



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

**A STUDY OF IOT BASED ENERGY METER
MONITORING VIA THINGSPEAK**

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Electronics Engineering Technology (Telecommunications) with Honours.

by

MUHAMAD FADHLI BIN MOHD NOOR

B071510088

930426-14-5989

FACULTY OF ELECTRICAL AND ELECTRONIC ENGINEERING
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.....
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.....
Khairul Anuar bin A.Rahman

Alamat Tetap: No 83,

Jalan Cecawi 6/27 Kota Damansara,

47810 Petaling Jaya,

Selangor Darul Ehsan

Cop Rasmi Penyelia

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Author : Muhamad Fadhli bin Mohd Noor

Date:

APPROVAL

This report is submitted to the Faculty of Electrical and Electrical Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Electronics Engineering Technology (Telecommunications) with Honours. The member of the supervisory is as follow:

Signature:

Supervisor: **Khairul Anuar bin A.Rahman**

Signature:

Co-supervisor: **Mohd Erdi bin Ayob**

ABSTRAK

Apabila Malaysia bergerak maju sebagai sebuah negara maju, jangkaan penggunaan elektrik akan meningkat apabila lebih banyak industri dan keperluan isi rumah. Jumlah Penggunaan Tenaga Kebangsaan kebanyakannya digunakan oleh sektor isi rumah. Ciri-ciri penggunaan elektrik yang tinggi kebanyakannya jarang dikenalpasti kerana sistem pengawasan elektrik yang kurang di Malaysia. Kotak pengedaran konvensional masih digunakan secara meluas di Malaysia. Ini bukan hanya membekalkan panel elektrik di kawasan rumah tangga. Projek ini bertujuan untuk membangunkan prototaip perkakasan yang terdiri daripada Raspberry-Pi dan Smart Meter untuk memantau pendekatan penggunaan elektrik. Dalam masalah ini, idea menggunakan meter tenaga pintar menggunakan IoT dan Raspberry-Pi telah diperkenalkan. Pengenal Smart DB yang merupakan SDM-120 memberikan ketepatan yang lebih baik dalam mengukur parameter dalam projek ini. Dengan pembangunan projek ini dilaksanakan, langkah-langkah penjimatan elektrik yang sesuai boleh dicadangkan oleh pengguna dan peningkatan kesedaran tenaga di kalangan pengguna. Dengan mengukur penggunaan tenaga, keputusan yang lebih baik boleh dibuat dengan menggunakan Internet of Things dan menjadikan tempat yang lebih bijak di dunia.

ABSTRACT

As Malaysia are moving forward as a developed country, the expectation on electricity consumption will increase as more industrials and households needs. Total National Energy Consumption mostly are consumed by household sector. The characteristic of high electricity consumption mostly is rarely to identify due to less electricity monitoring system in Malaysia. Conventional distribution box still being used widely in Malaysia. This is nothing but just supplying electrical panels in household area. This project is aiming on developed a prototype of hardware consisting Raspberry-Pi and Smart Meter for monitoring electricity usage approach. In this paper the idea of using smart energy meter using IoT and Raspberry-Pi have been introduced. The introduction of Smart DB which is SDM-120 provide better accuracy in measuring the parameter in this project. With this project development are implement, appropriate electrical-saving measures can be proposed by consumer and enhanced energy awareness among consumer. By measuring energy consumption, better decisions can be made by using Internet of Things and make the world smarter place.

DEDICATION

To my beloved parents, my siblings, my friends, my teachers, and my only one.

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TABLE OF CONTENTS

	PAGE
TABLE OF CONTENTS	x
LIST OF TABLES	xiv
LIST OF FIGURES	xv
LIST OF APPENDICES	xix
LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE	xx
CHAPTER 1 INTRODUCTION	1
1.1 Project Background	1
1.2 Problem Statement	3
1.3 Objective	4
1.4 Scopes of Work	4
a. Project Significance	5
b. Gantt Chart	6

