Visvesvaraya Technological University, Belagavi.

PROJECT REPORT

on

"AUTONOMOUS MOBILE RESCUE ROBOT IN FLOOD ZONE"

Project Report submitted in partial fulfillment of the requirement for the award of the degree of
Bachelor of Engineering
in
Electronics and Communication Engineering
For the academic year 2019-20

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CERTIFICATE

This is to Certify that the dissertation work **"Autonomous Mobile Rescue Robot In Flood Zone"** carried out by Abhishek CM , Jagadish R, Lavanya V, Raghavendra M, 1CR17EC400,1CR17EC409,1CR17EC412,1CR17EC424,bonafide students of **CMRIT** in partial fulfillment for the award of **Bachelor of Engineering** in **Electronics and Communication Engineering** of the **Visvesvaraya Technological University, Belagavi,** during the academic year **2019-20**. It is certified that all corrections/suggestions indicated for internal assessment have been incorporated in the report deposited in the departmental library. The project report has been approved as it satisfies the academic requirements in respect of Project work prescribed for the said degree.

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AUTONOMOUS MOBILE RESCUE ROBOT IN DISASTER ZONES

Abstract

Robotics has become a rapidly growing science that will enter the life of all classes of people in a few years. That is why we have tried to work in this field. The project that we are going to describe here is a robotic rescue team that uses its designed systems and utilized detection methods to help people and help rescuers to accurately detect victims when natural disasters such as floods and earthquakes occur. However, in addition to the functions listed, this robotic team can help in the identification of historic centers, help to protect the environment, be useful in mapping, and help the traffic police. The technologies used in this project can be implemented in various industrial fields, specially the virtual reality technology for communicating with the environment and better control that greatly expand the functionality of such robots. In this rescue team, a ground rescue robot functions as the main commander, an aerial rescue robot is used for more accurate identification and air support, and an automatic control ground robot is used for speeding up the operations. The three robots each have their own unique function and are linked together through a ground control center.

INTRODUCTION

Today, with the advancement of technology and the emergence of new sciences, the needs of humankind have changed. Robotics is one of the sciences responding to such needs. It has made great progress and moved from fiction to reality and has largely entered people's lives, so that today many companies and individuals are trying to be a pioneer in this new scientific and technological field and present new ideas and designs. We have been working for some time to present new, different, useful and high-quality designs in this branch of science. The design that we will be describing briefly in this article took a few years to be completed. We have carried out several tests and encountered numerous problems in various stages of the project. But now, the issues have been addressed and yet we have a long way ahead. The design that is explained here is a robotic rescue team equipped with top detection, communication and control systems. The design has specific features that distinguish it from similar projects in this area. These features are described and reviewed in this article. Briefly speaking, the robotic rescue team is a team consisting of a remote control rescue robot, an aerial rescue robot, and an automatic robot.

Thanks to the new communication and control technologies, the team identifies

and rescues the victims of disasters such as floods, earthquakes and other natural disasters and can be useful in the exploration of historical sites and identify the places where humans cannot enter for any reason. It should be mentioned that the technologies used in this design can be utilized in other robots, particularly industrial robots, in other dimensions and scales

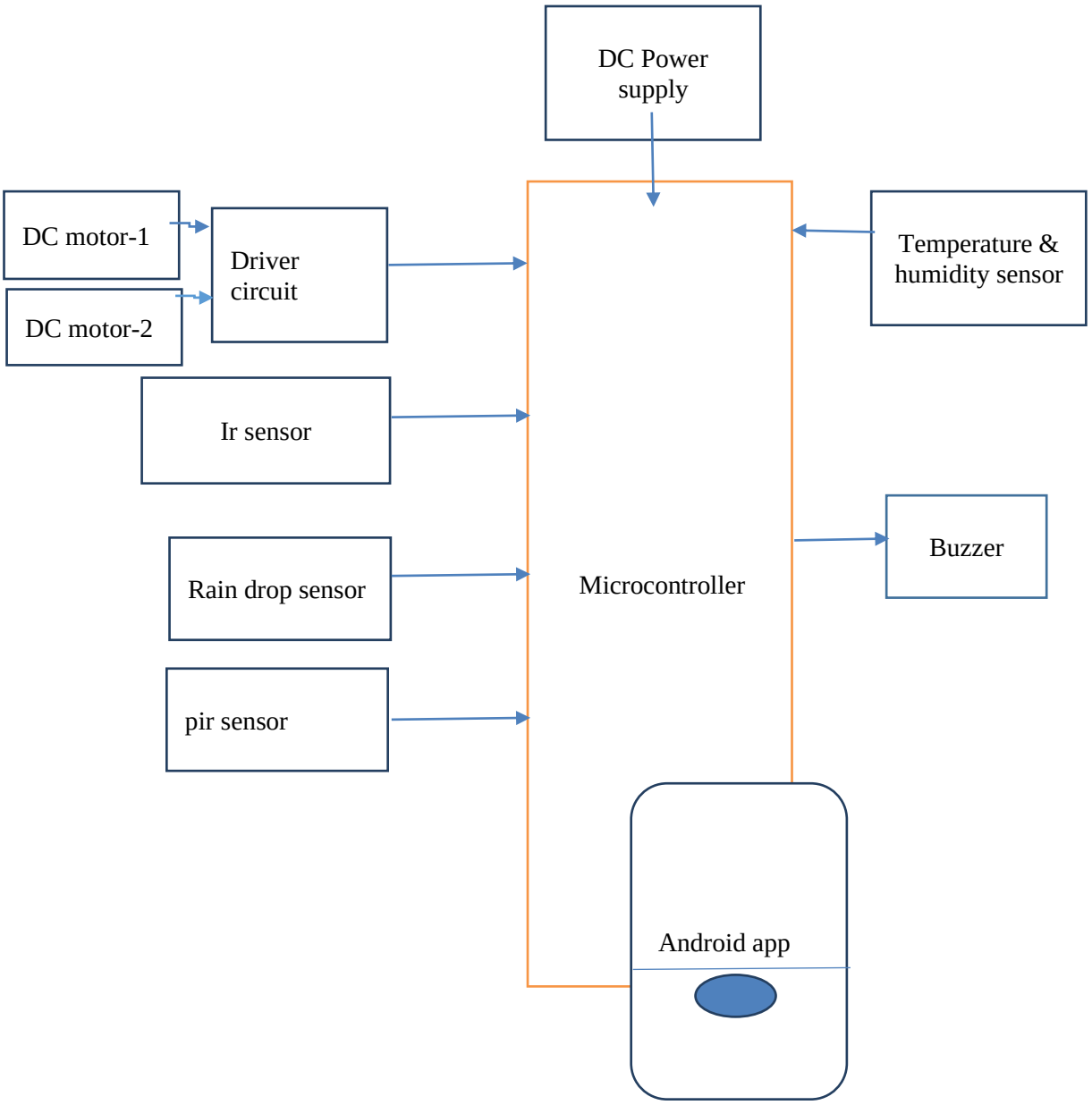
The design is described in four sections as follows:

2. Electronics section, including the control circuit design, startup circuits, power supplies, and the sensors used in the rescue team. This section consists of several parts.
3. Software section, which discusses the control interfaces, software systems, and data control, analysis and transfer.
4. Communication system, which is an important part and deals with the data management and transmission hardware and software

OBJECTIVE

1.Basic objective is usually used to survey and locate the victims of the disasters. They take the places of human who are sent to the risky area for finding the victims and providing the first aid.
2.Designed systems and utilized detection methods to help people and help rescuers to accurately detect victims when natural disasters such as floods and earthquakes occur.
3.Natural disasters and can be useful in the exploration of historical sites and identify the places where humans cannot enter for any reason

SYSTEM ARCHITECTURE



METHODOLOGY

This system consists of transmitter and receiver unit. Furthermore transmitter unit consist of rotational unit which has a specific set of sensors mount on it and a microcontroller. Receiver unit consist of android phone which gets alert notification will generates when ir sensor detects motion of human being and buzzer gets a beep and there is also an the pir sensor, rain drop sensor used to check rain.

COMPONENTS REQUIREMENT

Hardware components

1.Microcontroller
2.DC motor
3.Driver circuit
4.power supply
5.buzzer
6.ir sensor

Software requirements

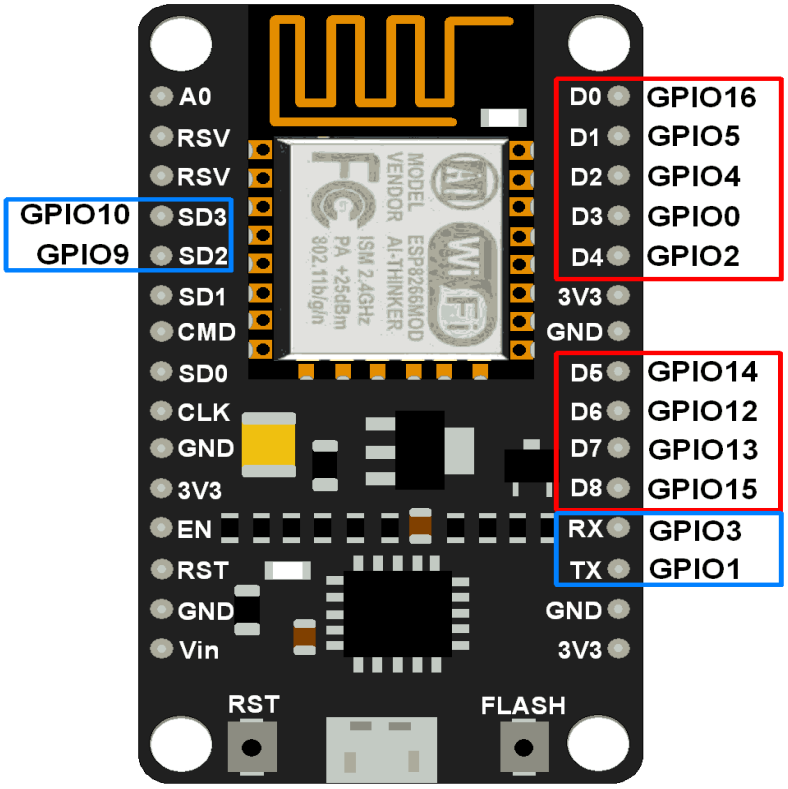
1.Embedded C
2.Arduino IDE

NodeMCU GPIO with Arduino IDE

Introduction

General-purpose input/output (GPIO) is a pin on an IC (Integrated Circuit). It can be either input pin or output pin, whose behavior can be controlled at the run time.

NodeMCU Development kit provides access to these GPIOs of ESP8266. The only thing to take care is that NodeMCUDev kit pins are numbered differently than internal GPIO notations of ESP8266 as shown in below figure and table. For example, the D0 pin on the NodeMCUDev kit is mapped to the internal GPIO pin 16 of ESP8266.



NodeMCUDevKit GPIOs

Below table gives NodeMCUDev Kit IO pins and ESP8266 internal GPIO pins mapping,

Pin Names on NodeMCU Development Kit	ESP8266 Internal GPIO Pin number
D0	GPIO16
D1	GPIO5
D2	GPIO4
D3	GPIO0
D4	GPIO2
D5	GPIO14
D6	GPIO12
D7	GPIO13
D8	GPIO15

Pin Names on NodeMCU Development Kit	ESP8266 Internal GPIO Pin number
D9/RX	GPIO3
D10/TX	GPIO1
D11/SD2	GPIO9
D12/SD3	GPIO10

The GPIO's shown in blue box (1, 3, 9, 10) are mostly not used for GPIO purpose on Dev Kit

ESP8266 is a system on a chip (SoC) design with components like the processor chip. The processor has around 16 GPIO lines, some of which are used internally to interface with other components of the SoC, like flash memory.

Since several lines are used internally within the ESP8266 SoC, we have about 11 GPIO pins remaining for GPIO purpose.

