Introduction

The Internet of things (IOT) concept enables us to connect the normal day to day devices with each other over the internet. The devices connected through IOT concept can be analysed remotely. The IOT concept provides the basic infrastructure and opportunities to form a connection between the physical world and computer-based systems. The concept has been gaining importance with more and more wireless devices that are increasing rapidly in the market. Hardware devices are connected with each other over the internet. Raspberry pi module used in the system provides the connectivity with the internet in the system.

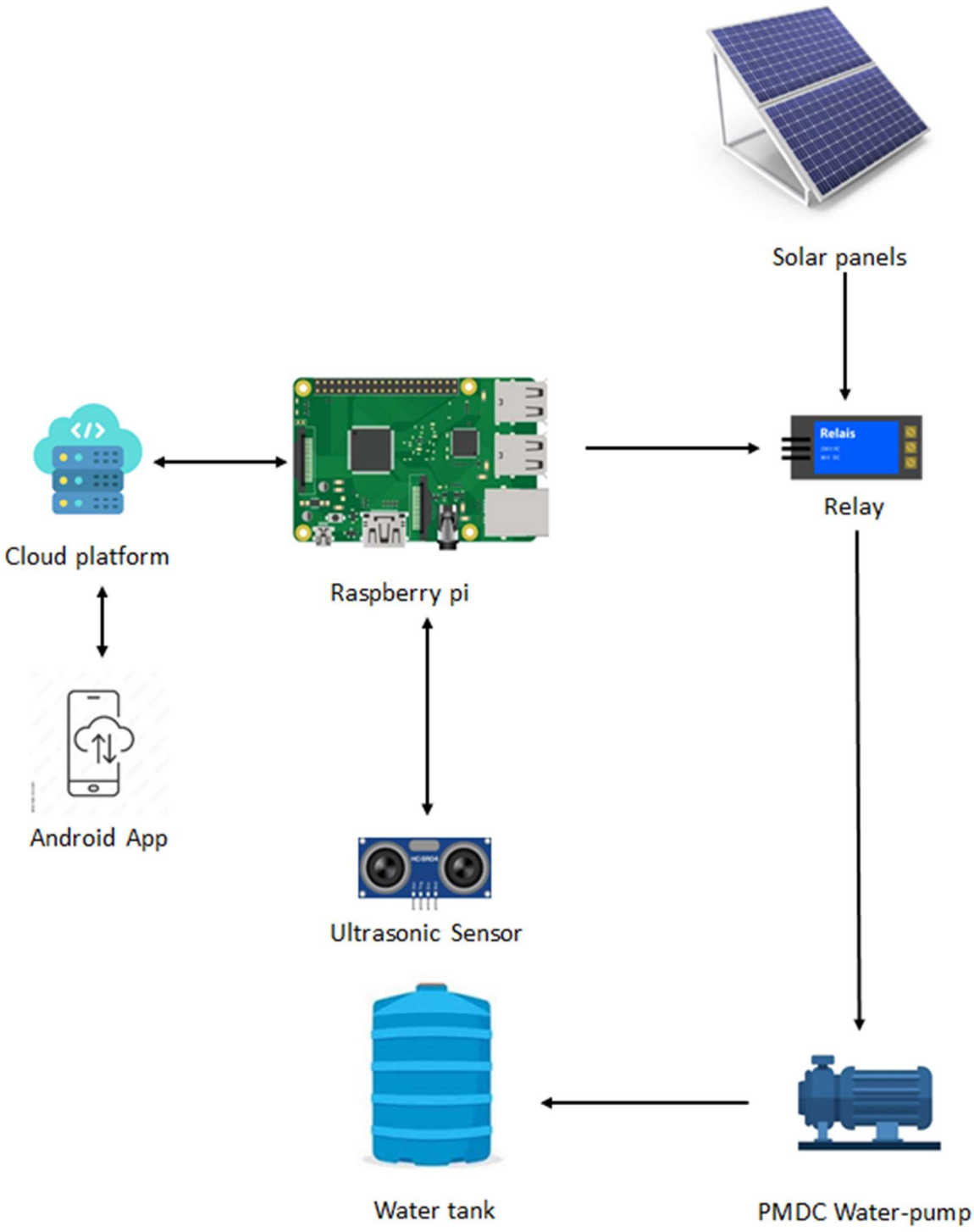
Scarcity of water is one of the biggest issues revolving across the globe. So, water conservation is one of the significant importance. Now a days in urban as well as in rural areas water tank system is available. The biggest disadvantage of this system is the overflow of from overhead tank and overrunning of water pump. Hence, in this project we are developing an automatic water tank level and pump control system, which ensures several benefits.

