Visvesvaraya Technological University

Belagavi

A Mini Project Report

On

WIRELESS DOOR LOCK

Submitted by

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In partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

IN

ELECTRONICS & COMMUNICATION

NEW HORIZON
COLLEGE OF ENGINEERING
New Horizon Knowledge Park, Ring Road, Marathalli
Autonomous College Permanently Affiliated to VTU, Approved by AICTE & UGC
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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CERTIFICATE

Certified that the Mini project entitled "WIRELESS DOORLOCK" is carried out by Ms. Keerthana P bearing USN: 1NH20EC063 and Ms. Monika M bearing USN: 1NH20EC083, bonafide students of NHCE, Bengaluru in partial fulfilment for the award of Bachelor of Engineering in Electronics and Communication of the Visvesvaraya Technological University, Belagavi during the year 2022-23. Itis certified that all corrections and suggestions indicated for Internal Assessment have been incorporated in the report deposited in the department library. The mini project report has been approved as it satisfies the academic requirements in respect of the mini project work prescribed for the said degree.

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2. _____	2. _____

Plagiarism report

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KEERTHANA P
MONIKA M

ABSTRACT

Due to rapid developments and advancements in technology have led to various aspects of our lives and even the way we secure our homes and properties. In our abstract, we are here to present a wireless door lock system which we can utilize Wi-Fi technology to provide a secure and access control.

The proposed system here aims to address the disadvantages and the limitations of using traditional key-based locks .by using Wi-Fi technology in the door lock system we users can lock or unlock the doors by using smart phones. here we eliminate the need of physical keys .

They consist mainly two components a internet enabled lock device and a mobile application installed on the users smartphone.

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CHAPTER 1

INTRODUCTION

Nowadays the home security system is very poor. Our project consists of a smart door lock system where we have developed a great solution to improve the home safety system.The term "Smart Home " basically defines a residence with various home automatic systems. we present a smart home technology using WI-Fi as it is more easy and efficient to use.This is a technology where it can be monitored, alerted and executed according to the desired functions. Arduino IDE software is used and internet devices to operate the door lock-in the home.

Fig 1.1

Here ,all data is controlled by internet android application in a app and we will be sending the data through Wi-Fi to control the door lock . Nobody can hack the system because it's closed-loop and the most secure system.

CHAPTER 2

LITERATURE REVIEW

Title of the paper	Authors	Year of publication	Outcome
Android based home door lock application via Bluetooth for disabled people	N.H.Ismail,Zarina Tukiran ,N.N Shamsuddin	30 November 2014	This project serves the need of people with any physical disabilities. Here they have used Bluetooth technology so that they can establish a good communication between user's smartphone and controller board .their prototype support manual controlling and microcontroller controlling to lock and unlock home door. They have connected the circuit with a relay board and then connected Arduino controller board as it can be controlled a Bluetooth available remote access from smartphone.

Title of the paper	Authors	Year of publication	Outcome
IRJET Smart Door Locking system	Kartik A Patil Niteen Vitalkar Pavano Hiremath Manoj A Murty	05 may 2020	The conceptual security has always been a significant worry to the public either in family or workplace . This project mainly concentrate on locking framework with the help of IOT (internet of thing).The Arduino nano is very adaptable working device which helps to provide a physical security by using biometric sensors which is easily available in any smart phone. The first step was to create a program by using aurdino IDE and then uploading it microcontroller that is the aurdino nano. The program here helps to set up a proper communication link between nano board and a smart phone via bluetooth. The main three requirements of this project was Arduino nano which is microcontroller, Bluetooth module and server motor which is used for locking and unlocking the door

Title of the paper	Authors	Year of publication	Outcome
Smart phone activated door lock using Wi-Fi	N.Hashim N.F.A.M.Azmi F.Idris N.Rahim	5 March 2016	We all know smart phones have a variety of uses and become one of most important device nowadays.This paper describes the design and operation of Door lock using smart phone through wifi technology. It is programmed using Android ,the smart phone can lock and unlock door with wifi range .Here the android application is designed by eclipse and peripheral interface controller (PIC) is used as the main controller of the design. This design is able to work within maximum range of 40 m to 150 m

CHAPTER-3

EXISTING SYSTEM

Fig.3.1

Traditional locks are mechanical locks where they often use pin and tumbler method with short and long metal pins to hold the lock cylinder in place. So when a key is inserted in the lock ,it lines up with long and short metal pins and moves them to a certain set distance and then unlock the mechanism . These locks lacks in security features like alarm sensors, video, and remote access leaves your home vulnerable.

The initial cost for a new lock is small but costs add up as you replace locks for new tenants or to regain the security .There is lack of remote access and control because
We cannot check the status of the lock when we aren't at home. We should also have to spend time and money in getting individual keys made for anyone who needs access to our home.

CHAPTER-4

PROPOSED SYSTEM

Fig.4.1

We present a Wireless door locks systems where it can lock and unlock doors without the need of electrical wiring. They are powered with the internal battery support systems. Here we control the door lock using Wi-Fiandroid application. With the help of android application we will be sending the information to open and close the door lock. The main purpose of the Wi-Fi Based Smart door locking system is to provide a solution to overcome the challenges and provide a perfect solution.

