DEVELOPMENT OF ANDROID APPLICATION TO MONITOR POWER
CONSUMPTION

KHAIRUL ANWAR BIN KAMAL

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Signature   : ....

Supervisor's Name   : EN. MOHD KHANAPIAH BIN NOR

Date   : 15 JUNE 2016

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ABSTRACT

Monitoring system wireless connection (Wi-Fi) have made a bunch of improvements, especially for applications that call for automation with reduction in human intervention and become more interesting nowadays with the increasing market demand for internet of things (IoT) technologies. The aim of this work is to improve the monitoring organization of manufactures by using manually to collect the data power consumption to Wi-Fi data transfer consumption through android apps. This application of power monitoring system using android application, which is convenient and efficient to achieve visualization of real time signals that are received from the smart meters database via a Wi-Fi module. This monitoring system app, develop for mobile via Wi-Fi technology on the Android platform. Android base cell phones itself go about as a receiver where receive the data from smart meter database.

ABSTRAK

Sistem pemantauan yang mengunakan jalur tanpa wayar (Wi-Fi) telah mendapat banyak penambahbaikan, terutamanya untuk aplikasi yang memerlukan automasi yang pengurangan kerja manusia dan menjadi lebih menarik pada masa kini dengan permintaan pasaran yang semakin meningkat dengan menggunakan "Internet of Thing"(IOT). Objektif kajian ini adalah untuk meningkatkan sistem pemantauan industri yamg sebelumnya menggunakan manual untuk mengumpul penggunaan kuasa elektrik kepada penggunaan pemindahan data melalui Wi-Fi dan aplikasi android. Aplikasi sistem pemantauan kuasa ini menggunakan aplikasi android, yang mudah dan cekap untuk mencapai visualisasi isyarat masa sebenar yang diterima daripada pangkalan data Smart Meter melalui modul Wi-Fi. Sistem ini, membangunkan satu applikasi yang digunakan pada telefon mudah alih melalui teknologi Wi-Fi di platform Android. Asas telefon pintar Android sebagai satu alat penerima di mana menerima data dari pangkalan data Smart Meter.

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CHAPTER I

INTRODUCTION

The bedrock for this project square measure provided during this chapter. And then it is very significant to know the content of this chapter before continuing into consecutive chapter. This chapter consists of the project's introduction, objectives, problem statement, scopes, and report structure.

1.1. Initiation of Development of Android Application to Monitor Power Consumption

At present, there has been a drastic modification in customers' slant within the mobile sector with the quick kinds of progress in chip development and programming. A lot of people's usage mobile for making calls or causing messages, and for leisure activity, as an example, social network, games, music functions folks to people individual corresponding organizations. The facility offer assumes a straight course and nearly not any device runs without power. Therefore, the energy consumption and conservation could be important a component part of the manufacture.

The traditional power meter, used by power organizations for accountancy is that the electromechanical effective energy unit meter. Its sturdy technical style is in use for over a century, nonetheless is not capable of over measurement the accumulated quantity of consumed energy [1]. The helplessness is that either an employee, sent by meter manually, which suggests prices and administration effort.

The conventional power meter, employed by powerful systems in accounting is that the electromechanical effort meter. The electromechanical meter is employed just for measurement the collective measure of intense energy. An obstacle is that either a employee, sent by vitality organization or the consumer himself ought to pursue the meter.

The electricity provides company adopts the electronic meters, that's an electronic measure of energy consumption. These meters have diminished collecting expense, increased measure truth, precise knowledge and most significantly reduced size, because of the advantages that go past the customary rotor plate energy meter.

1.2. Problem Statement

The excessive electricity consumption in the industry is a problem that needs to be controlled so that it can save the usage of electricity. The step taken by the industry to overcome this problem is collecting information on the usage of electricity from time to time on the electric energy meter.

The problem comes when a person forgets to get the information to study the energy usage, and it is too difficult to look backward at the previous log or data. To overpower this problem, the development of Android application to monitor power use is projected. This system the user will be easier to gather all the necessary data either during or prior information by utilizing the Android smart phone.

