CERTIFICATION OF APPROVAL

Seismic Activity Alert Using SMS

By

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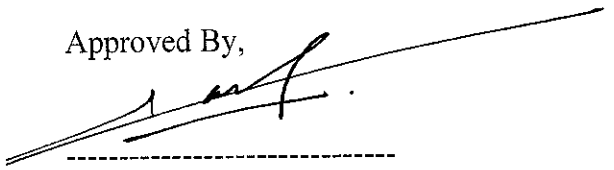
Approved By,



(Mr. Izzatdin Abdul Aziz)

UNIVERSITI TEKNOLOGI PETRONAS
TRONOH, PERAK
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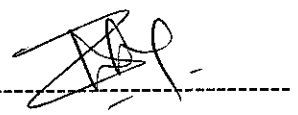
CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.



NORAISAH ABU BAKAR

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In the name of ALLAH, The Most Gracious and Most Merciful.

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ABBREVIATIONS AND NOMENCLATURES

SMS	Short Message Service
USGS	U.S. Geological Survey
GSM	Global System for Mobile Telecommunication
MM	Mobility Management
RR	Radio Resource Management
2G	Second Generation
3GPP	3rd Generation Partnership Project
GPS	Global Positioning System
GIS	Geographical Information System
DoD	Department of Defense
AFSC	Air Force Space Command
FOC	Full Operational Capability
IOC	Initial Operational Capability
SMSC	Short Message Service Center
MSC	Mobile Switching Center
SPS	Standard Positioning Service
SIM	Subscriber Identity Module
IIS	Internet Information Services
ASP VBScript	Active Server Pages VBScript
ASP	Active Server Pages
ASP.NET	Active Server Pages.NET

JSP	Java Server Pages
PHP	Hypertext Preprocessor
CFML	ColdFusion Markup Language
ODBC	Open Database Connectivity
ADO	ActiveX Data Objects
USB	Universal Serial Bus
DSN	Data Source Name
PRSSSB	PETRONAS Research and Scientific Services Sdn Bhd
DSS	Decision Support System
AI	Artificial Intelligence

ABSTRACT

The project, Seismic Activity Alert Using SMS is to provide early warning of the possibility of earthquake or natural disaster occurrences. By letting people know in advance, precautionary action can be taken to avoid casualties, environmental damage and financial losses. The objectives of this project are, firstly to perform a study on how to inform surrounding community remotely of incoming disaster, and secondly to develop an early warning detection system capable of notifying people using Short Message Service (SMS) based on the analysis result of seismic data.

The research will cover the seismic activity and earthquake, remote sensing technique, Global System for Mobile Communication (GSM), Global Positioning System (GPS), Geographical Information System (GIS), Short Message Service (SMS) and multicast concepts. The hypothetico-deductive method is used as the project's methodology. It includes observation, problem definition, theoretical framework, generation of hypothesis, data collection, analysis and interpretation, establishment of guideline for seismic activity alert using SMS and system development, and lastly, deduction.

This early warning detection system is beneficial not only for individual but also business organization so that precautionary action can be taken to prevent greater damages and casualties in the future.

CHAPTER 1

INTRODUCTION

1.1 Background

On December 25th 2004, undersea earthquake with the magnitude of 9.3 Richter scale triggers a tsunami that strikes Acheh, results in casualties up to 220, 000 deaths. Drastic seismic activity will normally cause earthquake, volcano eruptions and gas deformation to happen, result in financial losses, environmental damage as well as eradication of lives. Therefore, it shows how vital it is to have such a plan to at least notify people ahead in order to take precautionary action within a particular area.

Current prevention technology used by geologists to detect seismic activity is by using sensitive instruments placed on the ground or in deep holes, and link to satellite-based technology.

Whatever the method, the goal is the same, which is to determine the changes occurring beneath the earth that help to provide eruption warnings and to understand how it happened or work. In recent years, geologists have directed increased attention toward volcanic gas emissions (one of the seismic activity) because of the newly appreciated hazards they sometimes impose and their effects on the Earth's atmosphere and climate [1].

By monitoring these phenomena, geologists are sometimes able to anticipate an eruption days to weeks ahead of time and to detect remotely the occurrence of certain seismic activity such as explosive eruptions. As an example, in the case of volcano, scientists work as close as possible to the active vent(s) of a volcano so that they can observe and measure changes that often occur when magma rises toward the surface.

When a volcano shows signs of unrest or is erupting, they often make several visits a week to conduct various surveys and to install and maintain instruments that enable them to track its activity 24 hours a day. If an eruption causes significant changes to nearby watersheds, for example by killing vegetation and depositing fresh volcanic debris over broad areas, they will work extensively in river valleys to keep track of erosion and sedimentation downstream from the volcano [1].

Effort of geologists to collaborate with scientists specializing in satellite remote-sensing techniques to provide real-time warning of hazardous events (for example, eruption clouds) is still at the initial phase. Geologists already have the monitoring data with the corresponding level of hazards. It would be better if the telecommunication technology can be used to fulfill the needs of their experiments. What is important is the integration between these two fields might be beneficial to not only them, but also the communities. In this case, the SMS can be used as one of the tools available in the telecommunication technology.

Geologists who monitor an active volcano faces critical challenge of sensing potential lahars flows in real time so that a warning can be issued by public officials to people downstream. An even more difficult and less obvious challenge for geologists, however, comes in the weeks and years after an eruption that significantly alters a volcano's watersheds monitoring the long term threat of sediment transport and increased flooding.

Detection of lahars and other debris flows close to their sources provides an opportunity for timely warnings to people in downstream areas if adequate communication systems exist. U.S. Department of the Interior, USGS scientists have developed an inexpensive, durable, portable, and easily installed system to detect and continuously monitor the arrival and passage of debris flows and floods in river valleys draining active volcanoes. This system has the potential to save many lives from one of the most dangerous hazards posed to people who choose to live along rivers leading away from an active volcano.

Recent advances in volcano monitoring, new and refined volcano-hazard assessments, and better warning schemes have significantly improved capability to warn of volcano hazards and impending eruptions. Seismic information and warnings, however, no matter how timely or precise, will reduce seismic risk only if they are communicated effectively to a wide audience, especially to people who live and work in potentially hazardous areas and to emergency management specialists.

