

What is IOT

System
→ Brain = Device

Embedded System :-

1. Embedded is a System which is a combination of hardware and software provided that both should be ~~not~~ synchronised with each other.

Hardware + Software = Constructive output

if both do not interact with each other ^{then} you will get a destructive output

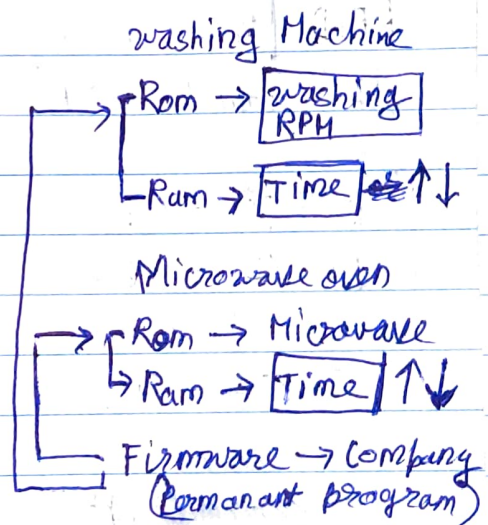
or definition

2. Embedded system is a system which is designed to perform single task at one time.

Examples of embedded system.

Washing Machine, Microwave oven, TV remote, Keyboard.

ROM	Ram
• Read only Memory • Permanent program	• Random Access Memory • Temporary Data.



Micro Controller:-

- This is chip on board which is designed to perform single task in one time. → Embedded system
- Micro processor:- is also a chip on board which is designed to perform, Multiple task at one time.

Processors Example

↳ Intel, snapdragon, AMD Ryzen 7, 8085, 8086

Micro Controller Example

↳ 8051, ~~Atmel~~ ^{ATHEL} ~~Microchip~~, ~~Micro~~ STM micro electronic

imp Sensor - Sensor is a device or a module which is designed to sense the ^{presence or absence of} physical quantity present in the environment.

Sensor is not a smart device

- > checks the physical presence or absence
- > It doesn't has the ability to take decisions.

Environment

- Humidity
- Atmospheric Pressure
- Temperature

RFID [Radio Frequency Identification]

for example DMRC Card or Metro Card.

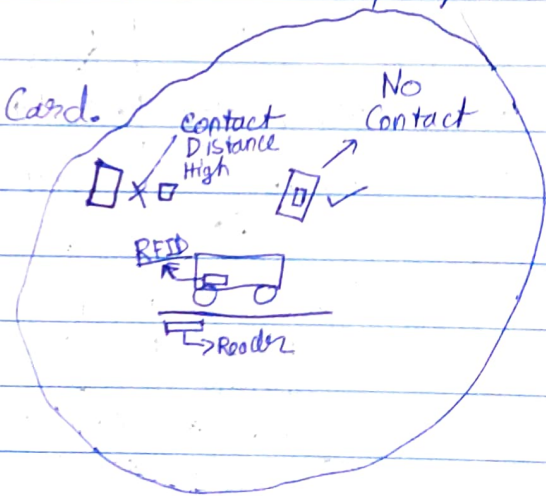
DMRC - 250 to 950 KHz

IRCTC - 865 to 867 MHz

LM85 Room temperature sensor

- Environment / physical quantity (Humidity, Atmospheric pressure, temperature)
- Efficiency
- Accuracy
- Price
- Durability,

28/03/22



BVITSD 207:INTRODUCTION TO INTERNET OF THINGS(IOT) AND ITS APPLICATIONS

Max Marks :100
Internal Assessment: 30
End Term Examination :70
Duration of Exam : 3 Hours

Unit I

Introduction to Internet of Things – applications/devices, protocols, communication model

Introduction - Overview of Internet of Things(IoT), the characteristics of devices and applications in IoT ecosystem, building blocks of IoT, Various technologies making up IoT ecosystem, IoT levels, IoT design methodology, The Physical Design/Logical Design of IoT, Functional blocks of IoT and Communication Models.