1.3. Objectives

The aims of this project are listed as follows:

1. To improve the monitoring system of industries from using manual data collection of power consumption to automatic Wi-Fi data transfer power-consumption through Android application.
2. To develop an Android app that can collect the data from online database.
3. To show the result is real-time.

1.4. Scope of Project

The scope of this project is only concentrating on the software where the application will be developed using integrated development environment (IDE) software called Android Studio. All of the key features regarding the application will be developed using Eclipse Juno including its user interface that are written in Java and Android's

XML. This applies exclusively for Android user version 4.0 until 5. The connexion between the smart meter and the apps need internet connection.

1.5.Thesis Structure

This report is divided into five parts. The linked departments are; Introduction, Literature Review, Methodology, Result and Discussion, and Conclusion on an individual base.

The main section covers define of the endeavour that incorporate venture's target, issue explanations, and elongation. This section helps the reader to see the basic plan of the project. The grandness of this endeavour is processed inside the issue proclamation phase. The extent of the venture examines the constraint of the project.

The second section is a writing audit of methodological and hypothetical idea utilize in the undertaking. Focusing on existing examination build the comprehension of the speculation. The correlation between others work will likewise be integrated into this division.

Third section examine about the scheme of the speculation. The overture of the venture are clarified with flow chart. The flowchart is utilized to show the strides and how the framework work.   Result and discussion of the project are shown in chapter 4. The finding of this project will be located and analysed in this chapter. Lastly, the fifth chapter will comprises the determination and recommendation for this task.

CHAPTER II

LITERATURE REVIEW

A literature review is a survey to study the required levels of existing research related data in order to raise the intellect of the concept and terminology that will be utilized throughout this inquiry.

2.1.Power Consumption in Industry

More than eighty per cent of world energy use comes from fuel, a finite and non-renewable supply. Fossil fuel-based energy sources, principally coal and petroleum, followed by fossil fuel, brought producing to the mass scale of output. Today, creating accounts for simply on top of one quarter of total energy consumption worldwide, however it's additionally created an oversized style of goods which require even one more sort of energy for development. With the rising rate of industrialisation, especially in growing countries with eighty percent of the world's population, energy has been the most significant business for property development, environmental protection and a good commonplace of living.

Energy, as a product of economic activities, contains merchandise and incidental services associated with fuel, heat and power. Equally the other goods, energy is that the results of production, like extraction of natural resources or transformation of materials and cores into a brand new product, which may be varied in the market or function input for output of alternative merchandise and services or be used for final consumption.

Data concerning the overall intensity of energy offered to a rural area for its medium and final consumption among a given amount of your time, is obtained from the energy balance. Energy has conjointly been the most focus of the strategic analysis programme, that`s aiming to analyse recent trends of production and utilization of

energy and suggest the long run direction of environmentally property, industrial growth through economical use of vitality within the industrial production process.

2.2.Method Power Consumption Monitoring

The industrial sector, in pace with the International Recommendations for Industrial Statistics, includes mining, producing and electricity and gas and heat supply. Industry runs a twin role in the energy market - as a producer and as a customer. Fabrication has evolved a brand new technology that will increase the effectiveness of energy output and minimizes energy use in yield of alternative product and services.

Industrial statistics provide a methodology for the measuring of level, structure, development and potential of energy yield and its use at macro and industrial sector level. Although, international fellow of grouping and diffusing energy information is not new, compilation of energy statistics, especially for economic analysis, has assumed new dimensions in recent years. Energy statistics, as accessible from totally different sources, lack compatibility that, in turn, determines the scope of economic analysis.

Some international efforts are created to produce a whole energy account, nevertheless, various countries still lack the capability of manufacturing elaborate energy data. Moreover, a basic methodological document, like International Recommendations for Energy Statistics (IRES), which might pose a regular for world-wide harmonization of energy statistics, has still to be finalised. The classification criteria for energy connected activities and merchandise are still inside the method of evolution.

At that place are primarily 2 approaches for compiling and accumulating statistics on energy output. The primary approach relies on the industrial survey technique. The data obtained for the energy sector from regular industry surveys are gathered and composed according to the national accounts ideas.