Objectives

Based on the rigorous literature review and discussions following objectives are set for the project

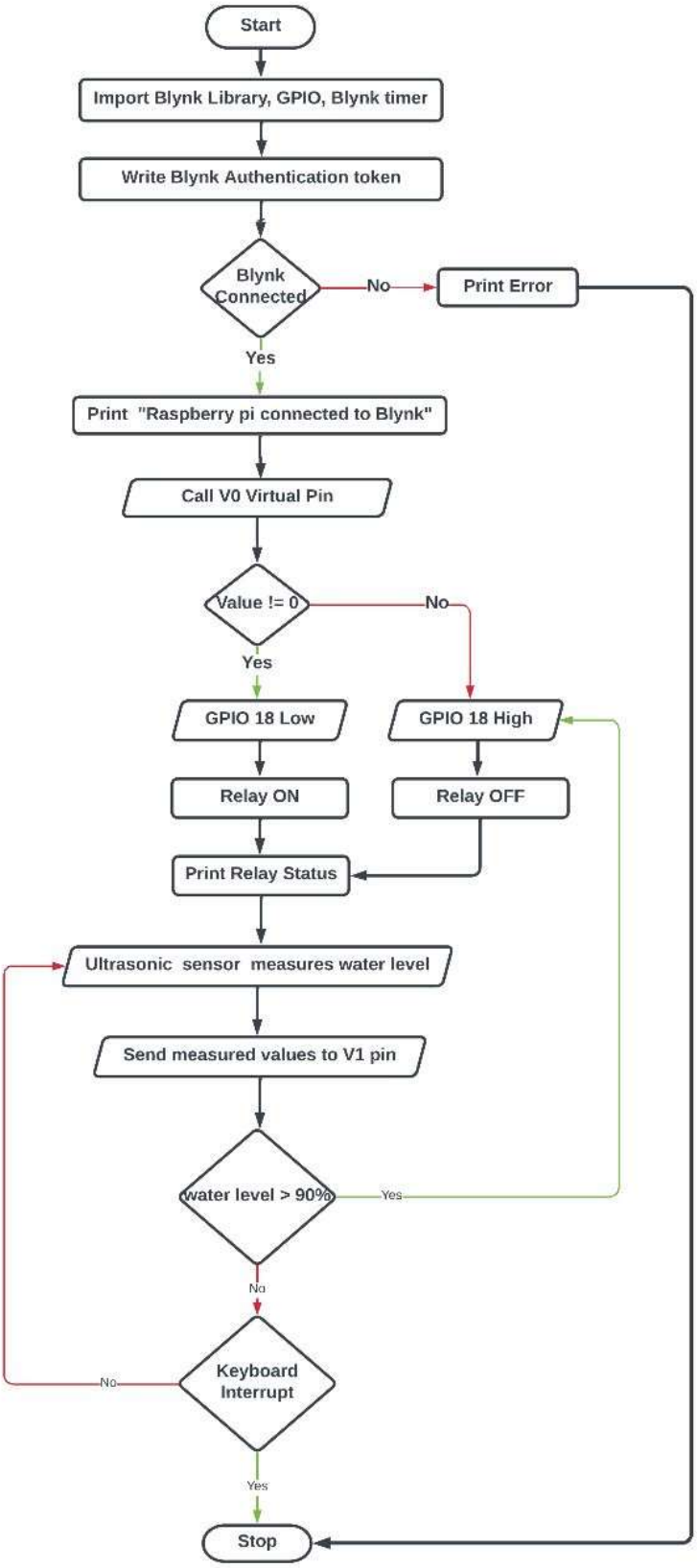
- To develop the control mechanism for SPV Water Pump using IoT
- To monitor the levels of water in water tank using mobile

