

# Development of Automated Electricity Calculation Applications by IOT technology via Cloud Computing

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## Abstract

The current economic downturn. As a result, many homes to survey and control costs. Of living on their own, whether it is the cost of living as well as the cost of utilities such as electricity, water, fuel vehicles to meet the income they receive. For expenses such as electricity, we could not avoid it, we have to determine the cost. We use electricity to a few units Must pay Amount to much You can also find ways to conserve electricity by the tariff. We should know electronics Use electric or power it up By observing the instruction manual or the label attached to the appliance, wrote that the power in watts (Watt) if appliances are much wattage. It consumes a lot as well. So you can calculate all the appliances in your home that use a few watts of power each. And enable a few hours per month Later, he was taken into calculation. You will note that each month you currently used to estimate how many units to guide the savings on electricity costs. Researcher has studied the application of the Internet for thing in the field of power electronics. This research Development of Automated Electricity Calculation Applications by IOT technology via Cloud Computing. The system can check voltage, can check the current, can check power, can check the amount of electricity used, can check the electricity and can turn on / off Power.

## Keywords

Internet of things, IOT via Cloud Computing, Automated Electricity Calculation

## 1. Introduction

In today's Internet to all things (Internet of things) have a role in our daily lives is huge. No matter what we do, where things are around us, often involving the Internet regularly. Thailand 4.0 model-driven blueprint of the country to prosperity, stability and sustainability in the Group 4 digital and offline Internet destinations.[1] Embedded technology (Digital & IOT- Embedded Technology) had a vision this group. Internet technology off protest To develop Thailand as a leader in agriculture, health and tourism. Asia's Sustainability The engine-driven cluster technology, a core technology 4, which is one of four areas: Internet Offline Rating (Internet of Things) is an environment that includes everything that can be communicated and connected through a communications' protocol for communication.Wired and wireless Internet accesses in all things. How are identifiable. Get to know the context of the environment. And interact, [2] interact and collaborate. The ability to communicate what this will lead to many innovations and new services, for example, home sensor detects the movement of residents. And send a signal to the on / off switch on the lights in the room. With or without people. The device measures the vital signs of the patient / seniors and send information to medical personnel. Call or send a text or emergency rescue units, and so on.

If everything is connected by the Internet. Will bring many benefits to a positive impact on the lives of human beings in terms of convenience and quick access to every piece of technology to communicate among themselves.[3] To facilitate for them the most. The Internet for everything (Internet of things) is beneficial to use in various fields. Whether it is transportation. The power of marketing, education and other

Researcher has studied the application of the Internet for everything in the field of power electronics. And concluded to develop an application automatically calculates the electricity. By an award-winning Internet technology to all. Through cloud computing to address the issue of energy than necessary. You can check the power supply via apps have. Including monitoring voltage, [4] current and power consumption.

### 1.1 Research Objectives

- To design and develop an Automated Electricity Calculation Applications by IOT technology via Cloud Computing.
- To develop an application that is capable of receiving data from hardware devices via the Internet. To calculate the amount of electricity used. And calculate electricity
- To develop an application to have the ability to control the on / off power

### 1.2 Research Range

Designed and developed an application automatically calculates the electricity. By applying Internet technology to all. Through cloud computing are as follows:

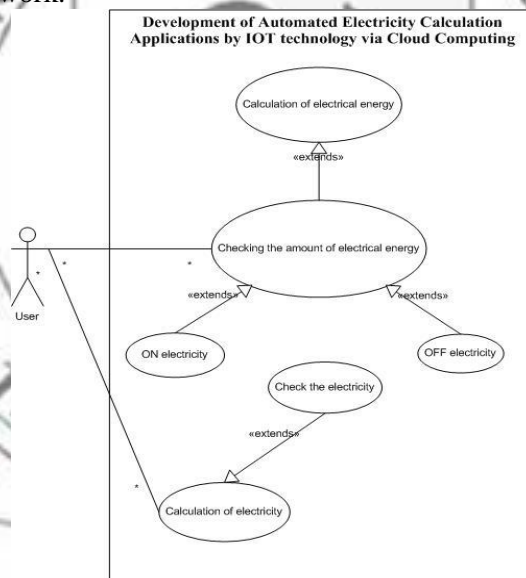
- Users can monitor voltage
- Users can check the current
- Users can monitor power
- Users can check the amount of electricity used
- Users can check the electricity
- Users can turn on / off power.

