

Flow Measurement Of Charges And Electricity Costs Monitoring System With Android Based Iot (Case Study: Boarding House Adelina)

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Abstract- In the Journal of Sensor and Actuator Networks Melanie Swan stated the developing world of the current sensor network that requires the sensor device can be monitored or controlled via the Internet or known as the Internet of Things (IOT). On the basis of interviews conducted at the boarding house Adelina having 1 electric meter between houses and boarding houses. Difficulties in monitoring the use of electricity at his boarding house. While the PLN as the sole ruler of businesses do not yet have a system that can provide electricity usage charges capable of realtime, therefore we need a monitoring system that is able to measure and calculate the cost of electricity consumption in dwellings use. The author uses ArduinoUno equipped with an Ethernet shield as a tool or the brain of the system is developed, the tool is assigned to process all the necessary activities in monitoring the flow of electricity. ArduinoUno necessitate current sensors to monitor electric current and current data captured by the sensors is sent cloud service. In making the system accessible online. The result is a system of monitoring the use of current and electricity costs, the researchers hope to reduce the problems associated with payment, to measure, how to monitor and calculate the cost of electricity.

I. INTRODUCTION

According to Melanie Swan in the Journal of Sensor and Actuator Networks declare the developing world of the current sensor network that requires the sensor device can be monitored or controlled via the Internet or known as the Internet of Things (IOT)[1]



Fig. 1. personal computer connected via the internet [9]

According to Beecham Research While there are nine division service of IOT namely IT & Network, Security / Public Safety, Retail, Transportation, Industrial, Healthcare, consumer and home, energy, buildings. In this research focused on the occupant and home. Based on interviews conducted by the author with the management of the boarding house located at

SD inpres street No. 45 RT 01/09 West Pisangan, Cirendeu Ciputat South Tangerang Mr. Gustian, he stated the use of electricity in a rooming house and in his erratic every month for houses and boarding houses using single power meter. Where the use of electricity at home and boarding house he occupied not be separated so that the owner of the boarding house can not determine how much the use of electricity for homes and how much electricity usage to a rooming house. So that the electricity costs incurred by the owner every month is different. According to the International Data Corporation (IDC), the largest smartphone market share holder until the second quarter of 2015 is an android. Android market share in the second quarter of 2015 amounted to 82.8%. With a market share of android was then used as a place to put this controller application power usage[1]. According to Muhammad Izwan in scientific work Electrical Home Energy Monitoring System where the system can warn the user if they reach the limit of electricity that can be compared with the last use of electricity[10] However, the application software running on Visual Basic on the desktop, this system can only be accessed on the desktop and the data is not stored in the cloud can not be categorized as IOT. While the scientific work entitled Ariefman Zulfā [11] prototype measurement of burden and costs of monitoring electric current to the microcontroller arduino on postpaid customers web-based, where the system is able to take measurements of the electric current. However, the system must be accessed through a local network that can be accessed only place installed a monitoring tool only.

Therefore, to help owners of boarding houses to control the electricity consumption needed a tool that can provide information on the use of electricity in order to control the use of electricity monthly, so the cost per month under control. This can be done with a system that uses a microcontroller to read the current sensor and displayed in the form of information that can be accessed anywhere using android smartphone. Which facilitates equipment controlled via android.

II. TEORICAL BASIC

Internet of Things is a global network of computers, a sensors and actuators are connected over internet protocol.

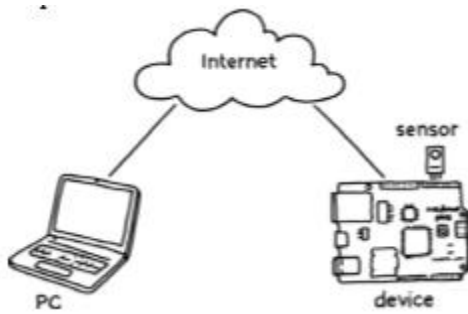


Fig. 2. A personal computer connected via the internet[2]

In the magazine IEEE (Institute of Electrical and Electronics Engineers) declare Internet of Things is a framework in which all have representation and presence on the internet. More specifically, the Internet of Things aims at offering new applications and communication services machine to machine (M2M), which is a communication that enables interaction Things and applications on a cloud definition of Internet of Things, according to the Oxford dictionary is interconnected via the Internet from devices embedded in everyday objects. Allow they send and receive data.

III. PROBLEM STATEMENT

The purpose of this study is to apply the concept of IOT on a monitoring system, create a system to record electricity usage load power, making Android app for monitoring load electric power consumption and converting into rupiah.