Block diagram



Block diagram

Flow chart for proposed model:



Methodology:

In this project the main task is to remotely monitor and control the devices connected through IoT technology. The overall block diagram consists of ultrasonic sensors, Raspberry Pi, SPV pump, and relay switching unit. The ultrasonic sensor is connected to the tank and Raspberry Pi. Raspberry Pi is used to fetch data from the ultrasonic sensor and send it to the Blynk server through GPIO pins. The relay is also connected to the Raspberry Pi board through GPIO pins. When the user tries to start the motor pump from the Blynk app, it will check the water levels. If the water level is above the set value, the relay will not activate. If the water level is below the set value, it will activate the relay and the motor pump will start. The water will flow until the water level reaches the set value and then the water pump will automatically stop. There will be no flow of water. During all these processes, Raspberry Pi is uploading sensor data to the cloud so that the user can monitor the water level.

Description Of Components

0.5HP SPV Powered DC pump:

SPV array of total capacity 400W is connected directly to the 0.5HP DC irrigation pump. Each panel is of 100W capacity and 4 numbers of panels are installed. Panels are connected in parallel to increase the output current; the voltage remains constant in this type of connection.

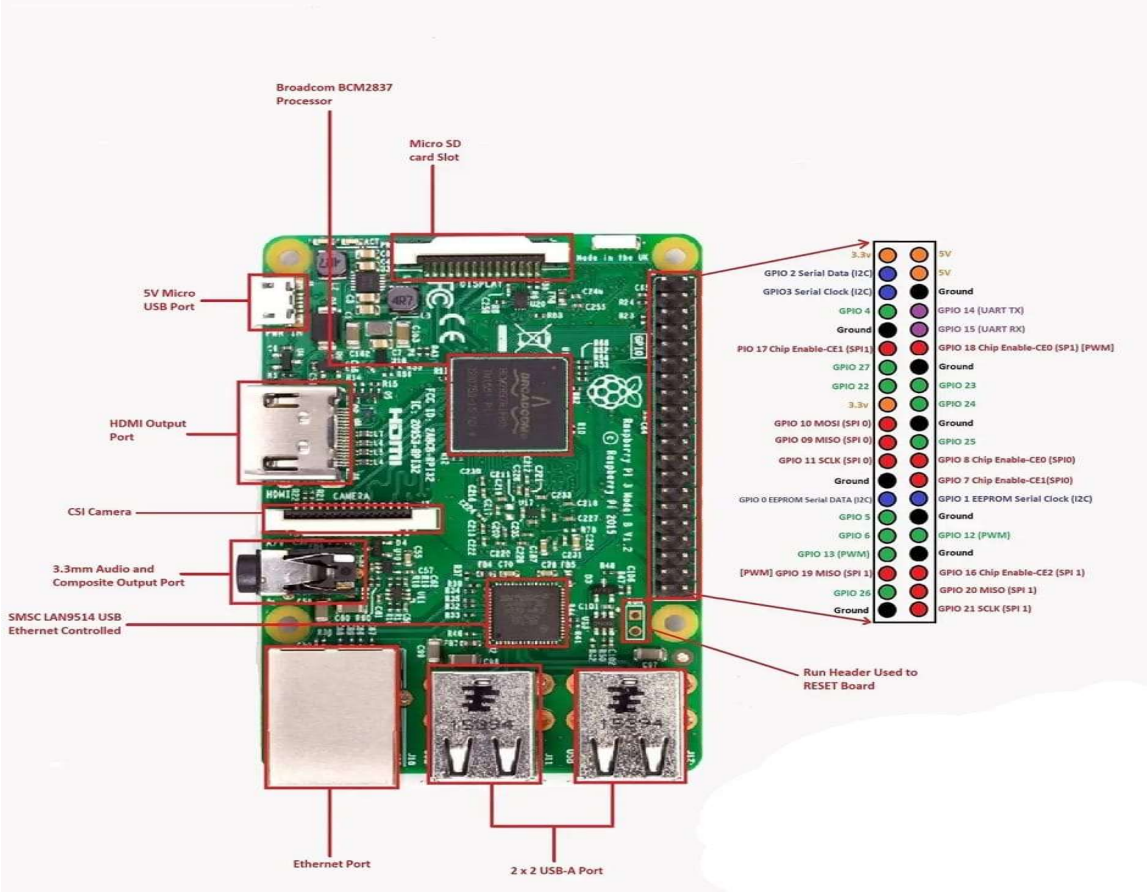
Dc irrigation pump

Raspberry Pi

The Raspberry Pi 3 b model is a single-board computer developed by the Raspberry Pi Foundation. This board consists of a 1.2Ghz 64-bit quad-core ARM processor and an 802.11n Wireless LAN, Bluetooth 4.1, and Bluetooth Low Energy. Like the previous version (the Pi 2) it consists of 1 GB of RAM, 4 USB ports, and full HDMI support.

Specifications of Raspberry PI 3 board:

- 64bit CPU Quad-Core 1.2GHz Broadcom BCM2837
- 1GB RAM
- BCM43438 wireless LAN and Bluetooth Low Energy (BLE) on board
- 100 Base Ethernet
- 40-pin extended GPIO
- 4 USB 2 ports
- 4 Pole 3.3mm stereo output and composite video port
- Full-size HDMI CSI (Camera Serial Interface) camera port for connecting a camera