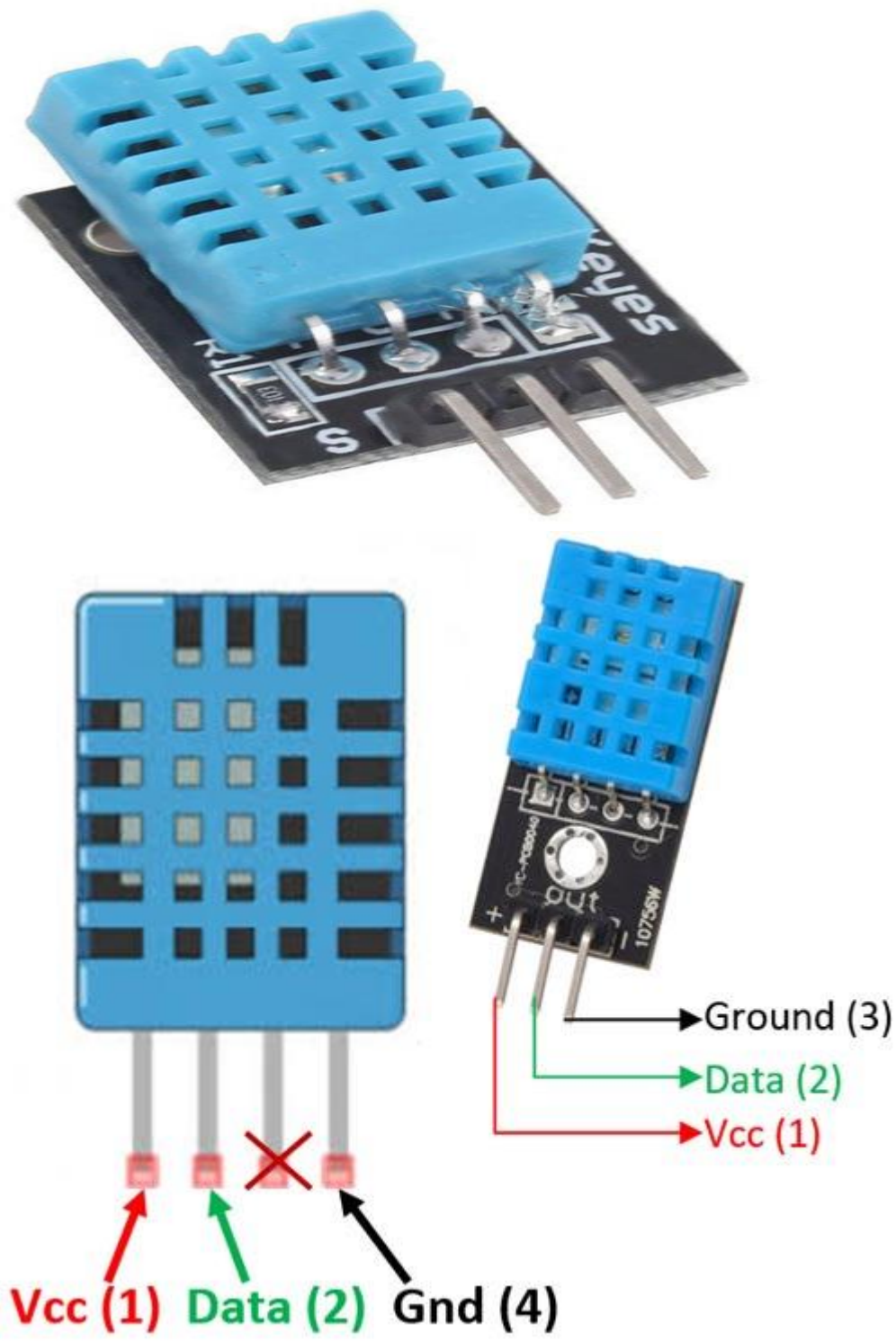
Now again 2 pins out of 11 are generally reserved for RX and TX in order to communicate with a host PC from which compiled object code is downloaded.

Hence finally, this leaves just 9 general purpose I/O pins i.e. D0 to D8.

As shown in above figure of NodeMCUDev Kit. We can see RX, TX, SD2, SD3 pins are not mostly used as GPIOs since they are used for other internal process. But we can try with SD3 (D12) pin which mostly like to respond for GPIO/PWM/interrupt like functions.

Note that D0/GPIO16 pin can be only used as GPIO read/write, no special functions are supported on it.

DHT11–Temperature and Humidity Sensor



DHT11–Temperature and Humidity Sensor
DHT11 Sensor Pinout

Pin Identification and Configuration:

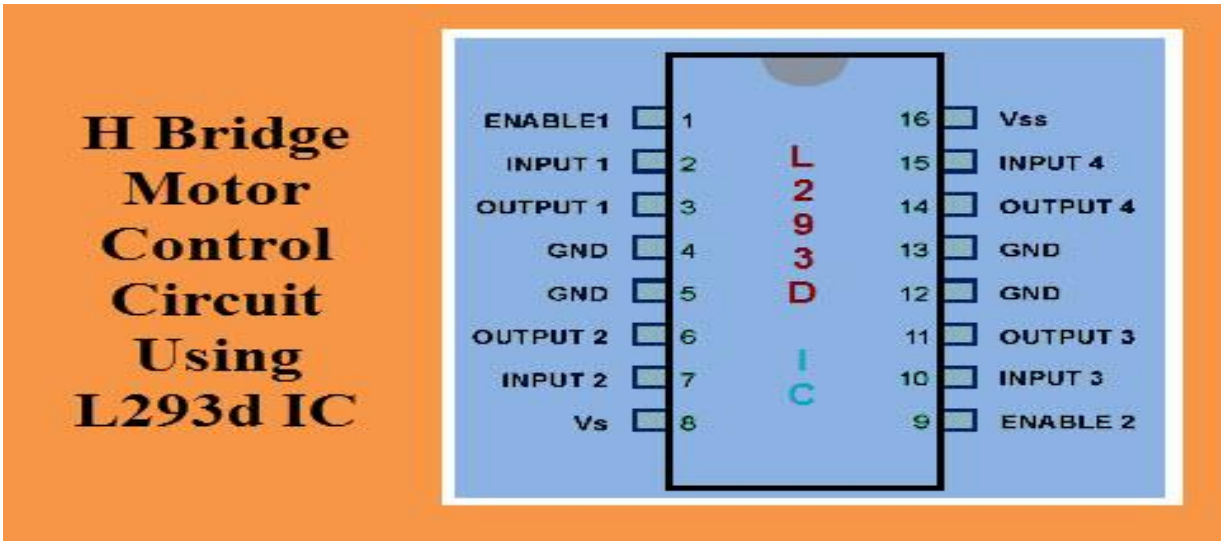
No:	Pin Name	Description
For Sensor		
1	Vcc	Power supply 3.5V to 5.5V
2	Data	Outputs both Temperature and Humidity through serial Data
3	NC	No Connection and hence not used
4	Ground	Connected to the ground of the circuit
For module		
1	Vcc	Power supply 3.5V to 5.5V
2	Data	Outputs both Temperature and Humidity through serial Data
3	Ground	Connected to the ground of the circuit

DHT11 Specifications:

- Operating Voltage: 3.5V to 5.5V
- Operating current: 0.3mA (measuring) 60uA (standby)
- Output: Serial data
- Temperature Range: 0°C to 50°C
- Humidity Range: 20% to 90%
- Resolution: Temperature and Humidity both are 16-bit
- Accuracy: ±1°C and ±1%

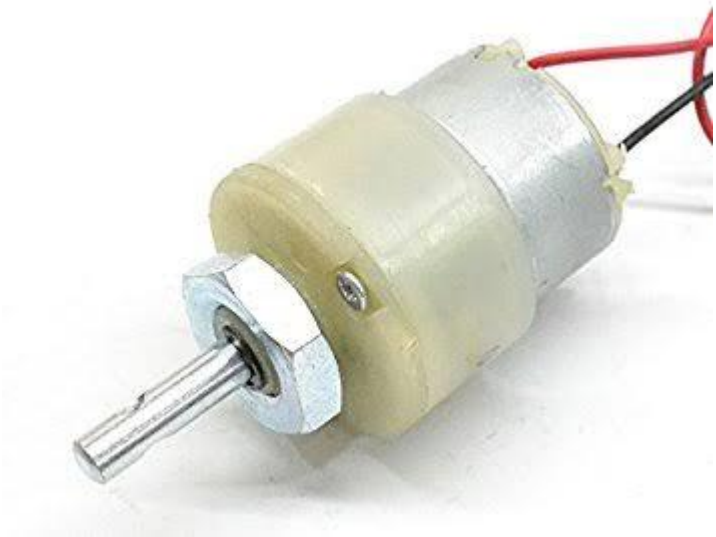
H-Bridge Motor Control Circuit Using L293d Motor Driver

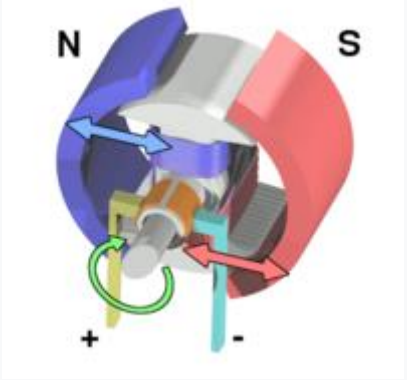
Common DC gear head motors need current above 250mA. There are many integrated circuits like ATmega16 Microcontroller, 555 timer IC. But, IC 74 series cannot supply this amount of current. When the motor is directly connected to the o/p of the above ICs then, they might damaged. To overcome this problem, a motor control circuit is required, which can act as a bridge between the above motors and ICs (integrated circuits). There are various ways of making H-bridge motor control circuit such as using transistor, relays and using L293D/L298.



H Bridge Motor Control Circuit Using L293d IC

DC motor





Workings of a brushed electric motor with a two-pole rotor (armature) and permanent magnet stator. "N" and "S" designate polarities on the inside axis faces of the magnets; the outside faces have opposite polarities. The + and - signs show where the DC current is applied to the commutator which supplies current to the armature coils.

A **DC motor** is any of a class of rotary electrical machines that converts direct current electrical energy into mechanical energy. The most common types rely on the forces produced by magnetic fields. Nearly all types of DC motors have some internal mechanism, either electromechanical or electronic, to periodically change the direction of current flow in part of the motor.

DC motors were the first form of motor widely used, as they could be powered from existing direct-current lighting power distribution systems. A DC motor's

speed can be controlled over a wide range, using either a variable supply voltage or by changing the strength of current in its field windings. Small DC motors are used in tools, toys, and appliances. The universal motor can operate on direct current but is a lightweight brushed motor used for portable power tools and appliances. Larger DC motors are currently used in propulsion of electric vehicles, elevator and hoists, and in drives for steel rolling mills. The advent of power electronics has made replacement of DC motors with AC motors possible in many applications.

Electromechanical Relay Construction with Working

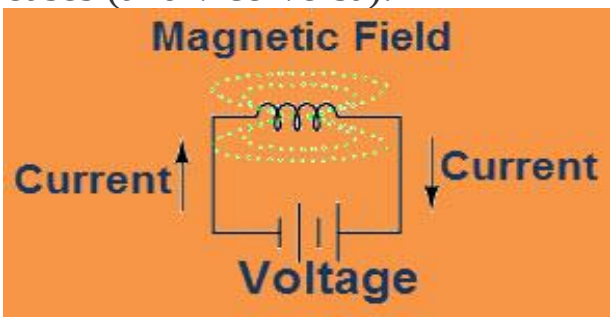
The electrical and electronics circuits are usually operated over a wide range of voltage, current, and power ratings. For every circuit or equipment or electrical network or power system protection system is desired to avoid the breakdown or temporary or permanent damage. Such that, equipments or circuits used for protecting are called as protecting equipment or circuit. In case of a small amount of voltage ratings, protection of the circuit depends on the cost of the original circuit to be protected and cost of the protection system essential to protect the circuit. But, in case of high cost circuits or equipments, it is desired to adopt a protection system or protection circuit and controlling device or controlling circuit to avoid economical loss and damage. Electromechanical Relay

Relay

The relay is an electromechanical switch used as a protecting device and also as a controlling device for various circuits, equipments, and electrical networks in a power system. The electromechanical relay can be defined as an electrically operated switch that completes or interrupts a circuit by physical movement of electrical contacts into contact with each other.

Electromechanical Relay Construction

The flow of current through an electrical conductor causes a magnetic field at right angles to the current flow direction. If this conductor is wrapped to form a coil, then the magnetic field produced gets oriented along the length of the coil. If the current flowing through the conductor increases, then the magnetic field strength also increases (and vice-versa).



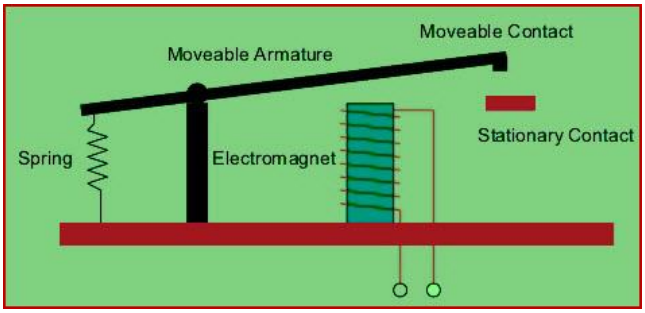
Electromechanical Relay Coil – Magnetic Field

The magnetic field produced by passing current through coil can be used for various purposes such as inductors, construction of transformer using two inductor coils with an iron core. But, in electromechanical relay construction the magnetic field produced in coil is used to exert mechanical force on magnetic objects. This is similar to permanent magnets used to attract magnetic objects, but here the magnetic field can be turned on or off by regulating current flow through the coil. Thus, we can say that the electromechanical relay operation is dependent on the current flowing through the coil.

Electromechanical Relay Working

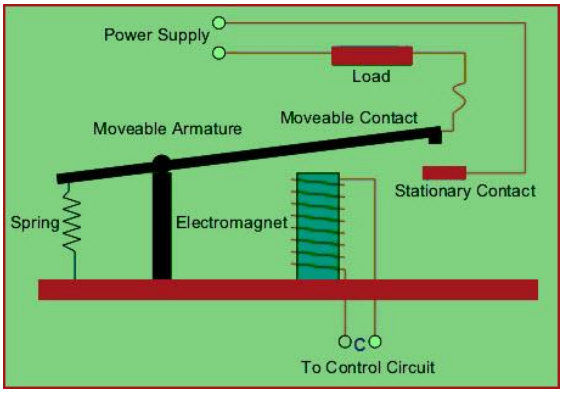
The electromechanical relay consists of various parts such as movable armature, movable contact & stationary contact or fixed contact, spring, electromagnet

(coil), the wire wrapped as coil with its terminals represented as 'C' which are connected as shown in the below figure to form electromechanical relay.



