



# PASSWORD BASED CIRCUIT BREAKER USING IOT

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**Abstract:** Electrical shocks no matter how small it can be dangerous in many ways. Electric shock from even a small household circuit can have various detrimental effects on the victim. So we can imagine the level of consequences in case of an electric shock from high power lines. The electrical maintenance workers are working in a very dangerous situation with higher voltage lines daily. If something goes wrong the result can be fatal. A better and remotely accessible circuit breaker system can be a safer option to use when it comes to working on high power lines. If miscommunication occurs during the job the lineman can get seriously electrocuted. The best way to avoid such an unwanted scenario is to build a remote way to switch the load on and off by the lineman itself. A fast response circuit braking system that can be used anywhere is what the perfect solution will look like. A simple and powerful circuit breaker and the controller is what this proposed project is. The whole process happens quickly with the high response time capability added to the system.

## I. INTRODUCTION

Utility work is necessary to keep the lights on in our homes, but it is also quite dangerous. Every day on the job, linemen risk falling, electric shocks, burns, and other accidents, some of which can be fatal. Utility workers undertake some of the most dangerous tasks in the industry when they operate on electrical lines. It is critical that workers are aware of these dangers. So, in order to eliminate these risk factors, a concept was developed to ensure lineman safety, so that the lineman can restore the fault line without risking his life, and to provide complete safety during the fault-correcting procedure. Also, it's critical to look after these linemen since they put in a lot of work to ensure that the electricity is turned back on in those places without fail, and they're a crucial aspect of human safety. Because many linemen have been injured by these types of accidents, this method ensures lineman safety and will help to reduce the number of electric accidents that occur in India and around the world.

## II. LITERATURE SURVEY

S.S. Biswas et.al. (2018)- Circuit breaker is an important component of Electrical power Systems and other electrical related industries. This is used for protection and switching loads. Hence, reliable operation of circuit breaker is important. Circuit breaker ages over time and number of operations. This increases a concern regarding reliability of circuit breaker operation. In order to improve reliability of circuit breaker it is common practice to carry out preventive maintenance at fixed time periods. Moreover in current practice the control of circuit breaker is realized through hardwired control logic which increases the size of the device control and metering cabinet of the circuit breaker and prevents integration of IoT. This lay limitations on decision making process as circuit breakers data are not accessible on the fly. Presently monitoring of circuit breaker is being carried out through proprietary solutions like Remote Terminal Units and SCADA. Proprietary solution raises a concern regarding reliability and security of the safety, safety related, strategic application as the backend implementation of proprietary solution can't accessible by the user.

H.U.Zaman et.al. (2018)-Along with the constant improvement of different electronic devices, the safety of technicians has also become a matter of great concern, as the lives of technicians are at risk while they work by switching off the circuit breakers, because even after the circuit breaker has been turned off, someone can unknowingly turn it on while the technician is still working. There must be a system for ensuring security for the technicians. Also, people do not like having to walk to switches all the time to turn on/off appliances such as fan/light/air conditioner. It results in wasted energy because of unnecessarily keeping appliance on. To solve these problems, we came up with a system with password controlled circuit breakers and wireless control of home appliances using an Android app. It replaces the traditional circuit breaker on/off system with a password controlled system, where nobody can turn on the circuit breaker without the password. Remote control of the home appliances helps the user save electricity. It also enhances the quality and comfort of life. The system also includes a

home security mechanism against illegal intrusion using a password controlled door lock system and a mechanism for detecting dangerous gas leakages.

D R Lalitha S et.al (2018)-Security is the prime concern in our day-to-day life. Everyone needs to be secure as much as possible. Especially people working in electrical field need to work with a lot of care as a small carelessness may lead to a loss of life. The main reason for such hazard is the lack of communication and coordination between the maintenance staff and electric substation staff. Hence forth it is important to make provision so that no lineman loses his life during the work. In order to overcome the problem a system has to be designed such that the control to turn on or off the line will be maintained by the in charge person only.

T. Munasinghe et.al (2019)-With the development of Internet of Things(IoT), sensing technology and communication technology, the interconnection of everything is the trend of social development. IoT applications are a bridge to connect objects and networks, widely used in various fields, involving more and more industries. In addition to the publicly available IoT platforms, self-developed private IoT applications are also urgently needed. This proposes a combination method of the Bluetooth module and the MIT APP Inventor 2 development platform to design the IoT application, which can remotely control the hardware device by the Android mobile phones.