- DSI (Display Serial Interface) display port for connecting a touchscreen display
- Micro SD port
- Micro USB power port (up to 2.5A)



Raspberry pi board

Ethernet port:

The Ethernet port enables wired internet access to the minicomputer. Without it, software updates, web surfing, etc., would not be possible using the Raspberry Pi.

SD card slot:

The Raspberry Pi board has a Secure Digital card or SD card slot where users must insert SD cards for the computer to function. The SD card functions like a hard drive as it contains the operating system necessary for turning the system on. It also serves to store data.

General Purpose Input and Output (GPIO) pins:

These are upward projecting pins in a cluster on one side of the board. GPIO pins are used to interact with other electronic circuits. They can read and control the electric signals from other boards or devices based on how the user programs them

USB ports:

Universal service bus (USB) ports are a principal part of Raspberry Pi. They allow the computer to connect to a keyboard, mouse, hard drives, etc.

Power source:

Raspberry Pi has a power source connector that typically uses a 5V micro USB power cable. The amount of electricity any Raspberry Pi consumes depends on what it's used for and the number of peripheral hardware devices connected.

HDMI port:

Raspberry Pi board has an HDMI or High Definition Multimedia Interface port that allows the device to have video options of the output from the computer displayed. An HDMI cable connects the Raspberry Pi to an HDTV.

Central Processing Unit (CPU):

Every computer has a Central Processing Unit, and so does the Raspberry Pi. It is the computer's brain and carries out instructions using logical and mathematical operations. Raspberry Pi makes use of the ARM11 series processor on its boards

Relay:

It acts as an electromagnetic switch and can be used to control external devices. Relay works on the principle of energizing an electromagnet. It consists of primary coil, 2 contacts, one is normally open contact “NO” & the other is normally closed contact “NC” & pole normally identified a common. When relay is in off state the pole (common) is connected to normally closed (NC contact).