1.2 Problem Statement

Communities, people, and economic activities are threatened by world natural disasters with different kinds of hazards. Those hazards may lead to eruptions and potential future risks such as casualties and property damage. Findings indicated that the level of disasters is depending on the level of seismic activity happened beneath the earth. Major disasters are usually preceded by minor eruptions over period of days and weeks.

A warning system or scheme that detects specific hazards should be developed. The expected warning system is the one that can specifies when and where the disaster is most likely to occur and what type and size of disaster should be estimated. Strategy to provide warnings will involve a series of alert level that corresponds to a level of seismic activity that happened. An appropriate level of alert should be introduced, for example, when the monitoring data indicates a level that can lead to a significant natural disaster, higher level of alert needs to be issued.

This real- time detection will provide immediate notification of the activity to the public and local, state and federal emergency management officials. It will also offer the public and civil authorities a framework they can use to gauge and coordinate their response to a developing disaster's emergency action.

1.3 Objectives

- To perform a study on how to inform surrounding community remotely of incoming disaster.
- To develop an early warning detection system capable of notifying communities using SMS based on analysis result of seismic data.

1.4 Scope of Study

- Applying the concept of multicast which is the fundamental basis of notifying people within the particular area only.
- Using SMS and implementing this common telecommunication tool.
- Usage of GSM modem as a medium to send alert message from application that resides in computer to the particular mobile phones.
- Usage of Ozeki Message Server to ease the process of sending SMS from application on computer to the particular mobile phones.
- Focusing on the remote sensing technique used by geologists to know where the seismic data originate.
- Analysis of seismic data and its corresponding seismograph from the seismic activity that is provided by geologists.
- Understanding of seismic activity occurrence and their consequences to help in setting the predetermined level of hazard.
- Manipulation of data according to the predetermined level to notify communities within the particular area using SMS.
- Development of system using ASP VBScript.

1.5 Project Timeline

The project timeline consists of four main tasks with the corresponding list of activities. The main tasks are Project Identification and Planning, Data Analysis, Project Design and Implementation. The duration of the project is one year or two semesters which are semester July 2005 and semester January 2006. Refer to Appendix G.

CHAPTER 2

LITERATURE REVIEW

2.1 Seismic activity and earthquake

An earthquake is a sudden and sometimes catastrophic movement of a part of the Earth's crust. Earthquakes result from the dynamic release of elastic strain energy that radiates seismic waves. Earthquakes typically result from the movement of faults, planar zones of deformation within the Earth's upper crust. Most earthquakes are powered by the release of the elastic strain that accumulates over time, typically, at the boundaries of the plates that make up the Earth's lithosphere via a process called Elastic-rebound theory. The Earth is made up of tectonic plates driven by the heat in the Earth's mantle and core. Eventually when enough stress accumulates, the plates move, causing an earthquake [2].

In May 2005, scientists reported that the earthquake itself lasted close to ten minutes when most major earthquakes last no more than a few seconds; it caused the entire planet to vibrate at least a few centimeters. It also triggered earthquakes elsewhere, as far away as Alaska (Science) [3].

Seismic activity happened beneath the earth will cause earthquake, either minor or major. When the earthquake happened, not only the area where the epicenter occurs will be affected, but also the areas that are on the other region. As an example, on December 26th, 2004, the earthquake that caused tsunami has affected Acheh, Indonesia and the other regions are also affected, such as Malaysia. Till now, people at Kuala Muda Kedah and Pulau Pinang still have the nightmares that result from the tsunami.

The earthquake originated in the Indian Ocean just north of Simeulue island, off the western coast of northern Sumatra, Indonesia. The resulting tsunami devastated the shores of Indonesia, Sri Lanka, South India, Thailand and other countries with waves up to 30 m (100 ft). It caused serious damage and deaths as far as the east coast of Africa,

with the furthest recorded death due to the tsunami occurring at Port Elizabeth in South Africa, 8,000 km away from the epicenter.

Despite a lag of up to several hours between the earthquake and the impact of the tsunami, nearly all of the victims were taken completely by surprise; there were no tsunami warning systems in the Indian Ocean to detect tsunamis, or equally importantly, to warn the general populace living around the ocean. Tsunami detection is not easy because while a tsunami is in deep water it has a very low height and a network of sensors is needed to detect it. Setting up the communications infrastructure to issue timely warnings is an even bigger problem, particularly in a relatively poor part of the world [3].

It is undeniable that we as human need to accept all things that happened as fate. However, it should not be a reason that we cannot at least have early sign that a disaster will occur. By knowing that, safety precautions can be taken to avoid unwanted mishaps. It seems like there is a high need to have such a warning or alert to notify people about the upcoming disaster.

2.2 Remote sensing technique

In the broader sense, remote sensing is the measurement or acquisition of information of an object or phenomenon, by a recording device that is not in physical or intimate contact with the object. In practice, remote sensing is the utilization at a distance of any device for gathering information about the environment [4].

Applied remote sensing has become an inevitable technology tool contributing to human's progress toward sustainability, by supporting the solution of environment-related tasks on local, regional and global levels. It has helped policy decision making to reduce negative societal-economic impacts and assist in ensuring sustainable development on the long term. Remote sensing will be an integrated part of the advanced

Information Technology and Telecommunication infrastructure, the foundation of the information society [5].

Remote sensors can provide a real time record changes that may occur in a short time scale. Therefore, data from remote sensing technique can be exploited to get direct benefits in climate change research, agriculture, environmental monitoring, cartography and water resources management.

2.3 Global System for Mobile Telecommunication (GSM)

GSM is nothing more than a network of computers. Depending on the application, a language has to be developed for such a communications network. That language is the signaling system, which allows intersystem communication by defining fixed protocol. The study of the signaling system provides insight into the internal workings of a communication system [6].

Most of the signaling is necessary to support mobility of a subscriber. All messages of the area MM and RR, in particular serve only for that purpose. Signaling is the language of telecommunications that machines and computers used to communicate with each other. In particular, the signals that user enters used to be converted to a format that is appropriate for machines and then transmitted to a remote entity. The signal (e.g., the identity of the called party) is not part of the communication as such, that is, they are not payload or a revenue- earning entity. The main task of signaling is still to set up and to clear a connection between end users or machines [6].