Unit II Things and Connections

Working of Controlled Systems, Real-time systems with feedback loop e.g. thermostat in refrigerator, AC, etc. Connectivity models – TCP/IP versus OSI model, different type of modes using wired and wireless methodology, The process flow of an IoT application.

Sensors, Actuators and Microcontrollers

Sensor - Measuring physical quantities in digital world e.g. light sensor, moisture sensor, temperature sensor, etc.

Actuator – moving or controlling system e.g. DC motor, different type of actuators

Controller – Role of microcontroller as gateway to interfacing sensors and actuators, microcontroller vs microprocessor, different type of microcontrollers in embedded ecosystem.

Unit III Embedded C

Embedded 'C' Language basics - Variables and Identifiers, Built-in Data Types, Arithmetic operators and Expressions, Constants and Literals, assignment. Conditional Statements and Loops - Decision making using Relational Operators, Logical Connectives - conditions, if-else statement, Loops: while loop, do while, for loop, Nested loops, Infinite loops, Switch statement. Arrays – Declaring and manipulating single dimension arrays

Functions - Standard Library of C functions in Arduino IDE, Prototype of a function: Formal parameter list, Return Type, Function call.

Unit IV Building IoT applications

Introduction to Arduino IDE – writing code in sketch, compiling-debugging, uploading the file to Arduino board, role of serial monitor.

Interfacing sensors – The working of digital versus analog pins in Arduino platform, interfacing LED, Button, Sensors-DHT, LDR, MQ135. Display the data on Liquid Crystal Display(LCD), interfacing keypad Serial communication – interfacing HC-05(Bluetooth module) Control/handle 220v AC supply – interfacing relay module.

Unit V Security and Future of IoT ecosystem

Need of security in IoT - Why Security? Privacy for IoT enabled devices- IoT security for consumer devices- Security levels, protecting IoT devices

Future IoT eco system - Need of power full core for building secure algorithms, Examples for new trends - AI, ML penetration to IoT

Name : Naman Arora
Roll : 20
Course : BCA

Application of Domain in IOT

> Manufacturing	approx	40%
> HealthCare	approx	32%
> Security	approx	8%
> Others		20%

40
32
8
80
100
80
20

Q What is IOT? Explain in Detail.

Ans The term IOT means Internet of things. It consists of Embedded system which is the communication of hardware & software and synchronised to each other to give constructive output. The examples are like microwave oven, washing machine. It is also defined to do 1 task at a time.

Features of IOT

- AI: Artificial intelligence is used to reduce human interference for example an automatic coffee machine with AI.
- Sensor: A sensor is not a smart device which is used to give two values (true/false) for any given condition.
- Connectivity: Connectivity is something which is important for transferring data. Therefore to store it in a central server.
- Analyzing: Analyzing of the data/information to bring out meaningful insights.

4 Main Components of IOT

- Low Power Embedded System: low power embedded system that consumes low power so that it can increase the utilization like a normal TV use 12V.
- Cloud Computing: Cloud computing is used to ^{store} ~~analyse~~ the data and give by multiple users on the ~~Cloud~~ and this is a digital space like google drive, github.

Availability of Big data: Big Data is collection of multiple fields of data and are then used analysing that data to give meaningful insights.

Network Connection: Network communication is very necessary as of now like there 9 billion devices that are currently connected on the internet this can grow up to 20 billion in the upcoming years.

Advantages of IOT

- > It reduces human intercession thereby reducing the chance of error.
- > It increase security using multiple ways such as mod.
- > It is more accurate than humans.
- > It increases the availability / accessibility.