CHAPTER-5

CIRCUIT DIAGRAM

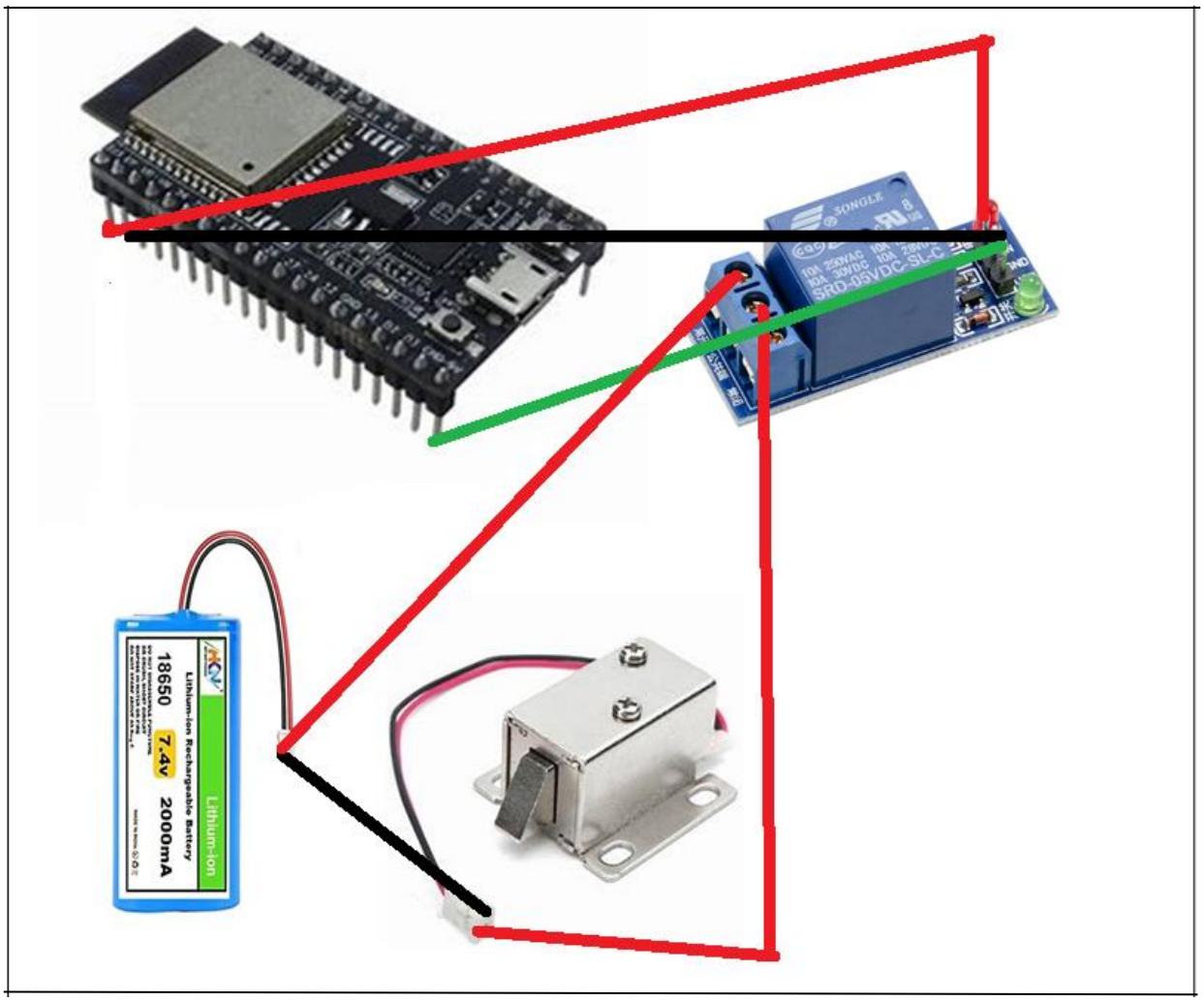
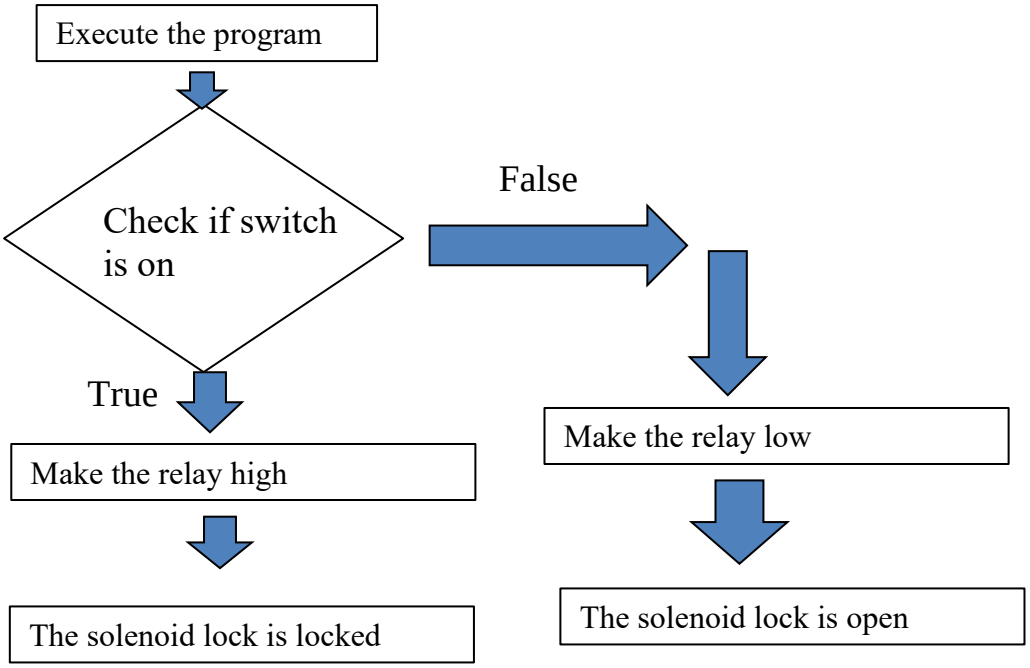


Fig 5.1

CHAPTER-6

FLOWCHART



CHAPTER-7

WORKING

The code is written in the Arduino Ide platform. The Esp 32 has an in-built wifi. So the after uploading the code to esp 32, it is connected to wifi using the blynk app.

The blynk app consists of a virtual pin switch which can be turned on and off by the user.
Whenever the user presses the on button, the blynk app sends a ‘1’ through the blynk cloud which is then read and the ouput is given to the relay as ‘high’. When the relay is high, the Solenoid lock is locked.