The GSM is the most popular standard for mobile phones in the world. GSM service is used by over 1.5 billion people across more than 210 countries and territories. The ubiquity of the GSM standard makes international roaming very common between mobile phone operators, enabling subscribers to use their phones in many parts of the world. GSM differs significantly from its predecessors in that both signaling and speech

channels are digital, which means that it is considered a 2G mobile phone system. This fact has also meant that data communication was built into the system from very early on. GSM is an open standard which is currently developed by the 3GPP [7].

The study of GSM is important as it serves as the telecommunication tool that is becoming more beneficial in this rapid technology changing era. The integration of it with the other technology will be beneficial and that effort has been put widely nowadays. For example, it serves as the basic and foundation for SMS and it can be used with the integration of GPS and also GIS.

2.4 Global Positioning System (GPS)

The GPS is a DoD developed, worldwide, satellite-based radio navigation system that will be the DoD's primary radio navigation system well into the next century. The constellation consists of 24 operational satellites. The U.S. AFSC formally declared the GPS satellite constellation as having met the requirement for FOC as of April 27, 1995. Requirements include 24 operational satellites (Block II/IIA) functioning in their assigned orbits and successful testing completed for operational military functionality [8].

Prior to FOC an IOC was declared on December 8, 1993 when 24 GPS satellites (Block I and Block II/IIA) were operating in their assigned orbits, available for navigation use and providing the GPS levels specified below [8].

GPS allows people around the globe to be located wherever and whenever they are going. This can be done by manipulating the use of SPS by register ourselves to the system such as by using in-car GPS system. By then, our personal data and identification has already resided on the server and with the help of satellite, we can easily be identified whenever we are.

We just need to remember the incident occurs on the early 2005 whereby, there was a school teacher that has been kidnapped and gang-rapped by a few guys. Thank God, her

wise action that she took by registering her car to the GPS allows her to be saved by police. The satellite has located her car that has been used by those robbers.

2.5 Geographical Information System (GIS)

A GIS is a computer system capable of capturing, storing, analyzing, and displaying geographically referenced information; that is, data identified according to location. Practitioners also define a GIS as including the procedures, operating personnel, and spatial data that go into the system [9].

The power of a GIS comes from the ability to relate different information in a spatial context and to reach a conclusion about this relationship. Most of the information we have about our world contains a location reference, placing that information at some point on the globe. When rainfall information is collected, it is important to know where the rainfall is located. This is done by using a location reference system, such as longitude and latitude, and perhaps elevation. Comparing the rainfall information with other information, such as the location of marshes across the landscape, may show that certain marshes receive little rainfall. This fact may indicate that these marshes are likely to dry up, and this inference can help us make the most appropriate decisions about how humans should interact with the marsh. A GIS, therefore, can reveal important new information that leads to better decision making [9].

GIS is a technology that is used to view and analyze data from a geographic perspective. GIS links location to information such as people to addresses, buildings to parcels, or streets within a network and layers that information to give a better understanding of how it all interrelates. With reference to the explanation of GPS, in the teacher's case, GPS is used together with GIS to allow the location detection of the teacher.

2.6 Short Message Services (SMS)

SMS is a mobile data service that allows alphanumeric messaging between mobile phones and other equipment such as voice mail systems and email [6].

SMS is a store-and-forward system. Messages are sent to a SMSC from various devices such as another mobile phone or via email. The SMSC interacts with the mobile network to determine the availability of a user and the user's location to receive a short message [10].

Because SMS uses the control channel rather than the voice channel, a unique feature of SMS is that the user can receive a SMS whether or not a call is in progress - the phone need only be turned on. If the phone is not turned on, the SMSC will wait until the phone is turned on to send the message. A "message received" is sent to the SMSC from the MSC upon delivery to the mobile device, allowing the SMSC to provide confirmation of receipt to the sender upon request [10].

The unique feature of SMS makes it the best tool to be used for this project. Each of the people within the particular area in the case of disaster will get the information or sign or alert. Even though they do not get the information from the radio, they can still be notified with the possibility of disaster occurrence as SMS will keep them alert.

2.7 Multicast

Multicast is the delivery of information to a group of destinations simultaneously using the most efficient strategy to deliver the messages over each link of the network only once and only create copies when the links to the destinations split [11].

Multicast is communication between a single sender and multiple receivers on a network. Typical uses include the updating of mobile personnel from a home office and the periodic issuance of online newsletters [12].

With a multicast design, applications can send a copy of each packet and address it to the group of computers that want to receive it. This technique addresses packets to a group of receivers rather than to a single receiver, and it depends on the network to forward the packets to only the networks that need to receive them.

CHAPTER 3

METHODOLOGY/PROJECT WORK

3.1 Procedure Identification

Hypothetico- Deductive Method is the approach used for this project, which serves as the typical method in a research field.