## 2. Research methodology

To design and develop an application automatically calculates the electricity. By an Internet of Things via Cloud Computing research study tools. And system development The research theory Documents and related research.

### 2.1 Use Case Diagram

Shows the functioning of the system that consist of Actor which is the user of the system, and Use Case that shows the function of the system. The two parts will be linked and showed relationship in **Figure 1**. It can be seen that there are 1 level of user access rights: 1) each user would have function as specified in the work.

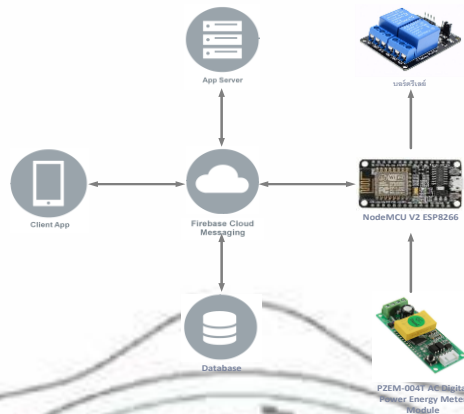


**Figure 1** Figure's Use Case Diagram

User can monitor voltage, can check the current, can monitor power, can check the amount of electricity used, can check the electricity and can turn on / off power.

### 2.2 System Architecture

System Architecture Design Show Users access the system via the Internet in the form of an application. This data is managed through Firebase on Cloud Computing, which will manage the database and the server will try to work with the board NodeMCU V2 NodeMCU V2 ESP8266[5] Development Kit to connect and exchange information between devices. in **Figure 2**



**Figure 2 Figure's System Architecture**

### 3. Operation performance

Operating in the Development of Automated Electricity Calculation Applications by IOT technology via Cloud Computing to develop and install the system. And an application for calculating the amount of electricity used. And calculating power The work consists of two main parts, equipment, Hardware. Part of Applications. Which can be run by the user below.

#### 3.1 Hardware

- A series of experimental prototype circuit IOT technology to bring my application to be able to control the on / off electricity, including voltage electricity. The amount of electricity used And an electric charge via the apps automatically., **Figure 3**.



**Figure 3 Figure's Hardware Automated Electricity Calculation Applications by IOT technology via Cloud Computing**

- Board relay two channels operate at 5V voltage regulator supports two channels can be connected to the microcontroller directly. The Op to between the microcontroller and the relay. A second indicator is the transistor to drive the relay. Details are as follows:

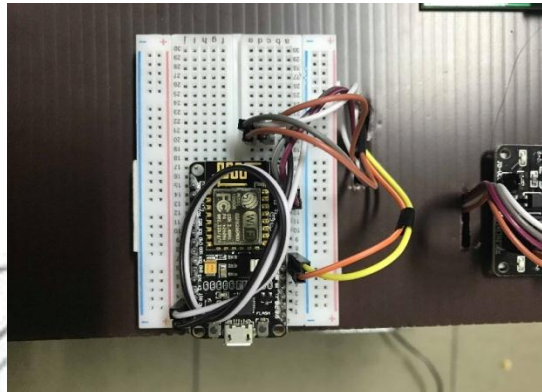
- Relay 5V 10A
- 5V working voltage
- relay driver transistor, **Figure 4**.



**Figure 4 Figure's Relay 5V 10A**

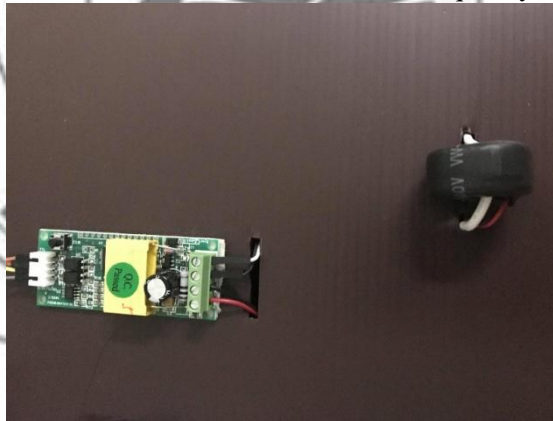
- NodeMCU Development Kit V2 is developed from the original NodeMCU Version is a module that contains ESP8266-12 E Antenna PCB Antenna connection pin headers for including GPIO,