Again, when the user presses the off button, The blynk app sends a ‘0’ through the blynk cloud which is then read and ouput is given to the relay as ‘low’. When the relay is low,the solenoid lock is released.

CHAPTER-8

SOFTWARE SPECIFICATIONS:

ARDUINO IDE

Fig 8.1

Arduino is an open-source and software company, project, and user community that designs and manufactures single-board microcontroller and microcontroller kits for building digital devices. Its hardware products are licensed under a CC-BY SA while the software is licensed under the GNU Lesser Public Liscenvce (LGPL) or the GNU General Public Licence (GPL), permitting the manufacture of Arduino boards and software distribution by anyone. Arduino boards are available commercially from the official website or through authorized distributors.

Arduino board designs use a variety of microprocessors and controllers. The boards are equipped with sets of digital and analog input/output (I/O) pins that may be interfaced to various expansion boards ('shields') or breadboards (for prototyping) and other circuits. The boards feature serial communications interfaces, including Bus (USB) on some models, which are also used for loading programs. The microcontrollers can be programmed using the C and C++ programming Languages, using a standard API which is also known as the Arduino Programming Language, inspired by the Processing Language and used with a modified version of the Processing IDE. In addition to using traditional complier toolchains, the Arduino project provides an integrated development environment (IDE) and a command line tool developed in Go.

The Arduino project began in 2005 as a tool for students at the Interaction New design Italy, aiming to provide a low-cost and easy way for novices and professionals to create devices that interact with their environment using sensors and actuators. Common examples of such devices intended for beginner hobbyists include simple robots, thermostats, and motion detectors.

The name *Arduino* comes from a bar in Ivrea, Italy, where some of the project's founders used to meet. The bar was named after Arduin of Irvea, who was the margrave of the March of Irvea and King of Italy from 1002 to 1014.

BLYNK CLOUD

Fig 8.2

Blynk is an Internet of things (IoT) company which provides a platform for building mobile (IOS and Android) applications that can connect electronic devices to the Internet and remotely monitor and control these devices.

Blynk was founded by Pavel Bayborodin, a user experience (UX) expert in mobile and automotive space. The IoT platform was launched in 2014.

Blynk platform is used by engineers to connect MCUs and prototyping development boards like Arduino, ESP8266 or SBCs like Raspberry Pi over Wi-Fi, Ethernet or the cellular to the Internet and build custom mobile applications to remotely monitor and control electronic equipment.

Blynk Cloud is open-source.

Examples of platform applications are Smart Home, environmental monitoring, industrial equipment remote control.

BLYNK APP

Blynk offers native iOS and Android mobile apps which allow to remotely control connected devices and visualize data from them.
App operates in two modes:

- Developer Mode:

The primary function of Developer Mode in the mobile app is to build and edit the Mobile Dashboard User Interface (GUI) for the given Device Template.
Mobile Dashboard is built from Widgets - modular UI elements which can be positioned on the canvas. Every Widget serves a special function (a button, a slider, a chart, etc). Every Widget has its own settings based on its functionality**.**

- End user mode:

This mode is used by both the makers and the end-users.
It's focused on devices, automations and notifications view and management with the help of widgets and additional screens containing specific information about data that is set/sent/received to/from Blynk.Cloud and devices.

Home screen:
Home screen consists of up to 3 tabs depending on the configuration Devices, Automation and Notifications
Devices

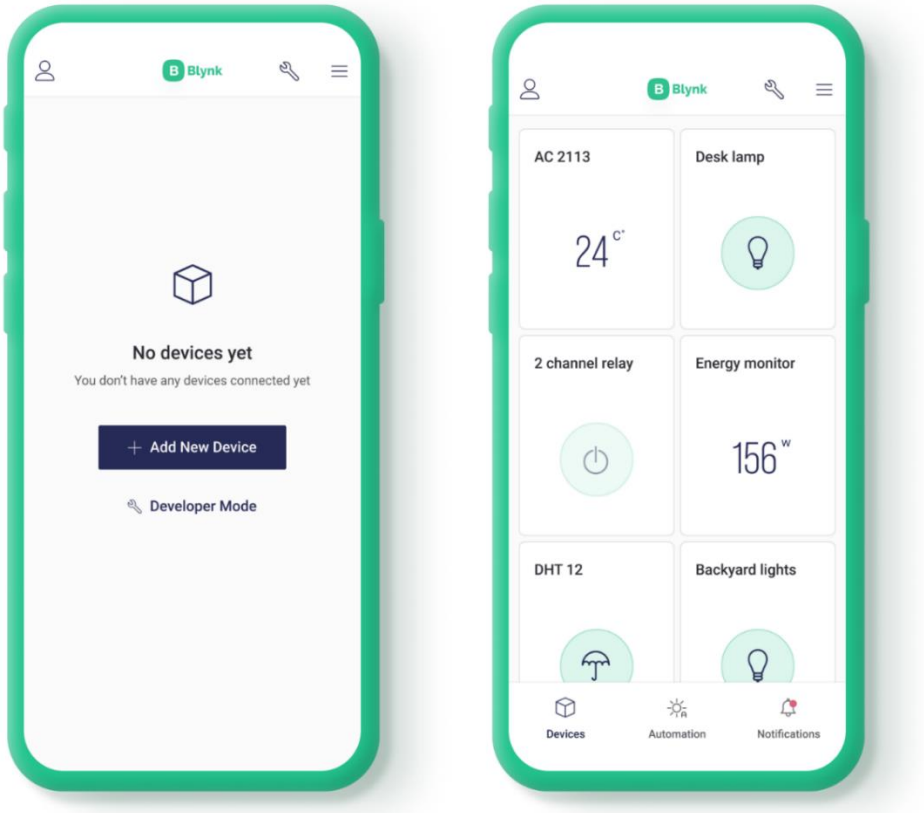


Fig 8.3

Devices tab:
This section is open by default when you open the app. All created devices will be listed here and their tiles will look according to their template type. To add new device go to the Right menu by tapping the top right button in the navigation bar. There are also options to change how devices are sorted.
If there are no devices yet, there is a button "Add new device" in the middle which takes you right to the device provisioning routine.
Automation tab:
You can automate your connected devices with the following triggers:

- Time of the day
- Sunset and sunrise
- Device trigger
- Manual execution (Scenes)

Notifications:

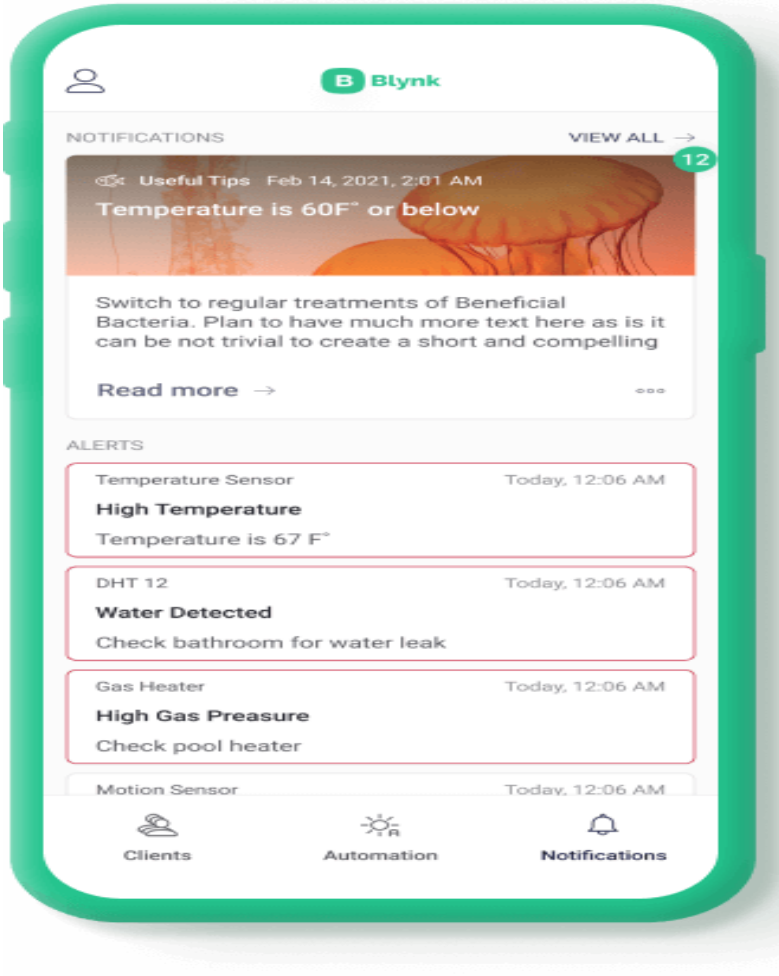


Fig 8.4

Notifications tab:
The list of notifications from all devices will be here.
In order to be listed here, the template should have the Event configured and the event should be triggered in the device.

Device dashboard:

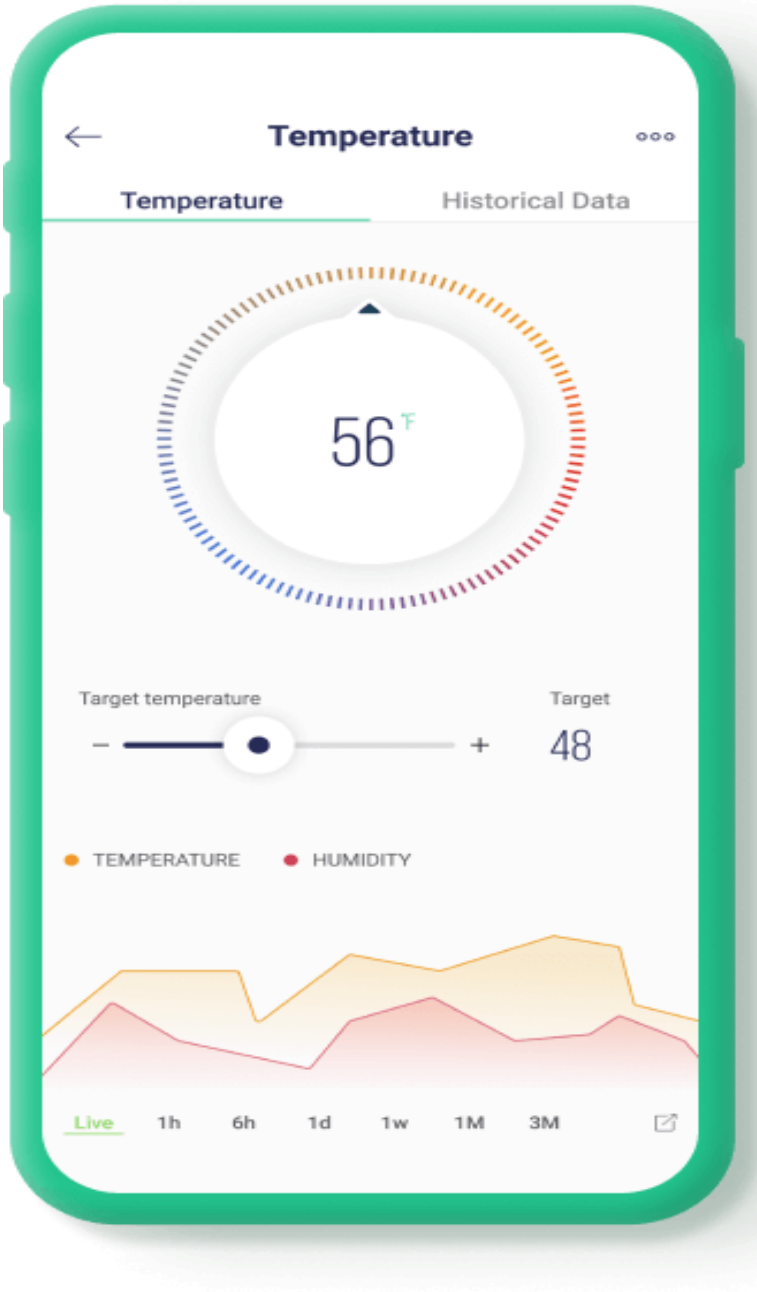


Fig 8.5

When a user taps on the device tile, the device dashboard will be opened. It consists of widgets that allow controlling and monitoring the device. The layout of the widgets and their settings can be edited in the Developer mode