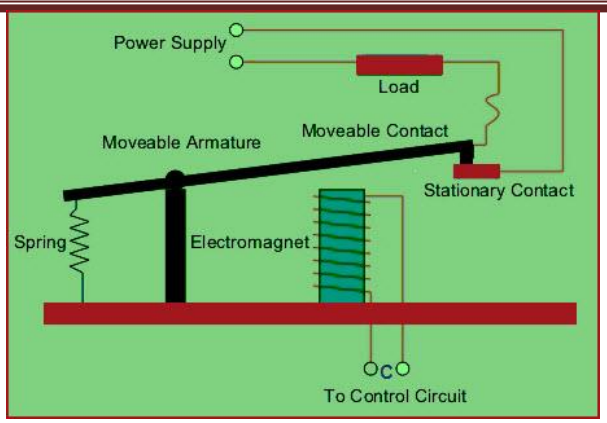
Electromechanical Relay Construction

If there is no supply given to the coil terminals, then the relay remains in the off condition as shown in the below figure and the load connected to relay also remains turned off as no power supply is given to load.



Electromechanical Relay Working (OFF condition)

If the relay coil is energized by giving supply to the coil terminals at 'C', then the movable contact of the relay is attracted towards the fixed contact. Thus, the relay turns on and the supply is connected to the load as shown in the below figure.

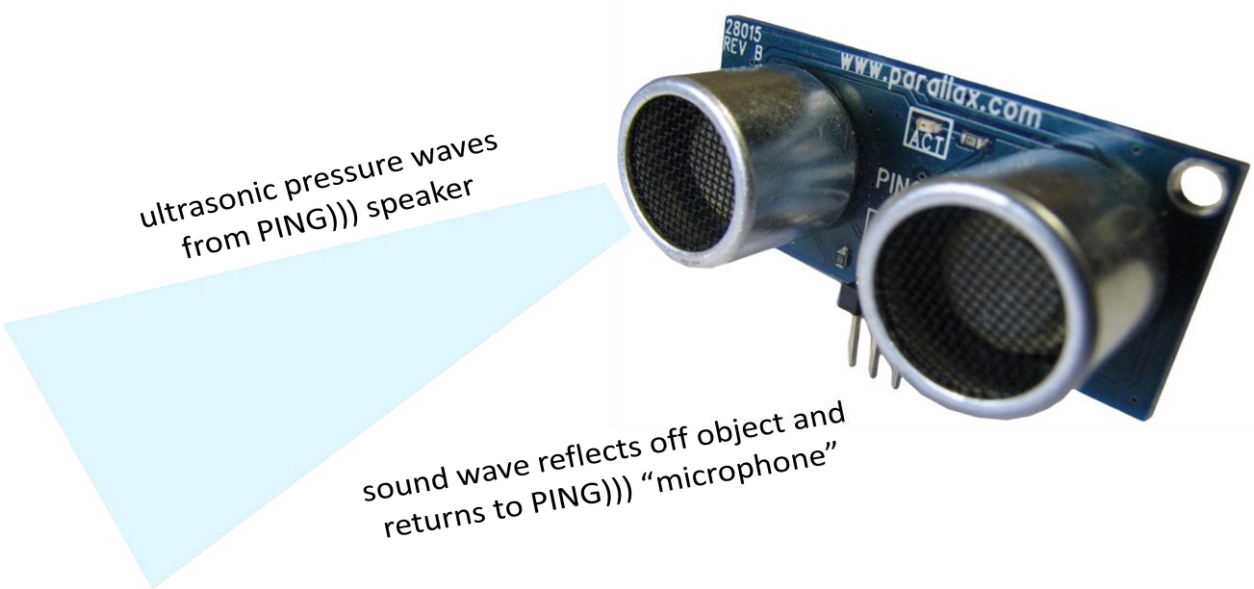


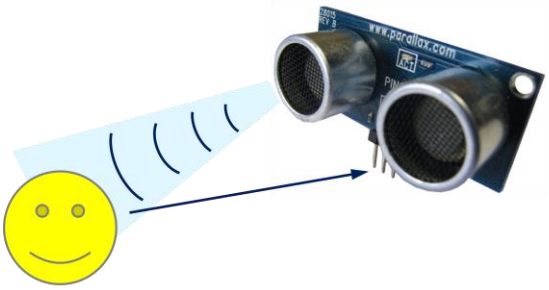
Electromechanical Relay Working (ON condition)

There are various types of relays, the relays which are energized by electrical supply and performs a mechanical action (on or off) to make or break a circuit are called as electromechanical relays. There are various types of relays such as Buchholz relay, latching relay, polarized relay, mercury relay, solid state relay, polarized relay, vacuum relay, and so on.

ULTRASONIC SENSOR

The PING))) sensor emits short bursts of sound and listens for this sound to echo off of nearby objects. The frequency of the sound is too high for humans to hear (it is ultrasonic). The PING))) sensor measures the time of flight of the sound burst. A user then computes the distance to an object using this time of flight and the speed of sound (1,126 ft/s).





Computing Distance

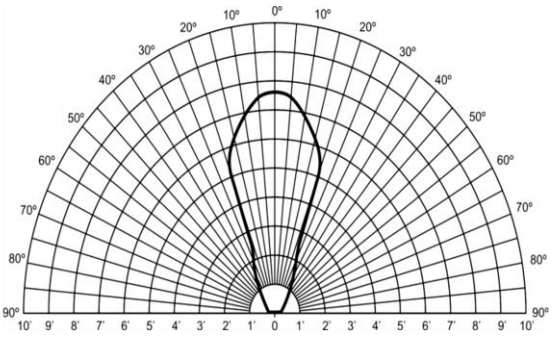
The PING))) measures the time required for the burst of sound to travel to the target and then back to the PING))). The speed of sound is 1,126 $\frac{ft}{s}$ in dry air at 68°F, which means that sound can travel 1 inch in 74 ms:

$$speed\ of\ sound = 1{,}126\ \frac{ft}{s} \cdot \frac{12\ in}{ft} \cdot \frac{s}{1{,}000{,}000\ \mu s} = \frac{1\ in}{74\ \mu s}$$

Since the sound wave must travel out to the target and back again, a factor of 2 must be incorporated into distance calculations. If a variable "duration" records the time of flight of the sound wave, then the distance to the target in inches is computed as follows:

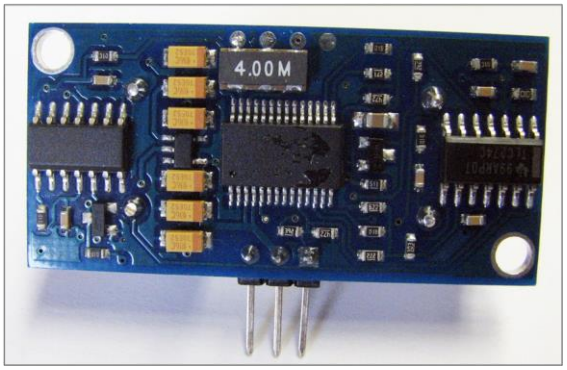
$$inches = duration\ (\mu s) \cdot \frac{round\ trip}{2\ one\ way\ trips} \cdot \frac{1\ in}{74\ \mu s}$$

2



Specifications

- measurement range: 0.8 in to 120 inches
- supply voltage: 5V
- supply current: 30mA



- The Arduino triggers the PING))) by sending a 5ms pulse to the sensor through pin 7, which is initially configured as an Arduino OUTPUT.
- Immediately after sending this pulse, pin 7 is switched to an INPUT.
- When the PING))) receives the 5ms pulse from the Arduino, it sends a 40kHz (ultrasonic) burst of sound out its "speaker" and sets pin 7 to HIGH.
- The PING))) then waits for the sound burst to reflect off of something and return to the "microphone" where it is detected; the PING))) then sets pin 7 to LOW.
- The Arduino uses the pulseIn command to measure the time of flight of the sound wave in microseconds (the time that pin 7, when configured as an input, is HIGH).
- The "time of flight" of the sound wave in ms is stored in the variable "duration."

RAIN DROP SENSOR

Description

The rain sensor module is an easy tool for rain detection. It can be used as a switch when raindrop falls through the raining board and also for measuring rainfall intensity. The module features, a rain board and the control board that is separate for more convenience, power indicator LED and an adjustable sensitivity though a potentiometer.
The analog output is used in detection of drops in the amount of rainfall. Connected to 5V power supply, the LED will turn on when induction board has no rain drop, and DO output is high. When dropping a little amount water, DO output is low, the

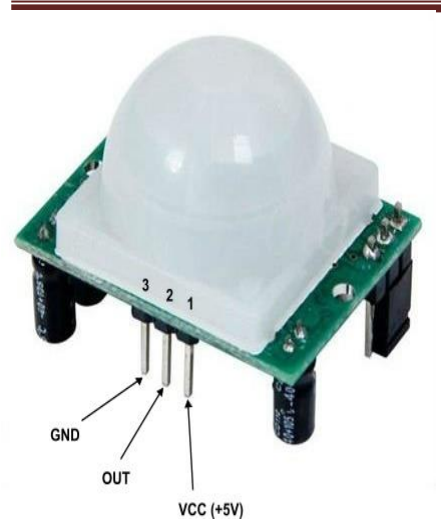
Specifications

- Adopts high quality of RF-04 double sided material.
- Area: 5cm x 4cm nickel plate on side,
- Anti-oxidation, anti-conductivity, with long use time;
- Comparator output signal clean waveform is good, driving ability, over 15mA;
- Potentiometer adjust the sensitivity;
- Working voltage 5V;
- Output format: Digital switching output (0 and 1) and analog voltage output AO;
- With bolt holes for easy installation;
- Small board PCB size: 3.2cm x 1.4cm;
- Uses a wide voltage LM393 comparator

Pin Configuration

1. VCC: 5V DC
2. GND: ground
3. DO: high/low output
4. AO: analog output

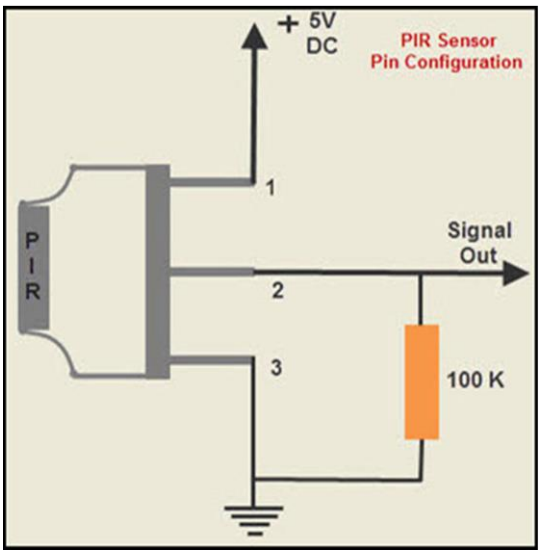
PIR SENSOR



The PIR sensor used to detect the movement of human being within a certain range of the sensor is called as PIR sensor or passive infrared sensor (approximately have an average value of 10m, but 5m to 12m is the actual detection range of the sensor). Fundamentally, pyroelectric sensors that detect the levels of infrared radiation are used to make PIR sensors. There are different types of sensor and here let us discuss about PIR sensor with dome shaped Fresnel lens.

The PIR sensor circuit is used in numerous electronics projects which are used to discover a human being entering or leaving the particular area or room. These passive infrared sensors are flat control, consists of a wide range of lens, and PIR sensors can be easily interfaced with electronics circuits.

The PIR sensor circuit consists of three pins, power supply pin, output signal pin, and ground pin. The PIR sensor circuit is having ceramic substrate and filter window as shown in the figure and also having dome like structure called as Fresnel lens.



The pin configuration of the PIR sensor is shown in the figure.
PIR sensor consists of three pins, ground, signal, and power at the side or bottom.
Generally, the PIR sensor power is up to 5V, but, the large size PIR modules operate a relay instead of direct output.
It is very simple and easy to interface the sensor with a microcontroller.
The output of the PIR is (usually digital output) either low or high.

ADVANTAGES

1.Rescue robots save peoples lives on any platform, They are stronger to carry more people in a single run to save lives,
2. Rescue robots are used to search for victims & survivors, They are very suitable to be used in disaster scenarios, Disasters rescue robots are sent into the rubble to look for survivors & bodies, If the robots have trouble during working in the rubble, Engineers and scientists will try to change the shapes of the robots to work without wheels.