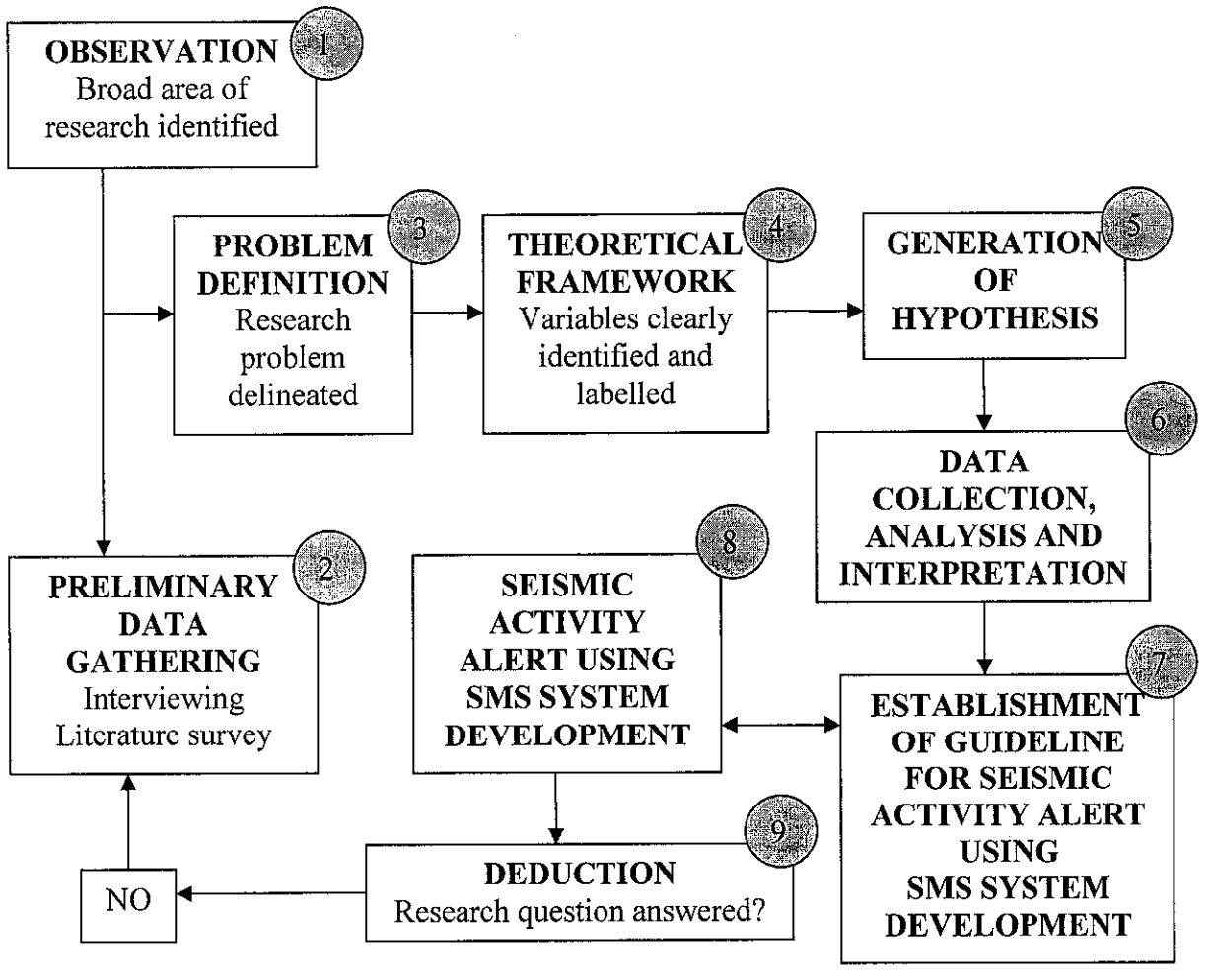

Figure 1: Research Method and Seismic Activity Alert Using SMS System Development Lifecycle

3.1.1 Observation

From the observation, it is quite obvious that there is loose integration between geologists who are working on detection and monitoring seismic activity with telecommunication experts. The observation is to also find out whether there is an extension or an integration of the seismic data with the telecommunication technology to at least communicate the results to the communities.

The observation also involves the potential of SMS to notify communities about the hazards from the seismic activity happened beneath the earth. SMS as the tool that is very popular among people as it is mainly cheap and also easy to use and not to forget, everybody has the hand phone.

3.1.2 Preliminary Data Gathering

This stage involves seeking thorough information of what being observed earlier. The active searches are done by internet researches, reading articles, research papers and books regarding seismic activities. Final year projects dated 2003 and 2004 relating to SMS, simulation and emulator have also been reviewed.

GSM needs to be understood first in order to understand the SMS. Findings pertaining SMS and GSM as well as idea generation on how to perform the research will be noted for further review.

The sources for seismic activity are also limited therefore, extra effort need to be put by consulting geologists and internet researches. An interview session with Prof Tjia Hong Djin from Orogenic Resources Sdn Bhd who is a well- known geologist has been done to enhance the understanding pertaining seismic activity fundamentals. This is to get clear information on how seismic activities happened and how seismic data are gathered.

An interview session was also conducted with geologists at PRSSSB, Bangi, Selangor. However, they cannot provide the seismic data which is the fundamental basis for the system. Fortunately, they helped to contact Mrs. Irene Ueuu Swee Meo, an executive at Malaysian Meteorological Service, Ministry of Science, Technology and Innovation. By phone conversation, it has been acknowledged that there are twelve sensors located at twelve different locations in Malaysia. These sensors provide Malaysian Meteorological Service, Ministry of Science, Technology and Innovation with seismic data in addition to other data such as weather data. The information regarding how the seismic data records are gathered and manipulated have been provided by her. The seismic data recorded are published at http://www.kjc.gov.my. Malaysia citizens who wish to know the exact information if there is a seismic activity will be able to know by accessing the web site and also listen from television or radio.

3.1.3 Problem Definition

This is where the problem is defined and narrowed down to ease the study. Broad and unnecessary elements that could make the problem vague are filtered and eliminated, thus will simplify the problem. By doing this, it would be clear to help in seeking solution for the problem.

The model of seismic activity will not be created in this project as it would be out of the scope and lack of engineering work knowledge. The main development of the system lingers around software and telecommunication parts. The seismic data will be analyzed carefully to understand the graph generated by them.

Therefore, the problem has been identified by filtering other unnecessary elements that are considered out of scope and less important for this project.

3.1.4 Theoretical Framework

In this stage, the attempt to integrate all the information in logical manner is conducted. The problem can now be conceptualized. Theory was formulated through readings and observation. Developing the theoretical framework assist in hypothesizing and test certain relationship so as to improve understanding of the situation. Based on the observation and data gathering, the following theory was postulated. The theory as shown in Figure 2 indicates that the relationship of using SMS to issue an early warning system can provide an effective notification of the disaster to the communities within the particular area.