Relay

When the logic signals from controller or any other circuits like timers, op-amps are applied to base of the transistor through resistor 1K Ohm. When base signal is high, transistor saturates, and it energizes the relay. The transistor act as a small signal amplifier, resistor of 1KOhm is used to provide proper emitter base voltage to turn the transistor to ON state from OFF state.

When transistor starts conducting, current starts flowing through the coil. Coil develops its own magnetic flux when the strength of current is suitable; whenever a sufficient flux is produced it attracts the pole to make contact with normally open position ‘NO’. Hence the load connected to it performs its operation until the contact is broken. A diode connected in parallel across the primary coil is to eliminate the effect of back EMF on the transistor. Relays have great application in industry. Using the principle of energizing an Electromagnet we can handle large voltages & current application.

Ultrasonic Sensor: It is used as the water level sensor it uses ultrasonic sound to determine the water level by calculating time interval between transmission of the high frequency sound and receiving of echo from the surface of water the height of water level from the sensor can be calculated.

Ultrasonic sensor

The speed of ultrasonic sound S at 20℃ temperature is given by

S= 343.5m/s=343.5*100cm/s

S= (343.5*100)/1000000cm/µs

S= 0.03435cm/ µs

The time T in microseconds from transmitting and receiving the echo after reflecting by the

object kept at a distance d can be calculated by using the pulse in function available in

Arduino library. So, the actual time taken between the transmitter and object will be T/2.

Therefore, the distance d in centimetre between the transmitter and object in ultrasonic sensor

can be calculated using the relation between speed, time, and distance

d=S*(T/2) =0.03435*(T/2)

Jumper wires:

A jumper wire is an electrical wire or group of them in a cable with a connector or pin at each end which is normally used to interconnect the components of a breadboard or other prototype or test circuit internally or with other equipment or components without soldering

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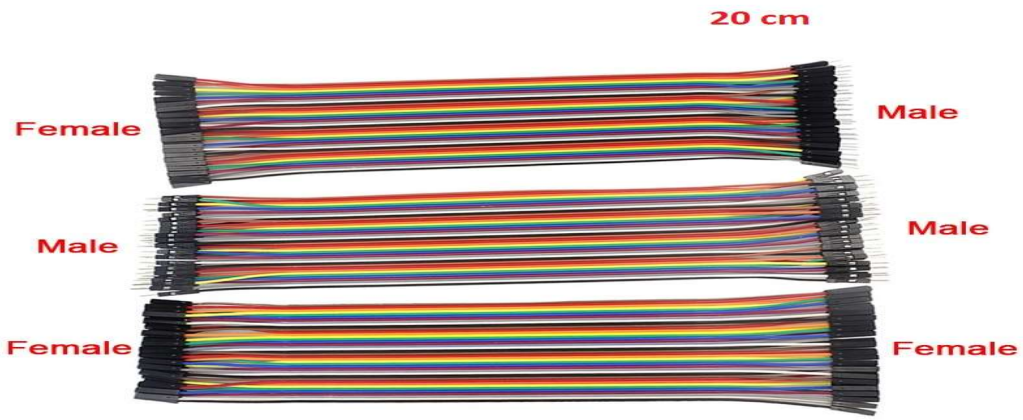
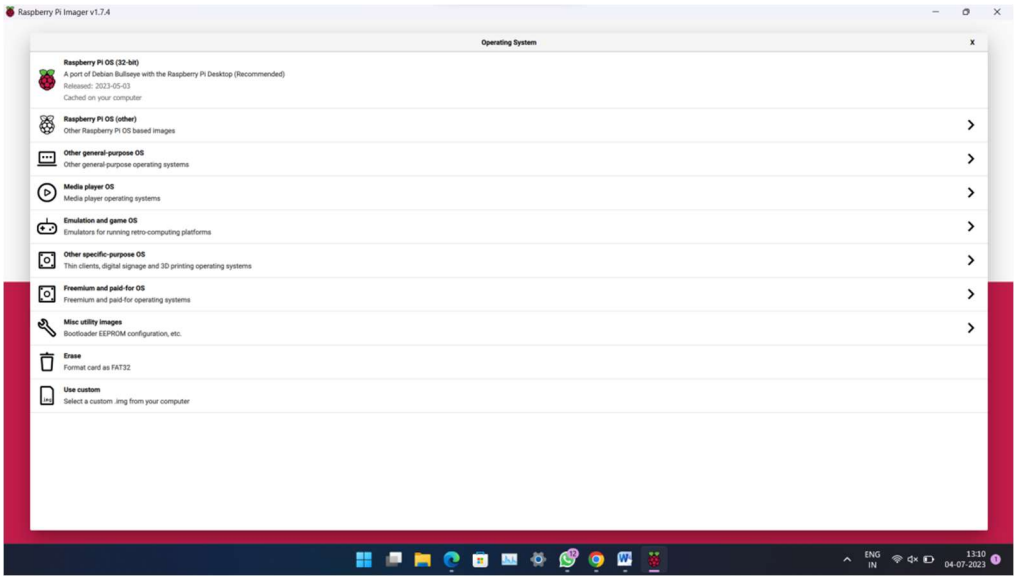