PWM, I2C, 1-wire, ADC. SPI has increased largely from the original Version of USB-to-TTL micro USB port and a USB to Serial chip of silicon lab cp2 1 0 2 is connected to a PC for application development. Installable firmware NodeMCU and also the size of the PCB can be reduced with the use of the breadboard., **Figure 5**



**Figure 5** Figure's NodeMCU ESP8266

- PZEM-004T AC Digital Power Energy Meter Module is a module power consumption. Measure the voltage of the power house. Measurement of the electrical power used. Power Measurement And measuring the electric power per hour (Wh), which could bring these values to calculate electricity bill Or measure the power consumption of individual appliances. And measuring the voltage is 80–260 VAC electrical current and measure the 0–100 A run at a frequency of 45 — 65Hz.[6], **Figure 6**



**Figure 6** Figure's PZEM-004T AC Digital Power Energy Meter Module

### 3.1 Applications

- Users can turn on / off the power of this screen by hand, press the light bulb. On the status is yellow and gray flag is OFF., **Figure 7**





Figure 7 Figure's Application controlled on / off power.

- The main screen of the application can be controlled by an on / off power. Status and power outlet voltage electrical power consumption. The auto power., **Figure 8**
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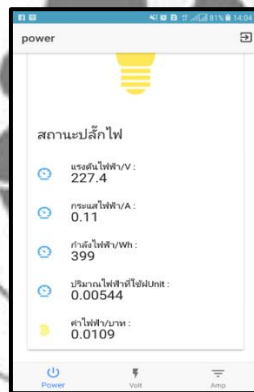


Figure 8 Figure's Application Details of the electricity used.

- A screen for displaying a graph of voltage from actual use. The processors come in the form of figures and graphs.



Figure 9 Figure's Application Graph Display of Voltage.



Figure 10 Figure's Graph display of Electricity.

#### 4. Result and Discussion

The following 2 evaluator groups are used in the System Performance Evaluation: 1) Software specialists and Hardware specialists = 5 persons and 2) a group of 20 users. Following are the evaluation outcomes summary: System performance evaluation by specialists shown performance is "Good" ( $\bar{x} = 4.29$ , S.D. = 0.28), where all 5 criteria are "Good" as shown in Table1. System Performance evaluation will use 2 groups of evaluator, 1) Software specialists and Hardware specialists: 5 persons. 2) 20 Users The results of evaluation as followed; System performance evaluation by specialists shown performance is "Good" ( $\bar{x} = 4.29$ , S.D. = 0.28), where all 5 criteria are "Good" as shown in Table1.

Table 1. System performance evaluated by Specialists

No.	Criteria	$\bar{x}$	S.D.
1	Functional Testing	4.48	0.22
2	Functional Requirement Testing	4.24	0.32
3	Usability Testing	4.32	0.22
4	Security Testing	4.24	0.47
5	Performance Testing	4.20	0.44

System performance evaluation by Normal user shown performance is "Good" ( $\bar{x} = 4.20$ , S.D. = 0.37) where all 5 criteria are "Good" as shown in Table2.

Table 2. System performance evaluated by Normal Users.

No.	Criteria	$\bar{X}$	S.D.
1	Functional Testing	4.26	0.36
2	Functional Requirement Testing	4.06	0.49
3	Usability Testing	4.15	0.45
4	Security Testing	4.33	0.35
5	Performance Testing	4.23	0.53

#### 5. Conclusion

This research Development of Automated Electricity Calculation Applications by IOT technology via Cloud Computing. The system can monitor voltage, can check the current, can monitor power, can check the amount of electricity used, can check the electricity and can turn on / off. Power. In this

research led to the development of this prototype in a real place to go. This system has been evaluated by an expert Graeme Expo. And hardware and software.

## 6. Acknowledgement

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