Disadvantage of IOT

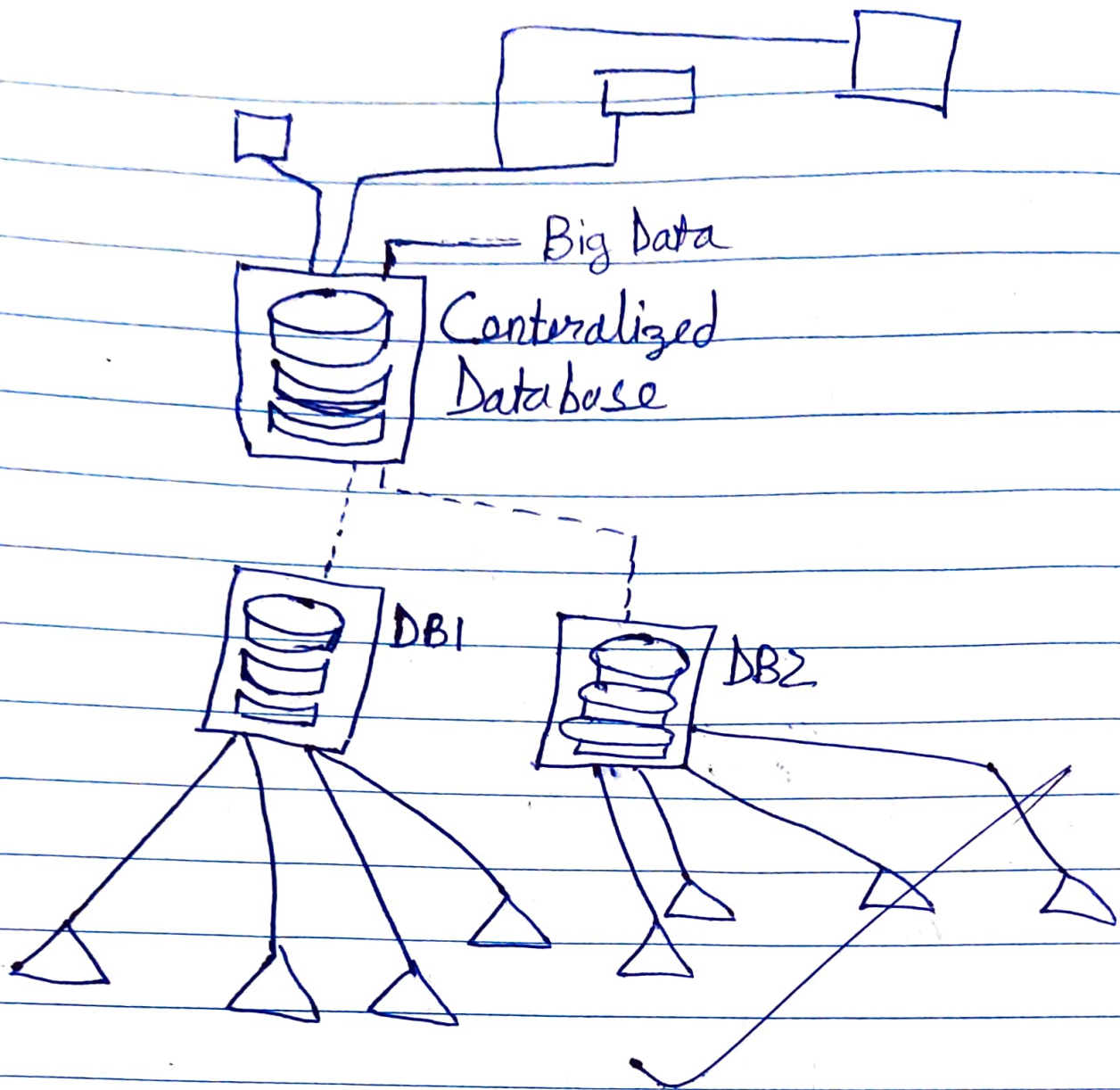
- > IOT might not be suitable for a country where the population index is high as compared to countries with a smaller population index. Therefore, Yes we can use Semi-AI stuff but using complete digitization can risk the employment rate.
- > IOT application should be serviced regularly so as to use the services for which it is implemented.

