



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

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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. Pengenalan 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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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.

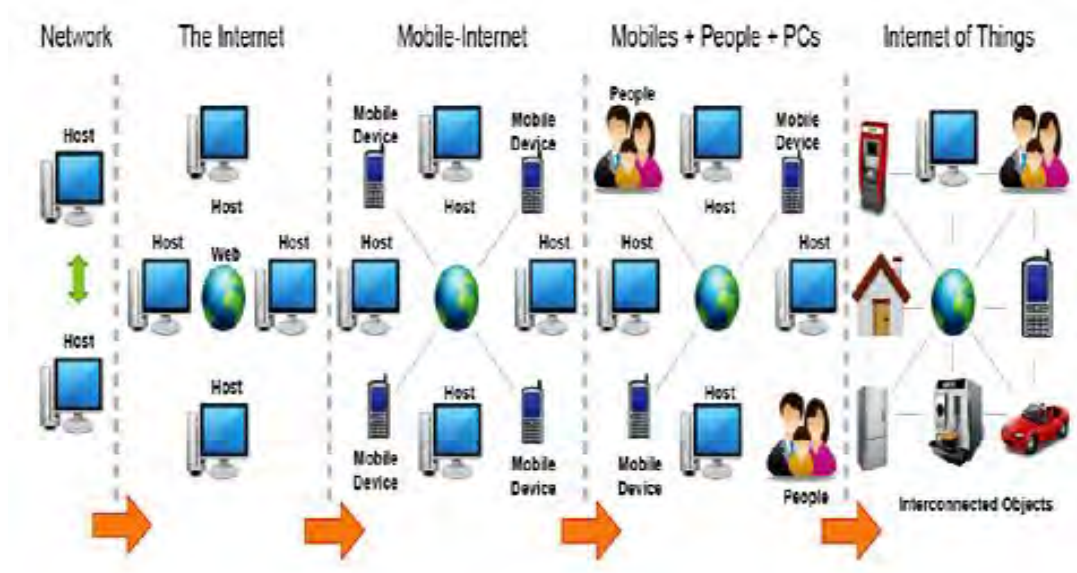


Figure 1. 1 : Evolution of Internet

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.