Md. Sanwar Hossain et.al (2019)-Remote monitoring and controlling of the substations equipment is an important issue for the power or energy management department which is normally done manually, or using an expensive PLC and SCADA system. With the emergence of the internet and computational era, a smart monitoring and reliable controlling system over the entire substations equipment is highly desirable that can be achieved by introducing the IoT technology. Internet of things is the network of physical devices embedded with sensors, actuators, electronics, softwares and network connectivity which have the ability to identify, collect and exchange the data. Each thing is identifiable through their embedded computing system and able to interoperate within the existing internet infrastructure.

B. Sai kumar et.al (2020)-Security is the primary concern in our daily life while performing any type of activity. In the present situation, accidental and unexpected death of lineman is often read and evidenced. In this way, a safety measure to safe guard the lineman is found very necessary looking into the present working schedule. The lineman safety system is constructed to control the control panel doors and circuit breaker by using a password for the safety.

B. Mounika et.al (2021) -A circuit breaker is an automatically operated electrical equipment constructed to protect an electrical circuit from damage caused by short circuit and overload. The basic function of a circuit breaker is to detect a fault condition and interrupt current flow. When operated manually we can see fatal electrical accidents to the line man are increasing during the high voltage line repair due to the miscommunication and coordination between the electrical substation staff and the lineman. In order to decrease such types of electrical accidents, the breaker can be so constructed such that only authorized person can operate it with a password. This improves the security of the worker because no one can turn on the line without the password. The system is fully controlled by the microcontroller. A keypad is used to enter the password and a relay to close or open the breaker, which is indicated by a lamp.

### III. OBJECTIVE

Main objectives of this work can be illustrated as:

- Ensuring the security of the circuit or device by preventing unauthorized access.
- Providing a reliable way to control the power supply to the circuit or device.
- Allowing remote access and control through the use of IoT.

### IV. METHODOLOGY AND PROCEDURE

#### Components and Software Used

In this project, we are using components such as load relay, NodeMCU with wifi module, 16\*2 LCD display,two loads and power supply. Software used are html, php, android in server side and Embedded C in controller side. The entire communication of the system is handled by the connectivity of internet through wifi module.

#### NODEMCU

NodeMCU is a small board, based on the chip ESP-12 Wi-Fi module containing a single-chip ESP8266 Wi-Fi SoC. The NodeMCU is an open-source firmware and development kit that helps to prototype our IOT product within a few script lines. The ESP-12 is one of the available modules containing an ESP8266 chip it is becoming more popular because of its integrated Wi-Fi module.

#### LCD display

These displays are mainly preferred for multi-segment light emitting and seven segments. The main benefits of using this module are inexpensive, simply programmable, and there are no limitations for displaying custom characters, special and even animations.. etc. The operating voltage of this display is 4.7V-5.3V.

### Load relay(JQC3FC)

The JQC3FC relay is a type of electromagnetic relay that is commonly used in various industrial and consumer electronic applications. The JQC3FC relay has a DPDT (Double Pole Double Throw) contact configuration, which means it has two sets of normally open (NO) and normally closed (NC) contacts that switch together when the relay is activated. The JQC3FC relay is available in different coil voltages, typically ranging from 3V DC to 48V DC.). The contact rating of the JQC3FC relay depends on the type of load being switched and the voltage and current rating of the load. Generally, the JQC3FC relay is rated for switching low to medium power loads up to 10A. Overall, the JQC3FC relay is a versatile and reliable component that is widely used in various industrial and consumer electronic applications, including power supplies, lighting controls, home appliances, and automotive electronics.

### Power supply

A transformer is an electrical device that changes voltage from one level to another level. Basically, a transformer changes electricity from high to low voltage or low to a high voltage using the properties of electricity. For the working of the system a power supply needed. The microcontroller needs only 5 volt DC for its working . AC/DC adaptor circuit used in the system as a power supply.

The system consists of a microcontroller unit (MCU), a Wi-Fi module, a password management system, and a circuit breaker. The working of the system can be explained as follows:

The lineman enters a password through a web interface to activate the circuit breaker. The password is verified by the password management system. Once the password is verified, the MCU sends a signal to the circuit breaker to activate or deactivate the electrical circuit. The Wi-Fi module sends a notification to the lineman's mobile device or email when the circuit breaker is activated or deactivated. The system records the time and date of the circuit breaker operation for future reference.