CHAPTER 2	LITERATURE REVIEW	7
2.1	Introduction	7
2.2	Needs for Energy Meter Monitoring System	7
2.3	Information for the user	8
2.4	Previous Research Study on Monitoring System	9
2.4.1	Design of the networked electric meter based on GPRS	9
2.4.2	Design and Implementation of IoT based Digital Energy Meter for Remote Monitoring.....	10
2.4.3	Development of Inbuilt Energy Management Controller for Smart meter.	11
2.4.4	Automatic Electric Meter Reading System based on ZigBee.....	12
2.4.5	Smart Meters as a tool for energy efficient.....	13
2.4.6	Wi-Fi Based Smart Energy Meter	14
2.4.7	Wireless IoT based Metering System for Energy Efficient Smart Cities	16
2.4.8	IoT based Real- Time Residential Energy Meter Monitoring System ...	18
2.4.9	Real Time Energy Measurement Using Smart Meter.....	21
2.4.10	Development of an Internet Based Prepaid Energy Meter	22
2.4.11	Smart Energy Metering and Power Theft Control using Arduino & GSM	25
2.4.12	Smart Energy Meter Using Arduino and GSM	27
2.5	Summary of comparison made between previous research journal	35

CHAPTER 3	METHODOLOGY	36
3.1	Introduction	36
3.2	System Architecture	36
3.3	IoT Energy Meter Monitoring via Thing Speak.	37
3.3.1	Raspberry-Pi Zero Development Board	40
3.3.2	Eastron SDM 120 Smart Meter	42
3.3.3	Max 485 Module.....	46
3.3.4	(Organic light-emitting diode) OLED Display.....	47
3.3.5	PIC12F1840 Microcontroller.....	47
3.3.6	7805 IC Regulator Circuit.....	48
3.3.7	Altium Designer Suite	48
3.3.8	Thing Speak	49
3.4	Project Cost	51
CHAPTER 4	RESULTS AND DISCUSSION	52
4.1	Result and Discussion	52
4.2	Application Interface	52
4.3	Hardware Setup	54
4.3.1	Hardware Circuit Connection	54
4.3.2	The Final Result of Hardware Product	56
4.3.3	Data Analysis	59

CHAPTER 5	CONCLUSION	67
5.1	Conclusion	67
5.2	Recommendation	68
REFERENCES	69	
APPENDIX	72	

LIST OF TABLES

TABLE	TITLE	PAGE
Table 1. 1 :	Gantt Chart for PSM 1 and PSM 2	6
Table 2.4. 1 :	Table below show comparison of wireless protocol	28
Table 2.4. 2 :	Comparison on previous research journal	29
Table 3. 1:	Table below show the expected total cost for this project.	51
Table A. I		72
Table A. II		73
Table A. III		74
Table A. IV		75
Table A. V		76
Table A. VI		77

LIST OF FIGURES

FIGURE	TITLE	PAGE
Figure 1. 1 :	Evolution of Internet	1
Figure 2.4. 1 :	System architecture of how the system works	9
Figure 2.4. 2 :	Block diagram for the system architecture.	10
Figure 2.4. 3 :	System Architecture	11
Figure 2.4. 4 :	The prototype develops for this project	11
Figure 2.4. 5 :	System architecture of monitoring system using ZigBee for Utility Private HAN	12
Figure 2.4. 6 :	Structure of system operation	13
Figure 2.4. 7 :	Diagram above show how the flow of the system works.	14
Figure 2.4. 8 :	Show the GUI interface database of the billing system	15
Figure 2.4. 9 :	Schematic diagram for the smart energy meter system	15
Figure 2.4. 10 :	Overall System Block Diagram	17
Figure 2.4. 11 :	Final Proposed System	17
Figure 2.4. 12 :	Architecture of the proposed system	19
Figure 2.4. 13 :	Messaging Service	19
Figure 2.4. 14 :	Process flow	20
Figure 2.4. 15 :	Block diagram of the proposed system	21
Figure 2.4. 16 :	Constructed Internet Based Prepaid Energy Meter	23