Device info and timeline:
At the top right corner of the dashboard, there's an ... icon that opens another view with the Device Information and Timeline.
On the Device info tab, you can edit a device name, change other metadata values, view other things like firmware version, etc.

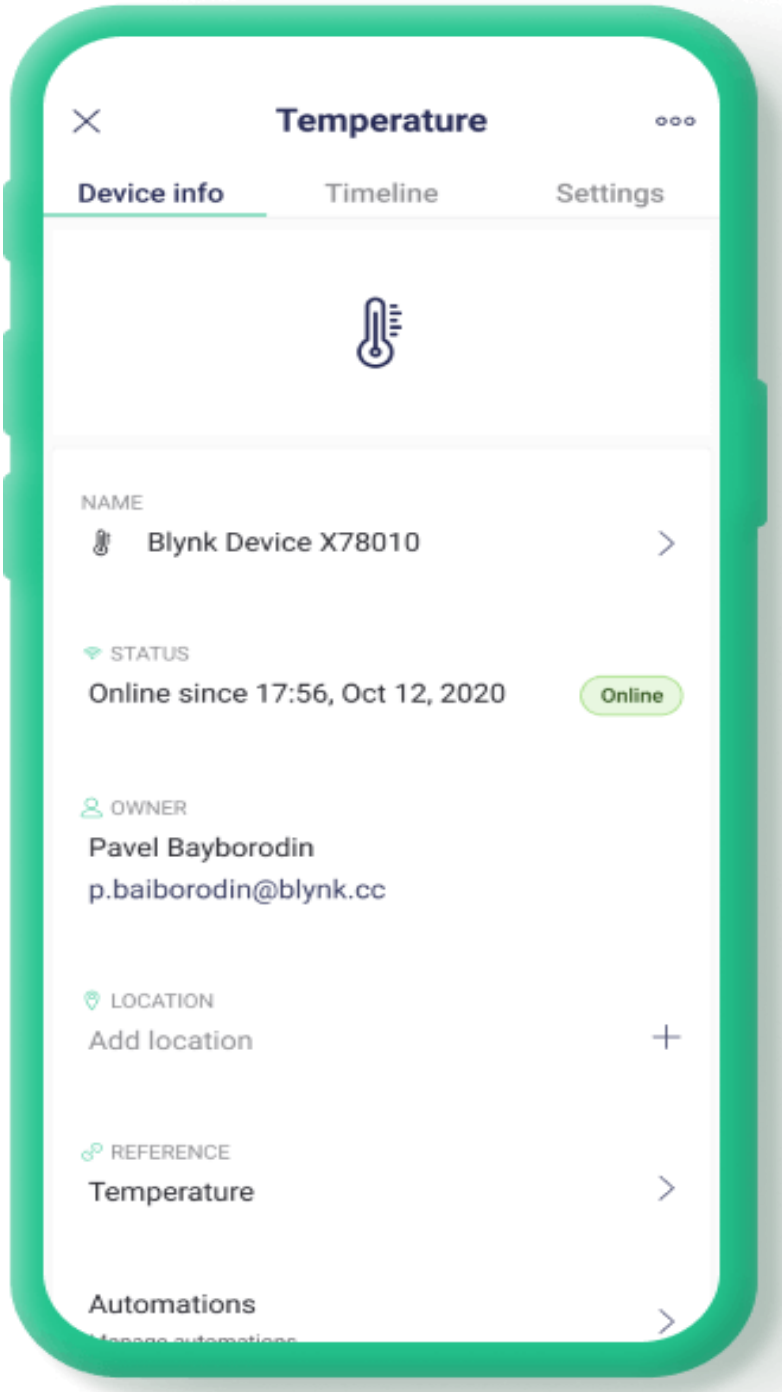


Fig 8.6

Device profile:
On the Timeline tab, you'll find the list of all events of the device (for example online, offline and custom Events)