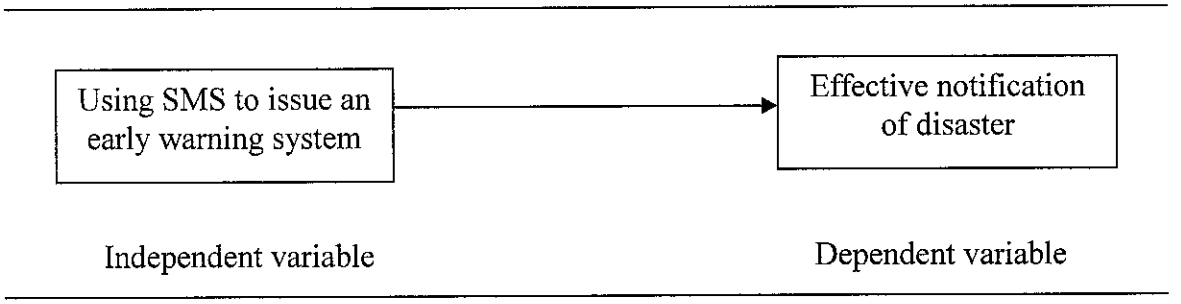

Figure 2: Diagram on relationship between independent and dependent variable

3.1.5 Generation of Hypothesis

This is the next logical step after theoretical framework. Critical variables are placed under several conditions, whereby it consists of dependent and independent variables. Each relation of the theoretical framework is put into conditional statement to justify the truth of the hypothesis.

The hypothesis is that the people within the particular area will be effectively notified using SMS once the monitoring data shows a certain level of danger.

3.1.6 Data Collection, Analysis and Interpretation

This stage is the most extensive stage whereby the data gathered need to be analyzed. There will be complex relationship between monitoring data and seismic activities that require extra work to understand them clearly before any manipulation can be done. Next, the danger level need to be assigned so that the system that will be developed will know when to notify communities when there is the occurrence of seismic activity and the possibility of the disasters.

3.1.7 Establishment of Guideline for Seismic Activity Alert Using SMS System Development

The establishment of the system flow, Data Flow Diagram, use case and other system engineering tools is used to help the establishment of the guideline for the project.

3.1.8 Seismic Activity Alert Using SMS System Development

After getting the firm knowledge on how to relate the seismic data with the SMS and also GSM, the next step is to develop the application based on the guideline. A system with a predetermined level of hazard will be developed using Macromedia ASP VBScript programming language. The monitoring data will be entered and the trial will be given whether the system successfully recognizes people within the cell and notify them regarding the hazards.

This is the process of arriving at conclusion by interpreting the results of the notification. The next process will be system testing to cross check system logic, optimization and capability.

Basic Software Development Life Cycle (SDLC) is applied in this phase. Table 1 shows the phases involved and their corresponding activities.

Table 1: Phases involved in Seismic Activity Alert Using SMS system development and activities available

Phases	Activities
Planning	• Produce high level document of the project that relates to the project's objectives and scopes. • Identify phases involved in the project. • Design architecture of the whole system. • Confirm tools to be used.
Analysis	• Design focuses on high level design like, what programs are needed and how are they going to interact, low-level design (how the individual programs are going to work), interface design (what are the interfaces going to look like) and data design (what data will be required).
Implementation	• Creation of database for seismic data. • Choose and start to code using the right programming tool. • Produce interface. • Integrate application with the GSM modem.
Testing	• Send SMS from application to the mobile phones.
Maintenance	• Making changes to the interface and the programming behind it to make them more reliable.

3.1.9 Deduction

Here, the objectives of the project will be evaluated whether the objectives have successfully being met.

3.2 Tools and Equipments Required

To ensure the success of the Seismic Activity Alert Using SMS System development, these tools and equipments will be used:-

- Computer

- Windows XP Professional

- Internet Information Services (IIS) version 5.1
  IIS makes it easy to publish information on the Internet or intranet. IIS includes a broad range of administrative features for managing Web sites and Web server. With programmatic features like ASP, scalable and flexible Web applications can be created and deployed.

- Macromedia Dreamweaver MX 2004
  Macromedia Dreamweaver MX 2004 is a professional HTML editor for designing, coding, and developing websites, web pages, and web applications. Dreamweaver provides helpful tools to enhance web creation experience. The visual editing features in Dreamweaver let me quickly create pages without writing a line of code. Dreamweaver also includes many coding-related tools and features if I prefer to code by hand. And Dreamweaver helps me to build dynamic database-backed and powerful web applications using server languages such as ASP, ASP.NET, CFML, JSP, and PHP.

- Active Server Pages VBScript (ASP VBScript)

  Macromedia Dreamweaver MX 2004 is used together with ASP VBScript server language. Together with Macromedia Dreamweaver MX 2004, interface for Seismic Activity Alert system is developed. Below are the advantages of ASP VBScript that makes me using it as the server language to develop web applications: -

  - It is relatively cheap and easy to find a host for an ASP- driven Web site.
  - There is a large ASP community, and it is easy to find resources (books and Web sites).
  - ASP is stable and mature in the Windows environment.
  - ASP is free. It is bundled with IIS on Windows NT.
  - ASP can interface with ODBC- compliant databases (Access & SQL Server) through ADO.
  - ASP can be extended by third- party components. Own components can be built so that code can be reused and execution speed is improved.
  - ASP has built- in objects that aid Web development, such as the Request object (retrieves posted form data) and the Session object (handles user sessions).
  - Microsoft is committed to improving ASP and the supporting scripting languages. ASP.NET is major upgrade to ASP.

- Microsoft Access 2003

  Microsoft Office Access is a relational database management system which combines the relational Microsoft Jet Database Engine with a graphical user interface. Seismic data are stored in the Microsoft Access 2003 database. This database will be linked with the ASP VBScript with Data Source Name (DSN).

- Microsoft Visio 2003

  Microsoft Office Visio Professional 2003 gives business and technical users the power to visualize and communicate ideas, information, and systems. It can be used to create a directional map, a block diagram, a basic and a cross-functional flowchart, an organization chart, and an office layout. Microsoft Vision 2003 is used to create flow chart for Seismic Activity Alert Using SMS.

- GSM modem

  A GSM modem or phone connected to a PC serial port or to a USB port with an appropriate modem driver. A GSM modem is a wireless modem that works with a GSM wireless network. Typically, an external GSM modem is connected to a computer through a serial cable or a USB cable. GSM modem from Siemens brand is used for this project. To use this, SIM card is inserted into the GSM modem. Whenever appropriate, the system will send SMS to the particular people using the credits available in the SIM card.