3.Rescue robots are already being used around the world, these robots have only been sent to one earthquake before and that was in 2010 Haiti earthquake, The robot utilized there was called the "Seabotix ROV" and it looked for seawall damage, Rescue robots can carry out duties similar to human duties without the actual danger to human lives

4. Robots can rescue survivors in any event and they can also save soldiers who have fallen in battle, The rescue robots are excellent evidence for machine intelligence.
5.Types of rescue robots are Aerial rescue robots, Fire-fighting robots, Marine rescue robots, Medical robots, Military robots, Path opening robots, Snake robots & Swarm robots.
Features of rescue robot
1. There are some developing of rescue robots for commercial purpose but still in a small group of research and very expensive.
2.For rescue robots, the basic objective is usually used to survey and locate the victims of the disasters. They take the places of human who are sent to the risky area for finding the victims.
3.rescue robot which is controlled by joystick and head mounted display like virtual reality head set.
4.This robot is equipped with a lot of sensors such as pir,rain drop sensor etc

EMBEDDED C

Embedded C Programming is the soul of the processor functioning inside each and every embedded system we come across in our daily life, such as mobile phone, washing machine, and digital camera.
Each processor is associated with an embedded software. The first and foremost thing is the embedded software that decides functioning of the embedded system. Embedded C language is most frequently used to program the microcontroller.
Earlier, many embedded applications were developed using assembly level programming. However, they did not provide portability. This disadvantage was overcome by the advent of various high level languages like C, Pascal, and COBOL. However, it was the C language that got extensive acceptance for embedded systems, and it continues to do so. The C code written is more reliable, scalable, and portable; and in fact, much easier to understand.

ABOUT IOT TECHNOLOGY

IoT (Internet of Things) is an advanced automation and analytics system which exploits networking, sensing, big data, and artificial intelligence technology to deliver complete systems for a product or service. These systems allow greater transparency, control, and performance when applied to any industry or system.

IoT systems have applications across industries through their unique flexibility and ability to be suitable in any environment. They enhance data collection, automation, operations, and much more through smart devices and powerful enabling technology.

IoT systems allow users to achieve deeper automation, analysis, and integration within a system. They improve the reach of these areas and their accuracy. IoT utilizes existing and emerging technology for sensing, networking, and robotics.

IoT exploits recent advances in software, falling hardware prices, and modern

attitudes towards technology. Its new and advanced elements bring major changes in the delivery of products, goods, and services; and the social, economic, and political impact of those changes.

IOT FEATURES

The most important features of IoT include artificial intelligence, connectivity, sensors, active engagement, and small device use. A brief review of these features is given below −

- **AI** − IoT essentially makes virtually anything "smart", meaning it enhances every aspect of life with the power of data collection, artificial intelligence algorithms, and networks. This can mean something as simple as enhancing your refrigerator and cabinets to detect when milk and your favorite cereal run low, and to then place an order with your preferred grocer.
- **Connectivity** − New enabling technologies for networking, and specifically IoT networking, mean networks are no longer exclusively tied to major providers. Networks can exist on a much smaller and cheaper scale while still being practical. IoT creates these small networks between its system devices.
- **Sensors** − IoT loses its distinction without sensors. They act as defining instruments which transform IoT from a standard passive network of devices into an active system capable of real-world integration.

- **Active Engagement** − Much of today's interaction with connected technology happens through passive engagement. IoT introduces a new paradigm for active content, product, or service engagement.
- **Small Devices** − Devices, as predicted, have become smaller, cheaper, and more powerful over time. IoT exploits purpose-built small devices to deliver its precision, scalability, and versatility.

IOT ADVANTAGES

The advantages of IoT span across every area of lifestyle and business. Here is a list of some of the advantages that IoT has to offer −

- **Improved Customer Engagement** − Current analytics suffer from blind-spots and significant flaws in accuracy; and as noted, engagement remains passive. IoT completely transforms this to achieve richer and more effective engagement with audiences.
- **Technology Optimization** − The same technologies and data which improve the customer experience also improve device use, and aid in more potent improvements to technology. IoT unlocks a world of critical functional and field data.
- **Reduced Waste** − IoT makes areas of improvement clear. Current analytics give us superficial insight, but IoT provides real-world information leading to more effective management of resources.
- **Enhanced Data Collection** − Modern data collection suffers from its limitations and its design for passive use. IoT breaks it out of those spaces,

and places it exactly where humans really want to go to analyze our world. It allows an accurate picture of everything.

IOT SOFTWARE

IoT software addresses its key areas of networking and action through platforms, embedded systems, partner systems, and middleware. These individual and master applications are responsible for data collection, device integration, real-time analytics, and application and process extension within the IoT network. They exploit integration with critical business systems (e.g., ordering systems, robotics, scheduling, and more) in the execution of related tasks.

- **Data Collection**

  This software manages sensing, measurements, light data filtering, light data security, and aggregation of data. It uses certain protocols to aid sensors in connecting with real-time, machine-to-machine networks. Then it collects data from multiple devices and distributes it in accordance with settings. It also works in reverse by distributing data over devices. The system eventually transmits all collected data to a central server.

- **Device Integration**

  Software supporting integration binds (dependent relationships) all system devices to create the body of the IoT system. It ensures the necessary cooperation and stable networking between devices. These applications are the defining software technology of the IoT network because without them,

it is not an IoT system. They manage the various applications, protocols, and limitations of each device to allow communication.

- **Real-Time Analytics**

  These applications take data or input from various devices and convert it into viable actions or clear patterns for human analysis. They analyze information based on various settings and designs in order to perform automation-related tasks or provide the data required by industry.

- **Application and Process Extension**

  These applications extend the reach of existing systems and software to allow a wider, more effective system. They integrate predefined devices for specific purposes such as allowing certain mobile devices or engineering instruments access. It supports improved productivity and more accurate data collection.

IOT TECHNOLOGY AND PROTOCOLS

IoT primarily exploits standard protocols and networking technologies. However, the major enabling technologies and protocols of IoT are RFID, NFC, low-energy Bluetooth, low-energy wireless, low-energy radio protocols, LTE-A, and WiFi-Direct. These technologies support the specific networking functionality needed in an IoT system in contrast to a standard uniform network of common systems.

- **NFC and RFID**

RFID (radio-frequency identification) and NFC (near-field communication) provide simple, lowenergy, and versatile options for identity and access tokens, connection bootstrapping, and payments.

- RFID technology employs 2-way radio transmitter-receivers to identify and track tags associated with objects.
- NFC consists of communication protocols for electronic devices, typically a mobile device and a standard device.

- **Low-Energy Bluetooth**

This technology supports the low-power, long-use need of IoT function while exploiting a standard technology with native support across systems.

- **Low-Energy Wireless**

This technology replaces the most power hungry aspect of an IoT system. Though sensors and other elements can power down over long periods, communication links (i.e., wireless) must remain in listening mode. Low-energy wireless not only reduces consumption, but also extends the life of the device through less use.

- **Radio Protocols**

ZigBee, Z-Wave, and Thread are radio protocols for creating low-rate private area networks. These technologies are low-power, but offer high throughput

unlike many similar options. This increases the power of small local device networks without the typical costs.

- **LTE-A**

LTE-A, or LTE Advanced, delivers an important upgrade to LTE technology by increasing not only its coverage, but also reducing its latency and raising its throughput. It gives IoT a tremendous power through expanding its range, with its most significant applications being vehicle, UAV, and similar communication.

- **WiFi-Direct**

WiFi-Direct eliminates the need for an access point. It allows P2P (peer-to-peer) connections with the speed of WiFi, but with lower latency. WiFi-Direct eliminates an element of a network that often bogs it down, and it does not compromise on speed or throughput.

BLYNK APP

Blynk is a toolset for all makers, badass inventors, designers, teachers, nerds and geeks who would love to use their smartphones to control electronics like Arduino, RaspberryPi and similar ones. We've done all the hard work of establishing internet connection, building an app and writing hardware code.

With Blynk, you simply snap together an amazing interface from various widgets we provide, upload the example code to your hardware and enjoy seeing first results in under 5 minutes! It works perfectly for newbie makers and saves

tons of time for evil geniuses.

Blynk will work with all popular boards and shields. We wanted to give you full freedom when deciding how to plug Blynk into your existing or new project.You will also enjoy the convenience of Blynk Cloud. Which is, by the way is free and open-source.

Imagine a prototyping board on your smartphone where you drag and drop buttons, sliders, displays, graphs and other functional widgets. And in a matter of minutes these widgets can control Arduino and get data from it.

Blynk is not an app that works only with a particular shield. Instead, it's been designed to support the boards and shields you are already using. And it works on iOs and Android.

UPD: Blynk also works over USB. This means you can tinker with the app by connecting it to your laptop or desktop while waiting for some internet shield to arrive.

Blynk works over the Internet. So the one and only requirement is that your hardware can talk to the Internet.

No matter what type of connection you choose - Ethernet, Wi-Fi or maybe this new ESP8266 everyone is talking about – Blynk libraries and example sketches will get you online, connect to Blynk Server and pair up with your smartphone.

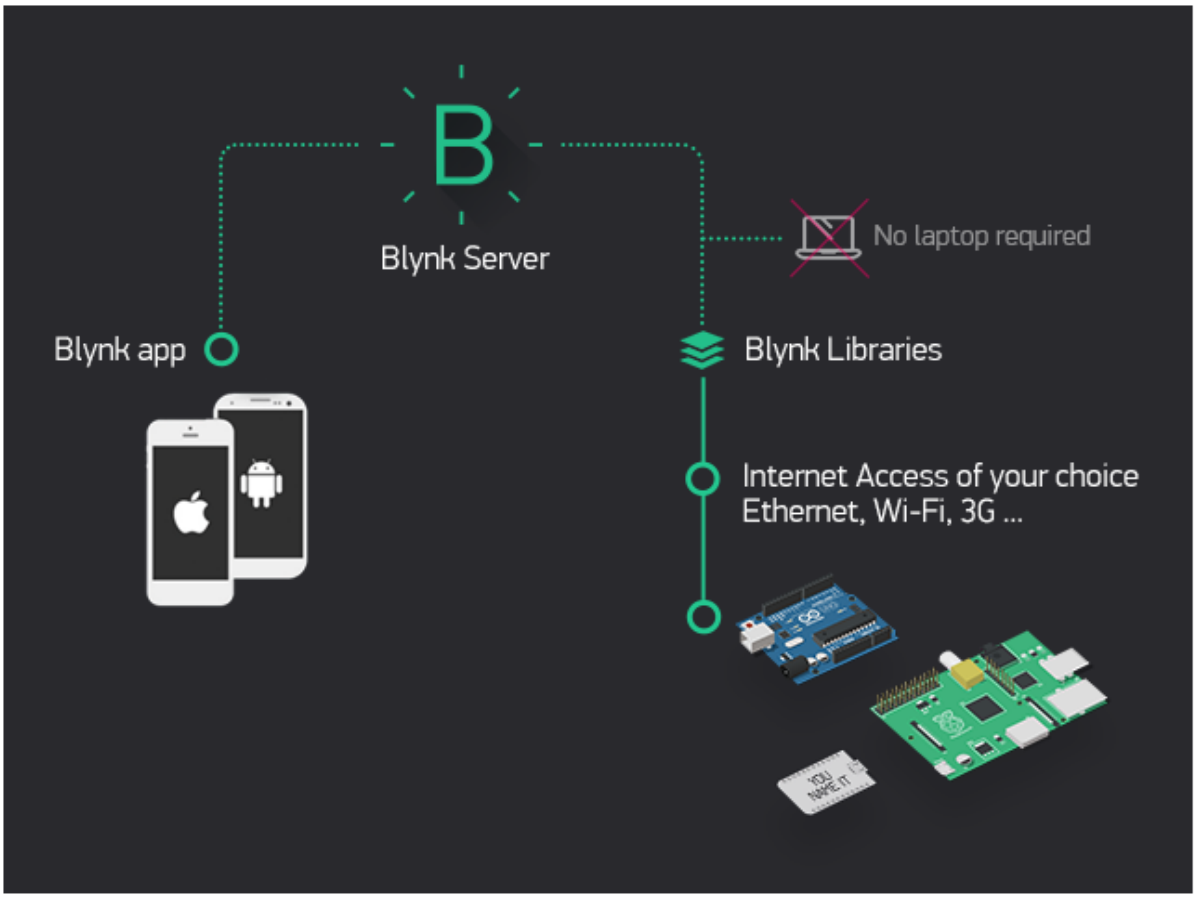


FIG: Blynk architecture

Currently, Blynk libraries work with:

- USB
- Ethernet shield
- WiFi shield
- Arduino with Ethernet
- Arduino YÚN (testing in progress)
- ESP8266
- Raspberry Pi (Blynk will communicate with Pi's GPIOs)
- more Arduino compatible shields and boards (this list will be updated as we test the compatibility)

It's not that easy to take Arduino out of your home network, so we've built

a Blynk server. It handles all the authentication and communication, and also keeps an eye on your board while the smartphone is offline. Blynk server runs on Java and is open-source. You will be able to run it locally if you really need to. Messaging between mobile apps , Blynk Server and Arduino is based on a simple, lightweight and fast binary protocol over TCP/IP sockets.