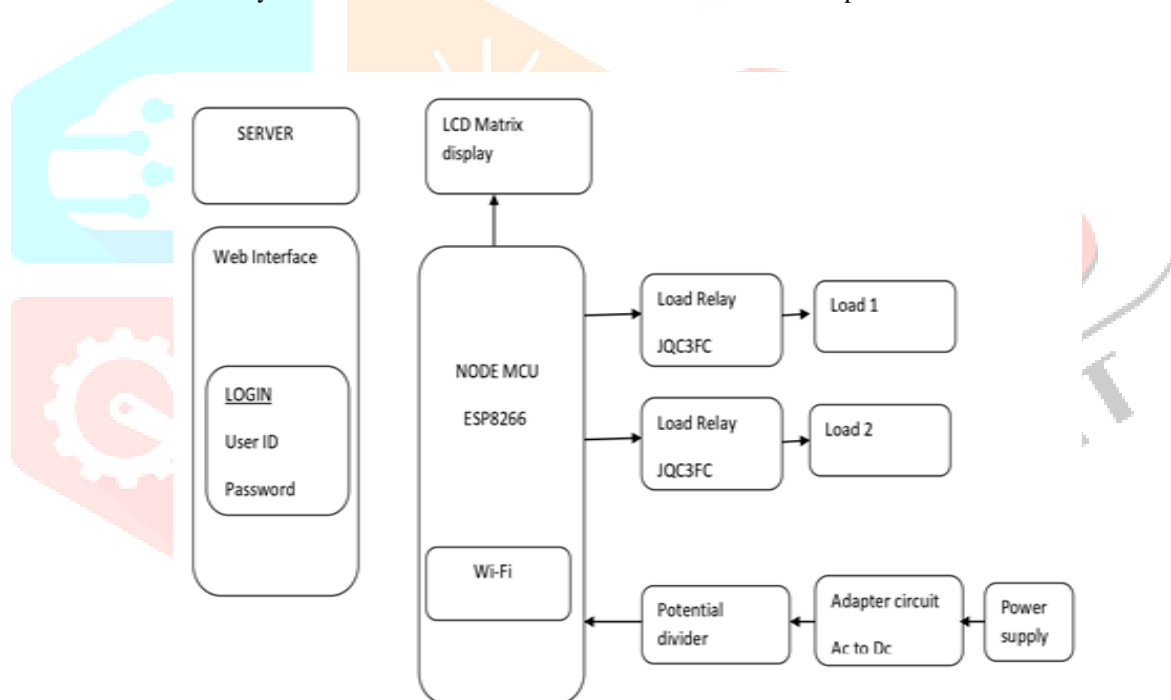


FIGURE 1:BLOCK DIAGRAM

### V. ADVANTAGES

- Improved security: Password-based circuit breakers can improve the security of electrical systems by requiring a password to be entered before the circuit can be accessed. This can prevent unauthorized users from accessing the circuit, which can help to prevent damage to equipment or even injury to people
- User accountability: By requiring users to enter a password before accessing a circuit, password-based circuit breakers can help to ensure that users are held accountable for their actions. This can be especially important in situations where the circuit is used by multiple users or where the circuit is being accessed remotely.
- Cost-effective: Password-based circuit breakers can be a cost-effective way to improve the security of electrical systems, especially compared to more complex access control systems that require additional hardware or software

## VI. DISADVANTAGES

- Security vulnerabilities: Passwords can be easily compromised, especially if they are weak or predictable. Hackers may be able to gain access to the system and cause a power outage or damage to the electrical system. Additionally, IoT devices themselves can have security vulnerabilities that can be exploited
- Internet connectivity issues: If the internet connection goes down, it may not be possible to remotely control the circuit breaker, which could be problematic in emergency situations.
- Dependence on third-party services: IoT devices typically rely on third-party services, such as cloud platforms or mobile apps, which can be a point of failure or cause disruptions in service.

## VII. SCOPE OF THE PROJECT

Password-based circuit breakers using IoT can be used to enhance lineman safety in electrical power systems. The scope of this technology in improving lineman safety can include Remote Control: Password-based circuit breakers can enable linemen to control electrical equipment from a remote location, reducing the risk of electrical shock or electrocution. Unauthorized Access Prevention: Password-based circuit breakers can prevent unauthorized personnel from accessing electrical equipment. This can prevent accidental or intentional damage to the system, ensuring lineman safety. Monitoring: IoT-enabled circuit breakers can provide real-time data on electrical usage, identifying potential safety hazards and enabling proactive maintenance and repairs. Alerts and Notifications: Password-based circuit breakers can provide alerts and notifications to linemen in case of any faults, hazards or alarms related to the electrical equipment, thereby enabling them to take prompt action. Increased Efficiency: Password-based circuit breakers can help in optimizing the performance of electrical equipment, thereby reducing the time that linemen need to spend on the field. This can help reduce the exposure of linemen to hazardous environments and enhance their safety. Overall, the use of password-based circuit breakers using IoT can play a significant role in improving lineman safety by providing enhanced control, monitoring, and protection of electrical equipment in power systems. It can also enable linemen to work more efficiently and effectively, reducing their exposure to hazardous conditions.

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