Figure 2.4. 17 : Block diagram of an Internet Based Prepaid Energy Meter (IBPEM)	23
Figure 2.4. 18 : Complete Circuit Diagram	24
Figure 2.4. 19 : Microcontroller system Implementation Circuit Diagram	26
Figure 2.4. 20 : Architecture Diagram	26
Figure 2.4. 21 : Block diagram of the proposed system	27
Figure 2.4. 22 : Hardware Implementation of Smart Energy Meter	28
Figure 3. 1 Block diagram of Energy Meter monitoring system via Thing Speak	37
Figure 3. 2 : Energy measurement flow chart	38
Figure 3. 3 : Project flow chart	39
Figure 3.3. 1 : Raspberry-Pi diagram	41
Figure 3.3. 2 : Component on board Raspberry-Pi zero function	41
Figure 3.3. 3 : Exemplified of Energy Smart Meter	44
Figure 3.3. 4 : Energy Smart Meter Layout	44
Figure 3.3. 5 : Diagram above show the connection between 240V power supply and live connection to load.	45
Figure 3.3. 6 : Max 485 Module	46
Figure 3.3. 7: Show an example of OLED Display	47
Figure 3.3. 8 : PIC12F1840	47
Figure 3.3. 9 : 7805 Regulator Circuit Schematic Diagram	48
Figure 3.3. 10 : User Interface while designing Printed Circuit Board	48

Figure 3.3. 11 : Example of tabulated data using ThingSpeak	49
Figure 3.3. 12 : Example of sensor data send to ThingSpeak by Raspberry-Pi	50
Figure 4. 1 : This show the graph that are produced in the ThingSpeak website System	53
Figure 4. 2 : User Interface for Raspberry-Pi when entering the PI configuring terminal.	53
Figure 4. 3 : The diagram above shows the component use in the circuit. Noted that the circuit also contain a regulator circuit to limit the voltage across the circuit down to 5V only.	54
Figure 4. 4 : Diagram above show PCB layout use in this project.	55
Figure 4. 5 : Actual PCB after been fabricate	55
Figure 4. 6 : The complete hardware use in this project development.	56
Figure 4. 7 : Diagram above demonstrate the data recorded into ThingSpeak IoT platform	57
Figure 4. 8 : Raspberry-Pi Zero that been used	58
Figure 4. 9 : Chart above shows trending data of power(kWh) in living area.	60
Figure 4. 10 : Chart above shows trending data of power(kWh) in kitchen area	61
Figure 4. 11 : Chart above shows trending data of power(kWh) in bed room area	62
Figure 4. 12 : Ownership of electrical appliances research data taken from journal reference ^[4] .	63
Figure 4. 13 : Statistic by National Energy Balance (2015) indicate how much energy spend by Malaysians domestic consumer yearly ^[4] .	64
Figure 4. 14 : Pie chart represent the distribution on energy generate in Malaysia ^[16] .	64

Figure 4. 15 : Statistic of how much total electricity energy net use in Malaysia by local
U.S Energy Information Administration 65

Figure 5. 1: An example of future implementation of additional features 68

LIST OF APPENDICES

APPENDIX	TITLE	PAGE
Appendix 1	Table of Data Appendix	72
Appendix 2	Programming Appendix	78

LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

TCP/IP	-	Transmission Control Protocol/Internet Protocol
Wi-Fi	-	Wireless Fidelity
GSM	-	Global System of Mobile Communication
IOT	-	Internet of Things
GPRS	-	General Packet Radio Service
ESAM	-	Enterprise Services Application Module
V	-	Voltage
HZ	-	Hertz
A	-	Ampere
GUI	-	Graphic User Interface
SMS	-	Short Message Service
AMI	-	Advance Metering Infrastructure
AMR	-	Automatic Meter Reading
AC	-	Alternating Current
GSM	-	Global System for Mobile
LCD	-	Liquid Crystal Display
USB	-	Universal Serial Bus
HAN	-	Home Area Network
PC	-	Personal Computer
DC	-	Direct Current
MCU	-	Microcontroller
TTL	-	Transistor–Transistor Logic

UART	-	Universal Asynchronous Receiver-Transmitter
>=	-	More Than Equal
kWh	-	kilowatt hour
IoT	-	Internet of Things
PCB	-	Printed Circuit Board

CHAPTER 1

INTRODUCTION

1.1 Project Background

With the great developments in the field of Internet and technologies, everything in our daily life has become towards to digital era. The importance of Internet has significantly grow as a part of our lives. This help the creation of a new technology known as Internet of Things(IoT).

‘Internet of Things’ semantically means a world-wide network of interconnected objects uniquely addressable, based on standard communications protocols. The figure below 1.1 indicates the evolution of internet. In the late 1960s, communication between two computers was made possible through a computer network.