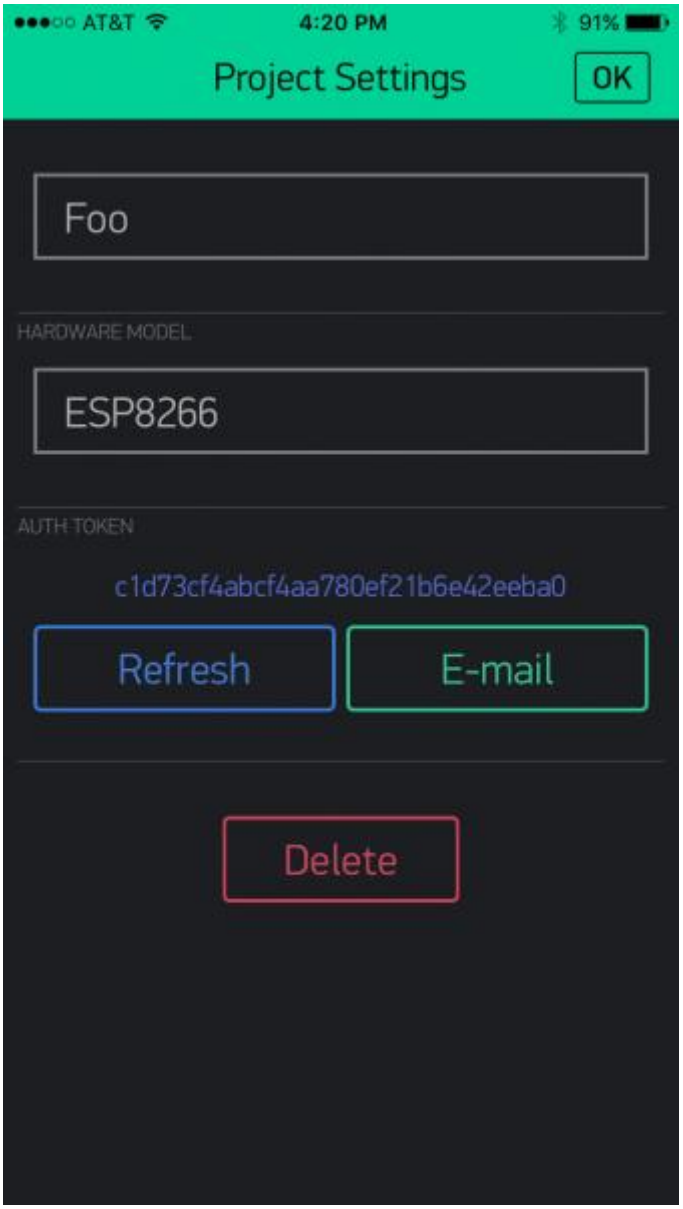
CREATING A PROJECT IN BLYNK APP

After downloading the app, create an account and log in. Welcome to Blynk!

You'll also need to install the **Blynk Arduino Library**, which helps generate the firmware running on your ESP8266. Download the latest release from Blynk's GitHub repo, and follow along with the directions there to install the required libraries.

Create a Blynk Project

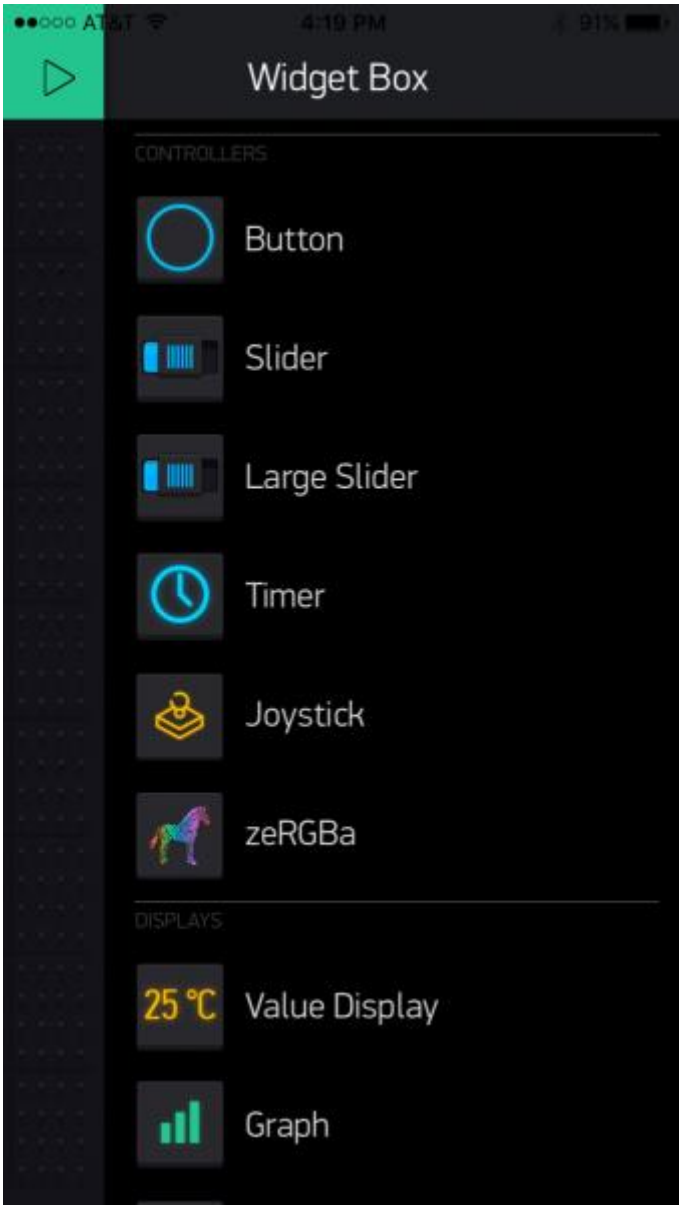
Next, click the "Create New Project" in the app to create a new Blynk app. Give it any name you please, just make sure the "Hardware Model" is set to **ESP8266**.



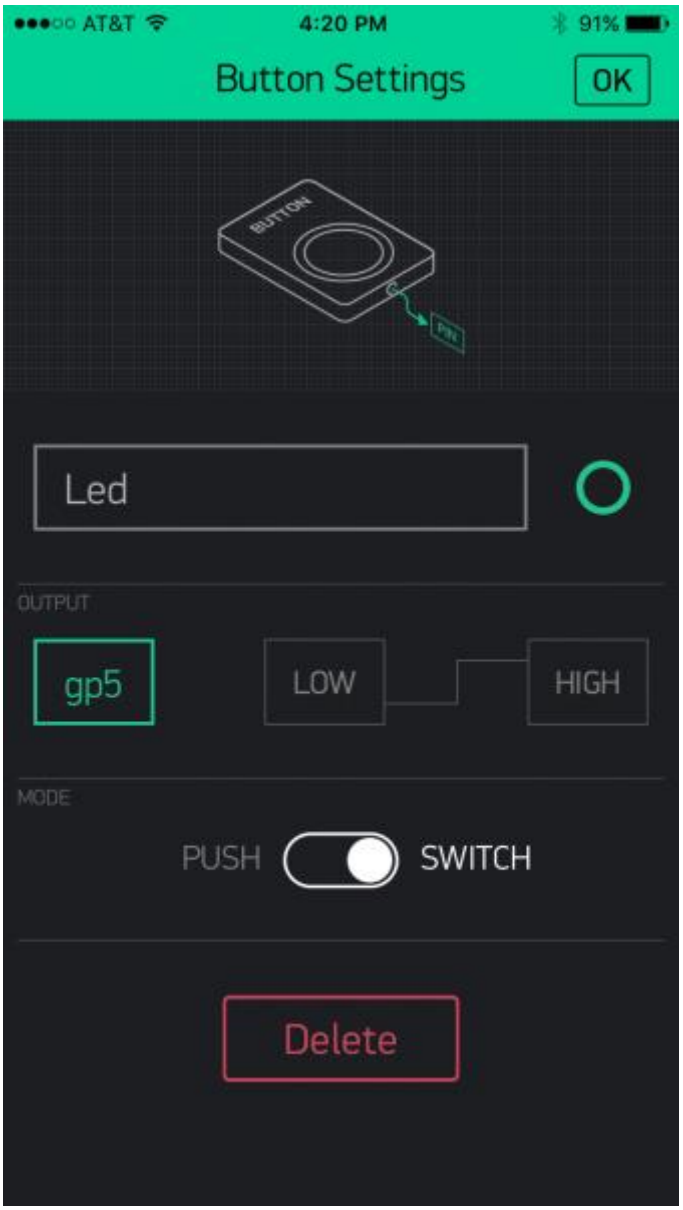
The **Auth Token** is very important – you'll need to stick it into your ESP8266's firmware. For now, copy it down or use the "E-mail" button to send it to yourself.

Add Widgets to the Project

Then you'll be presented with a blank new project. To open the widget box, click in the project window to open.

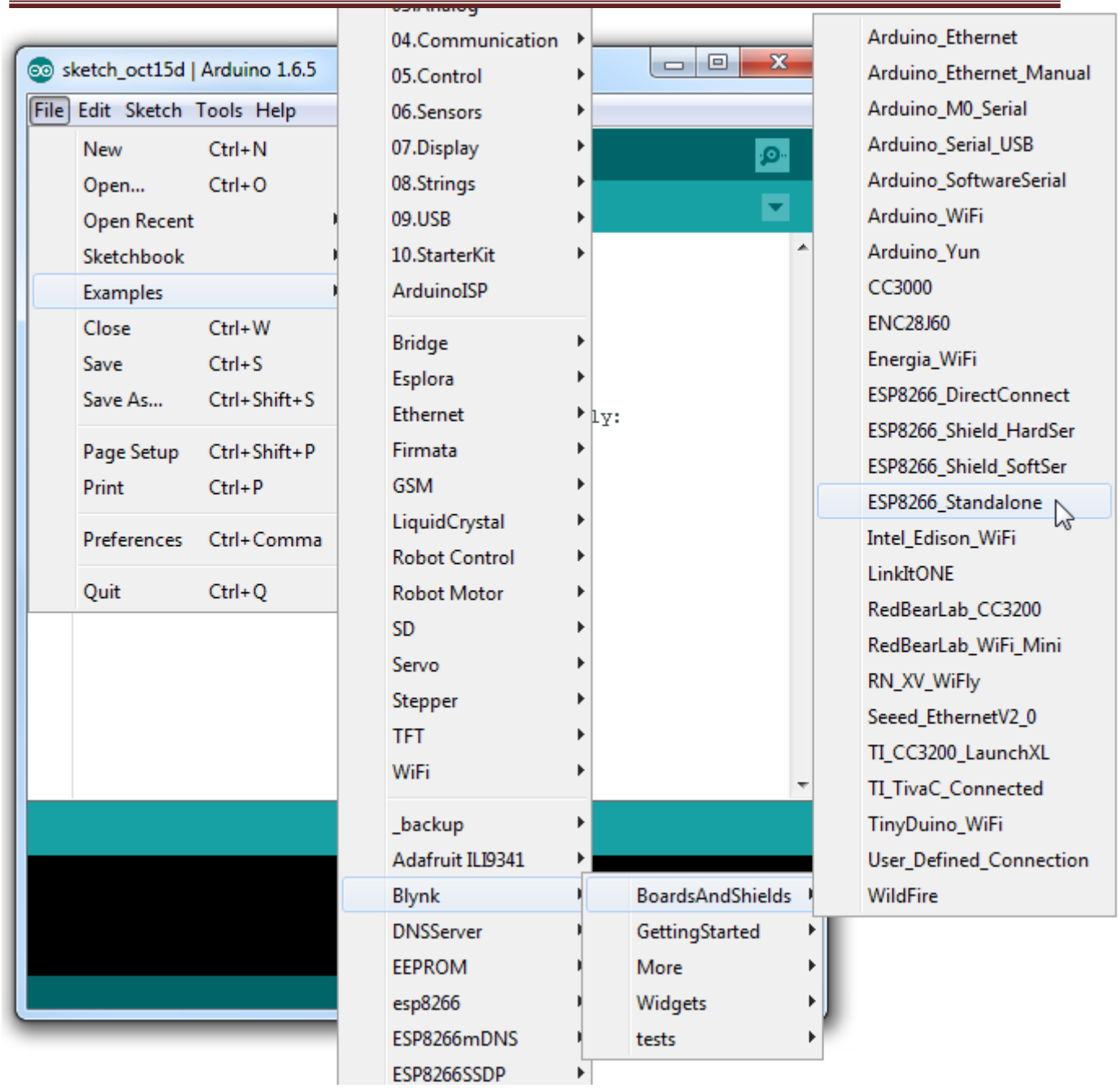


Add a **Button**, then click on it to change its settings. Buttons can toggle outputs on the ESP8266. Set the button's output to **gp5**, which is tied to an LED on the Thing Dev Board. You may also want to change the action to "Switch."



Upload the Blynk Firmware

Now that your Blynk project is set up, open Arduino and navigate to the **ESP8266_Standalone** example in the **File**>**Examples**>**Blynk**>**BoardsAndShields** menu.