Collected
In IOT we cannot implement everything because it should give more returns as what is invested for. If its visa versa then its disadvantageous to the economy as well and even wastage of financial resources.

Things should be used in a judicious way so as to give better results.

IOT in

- Usage of Manufacturing ~ 40%
 - > in manufacturing unit robotic automation is implemented heavily by automobile sector such as BMW for cars & well as bike, Kawasaki heavy industry used it for bikes; industrial vehicles
- Usage of IOT in healthcare ~ 32%
 - > In healthcare industry now a days we have smartwatches that can give immediate alert to the doctor nearest to that location.
 - > Implementation in modules like pacemaker used for people suffering from irregular heartbeat if ~~there~~ a person with that module or implantation starts to see abnormal activity in the heart the pacemaker will immediately send the signal to the hospital from where the implantment was conducted.



~~excellent~~

Cloud :-

Top players in of the Cloud

- AWS Amazon web services
- GCP google Cloud platform
- Microsoft Azure

Main ones

→ Alibaba

→ IBM

very good data provider but just because of chinese controversies regarding data privacy and reliability problems.

⇒ Why do we need to purchase a cloud in IOT?

Ans

What is IOT what are its Components?

Q10 mark

* Imp

• 4 Main components of IOT

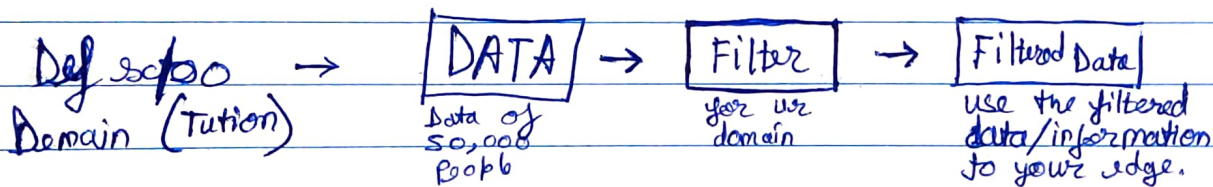
- > low power embedded system.
- > Cloud Computing
- > Availability of Big Data.
- > Network Connection.

• Characteristics of IOT

- > Reduces human interference
- > Cost
- > Accuracy
- > Global Accessibility of Data.
- > Availability.

• Features of IOT

- > AI (Artificial Intelligence). [Without human interference it uses decision making capabilities]
- > Sensor
- > Connectivity (establishment a connection between 2 points)
- > Analyzing (It requires information to predict future trends or meaningful insights.)



• Advantages of IOT

- > Efficient Resource Utilization.
- > Improved security
- > Low Power Consumption
- > Less human interaction.

⇒ 4 Level of IOT Implementation.

(3M)

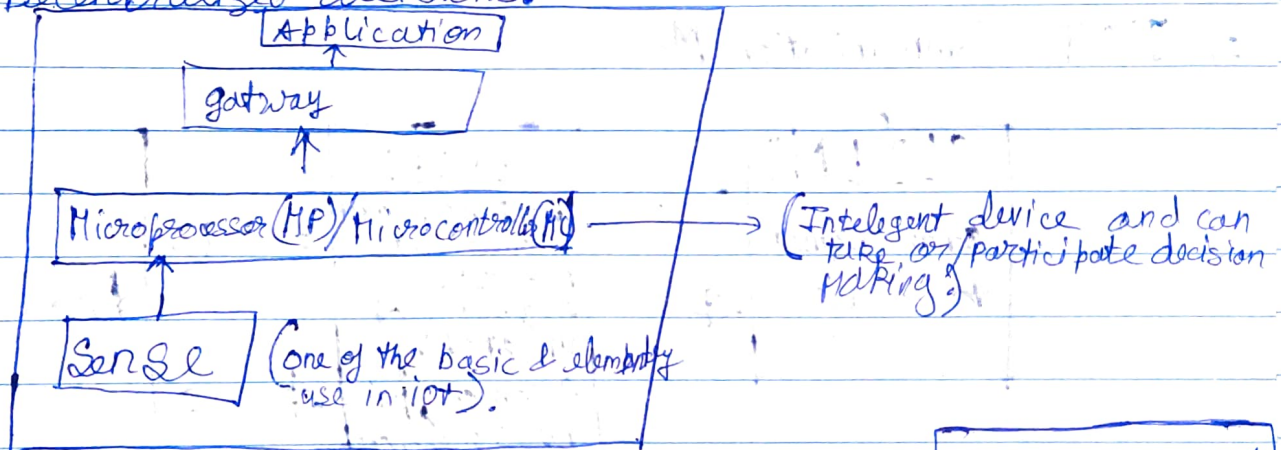
- Measurement :-
- Automation :-
- Innovation :-
- IOT all round all time :-