The second approach defines energy as a commercially created trade goods available on the marketplace. Production measures during this class are based on physical properties of commodities [2].

2.3.Android Operating System

The Android is a Linux-based operating system (OS) for mobile devices like Smartphone and tablet computers. It is developed by the Open handset Alliance, led by Google, and other firms. Google bought the initial developer of the software system, android Inc., in 2005.

The introduction of the android distribution in 2007 was declared with the founding of the Open handset Alliance, the association of eighty six hardware, software, and telecommunication firms dedicated to promoting open standards for mobile devices Google releases the mechanical man code as ASCII text files, underneath the Apache License. The android Open source Project (AOSP) is tasked with the sustenance and additional development of humanoid.

Android contains a giant community of developers writing applications "apps" that stretch the functionality of the devices. Developers write primarily during a custom-made version of Java. Apps can be downloaded from third-party sites or through online stores like Google Play (formerly Android Market), the app store run by Google. In October 2011, there have been over five hundred thousand apps available for Android, and also the calculable variety of applications downloaded from the Android Market as of December 2011 exceeded ten billion.

Android became the world's leading Smartphone platform at the close of 2010. For the first quarter of 2012, android had a fifty nine Smartphone market share worldwide, with a 331 million devices put in base and eighty five million activations or 934,000 per day. Analysts purpose to the advantage for android to be a multi-channel, multi-carrier OS [4].

2.3.1. Android version history

The first beta of the Android platform was released on November 5, 2007. Since then, it has been through a assortment of updates and bug holes. Though bug fixes are typically clear from the application developer's view, updates usually mean changes and additions to the framework API.

For that cause, besides the android platform version numbers, a second version number, referred to as the API level, is utilized to tell apart the framework API that has endured.

Since April 2009, every android version has been released beneath a Codename based on desserts, like Éclair, Froyo, and Gingerbread. This brought in a 3rd versioning scheme to the android platform, creating things even a pile of cryptic for first-time Android application developers. Understanding which version and which API level they are referring to, also as that new Apps are a piece of that android platform version, will only become a cumbersome memory exercise.

Table 2.1 Android version history

Version	Code Name	Release Date
6.0	Marshmallow	October 14, 2015
5.0	Lollipop	November 12, 2014
4.4 – 4.4.4	KitKat	October 31, 2013
4.1 - 4.3.1	Jelly Bean	July 9, 2012
4.0 - 4.0.4	Ice Cream Sandwich	December 16, 2011
3.0 - 3.2.6	Honeycomb	May 10, 2011
2.3 - 2.3.7	Gingerbread	December 6, 2010
2.2 – 2.2.3	Froyo	May 20, 2010
2.0 – 2.1	Éclair	October 26, 2009
1.6	Donut	September 15, 2009
1.5	Cupcake	April 27, 2009
1.1	Beta	February 9, 2009
1.0	Beta	November 5, 2007

2.3.2. Architecture of Android operating system

The controlling system of Android can split into four main layers: the kernel, libraries, application framework, and applications. As previously mentioned the kernel is Linux. The libraries that add up with Android provide much of the graphics, memory storage, and media capabilities. Planted inside the libraries layer is the Android runtime which contains the Dalvik Virtual Machine, which powers the applications. The application framework is the API that all applications will employ to access the lower stage of the architecture [4].

Figure 2.1 Android Architecture

2.3.2.1. The kernel Layer

Previous part was mentioned the core layer is Linux. Linux was selected since it has a demonstrated track record in desktop systems and in several cases does not require drivers to be rewritten. Linux provides such things as virtual memory, networking, drivers, and power management. Upon examining the kernel shipped with the Android source code, there are not any significant changes to the core functions of the kernel [4].

2.3.2.2. Native libraries layer

The native libraries layer provides Android with the capabilities for its core characteristics. Android is shipped with SGL, which acts as the primary 2D graphics rendering. Its counterpart is OpenGL ES which provides 3D graphics support. Android comes packaged with SQLite, which takes charge of most data storage. The WebKit web rendering engine is also shipped with Android and has been cut to provide web pages for smaller screen sizes.