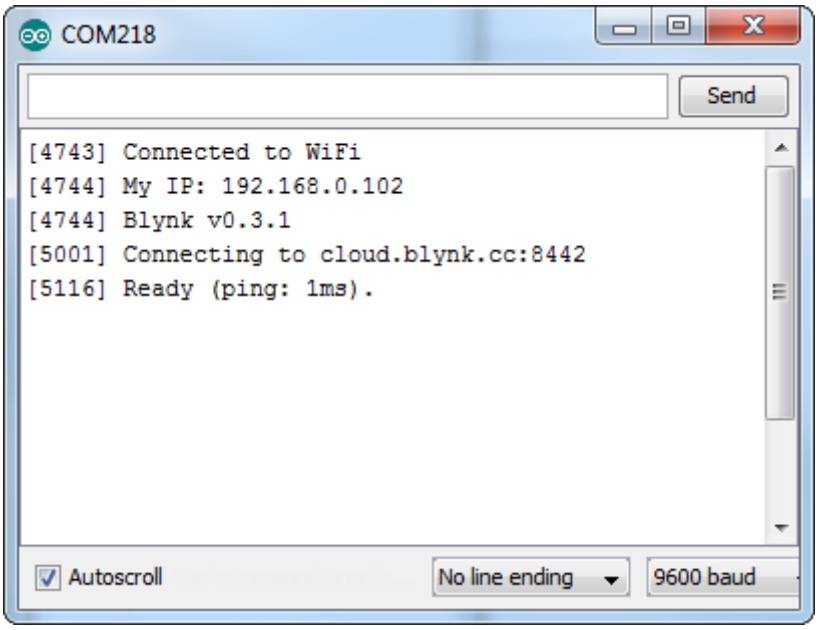


Before uploading, make sure to paste your **authoriazation token** into the `auth[]` variable. Also make sure to **load your WiFi network settings into the `Blynk.begin(auth, "ssid", "pass")`** function.

Then upload!

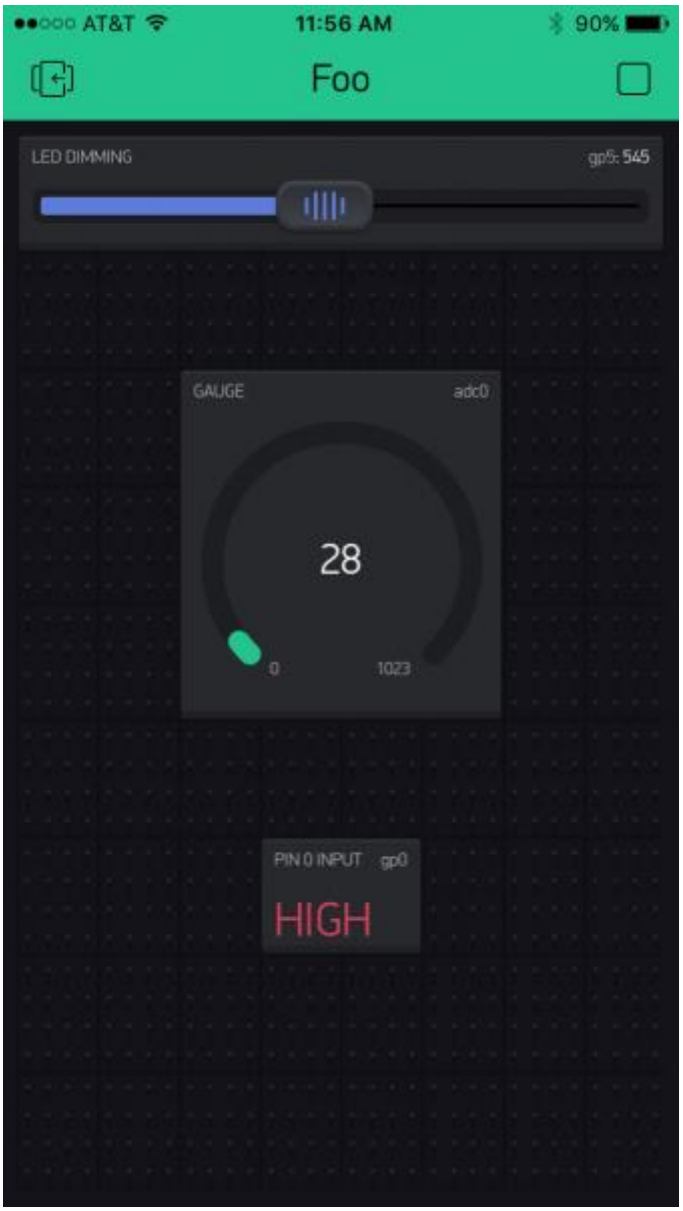
Run the Project

After the app has uploaded, open the serial monitor, setting the baud rate to 9600. Wait for the “Ready (ping: xms).” message.



Then click the “Run” button in the top right corner of the Blynk app. Press the button and watch the LED!

Then add more widgets to the project. They should immediately work on the ESP8266 without uploading any new firmware.



You can add analog output sliders, digital input monitors, and analog input gauges.

CLOUD

Cloud Computing provides us means of accessing the applications as utilities over the Internet. It allows us to create, configure, and customize the applications online.

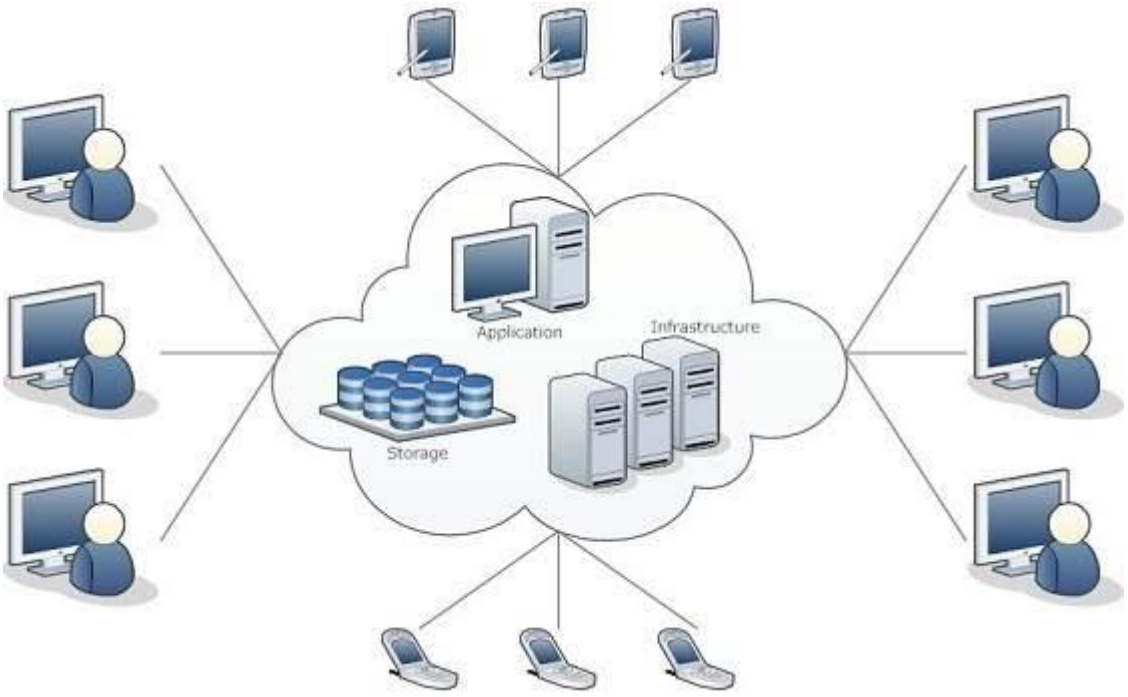
What is Cloud?

The term **Cloud** refers to a **Network** or **Internet.** In other words, we can say that Cloud is something, which is present at remote location. Cloud can provide services over public and private networks, i.e., WAN, LAN or VPN.

Applications such as e-mail, web conferencing, customer relationship management (CRM) execute on cloud.

What is Cloud Computing?

Cloud Computing refers to **manipulating, configuring,** and **accessing** the hardware and software resources remotely. It offers online data storage, infrastructure, and application.



Cloud computing offers **platform independency,** as the software is not required

to be installed locally on the PC. Hence, the Cloud Computing is making our business applications **mobile** and **collaborative.**

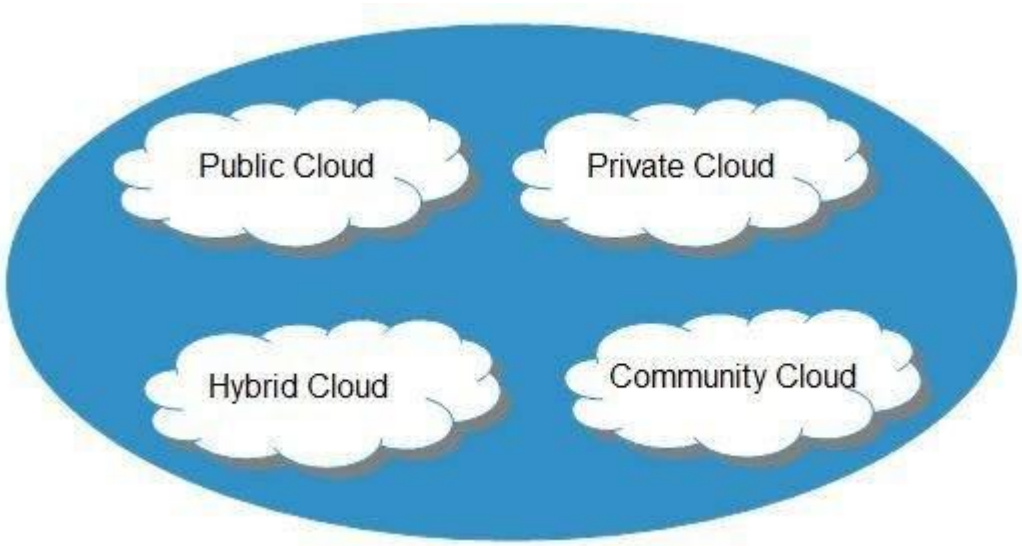
Basic Concepts

There are certain services and models working behind the scene making the cloud computing feasible and accessible to end users. Following are the working models for cloud computing:

- Deployment Models
- Service Models

Deployment Models

Deployment models define the type of access to the cloud, i.e., how the cloud is located? Cloud can have any of the four types of access: Public, Private, Hybrid, and Community.



Public Cloud

The **public cloud** allows systems and services to be easily accessible to the general public. Public cloud may be less secure because of its openness.

Private Cloud

The **private cloud** allows systems and services to be accessible within an organization. It is more secured because of its private nature.

Community Cloud

The **community cloud** allows systems and services to be accessible by a group of organizations.

Hybrid Cloud

The **hybrid cloud** is a mixture of public and private cloud, in which the critical activities are performed using private cloud while the non-critical activities are performed using public cloud.

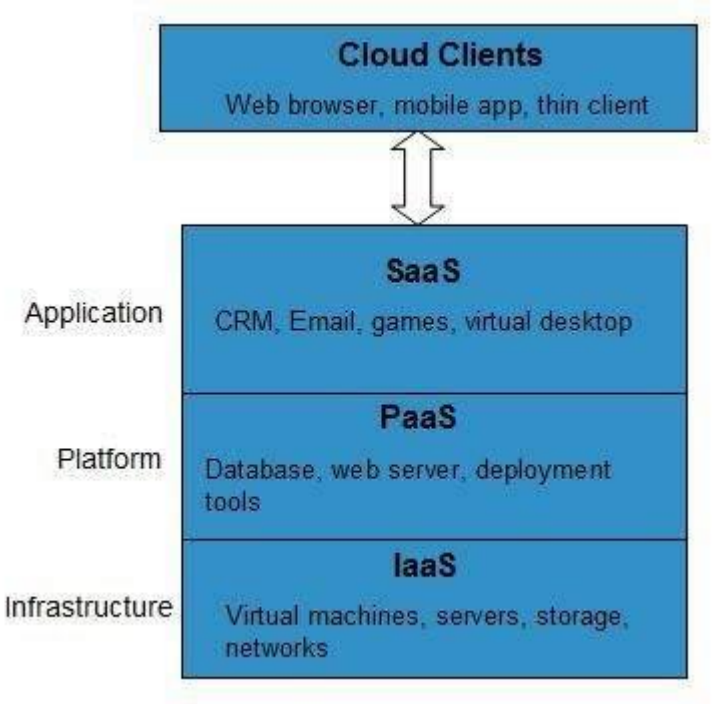
Service Models

Cloud computing is based on service models. These are categorized into three basic service models which are -

- Infrastructure-as–a-Service (IaaS)
- Platform-as-a-Service (PaaS)
- Software-as-a-Service (SaaS)

Anything-as-a-Service (XaaS) is yet another service model, which includes Network-as-a-Service, Business-as-a-Service, Identity-as-a-Service, Database-as-a-Service or Strategy-as-a-Service.

The **Infrastructure-as-a-Service (IaaS)** is the most basic level of service. Each of the service models inherit the security and management mechanism from the underlying model, as shown in the following diagram:



Infrastructure-as-a-Service (IaaS)

IaaS provides access to fundamental resources such as physical machines, virtual machines, virtual storage, etc.