Development

Development of the system in this study the authors use the method of Rapid Application Development (RAD) [6]. RAD is an object-oriented approach to the development of a system that includes a method and device software development. RAD aims to shorten the time that is typically required in traditional systems development life cycle between the design and implementation of an information system. RAD method consists of three main stages, namely planning terms, Workshop RAD design, and implementation[3].

A. Planning Needs

At this stage, explain what are the needs of the system, by defining the scope of the analysis system is running, problem identification, system requirements analysis, system development objectives, and analysis of the proposed system. In this first step, the authors began by identifying the needs of the user. To find out the needs of users, the authors conducted interviews, observation, literature study and analysis. First, the author interviewed the owner of the boarding house Adelina result is a rooming house owners need to monitor the flow of electricity on a regular basis to determine the amount of electricity consumption at regular intervals and realtime. After the authors get the user needs to interview, we analyze the needs of hardware, software and tools necessary to create a monitoring system. Detailed outline can be seen in Table 1 and 2.

TABLE I
HARDWARE COMPONENTS

No	Component
----	-----------

1	Arduino Uno
2	Ethernet Shield
3	Current Sensor SCT 013 100A
4	Ethernet Cable/ Kabel LAN

TABLE II
SOFTWARE AND TOOLS

No	Component
1	Arduino IDE
2	Programing Language PHP, HTML
3	Microsoft Visio
4	Adobe Photoshop CS

After that, the authors analyze the current system and the proposed system that we recommend to control the rooming house owner needs Adelina.



Fig. 3. Purposed System

In Fig.3 describes the system runs where the system by using ArduinoUno, Ethernet Shield Current Sensor SCT 013 for monitoring the use of electrical current to the boarding house Adelina. Here's an explanation of the system running electrical current measurements:

1. ArduinoUno and EthernetShield as a communicator between the captured data.
2. Current Sensor SCT-013 to measure the use of electric current.
3. Sensor measuring current flow in a rooming house Adelina through electric wires used for boarding houses Adelina.
4. Current Sensor obtain data on the use of current boarding houses Adelina.
5. The data obtained by the current sensor are stored by ArduinoUno.
6. Next forwarded using the Ethernet shield.
7. Using the Ethernet Shield uses the data is uploaded via the hosting that has created.
8. Data uploaded to a hosting made public ip.

From the data obtained will be forwarded by Ethernet Shield to the cloud. Furthermore, through the android app user can see the results of the monitoring conducted by ArduinoUno in realtime

B. Develop A Prototype

At this stage is defined as the design of the system being designed as a first step to develop a prototype. This design consists of a System Application Design, User Interface Design and translates into code. In the design phase of the application system, we use UML as a method of making a

child monitoring system. UML application system design shown in Fig.3.

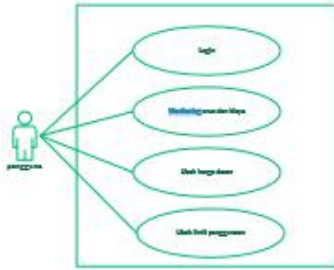


Fig.4. Use Case Diagram for Application System Design

In the next phase, the authors undertake the design of the user interface system. This design is done on every page contained in a android based system (Fig. 5).



Fig. 5. User Interface Design

In the last stage, the authors translate the prototype into the program code through Arduino IDE.

```

// EmonLibrary examples openenergymonitor.org, Licence
#include "EmonLib.h"
// Include Emon Library
#include <SPI.h>
#include <Ethernet.h>
EnergyMonitor emon1; // Create an ins

//This will keep track of the last time we sent sensor
unsigned long lastUpdate = 0;
String kirim;
String Colkirim = "arus=";

// assign a MAC address for the ethernet controller.
// fill in your address here:
byte mac[] = {0x90, 0xA1, 0xA2, 0xA3, 0xA4, 0xA5, 0xA6};
// fill in an available IP address on your network here
// for manual configuration:
IPAddress ip(192,168,137,177);
IPAddress server(192,168,137,1);

// initialize the library instances:
EthernetClient client;

void setup()
{
  Serial.begin(9600);

  emon1.current(1, 60.6); // Current: input
  Ethernet.begin(mac, ip);
  // print the Ethernet board/shield's IP address:

  Serial.print("IP Address: ");
  Serial.println(Ethernet.localIP());
}

void sendData() {
double Irms = emon1.calcIrms(1480); // Calculate Irms

Serial.print(Irms*230.0); // Apparent power
Serial.print(" | ");
Serial.println(Irms); // Irms
kirim = Colkirim + Irms;
//post via ethernet
if (client.connect(server, 80) {
  Serial.println("Connected to server");
  // Serial.println("Not connected");
  client.println("POST /pin/insert.php HTTP/1.1");
  client.println("Host: 192.168.137.1");
  client.println("User-Agent: Arduino/1.0");
  client.println("Content-Type: application/x-www-f
  client.println("Connection: close");
  client.print("Content-Length: ");
  client.println(kirim.length());
  client.println();
  client.println(kirim);
}
else {
  Serial.println("...");
}
}

void loop()
{
  // Check the last time we updated values.
  unsigned long now = millis();
  if(now - lastUpdate >= 5000){
    lastUpdate = now;
    sendData();
    if (client.connected())
      client.stop();
  }
}
  