Jumper Wire

Installing Raspberry Pi OS on A Raspberry Pi Board:

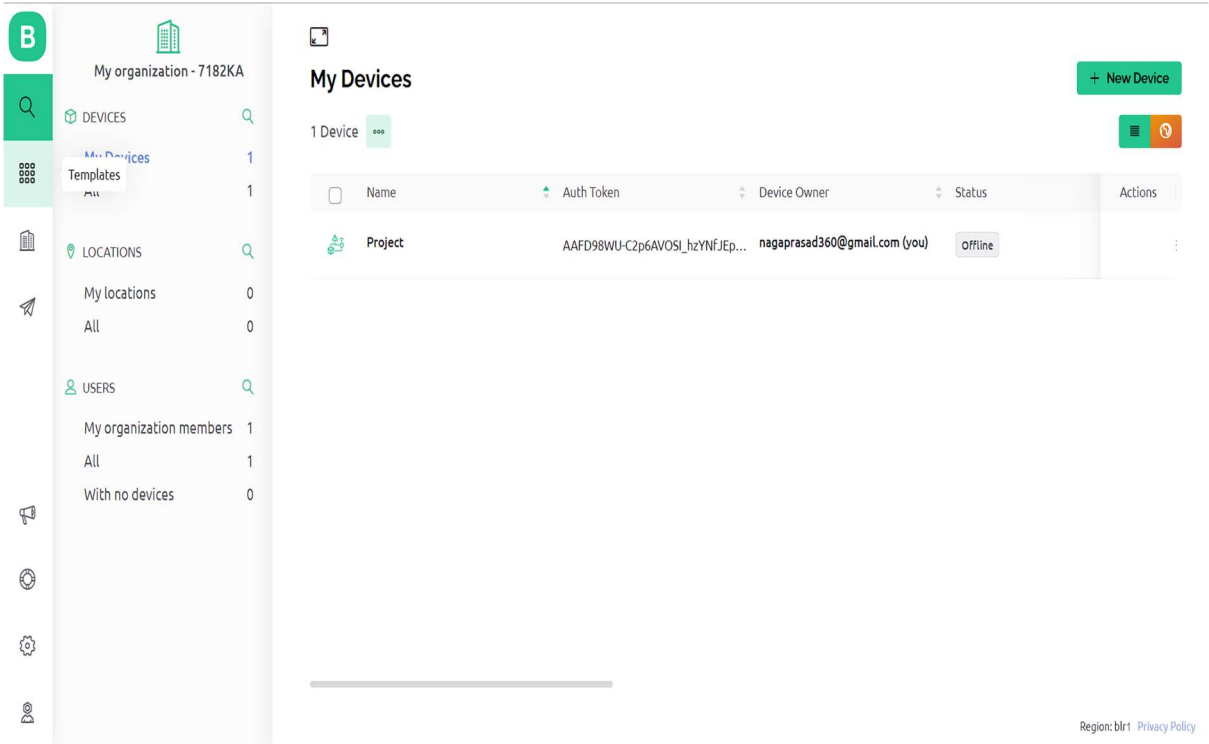
Raspberry Pi imager

- Install Computer Raspberry pi imager on
- Insert MicroSD card to Computer
- Open Raspberry pi Imager Software
- Select Raspberry pi OS version to be Installed
- Select storage device on which OS is being installed
- Click on write button to Start writing process
- After successful installation insert SD card on Raspberry pi board
- Connect monitor using HDMI cable
- Bootup the Raspberry Pi



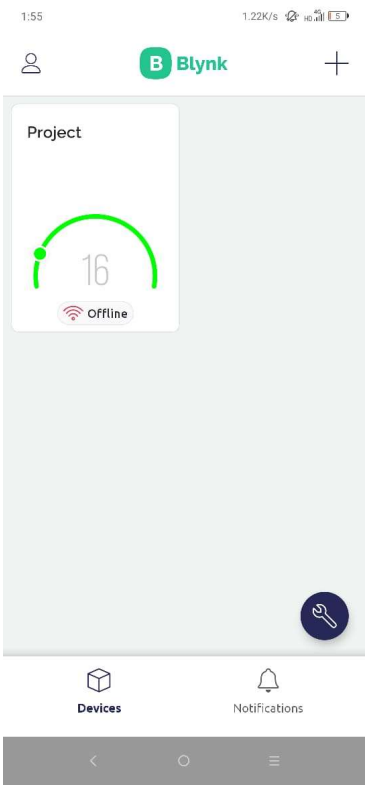
Selecting OS on Raspberry pi Imager

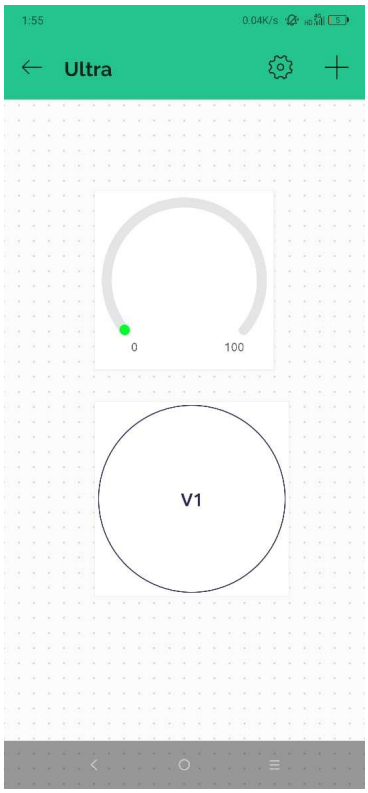
Setting up Blynk 2.0 Application:



Blynk Web dashboard

- Create a Blynk account on the Blynk website
- Click on New Template
- Give name to the Template. Select ‘Hardware Type’ as ‘Raspberry pi’ and ‘Connection Type’ as ‘WiFi’ and save it
- Click on New device and Select previous selected template
- Copy Blynk authentication token
- Click on web dashboard drag and drop Switch and gauge
- Click on switch and create data stream select virtual pin as V0
- Click on Gauge and create data steam select virtual pin V1
- Save the changes





- Install and open Blynk app on mobile
- Click on created template
- Click on + icon and add Switch and Gauge
- Click on Switch icon select type as switch

Configuration of Raspberry pi:

- Open the terminal and run “sudo apt update” & “sudo apt upgrade” command
- Install Blynk Library Using command “Git clone https//: github.com/vshymanskyy/blynk-library-python.git”
- Open text editor and write program code with blynk authentication token
- Save file name with “start.py” and save it in the blynk-library-python folder
- To Run program type command “cd blynk-library-python” and next “sudo python start.py”
- To Stop Program press Ctrl+C buttons