Platform-as-a-Service (PaaS)

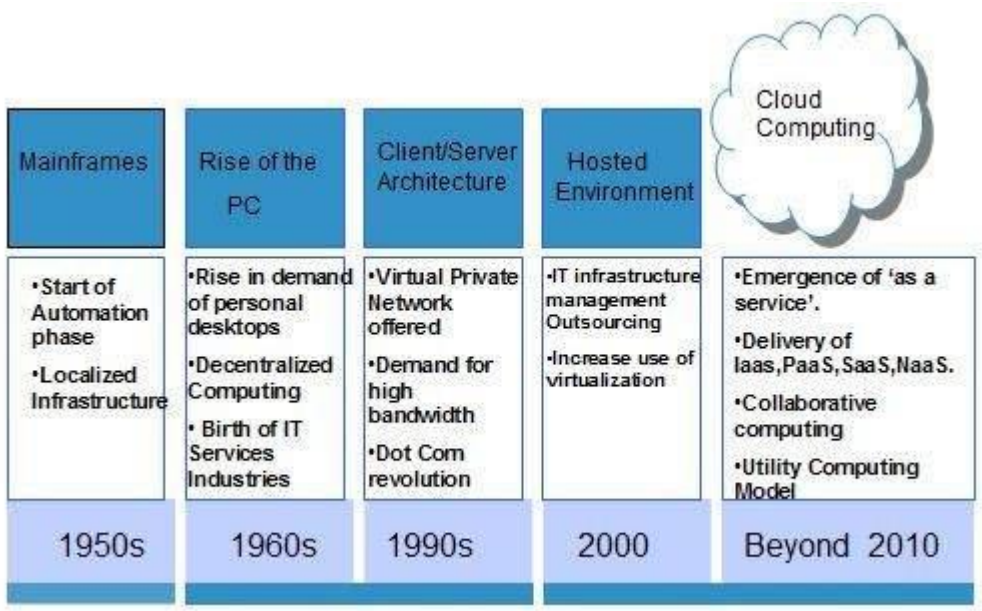
PaaS provides the runtime environment for applications, development and deployment tools, etc.

Software-as-a-Service (SaaS)

SaaS model allows to use software applications as a service to end-users.

History of Cloud Computing

The concept of **Cloud Computing** came into existence in the year 1950 with implementation of mainframe computers, accessible via **thin/static clients.** Since then, cloud computing has been evolved from static clients to dynamic ones and from software to services. The following diagram explains the evolution of cloud computing:

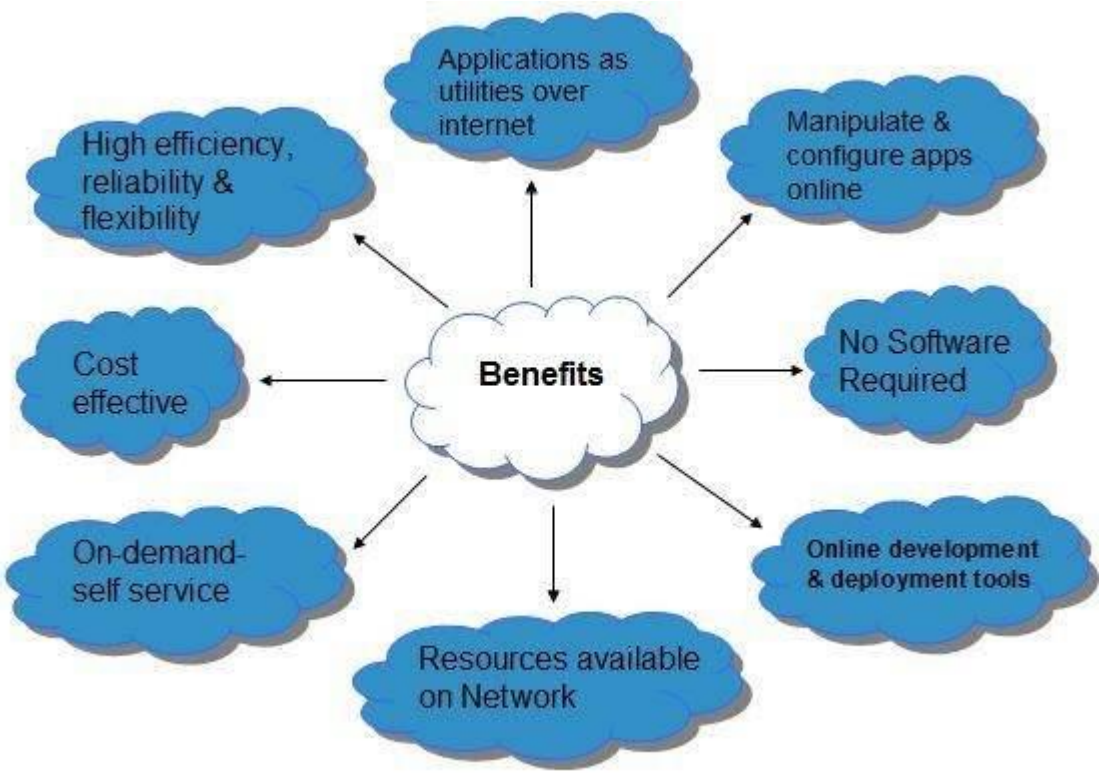


Benefits

Cloud Computing has numerous advantages. Some of them are listed below -

- One can access applications as utilities, over the Internet.
- One can manipulate and configure the applications online at any time.

- It does not require to install a software to access or manipulate cloud application.
- Cloud Computing offers online development and deployment tools, programming runtime environment through **PaaS model.**
- Cloud resources are available over the network in a manner that provide platform independent access to any type of clients.
- Cloud Computing offers **on-demand self-service.** The resources can be used without interaction with cloud service provider.
- Cloud Computing is highly cost effective because it operates at high efficiency with optimum utilization. It just requires an Internet connection
- Cloud Computing offers load balancing that makes it more reliable.



Risks related to Cloud Computing

Although cloud Computing is a promising innovation with various benefits in the

world of computing, it comes with risks. Some of them are discussed below:

Security and Privacy

It is the biggest concern about cloud computing. Since data management and infrastructure management in cloud is provided by third-party, it is always a risk to handover the sensitive information to cloud service providers.

Although the cloud computing vendors ensure highly secured password protected accounts, any sign of security breach may result in loss of customers and businesses.

Lock In

It is very difficult for the customers to switch from one **Cloud Service Provider (CSP)** to another. It results in dependency on a particular CSP for service.

Isolation Failure

This risk involves the failure of isolation mechanism that separates storage, memory, and routing between the different tenants.

Management Interface Compromise

In case of public cloud provider, the customer management interfaces are accessible through the Internet.

Insecure or Incomplete Data Deletion

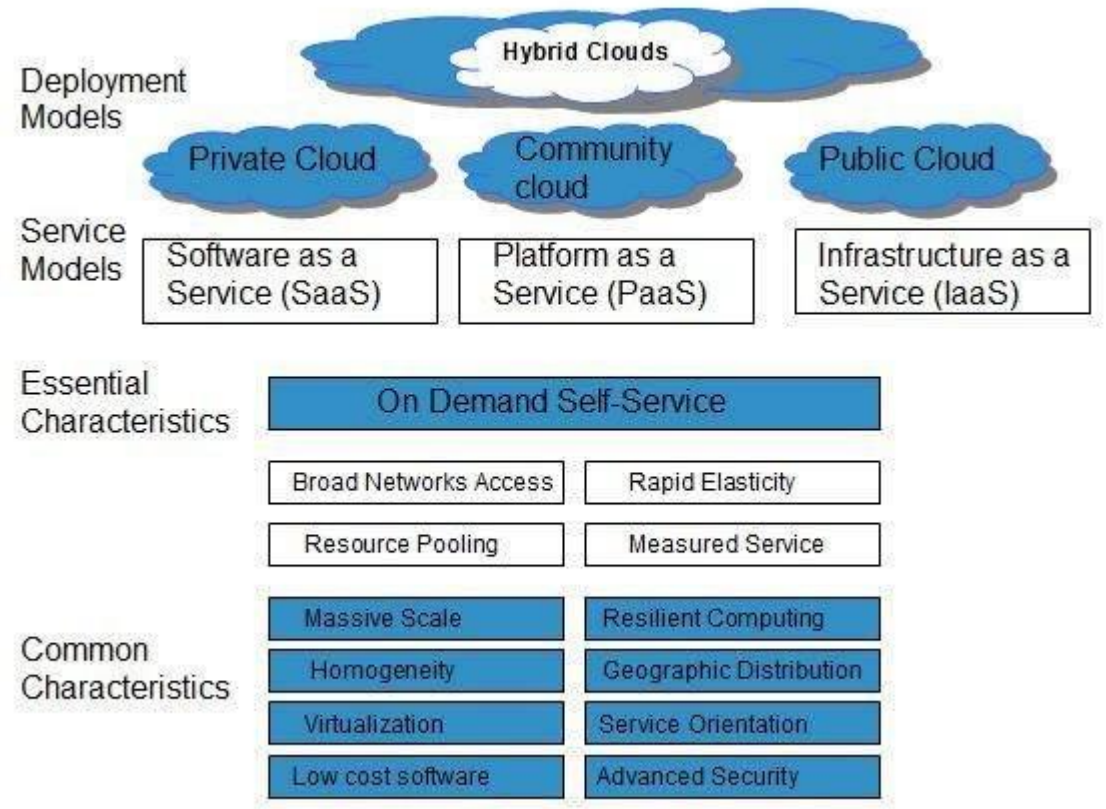
It is possible that the data requested for deletion may not get deleted. It happens because either of the following reasons

- Extra copies of data are stored but are not available at the time of deletion

- Disk that stores data of multiple tenants is destroyed.

Characteristics of Cloud Computing

There are four key characteristics of cloud computing. They are shown in the following diagram:



On Demand Self Service

Cloud Computing allows the users to use web services and resources on demand. One can logon to a website at any time and use them.

Broad Network Access

Since cloud computing is completely web based, it can be accessed from anywhere and at any time.

Resource Pooling

Cloud computing allows multiple tenants to share a pool of resources. One can share single physical instance of hardware, database and basic infrastructure.

Rapid Elasticity

It is very easy to scale the resources vertically or horizontally at any time. Scaling of resources means the ability of resources to deal with increasing or decreasing demand.

The resources being used by customers at any given point of time are automatically monitored.

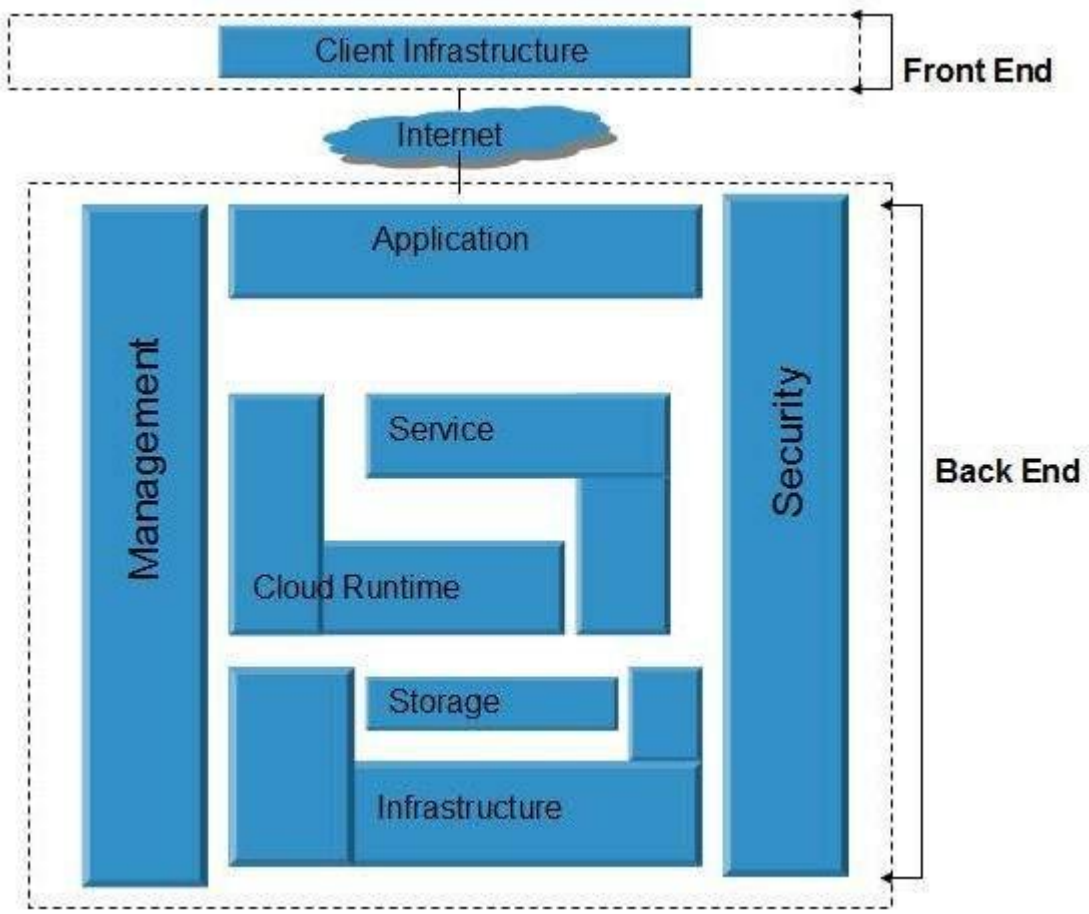
Measured Service

In this service cloud provider controls and monitors all the aspects of cloud service. Resource optimization, billing, and capacity planning etc. depend on it.