LM35 is a temperature sensor used in locomotive engine and passenger Car. Cuz its more vulnerable to fire/blast due to exceeding temperatures.

11/04/22

IOT Design Methodology.

1. Interoperability :-
2. Information Transparency :-
3. Technical assistance :-
4. Decentralized decisions :-



Comma Separated Value (CSV)

- Information Transparency :- (untouched, unmanipulated data).

- Technical assistance :- Analyzing the data and bring out meaning ~~data~~ data (eg there are multiple algo's for BigData ~~analysing~~ analysing)

Industry Design 4.0 -

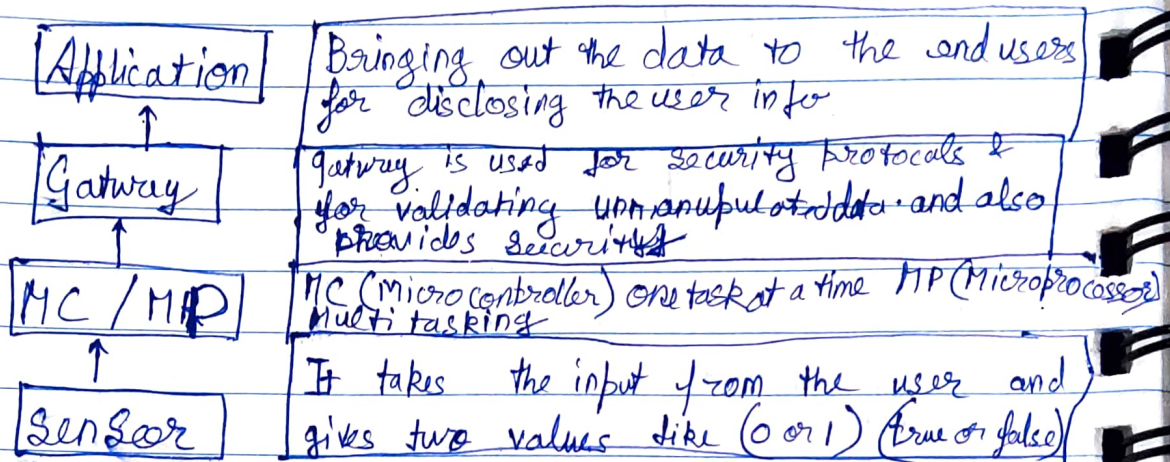
IOT ~~of~~ uses
Direct current and
hence the terminals
are to be connected
correctly & with
correct polarity

Logical Design of IOT.