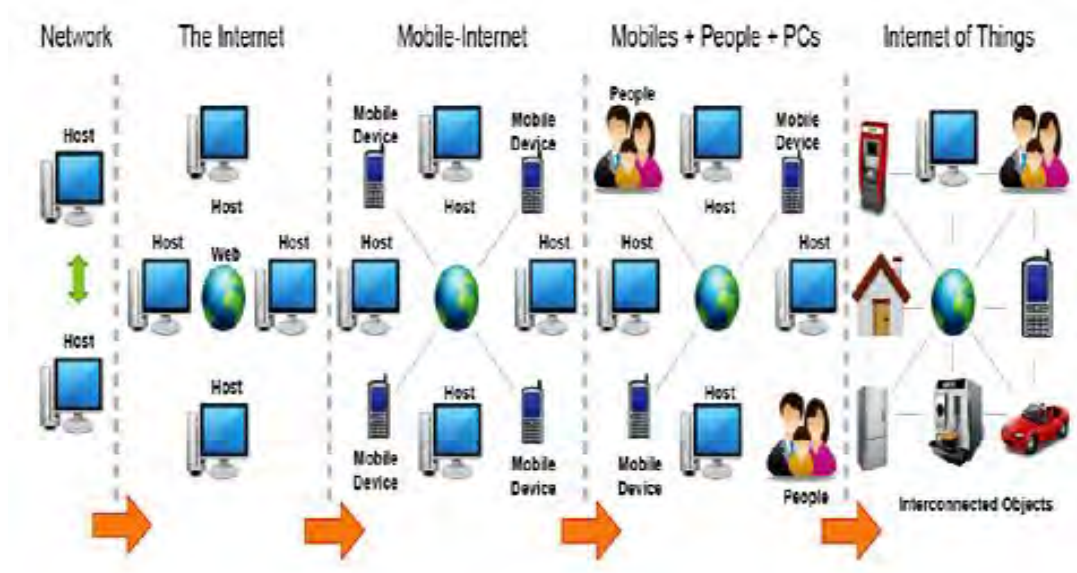


Figure 1. 1 : Evolution of Internet

The TCP/IP stack was introduced in the early 1980s. Then came the internet with its commercial use in the late 1980s. World Wide Web (WWW) became available and popular in 1991 and encouraged the rapid growth. Basic idea of IoT concept is the universal presence around us of a variety of things or objects such as Radio-Frequency Identification (RFID) tags, sensors, mobile phones connected through certain addressing scheme and can interact with other components in reaching a common goal.

Electricity has become one of the basic requirement for human life, being widely used for domestic, industrial and agricultural purposes. Since energy sources are limited and it has become our need to save as much energy as possible. At present, the need and demand for electricity goes on increasing across the global. Regardless of very well-developed sources for electricity, there are considerable amount of problem with distribution, metering, billing and monitoring of energy consumption area.

Relate between these two concepts, the development of a monitoring system by using ThingSpeak planned to monitor each of electricity usage in electricity meter are formed.

1.2 Problem Statement

At present, the need and demand for electricity are increasing rapidly whether in public or industrial sector. Even though of very well-developed sources for electricity, problems regarding distribution, metering, billing and monitoring of energy consumption are not yet been fixed. Furthermore, this problem getting worse further in collecting meter readings process. By in the early days, electromechanical meter or analogue meter was used to measure the energy. An appropriate system to control and monitor the power usage is one of the solutions for this problem

After all, energy consumer is having problems regarding statically errors in their monthly bills. With the present electrical technology, the develop of smart energy meter can be used to replace old electrotechnical energy meter. In some prospect, every new technology that are discovered can be used to replace any exist technology that are obsolete. The overall project will have as intent, to design IoT Energy Meter monitoring system via ThingSpeak.

The consumers are increasing rapidly and burden on electricity offering divisions is sharply increasing. The consumer must be facilitated by giving them an ideal solution that is the concept of IoT (Internet of Things) Based Energy Meter. Here the power reading is uploaded to Internet of Things cloud system using in build Raspberry-Pi Wi-Fi. It is an UART (Universal Asynchronous Receiver/Transmitter) to Wi-Fi module which allows Raspberry-Pi to connect to a Wi-Fi and make simple TCP/IP connections using AT commands. Raspberry-Pi is an impressive, low cost Wi-Fi module suitable for adding Wi-Fi functionality to an existing microcontroller.