transmission

→ Good scalability

→ Resistance to multipath fading

* ~~Network~~ Field Communication Technology
  Near

NFC = RFID + networking technologies

↓   (LAN, WAN, MAN, CAN)

(radio frequency ~~dan~~ identification)

→ NFC enabled ~~customers~~ consumer devices can be used to store and exchange any type of personal data like messages

Features
=

→ Easy to use

→ zero configuration

→ Instant natural connectivity

→ smart access

applications
=

→ metro train tickets

→ Bill generation

→ UPI Payments

* Low power Wide Area Networkings [LPWAN]
→ Interconnection of devices & applications
→ Superior to bluetooth in M2M devices
→ cost effective
→ Low power consumption

Technologies

1) Sigfox
2) Weightless
3) LoRa

Features
→ Long Range communication
→ Low transmission data rate
→ Low power consumption

Network Topologies

↓ Direct device connectivity (base station)
→ Traffic sent to servers (cloud) through internet
→ Base station transfer protocol from IOT like