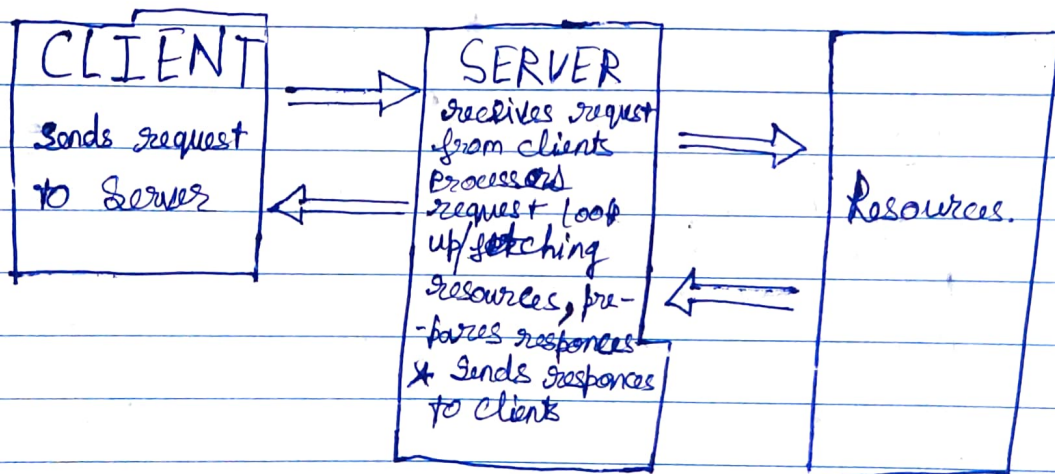
Most Imp *

- ①. IOT Functional Blocks
- ②. IOT Communication Model.
- ③. IOT Communication API's (Application Program Interface).

1. IOT Functional Block:



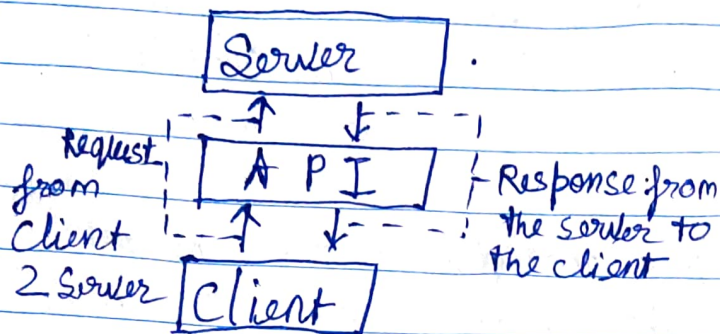
2. IOT Communication Model



REST [Representational state transfer]

imp

IOT Communication APIs (Application program Interface).



Various technologies making up IOT ecosystem.

• Iot Ecosystem components : The complete connectivity layer
The ecosystem are becoming smarter day by day and it is claimed with time we will be able to see a lot of variations in technology specifically, Internet of things (IoT). IOT is a network of smart devices, sensors & actuators that can interconnect with each other.

What are the Key Components

IOT is not just transforming connectivity among devices and objects but it is also allowing the people to get remote access easily. With so many advantages of IOT, it is interesting to see the main ecosystem components that IOT works on. Here are the main components on which IOT works on.

1. Gateway : Gate-way enables easy management of data traffic flowing between protocols & networks. On the other hand, It also translates the network protocols and makes sure that the devices & sensors are connected properly.

• It ~~also~~ can also work to preprocess the data from sensors & send them off to next level if it is configured accordingly. It is essential to be configured accordingly. It is essential to configure it as the presence of TCP/IP protocol allows easy flow.

Not only this, it gives proper encryption with the network flow & data transmission. The data flowing through it is in the higher order this protected by using latest encryption techniques. You can assume it like an extra layer between the cloud & device that filters away the attack & illegal network access.

2. Analytics :- The analog data of device & sensors are converted into a format that is easy to read and analyze. This is possible due to the IOT ecosystem that manages and helps in improving the system. The main factor that is influenced is security.

The most important function of IOT technology is that it supports real time analysis that easily observes the irregularities & prevent any loss or scam. Preventing the malicious things to attack the smart device ~~it~~ will only give you a sense of security but also it will save all your private data from being used for illegal purposes.