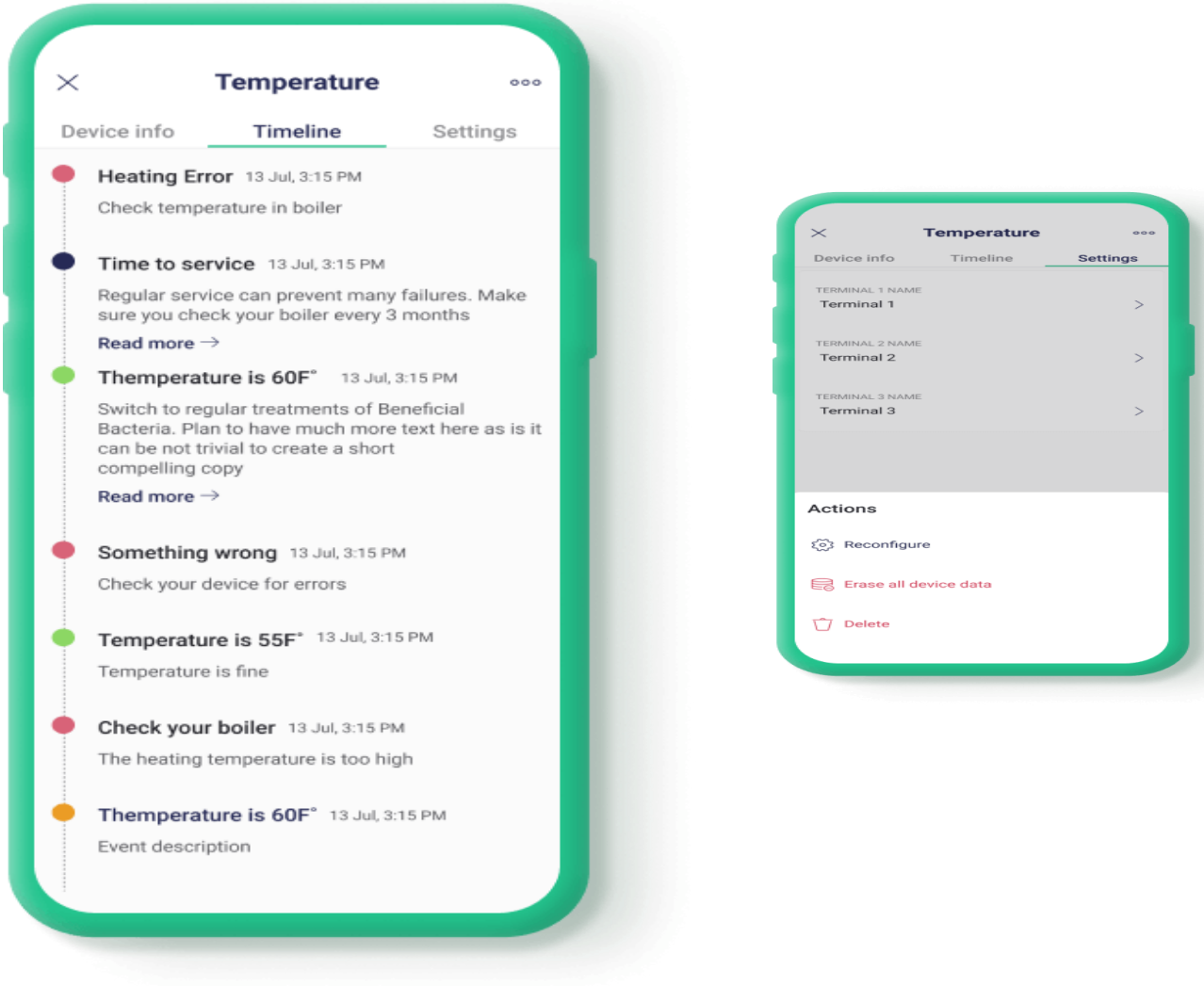


Fig 8.7

Device actions menu
At the top right corner of the Device Info and Timeline tabs, there's configure (gear) _**_icon that opens an actions menu with the following options:

- Reconfigure
- Erase all device data
- Delete device

Main menu

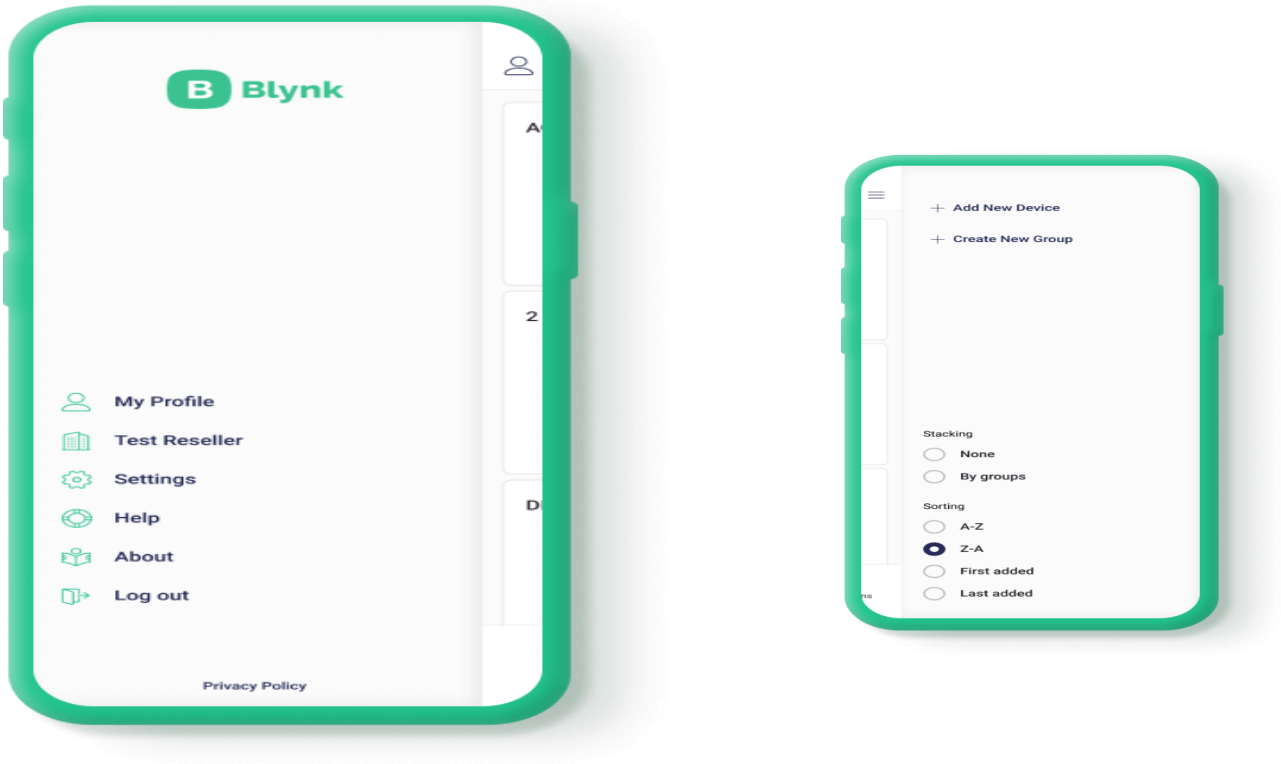


Fig 8.8

Left sidebar
At the top left corner, there's a Profile icon that will open the main menu when you tap on it. This menu consists of the following entries:

- My profile – here you can change your name, password, or delete your account.
- Organization settings – _**_here you can change the organization name, description, and time zone.
- Members – here you can invite new users to an organization by sending them an Email
- Switch organization – if you have other organizations created, you can switch to and from them using this switch.