The peculiar interest is the Dalvik virtual machine which is a portion of this stratum. The Dalvik virtual machine is a bytecode interpreter which is extremely optimized for executing on the mobile platform. The bytecodes are converted Java binaries that are very quick and efficient to go on smaller processors. The core libraries are written in Java and provide much of the core classes which would ordinarily be usable in a Java virtual machine [4].

2.3.2.3. Application framework layer

This layer and the stratum above it are composed completely in Java. The application framework provides all of the major APIs that the applications will use, including things like sharing information, accessing the telephony system, and receiving notifications. A significant thing to note about Android OS is that all applications use this same framework, no matter the source of the application. This is rather a deviation from what many other mobile OS designers have opted to serve. For example the iPhone most certainly differentiates between Apple software and third-party software down to the copy-and-paste feature [4].

2.3.2.4.   Application layer protocols

All of Android's software is written in Java, which is read by the Dalvik virtual machine. Even the most core features such as the phone and the contacts application reside in this layer. This layer contains software written by the Android team as well as any third-party software that is installed on the device. An topic of allowing third-party developers access to this layer is that the user interface can be overhauled comparatively easily. Third party applications can manage any issue that the Android team's application could see (such as the phone ringing). This means that so long as there is a replacement application for the dialer application, anyone could potentially write their own. Passed on this model we might expect that, as Android becomes more robust, the user will be able to determine what applications should handle which events [4].

2.4. Database system

Databases and database systems are an all-important piece of life in modern societies: most of us encounter several activities every day that affects just about interaction with a database. For example, if we go to the money box to deposit or withdraw funds, if we arrive at a hotel or airline reservation, if we access a computerized library catalogue to explore for a bibliographic item, or if we purchase something online such as a book, toy, or computer chances are that our activities will call for someone or some computer program accessing a database.

Even purchasing items at a supermarket often automatically update the database that holds the inventory list of foodstuff items. These interactions are examples of what we may call traditional database applications, in which most of the information that is stashed away and accessed is either textual or numeric. In the past few years, advances in technology have led to exciting new applications of database organisations. New media technology has made it possible to store images, audio clips, and video streams digitally.

These types of files are becoming an important component part of multimedia databases. Geographic information systems (GIS) can stack out and analyse maps,

weather data, and satellite images. Data warehouses and online analytical processing (OLAP) systems are applied in many companies to extract and analyse useful business info from very big databases to support decision making. Real-time and active database technology is used to contain industrial and manufacturing operations. And database search techniques are being applied to the World Wide Web to improve the lookup for information that is needed by users browsing the Internet [5].

2.5.Comparative literature studies

Table 2.2 Comparative studies with related work

Devices/ Research Name	Development of Android application to monitor power consumption	Sense Companion Monitoring energy consumptions of home appliances through a smartphone	Design and Development of Energy Measurement System based on the Android Platform	A smart metering for energy management system via gsm-sms based protocol	Wireless Monitoring of Household Electrical Power Meter Using Embedded RFID with Wireless Sensor Network Platform	Real Time Monitoring And Controlling System
Main Objectives	Power-consumption monitoring in industry	To manage the entire sensor network without the need of several controllers.	Efficient power measuring application for displaying power consumed on the Android phone.	The real time monitoring section is included for live monitoring and pricing.	Develop hardware for pastoral and environmental application	To be low cost and scalable allowing variety of devices to be controlled with minimum changes to its core.
Connectivity Device/s	Wi-Fi	Wireless sensor network (WSN) through a smartphone	GSM SIM300	Cellular based network is core of this remote module. (GSM-SMS)	RFID and Wireless sensor network (WSN)	Bluetooth
Other Feature	Compatible with Android device	Predicting the energy consumptions	Compatible with Android device	-	-	Compatible with Android device
Advantage	Easy to monitor the during or previous power-consumption data through smartphone.	Estimation Calculation	E-Bill	-	-	Controlling of home appliances
User	Industry	Household	Household	Household	Household	Household