The big companies collect the data in bulk & analyze it to ~~to~~ see the future opportunity so that they can easily develop more business.

advancements to grow/gain something out of it. This analysis easily helps in setting future trends that have a capability to rule the market from this analysis they can be one step ahead of the time & easily achieve success. Data may be a small word but it holds the power to make or break the business if used correctly.

3. Connectivity of ~~Data~~ Devices :- The main that complete connectivity layer are sensors & devices. Sensor collect the information & sends it off to the next layers where it is being processed. With the advancement of technology semiconductor technology is used that allows the production of micro smart sensors that can be used for several application.

The main components are :

- Proximity detection.
- Humidity or Moisture levels.
- Temperature sensors & Thermostats.
- Pressure sensors.
- RFID Tags.

The modern smart sensors and devices use various ways to be connected. The wireless networks like LORAWAN, Wifi, and bluetooth makes it easy for them to stay connected. They have their own advantages and drawbacks that are classified in various forms like efficiency rate, data transfer & power.

4. Cloud :- With the help of internet of things ecosystem, Companies are able to collect bulk data from the devices & application. There are various tools that are used for the purpose of data collection that can ~~allow~~ collect, process, handle and store the data.

efficiently in real time. It is also responsible for making a tough decision that can easily break the deal. This ~~is~~ all is done by one system that is IOT cloud.

It is an intimidating high performance network that connects servers together to optimize the controlling traffic & delivering accurate data analytics result.

One of the most important components of IOT Cloud is database management that is distributed in nature. The cloud basically combines many devices, gateways, protocol, devices & a data store that can be analyzed efficiently. These systems are used by many companies in order to have improved & efficient data analysis that can help in the development of services & products in addition to this, it also helps in ~~the development~~ forming an accurate strategy that can help in building an ideal business model.

5. User Interface :- This another factor on which IOT ecosystem depends immensely. It is important for the development to create a user friendly interface that could be accessed without putting any extra efforts in it and that can help in easy interaction.

With the help of advancement, there are various interactive design that could be used easily & that can easily solve any complex query.

For example, at home people have started to use the Colourful touch panels instead of the hard controls that were used earlier. It is increasing day to day as now the touchpads are also launched that can switch on the air conditioners from a distance.

This has set out a trend for the digital generation and have managed to hype up today's competitive market. The user interface is the first thing that users pay attention to before buying a device. Even customers are oriented to buy the devices that are user friendly & less complex that could be used with wireless connectivity.

18/04/22

Various Network Model

GSM (Global system for Mobile communication)

LORAWAN:

Wifi :

Bluetooth :

Zigbee :

Radio Frequency :

Bluetooth : (BT) :-

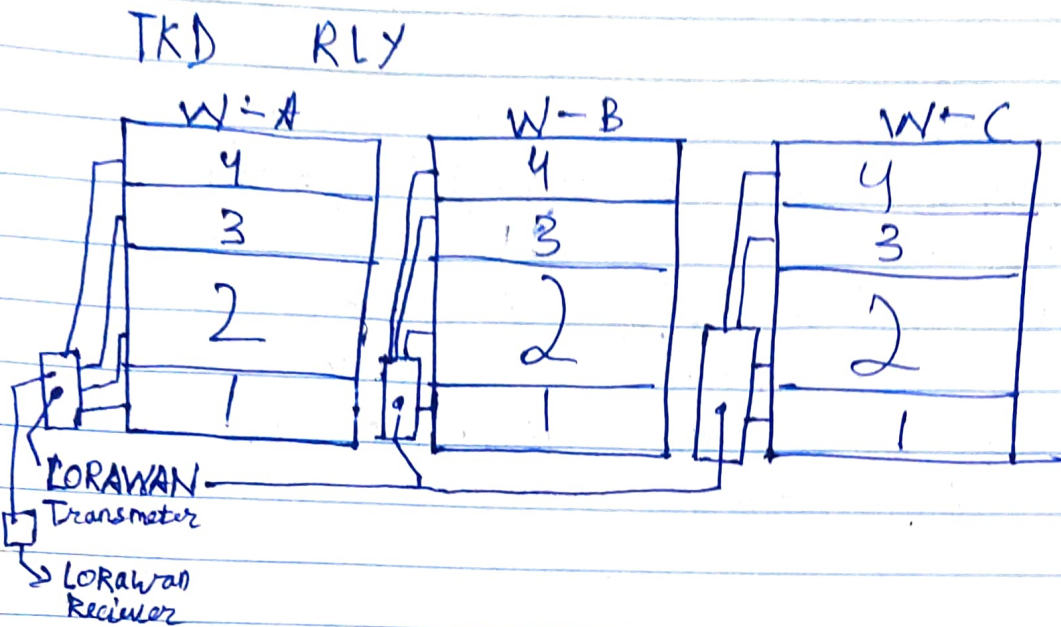
- > Frequency 2.4 GHz
- > Range 8-10 meters.
- > BT (Bluetooth) is the wireless form of communication.