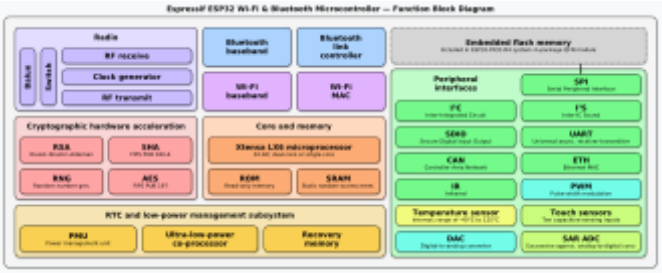
Right menu:

Right sidebar:
At the top right corner, there's a hamburger icon that will open the right sidebar menu when you tap on it. Depending on the active tab on the Main screen it offers to add new Device, create new Automation, new Group, etc.
This menu also offers the various sorting and stacking options for the devices and device groups list.

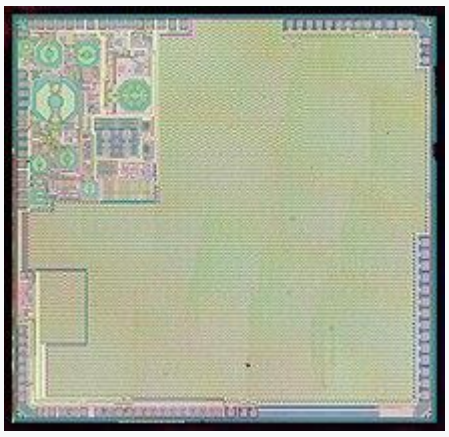
CHAPTER-9
HARDWARE SPECIFICATIONS:

ESP32

ESP32 is a series of low-cost, low-power system on a chi microcontrollers with integrated Wi-Fi and dual-mode bluetooth. The ESP32 series employs either a Tensilica Xtensa LX6 microprocessor in both dual-core and single-core variations, Xtensa LX7 dual-core microprocessor or a single-core RISC-V microprocessor and includes built-in antenna switches, RF balun, power amplifier, low-noise receive amplifier, filters, and power-management modules. ESP32 is created and developed by Espressif Systems, a Shanghai-based Chinese company, and is manufactured by TSMC using their 40 nm process. It is a successor to the ESP8266 microcontroller.



ESP32 function block diagram.



ESP32 Die shot

Fig 9.1

Features of the ESP32 include the following:

- Processors:
  - CPU: Xtensa dual-core (or single-core) 32-bit LX6 microprocessor, operating at 160 or 240 MHz and performing at up to 600 DMIPS
  - Ultra low power (ULP) co-processor

- Memory: 320 KiB RAM, 448 KiB ROM
- Wireless connectivity:
    - Wi-Fi: 802.11 b/g/n
    - Bluetooth: v4.2 BR/EDR and BLE (shares the radio with Wi-Fi)

- Peripheral interfaces:
    - 34 × programmable GPIOs
    - 12-bit SAR ADC up to 18 channels
    - 2 × 8-bit DACs
    - 10 × touch sensors (capacitive sensing GPIOs)
    - 4 × SPI
    - 2 × I²S interfaces
    - 2 × I²C interfaces
    - 3 × UART
    - SD/SDIO/CE-ATA/MMC/eMMC host controller
    - SDIO/SPI slave controller
    - Ethernet MAC interface with dedicated DMA and planned IEEE 1588 Precision Time Protocol support[4]
    - CAN bus 2.0
    - Infrared remote controller (TX/RX, up to 8 channels)
    - Pulse counter (capable of full quadrature decoding)
    - Motor PWM
    - LED PWM (up to 16 channels)
    - Ultra low power analog pre-amplifier

- Security:
    - IEEE 802.11 standard security features all supported, including WPA, WPA2, WPA3 (depending on version)[5] and WLAN Authentication and Privacy Infrastructure (WAPI)
    - Secure boot
    - Flash encryption
    - 1024-bit OTP, up to 768-bit for customers
    - Cryptographic hardware acceleration: AES, SHA-2, RSA, elliptic curve cryptography (ECC), random number generator (RNG)

- Power management:
    - Internal low-dropout regulator
    - Individual power domain for RTC
    - 5 μA deep sleep current
    - Wake up from GPIO interrupt, timer, ADC measurements, capacitive touch sensor interrupt

5V REALY

Fig 9.2

A relay is an electrically operated switch. It consists of a set of input terminals for a single or multiple control signals, and a set of operating contact terminals. The switch may have any number of contacts in multiple contact forms, such as make contacts, break contacts, or combinations thereof.

Relays are used where it is necessary to control a circuit by an independent low-power signal, or where several circuits must be controlled by one signal. Relays were first used in long-distance telegraph circuits as signal repeaters: they refresh the signal coming in from one circuit by transmitting it on another circuit. Relays were used extensively in telephone exchanges and early computers to perform logical operations.

The traditional form of a relay uses an electromagnet to close or open the contacts, but relays using other operating principles have also been invented, such as in solid-state relays which use semiconductor properties for control without relying on moving parts. Relays with calibrated operating characteristics and sometimes multiple operating coils are used to protect electrical circuits from overload or faults; in modern electric power systems these functions are performed by digital instruments still called protective relays.

Latching relays require only a single pulse of control power to operate the switch persistently. Another pulse applied to a second set of control terminals, or a pulse with opposite polarity, resets the switch, while repeated pulses of the same kind have no effects. Magnetic latching relays are useful in applications when interrupted power should not affect the circuits that the relay is controlling.