- Ozeki Message Server 6- SMS Server

  Ozeki Message Server 6 - SMS Server is a powerful, flexible SMS Gateway application that enables to send or receive SMS messages to mobile devices with the computer. It has an easy to use user interface, and an excellent internal architecture. The application can use a GSM mobile phone attached to the PC with a phone-to-PC data cable or IP SMS technology to transmit and receive the messages. Ozeki Message Server works on Microsoft Windows XP, 2000, 2003 operating systems.

- Mobile phones

  Any mobile phones can be used to receive the seismic activity alert in the form of SMS.

CHAPTER 4

RESULT AND DISCUSSION

4.1 Results

4.1.1 Interviews

Interview sessions have been made with Professor Tjia Hong Djin at Kuala Lumpur City Centre (KLCC) and also geologists at PRSSSB. Clear and concise explanation of the occurrence of seismic activity that can lead to natural hazards has been given by Professor Tjia Hong Djin. His opinion about the relevancy and worthiness of this project is high and show optimistic view of the project.

Basically, this is how earthquake happened: -

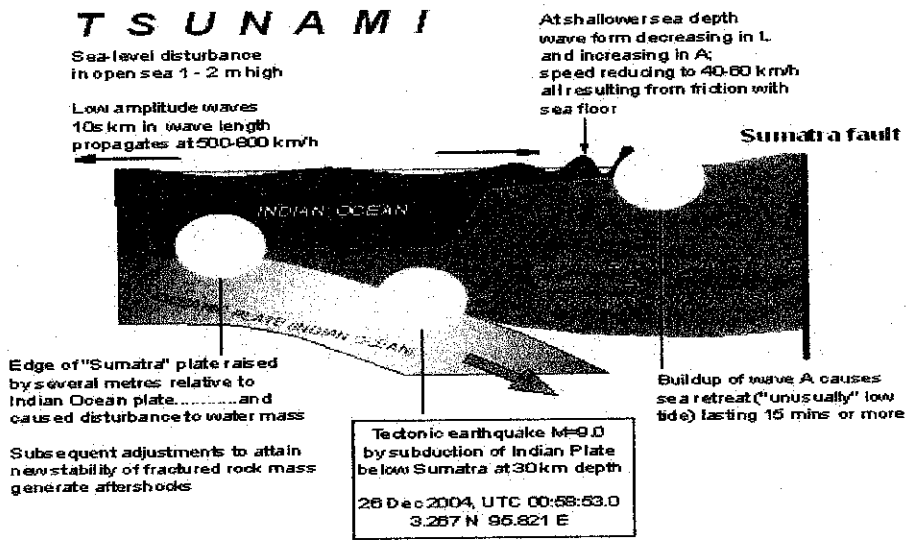

Figure 3: Occurrence of earthquake on December 26th, 2004

On December 25, 2004, along their border, the India plate pushes underneath the Burma plate in a northerly direction. Pressure builds over time until the sudden movement of plates causes an earthquake. As the India plate slips under the Burma plate, part of the ocean floor is displaced, forcing water upward. The water swells, propagating waves outward and thus creating tsunamis.

In general, an earthquake is a sudden and sometimes catastrophic movement of a part of the Earth's crust. Earthquakes result from the dynamic release of elastic strain energy that radiates seismic waves. Earthquakes typically result from the movement of faults, planar zones of deformation within the Earth's upper crust.

Not all seismic activity can cause earthquake and not all earthquake can cause tsunami. Human cannot predict the occurrence of them. Current method is to sense the occurrence based on the changes in reading from the remote sensors that are used to detect the seismic activity. The possibility of further disaster can only be predicted or expected based on a trend of a series of level issued by the remote sensors.

The things that can be done is preparing the emergency precautionary equipments and having a good notification to the particular people. Here, SMS notification is believed to be a good notification system to reach particular people at a particular area of possible occurrences in addition to the normal way of notification through television and radio.

4.1.2 Data Analysis

Seismic activity and earthquake occurrence are observed by accessing web pages that have been given by Professor Tjia Hong Djin and geologists at PRSSSB. Seismic data of the seismic activity occurrence in Malaysia region can be retrieved from Malaysian Meteorological Service, Ministry of Science, Technology and Innovation.

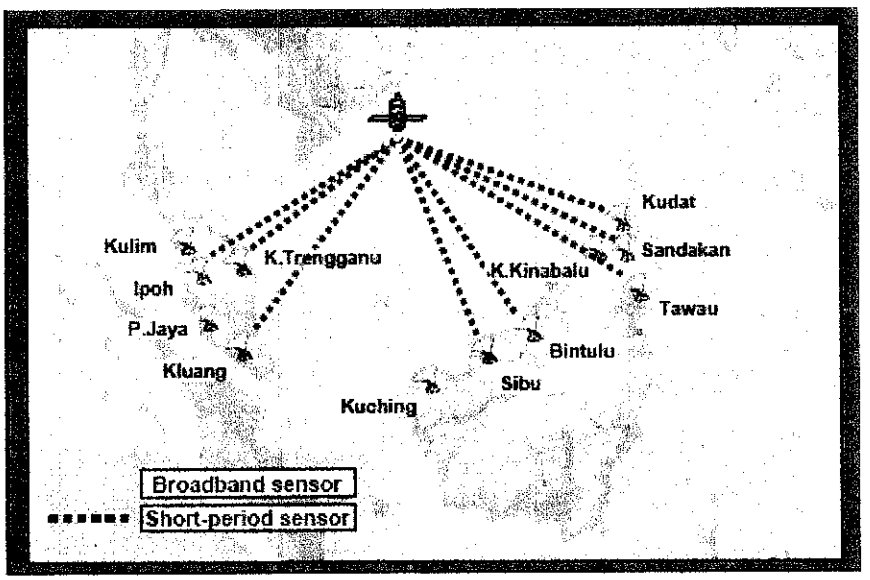

Figure 4: National Seismic Network

There are twelve sensors in Malaysia region. These sensors record seismic data and send the information to the headquarters at Malaysian Meteorological Service, Ministry of Science, Technology and Innovation. Those data contains five attributes which are date of occurrence, time of occurrence, magnitude of occurrence, latitude of occurrence, and longitude of occurrence. By analyzing the data, the trend of data will be visible. All the data will be fed into the system. There will be program written using ASP VBScript that will manipulate and group the data according to the appropriate group. The system will has its own predetermined level of hazard. The result of data that has been processed will be compared with the predetermined level and from that, whenever appropriate, the system will notify particular people within the particular area.