```

Fig.6. Encoding on Arduino

In the Arduino sketch contained #include that contains modules that are used so that the system can run as desired. That Emonlib.h which serves as a module to convert the current results were obtained through the current sensor. Furthermore, the encoding is set mac address etherned shield to be connected with the computer[4]. To perform a check using the IP method setup (). As well as calibrate the current user. In the method setup () will generate Internet Protocol sendaData Address. Using method (). Arduino will take the data produced by the current sensor. And then the data is stored in memory Arduino. Once the data is stored by Arduino and the data is directly included in the server using the

executable file php useful for the looping of the application. When finished the inclusion of data to the internet then it will return to repeat the process for monitoring[7].

C. Determining whether the prototype is acceptable

At this stage it will be testing the application. This testing is done to ensure that the program can work well when used. Of each test performed does not rule out the possibility of any error, but by doing this testing to minimize errors that exist in the application.

TABLE III
BLACK BOX TESTING

No	Link	Result
1	Send data from the microcontroller to the server	Successfully
2	Register on the login page for a link to the page register.	Successfully
3	login button on the login page	Successfully
4	Edit the data cost per KWH	Successfully
5	View data daily consumption of electricity	Successfully
6	Looking at the previous electricity consumption	Successfully

IV. RESULTS

The author has developed a system of monitoring the use of current and electricity costs. The author also uses technology that safety systems become more effective and efficient. In its development the authors use a variety of technologies, among others, Embedded System, cloud technology, database and android.

The author uses Arduino Uno equipped with an Ethernet shield as a tool or the brain of the system is developed, the tool is assigned to process all the necessary activities in monitoring the flow of electricity. Arduino Uno necessitate current sensors to monitor electric current and current data captured by the sensors is sent cloud service. In making the system accessible online. Power source with 5V micro USB 2.0 A is required to provide power to the Arduino Uno so that it can turn on and perform monitoring process properly and in accordance with needs. And further data generated by Arduino Uno developed into a monitoring system applications[5].

Display login page of the application used to login to the application. On the login page the user is prompted to enter your username and password to access the monitoring page of the application.

On the login page, there are buttons login and register. And at the register to create a new account for login. Without any user account can not access each page monitoring.



Fig.7. Log display on Application Featuring an electric monitoring.

On this page no input monitoring existing price from PLN. And pick a date that will be displayed data At IDR, user fill unit price Kwh. That price is set by PLN for the current unit. Next on the SET DATE and SET DATE2 a range of uses electricity from date and to date is monitored. Once on the set date next press the GO button.



Figure 8. Monitoring view on Application

Android page views if there is a process of data in a day. After the press the GO button it would appear that the amount of data used per day by Adelina Boarding House. As well as displaying the range of costs that should be used



Fig.9. Views electricity consumption in applications

V. CONCLUSIONS AND FUTURE WORK

A. Conclusion

So the authors designed a monitoring system load and cost of electrical current using the Arduino to help the owner of a rooming house Adelina for monitoring the use of electric current. This work presents the information to the owners of boarding houses Adelina about the use of the burden and cost of electric current on a regular basis. The monitoring system power consumption and electric current flows Estimator costs and expenses in boarding houses using current sensors AC / DC SCT-013 are connected to the Arduino Uno microcontroller

The monitoring system can measure electric current usage costs to be incurred by the owner of the boarding house day

per month. Application monitoring system can be accessed anywhere via the android application and monitoring system for the basic price data can be updated at any time when there is an official change of PLN.

B. Suggestions

Further development of communication system can implement the model IOT Back-end data sharing. Where data generated by monitoring tools can be integrated with smart home As well as the data for further development, current sensors AC / DC used 10A to a larger scale

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