SOLENOID LOCK

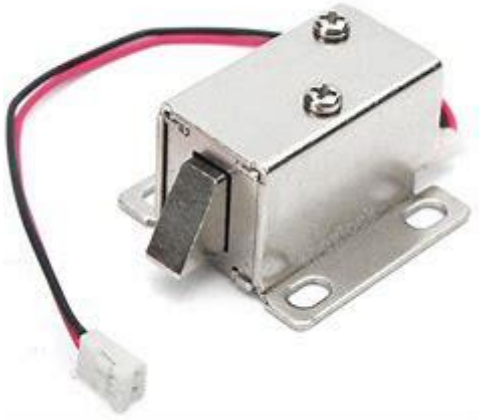


Fig 9.3

The principle behind an electromagnetic lock is the use of electromagnetism to lock a door when energized. The holding force should be collinear with the load, and the lock and armature plate should be face-to-face to achieve optimal operation.

The magnetic lock relies upon some of the basic concepts of electromagnetism. Essentially it consists of an electromagnet attracting a conductor with a force large enough to prevent the door from being opened. In a more detailed examination, the device makes use of the fact that a current through one or more loops of wire (known as a solenoid) produces a magnetic field. This works in free space, but if the solenoid is wrapped around a ferromagnetic core such as soft iron the effect of the field is greatly amplified. This is because the internal magnetic domains of the material align with each other to greatly enhance the magnetic flux density.

12 V BATTERY

Fig 9.4

A battery is a source of electric power consisting of one or more electrochemical cells with external connections[1] for powering electrical devices. When a battery is supplying power, its positive terminal is the cathode and its negative terminal is the anode. The terminal marked negative is the source of electrons that will flow through an external electric circuit to the positive terminal. When a battery is connected to an external electric load, a redox reaction converts high-energy reactants to lower-energy products, and the free-energy difference is delivered to the external circuit as electrical energy. Historically the term "battery" specifically referred to a device composed of multiple cells; however, the usage has evolved to include devices composed of a single cell.

Primary (single-use or "disposable") batteries are used once and discarded, as the electrode materials are irreversibly changed during discharge; a common example is the alkaline battery used for flashlights and a multitude of portable electronic devices. Secondary (rechargeable) batteries can be discharged and recharged multiple times using an applied electric current; the original composition of the electrodes can be restored by reverse current. Examples include the lead–acid batteries used in vehicles and lithium-ion batteries used for portable electronics such as laptops and mobile phones.

Batteries come in many shapes and sizes, from miniature cells used to power hearing aids and wristwatches to, at the largest extreme, huge battery banks the size of rooms that provide standby or emergency power for telephone exchanges and computer data centers. Batteries have much lower specific energy (energy per unit mass) than common fuels such as gasoline. In automobiles, this is somewhat offset by the higher efficiency of electric motors in converting electrical energy to mechanical work, compared to combustion engines.

CHAPTER 10
PROGRAM CODE

```
#define BLYNK_TEMPLATE_ID "TMPL3FNrY3Xlf"
#define BLYNK_TEMPLATE_NAME "WIRELESS LOCK"
#define BLYNK_FIRMWARE_VERSION        "0.1.0"
#define BLYNK_PRINT Serial
//#define BLYNK_DEBUG
#define APP_DEBUG
#include "BlynkEdgent.h"
BLYNK_WRITE(V0)
{
int pinValue = param.asInt();
digitalWrite(23,pinValue);
}
void setup()
{
 pinMode(23,OUTPUT);
Serial.begin(115200);
delay(100);

BlynkEdgent.begin();
}
void loop()
{
BlynkEdgent.run();
}
```

CHAPTER 11
ADVANTAGES AND DISAVANTAGES

Advantages:

- Convenience: with the help Smart locks systems , we can unlock your home with a smartphone, voice , fingerprint and any number of programmed codes
- Remote access and control: This lets to lock or unlock the door from anywhere since we will use a mobile app. And also no need to worry about whether door is lock or not ,simply we check the app, and can lock it from there as needed.
- Advanced security features. like anti-theft capabilities to prevent from tampering, intrusion alarms, two-way talk, and built-in cameras helps to keep your house safe
- Know who's coming in and out of your home: we will be Receiving notifications whenever someone unlocks the door.
- Enhanced security : the wireless door lock systems will have advanced encryption protocols and authentication mechanisms to ensure robust security. The fineger print or a facial recognition will be more common way for unlocking doors.
- Integration with smart home ecosystems:smart home ecosystems where it will allow homeowners to monitor the door locking and unlocking.the voice assistance like Alexa or Google assistant will enable the users to lock or unlock by using voice commands.
- The manufacturers will likely focus on design customization and asthetics . The users will have wide range of styles , finishes and form factors to choose from allowing them to decor their home

Disadvantages:

- Vulnerability to hacking: most smart technology is potential for hacking. The Smart lock developers are constantly updating the technology to prevent this, but they can always be a possibility to get hacked
- Dependence on technology: Smart lock systems are totally dependent on technology, which causes problems like Batteries may eventually need to be replaced, and the hardware of the smart lock system may become obsolete someday.
- Higher initial cost: Smart technology does come with a price tag which is higher than the most traditional lock systems.

CHAPTER 12

CONCLUSION

Our project gives a basic idea of how to control home security especially for door locks. By using solenoid door lock as a prototype for indoor and outdoor key lock system. It is based on android and arduino platform which are free open source software. The implementation is inexpensive and is reasonable for common people

CHAPTER 13
FUTURE SCOPE

- The future scope for this project wireless door look system is promising with so many advancements in technology and increasing demands for smart home solutions. They are some potential areas of development and improvement :
- We can use fingerprint for improved security.
- We can attach web cams to know who is unlocking the door.
- We can also try sending a message to the owner everytime the door is locked and unlocked.

CHAPTER 14
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