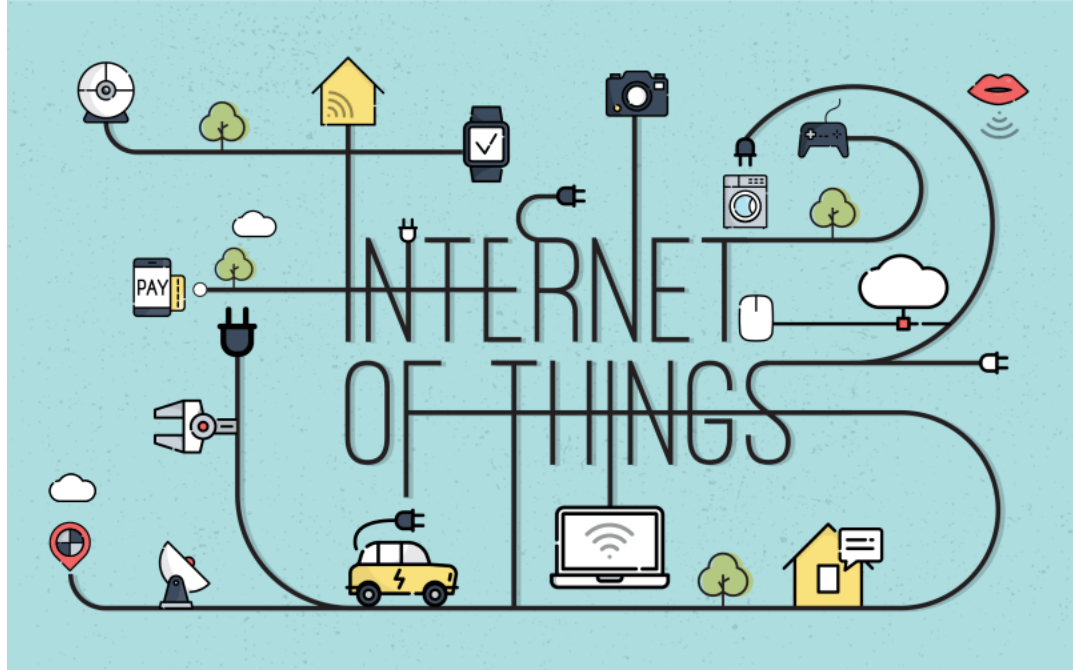


# Internet Of Things



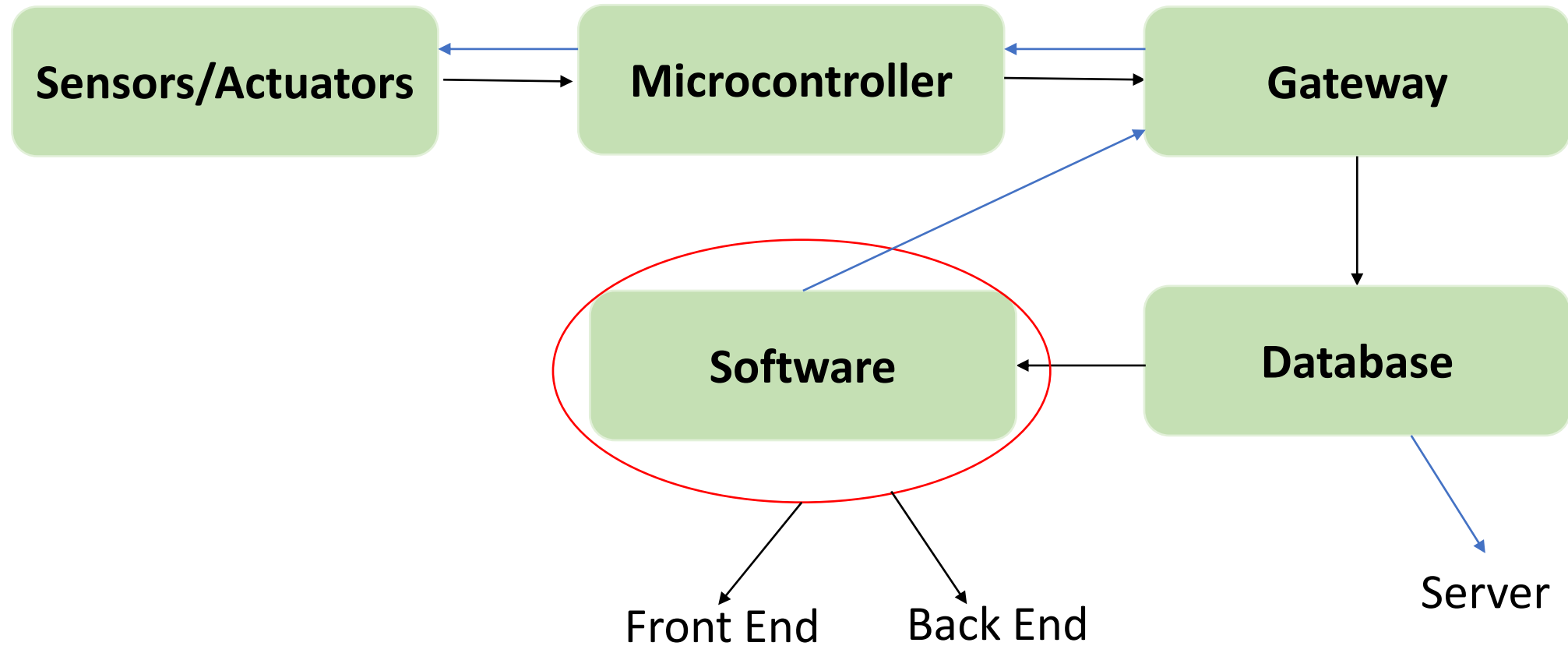
# Definition:-

- The internet of things is a network of physical devices that are interconnected together through the internet.
- The physical devices can be sensors, smart phones, cars and computers, wearable devices, industrial equipments and Home appliances.



# How IOT works?

- The Basic architecture behind the working of Internet of things are as follows :

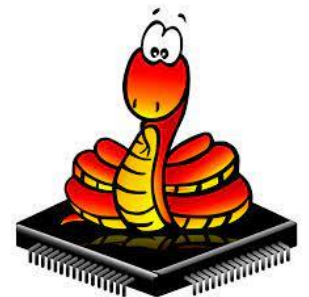
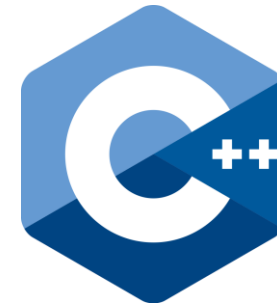


# Tech Stack for Internet of Things:

- The software stack which is used for internet of things can be broadly classified into the three main category:
  - Embedded Firmware
  - Front End
  - Back End

## 1. Embedded Firmware:

The Embedded firmware contains the language such as C or C++ which dictates the device how to function at the lowest level and the actual function of the devices. Nowadays, Python or Micro python is used.



## 2. Front End:

The Front end is a User Interface where the user interacts with data and controls what has to happen with the device through user friendly elements like range sliders, buttons and other things.

### Languages or frameworks used in Front-end:



- HTML is a language which defines the structures and contents of the webpage like forms, paragraph and inputs.

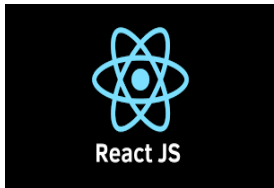


- CSS takes care of the visual effects of the webpage like fonts, colors, layouts and animations





- JavaScript is the language which is used to add interactivity and dynamism to the website such that it is very interactive.

Other Front End Framework based on the JavaScript is:



- React-js is front end framework based on JavaScript which is used to develop single page user-interfaces.

As we are dealing with the data collection we need data visualization frameworks based on the JavaScript are :

-   **plotly** D3.js and Plotly.js are opensource  
plotting Libraries

# Layman Terms:



This is HTML which provides structure of the web page like building with just bricks and pillars



The CSS is which is used to decorate the webpage and make it more attractive similar to this finished attractive house

## 2. Back End:

The Backend is particularly used to connect the database and other logical functions to the front end which is called an user interface.

### Languages or frameworks used in Back-end:

# django

- Django is a backend framework based on python which used to connect database with front-end and other logical activities of the frontend



- Express.js is a backend framework which is based on javascript to connect database with front-end and other logical activities.





Prometheus

## Database:

- Since the collection of data is in the form of time based data of sensor readings, the IIOT devices needed a database which writes and retrieves the data efficiently there comes a database called time series database. Database are tables where data is neatly structured for future use
- The Time Series Database Examples are:



# How Everything works and communicate together:

- Have you ever wondered how this everything communicate together seamlessly and securely. Does it feel a sort of magic, there comes an API(Application Programming Interface) which enables communication between microcontroller, database, frontend seamlessly.