Wifi : (Wireless Fidelity).

- > It is also a type of wireless form of communication.

RFID : (Radio Frequency)
> Works at 433 MHz

LORAWAN:



IMEI

[International Mobile Equipment Identification]
[used in mobile phone.]

In case your mobile phone is lost thus the police inquires regarding your IMEI

Topic : Difference between Micro Controller, Micro processor & Embedded System.

* Imp

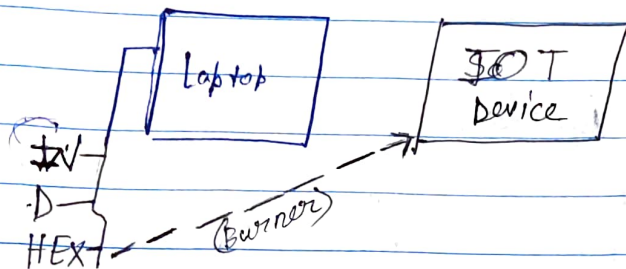
19/04/22

Software :

⇒ IDE (Integrated Development Environment).

3 task of IDE :-

- Writing of your code.
- Rectifying the error (Debugging). (error free)
- Machine File / HEX / EXE / Binary file / (.o, i)



Burner : A burner is a kind of software which is supposed to fetch the machine file from any location of your system and upload into target Hardware (Target Machine).

MC { 8051 → LED
ATMEL → LCD
Zily → Sensor } Application using Micro Controller.

Microelectronics : → Cloud.

Sensor Unit 2

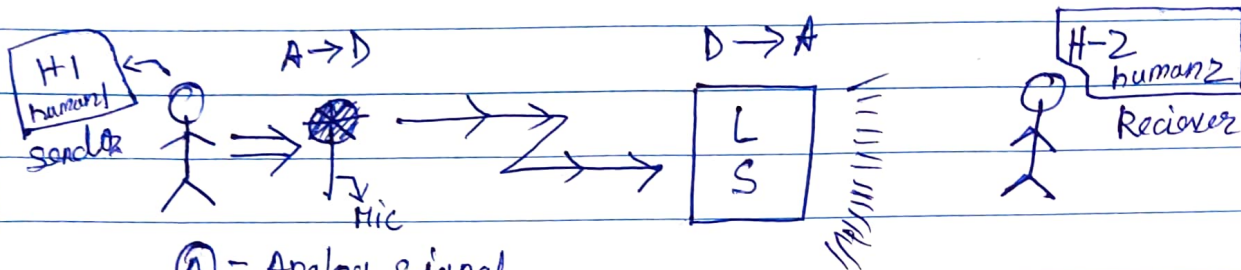
* imp

What is Sensor What are different type of Sensor and Explain it in detail

10M

⇒ Sensor is device or a module which is designed to only sense the presence or absence of any physical Quantity.

- Sensor is not smart device
- Sensor always deal with analog signals.



Ⓐ = Analog signal

Ⓓ = Digital signal