Cloud Computing architecture comprises of many cloud components, which are loosely coupled. We can broadly divide the cloud architecture into two parts:

- Front End
- Back End

Each of the ends is connected through a network, usually Internet. The following diagram shows the graphical view of cloud computing architecture:



Front End

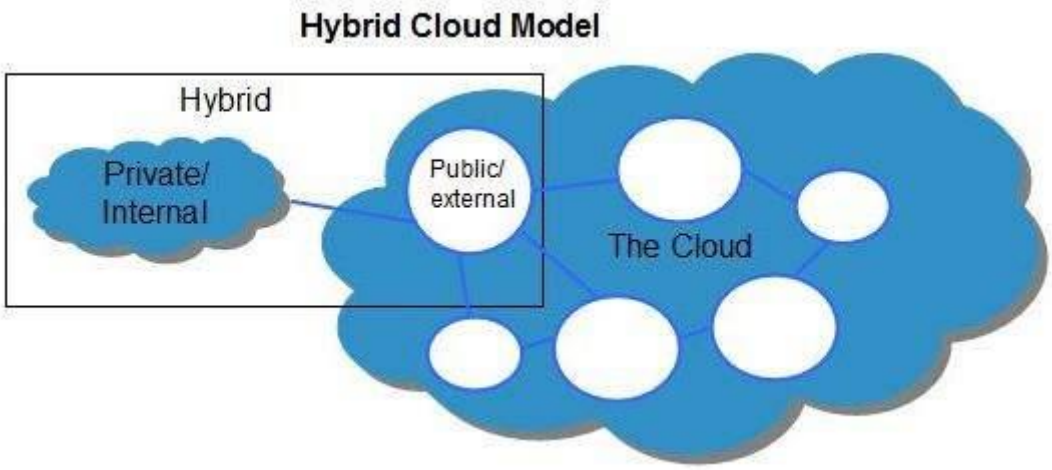
The **front end** refers to the client part of cloud computing system. It consists of interfaces and applications that are required to access the cloud computing platforms, Example - Web Browser.

Back End

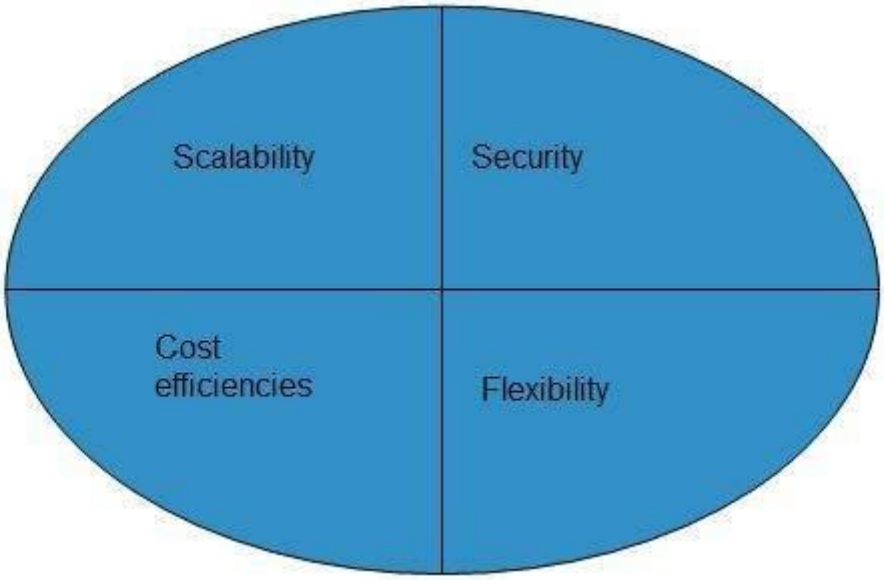
The **back End** refers to the cloud itself. It consists of all the resources required to provide cloud computing services. It comprises of huge data storage, virtual machines, security mechanism, services, deployment models, servers, etc.

Note

- It is the responsibility of the back end to provide built-in security mechanism, traffic control and protocols.
- The server employs certain protocols known as middleware, which help the connected devices to communicate with each other.
- **Hybrid Cloud** is a mixture of **public** and **private** cloud. Non-critical activities are performed using public cloud while the critical activities are performed using private cloud. The Hybrid Cloud Model is shown in the diagram below.

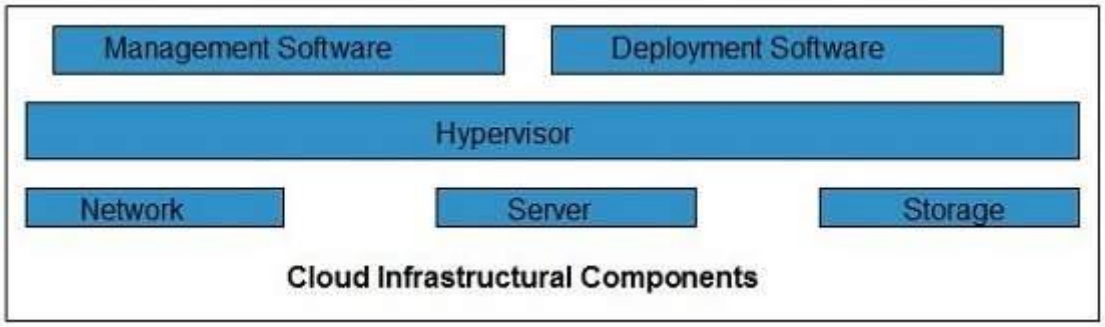


- **Benefits**
- There are many benefits of deploying cloud as hybrid cloud model. The following diagram shows some of those benefits:



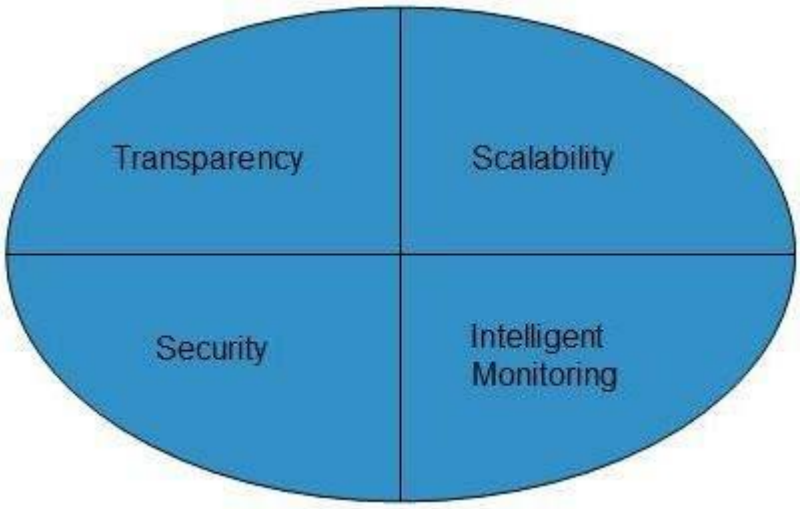
- **Scalability**
- It offers features of both, the public cloud scalability and the private cloud scalability.
- **Flexibility**
- It offers secure resources and scalable public resources.
- **Cost Efficiency**
- Public clouds are more cost effective than private ones. Therefore, hybrid clouds can be cost saving.
- **Security**
- The private cloud in hybrid cloud ensures higher degree of security.
- **Disadvantages**
- **Networking Issues**
- Networking becomes complex due to presence of private and public cloud.
- **Security Compliance**
- It is necessary to ensure that cloud services are compliant with security policies of the organization.

- **Infrastructure Dependency**
- The **hybrid cloud model** is dependent on internal IT infrastructure, therefore it is necessary to ensure redundancy across data centers.
- **Cloud infrastructure** consists of servers, storage devices, network, cloud management software, deployment software, and platform virtualization.



- **Hypervisor**
- **Hypervisor** is a **firmware** or **low-level program** that acts as a Virtual Machine Manager. It allows to share the single physical instance of cloud resources between several tenants.
- **Management Software**
- It helps to maintain and configure the infrastructure.
- **Deployment Software**
- It helps to deploy and integrate the application on the cloud.
- **Network**
- It is the key component of cloud infrastructure. It allows to connect cloud services over the Internet. It is also possible to deliver network as a utility over the Internet, which means, the customer can customize the network route and protocol.
- **Server**

- The **server** helps to compute the resource sharing and offers other services such as resource allocation and de-allocation, monitoring the resources, providing security etc.
- **Storage**
- Cloud keeps multiple replicas of storage. If one of the storage resources fails, then it can be extracted from another one, which makes cloud computing more reliable.
- **Infrastructural Constraints**
- Fundamental constraints that cloud infrastructure should implement are shown in the following diagram:



- **Transparency**
- Virtualization is the key to share resources in cloud environment. But it is not possible to satisfy the demand with single resource or server. Therefore, there must be transparency in resources, load balancing and application, so that we can scale them on demand.

- **Scalability**
- Scaling up an application delivery solution is not that easy as scaling up an application because it involves configuration overhead or even re-architecting the network. So, application delivery solution is need to be scalable which will require the virtual infrastructure such that resource can be provisioned and de-provisioned easily.
- **Intelligent Monitoring**
- To achieve transparency and scalability, application solution delivery will need to be capable of intelligent monitoring.
- **Security**
- The mega data center in the cloud should be securely architected. Also the control node, an entry point in mega data center, also needs to be secure.

CONCLUSION

The goal of this research was to provide a low cost rescue robot for human detection in a disaster environment. Though, the existing Urban Search and Rescue Robots are equipped with various sensors, but the problem with them is the cost. The sensors used in the development of this project are easily available and cost effective.

In this paper, a new method for detecting surviving humans in destructed environments using simulated autonomous robot is proposed. The robot uses two levels of sensing in order to achieve higher cost-effectiveness in the detecting process in terms of the actual cost of equipment, the processing cost, the communication cost, the storage cost, and the power cost. The first level is an ultrasonic sensor that is used as the primary sensor in order to detect the existence of living humans in a scene. The second level is a human body shape sensor. This level uses low-cost web camera in order to confirm the existence of a human shape. The robot is assumed to be equipped with a simple Temperature and bomb sensor in order to detect fire in Rescue scenario and suspected metal respectively and a wireless communication link in order to communicate with the rescue team whenever a need arises.

PROBLEM STATEMENT

Earthquakes produce a devastating effect and they see no difference between human and material lot of times humans are buried among the debris and it become impossible to detect them Detection by rescue workers becomes time consuming and due to the vast area that gets affected it becomes more difficult.The project proposes an autonomous robotic vehicle that moves in the earthquake prone area and helps in identifying the live people and rescue operations

LITERTATURE SURVEY

Usha Tiwari, Rahul Kaushik, Shraddha Subramaniyan, (2014), "A technical review on Human Rescue Robots", VSRD-IJEECE, Vil. 2 (3), 127-134 has explained about designing a Robot to navigate in the rubble with various sensors. This method used 2 methods to detect alive human, one is IR radiation emerging from the live humans and other is using the sound or cry for the help made from the humans.

Mauricio Correa, Gabriel Hermosilla, Rodrigo Verschae, Javier Ruiz-del-Solar, (2012), "Human Detection and Identification by Robots using Thermal and Visual information in Domestic Environments", J Intell Robot Syst (2012) 66:223-243 has given the concept of enabling robots to detect and identify humans in domestic environment. This work was done with the aid of Thermal and Visual Information sources that were integrated to detect humans and further processed to verify it.

Remote Operated and Controlled Hexapod (ROACH) is a six-legged design that provides significant advantages in mobility over wheeled and tracked designs. It was equipped with predefined walking gaits, cameras, which transmit, live audio and videos of the disaster site, as well as information about locations of objects with respect to the robot‟s position to the interface on the laptop. Specialized robots have been designed for these types of environments such as KOHGA the snake like robot. This robot was constructed by connecting multiple crawler vehicles serially, resulting in a long and thin structure so that it can enter narrow space. Quality work has been done in the field of robotics. They came into existence in the early 21st century but since then enormous improvements have been made in its concept, design based on purpose of use. Various rescue robots have been developed and some of these are – CRASAR (Centre for Robot-Assisted Search and Rescue) in University of South Florida.This robot was used

for first time in real conditions on 11th September 2001 in the World Trade Centre disaster. Different sensors like millimeter wave radar for measuring distance, a color CCD camera for vision and a forward-looking infrared camera for the human heat detection were used in it.

Shwetha, R, Dr. Chethan H K, (2014), "Automatic and Manual Controlled Alive Human Detection Robot during disaster Management", International Journal for Technological Research in Engineering", ISSN: 2347-4718, Volume 1, Issue 11 has done a work on designing an economical robot, which works using AVR, MCU, PIR sensor. This robot senses the human body temperature using PIR sensor and an alarm/indicator is used to indicate the signal when it detects alive body and this message is sent through SMS using GSM technology to enable rescue operation.

Burion presented a project that provided a sensor suitable for human detection for the USAR robots. It evaluated several types of sensors for detecting humans such as pyro electric sensor, USB camera, microphone, and IR. The pyro electric sensor was used to detect the human body radiation. The camera was used for motion detection. A microphone was used for long duration and high amplitude sound detection. The IR camera was used to detect humans by their heat image. The main idea was to detect a change in the image scene by checking the values of the pixels. Several images for the scene were acquired and subtracted from each other to discover if a motion has occurred. The used technique was fairly efficient in detecting the victims. But still, the robot was not fully autonomous and was dependent on the operator.

APPLICATIONS

- In military applications to detect the presence of human being.
- In Rescue operations where human reach is not possible.
- Tracking of rescue robot using android applications
- Current unmanned maritime vehicles being used for search and rescue are relatively small and have a limited rangebut that will probably change in the future
- Mobile *robot* system *rescue application.*

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