4.1.3 Architecture of the system

The architecture for the system has been formulated. As depicted in Figure 5, when there is seismic activity happened beneath the earth, the remote sensors that are attached to the base station or tower will record the value of seismic data and send to the headquarters on land at Malaysian Meteorological Service, Ministry of Science, Technology and Innovation. The analysis and manipulation of data will be done at the headquarters. When necessary, the notification will be sent to the public.

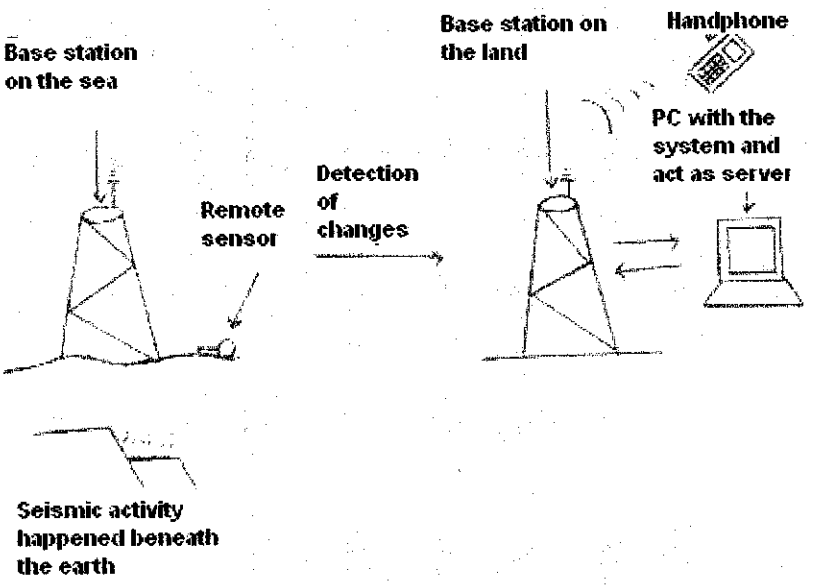

Figure 5: Architecture of Seismic Activity Alert Using SMS

Flowchart diagram below can be used to visualize the process: -

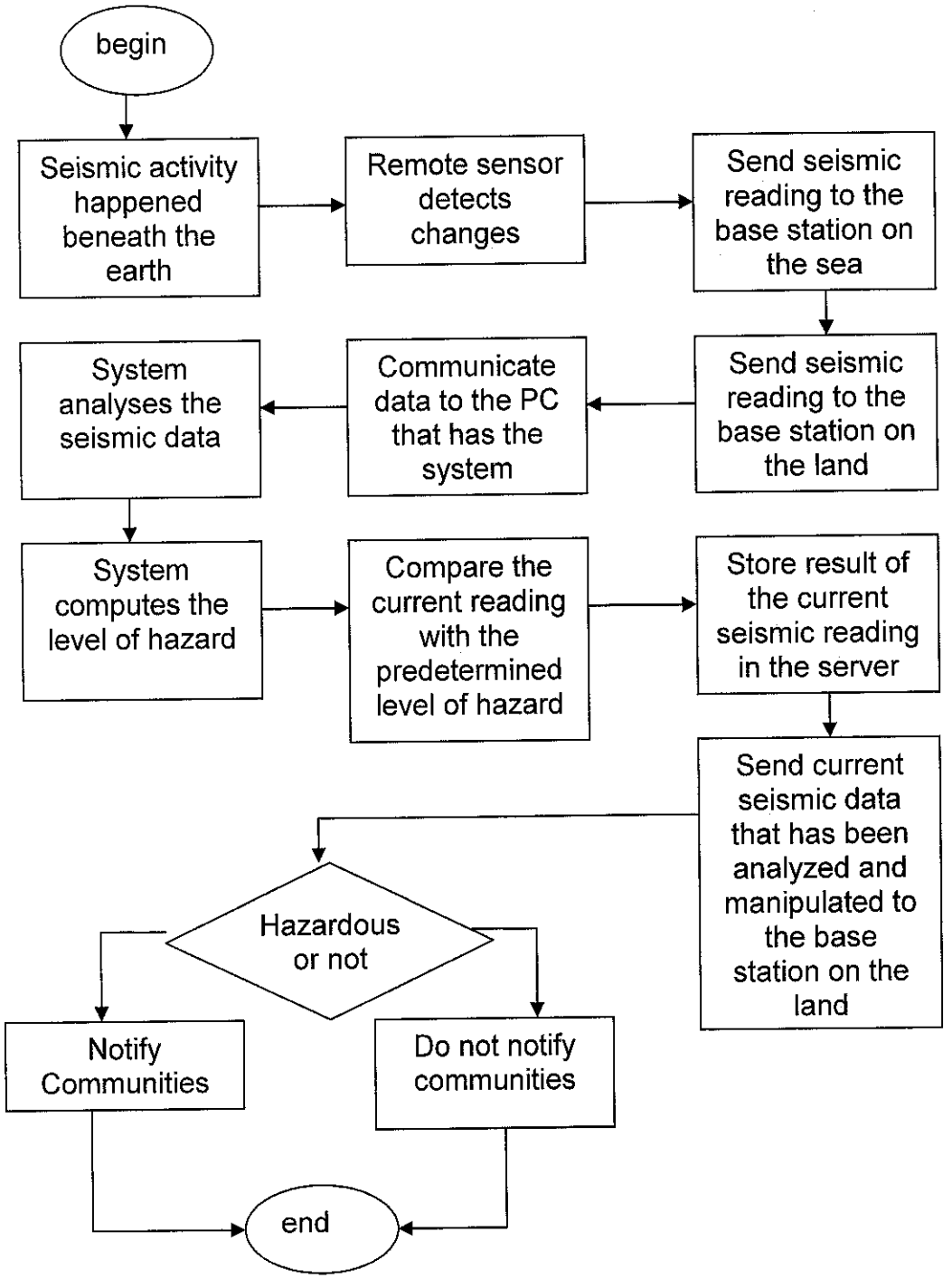

Figure 6: Data Flow Diagram Seismic Activity Alert Using SMS

For the purpose of the project, the seismic data is retrieved from Malaysian Meteorological Service, Ministry of Science, Technology and Innovation which can be accessed from http://www.kjc.gov.my with five attributes which are date of occurrence, time of occurrence, magnitude of occurrence, latitude of occurrence, and longitude of occurrence.