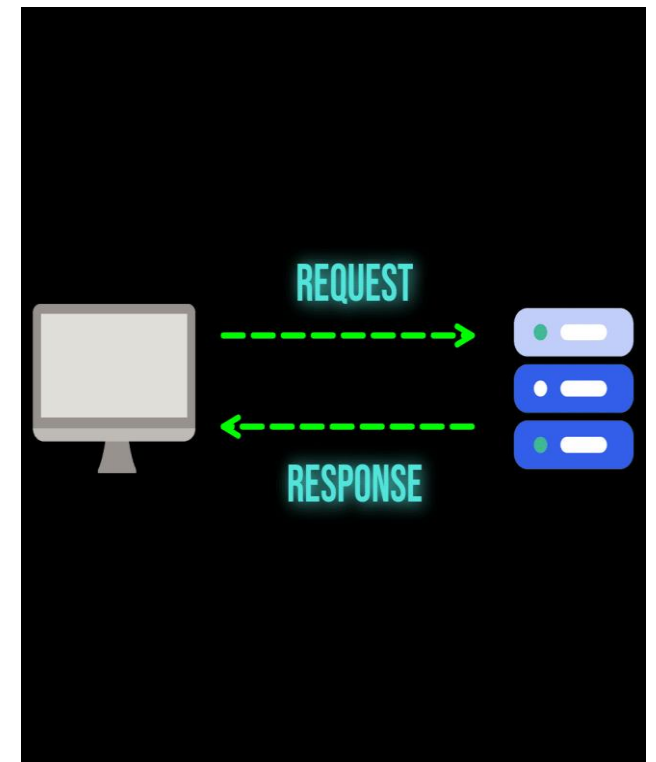


# How Web IOT works?

- Web apps communicate with a server using a protocol called Http protocol where client request something to server where it sends response back

Basically, HTTP protocol methods are mainly these 4 types:

Method	Use
GET	Asks the server to retrieve a resource.
POST	Asks the server to create a new resource.
PUT	Asks the server to edit/update an existing resource.
DELETE	Asks the server to delete a resource.



# How Device Communicate to server ?

Method	Use
Wi-Fi	Instead of a physical cord, it uses radio waves to connect your phone, laptop, tablet, or other gadget to the internet.
Bluetooth	<b>Imagine Bluetooth as a short-range walkie-talkie for your devices.</b> Instead of blasting a signal out to a wide area like Wi-Fi, Bluetooth creates a private connection between two specific devices.
Cellular	It is nothing but a mobile data which is available everywhere you go with the help of towers. The range is unlimited
Zigbee	Unlike Wi-Fi or Bluetooth which connect devices directly to a central hub (like a router), Zigbee devices can talk to each other directly, passing messages along from device to device. Imagine a chain of ants all communicating with each other to get information to the queen ant.

- The Device Communicates basically using the following methodologies to the gateway or server using following communications:



## Advantages of IOT:

- Remote monitoring of the device and controlling of the device
- Collection of data remotely and critical system alerts from hazardous or critical areas.
- This increase productivity by eliminating the manual entering of data from the system such as pressure gauge, temperature gauge and humidity gauge.etc.
- The vast data collected by IoT devices provides valuable insights that can inform better decision-making. Businesses can analyze this data to understand customer behavior, optimize processes, and identify new opportunities.
- IoT can promote environmental sustainability. Smart grids can optimize energy use, leak detection systems can minimize resource waste, and precision agriculture techniques enabled by IoT can reduce water consumption

# Application of IOT in Oil and Gas:

- Remote monitoring of Oil and gas rigs whether it is in working condition or down, detection of Oil Leaks there by reducing or optimizing such that down time is less
- Predictive Maintenance there by reducing the cost in the terms by eliminating the industry standard preventive maintenance method and keeping the equipment health intact.
- Collecting equipment data for machine learning models such that it can correctly predict the outcomes using supervised learning outcome.
- Collection of process parameters while processing Oil and Gas inside pressure vessels and other process parameters.
- It can used to collect environmental data like emissions, flare stacks and other data to comply with the regulations of industry

# Free Resource Links to learn IOT

## Software Stack :

Language	Resource Link
HTML & CSS	<a href="https://youtu.be/a_iQb1lnAEQ?si=rnfqdJkag--bpVqo">https://youtu.be/a_iQb1lnAEQ?si=rnfqdJkag--bpVqo</a>
Full Stack Web Development	<a href="https://youtu.be/nu_pCVPKzTk?si=mNnsPEEUyQJeEzHe">https://youtu.be/nu_pCVPKzTk?si=mNnsPEEUyQJeEzHe</a>
Embedded Software	<a href="https://www.freecodecamp.org/news/arduino-for-everybody/#:~:text=The%20course%20covers%20the%20basics,to%20no%20experience%20in%20electronics.">https://www.freecodecamp.org/news/arduino-for-everybody/#:~:text=The%20course%20covers%20the%20basics,to%20no%20experience%20in%20electronics.</a>
React JS	<a href="https://react.dev/">https://react.dev/</a>
Plotly JS	<a href="https://plotly.com/javascript/">https://plotly.com/javascript/</a>