This real time data will be stored in the database. Each sensor will have their corresponding area. As the seismic model cannot be provided for this project, the system will require administrator to enter data.

Data that will be entered into the system is from seismic activities that occur along Malaysia region and the nearest neighbours' countries such as Indonesia, Thailand and etc. The seismic data will be matched with the nearest sensors according to the latitude and longitude of the occurrence. There can be more than one sensor that matched the entered seismic data. The list of sensors will have their corresponding list of areas. When the seismic data meet or exceed the level of predetermined level of hazard, the notification can be sent to the particular area that is prone to the possible disastrous occurrence.

4.1.4 Product

4.1.4.1 Database

Microsoft Access 2003 database is used for storage and retrieval of seismic data. There are three tables stored in database named sensor_info table, area_info table and data_info table. Descriptions of the tables are as below: -

- sensor_info table
    - Stores sensor information such as ID of the sensor, name of the sensor, latitude of the sensor and longitude of the sensor. Twelve sensors are located at twelve locations along Malaysia beaches. Refer Appendix A1.

- area_info table
    - Stores area information including name of the area, latitude of the area, and longitude of the area that are covered by corresponding sensor. Refer Appendix A2.

- data_info table
    - Stores incoming data which was generated by the sensor including magnitude of the data, latitude of the data and longitude of the data. For the purpose of this project, the data_info table will get the data that is entered manually. Refer Appendix A3.

4.1.4.2 Web Application

- Insert data page
    - The system will record incoming data with their corresponding magnitude, latitude and longitude. This is the data of the seismic activity occurrence that occur at the neighbours' countries. Refer Appendix B1.

- Search for sensor page
    - After seismic data has been entered into data_info table, it will be match against the nearest sensor(s). Refer Appendix B2.

- Sensor location page
    - The list of sensor(s) that matched the seismic data being entered will be displayed. The selection of sensor will direct administrator to the area selection page. Refer Appendix B3.

- Area selection page
    - After the selection of the sensor, there will be list of areas that belongs to the sensor has been selected before. Refer Appendix B4.

- Ready to send notification via SMS page
    - This page is to view the sensor name, area selected with the corresponding latitude and longitude and if the administrator wants to send SMS, he or she will click the button. Refer Appendix B6.

4.1.4.3 Interface on the mobile phones

Once the area has been selected to be notified, the system will send SMS using Ozeki Message Server 6- SMS Server. The message will be received by particular people at the particular area of possible occurrence only. Refer Appendix C1.

4.2 Discussion

4.2.1 Ozeki Message Server 6- SMS Server

Ozeki Message Server 6- SMS Server used as a SMS gateway application has been used as a tool to send SMS from the web application created with ASP VBScript to the mobile

phone. GSM modem being attached to the computer with a phone-to-PC cable to transmit messages from the system whenever appropriate. Refer Appendix D1.

The GSM phone attached to the computer using Ozeki Message Server program as gateway to send or receive SMS messages. The computer program uses the GSM phone to communicate with the GSM network. If a message is sent by the application running on the computer it is first sent to the attached GSM phone, and as a second step the GSM phone transmits the messages to the SMSC of the GSM service provider through a wireless link When a message is received, the GSM phone stores the message in its memory or on the SIM card and sends a notification to the PC. When the program running on the PC receives this notification, it reads the appropriate memory cell and deletes the message from the phone to make room for the next incoming message. Refer Appendix D2.

Ozeki Message Server is installed in the computer in which the web application resides. In order to make the web application interact with the Ozeki Message Server, the ASP codes provided by the Ozeki web site need to be embedded in the web page. Only then, the Ozeki Message Server can sent SMS to the particular party once the 'Send SMS' button being clicked by administrator.

Ozeki Message Server installation package contains Ozeki Message Server, Ozeki Message Server Monitor and Ozeki Message Server Manager.

4.2.1.1 Ozeki Message Server

Ozeki Message Server operates GSM phones. It handles message queues and users. It runs as a system service in the background. It contains a built in HTTP server that is used by clients. When the Ozeki Message Server is installed, a new service will be registered in the system. This service will communicate with the GSM phone attached to the computer. The properties of the new service can be checked by starting the Windows

Service Manager as shown in Appendix D3. In the Service Manager, there is an entry called Ozeki Message Server. The properties can be seen by clicking the link with the right mouse button to see its properties as shown in Appendix D4.

4.2.1.2 Ozeki Message Server Monitor

Once Ozeki Message Server 6- SMS Server has successfully being installed, the status of the Message Engine can be known from the Ozeki Message Server Monitor as shown in Appendix D5.

Options for starting or stopping the configuration of the server can be selected once the menu is opened by clicking the icon with the right mouse button. Refer Appendix D6.

4.2.1.3 Ozeki Message Server Manager

Ozeki Message Server Manager as the main user interface of the application need to be log on before it can be used to configure the service, to send or receive messages, to maintain the address book and to get information from the server real time. Refer Appendix D7. It can be used a management console to manage the server remotely over the network. The Message Server Manager can be started from the Start menu or from the Server Monitor Taskbar icon. After startup the Ozeki Message Server Manager requires a login name and a password.

4.2.2 GSM modem

GSM modem used in the project is Siemens TC35 model. It can be connected directly to the power supply of the computer. It uses an external antenna and it has a standard 9 pin RS232 interface. To connect the device with the computer, I need to have a standard RS232 "mouse extender".

GSM modem needs to be inserted with the SIM card with the credits in it. The configuration using Hyper Terminal need to be used in order to ensure that the computer can communicate with the GSM modem. Refer Appendix E2. Name of the connection need to be entered as shown in Appendix E3. The port for connection is selected as shown in Appendix E4. Availability of the port for the connection can be checked at the Device Manager as shown in Appendix E5. Then, restore the defaults to ensure that it match the Ozeki Message Server setting as shown in Appendix E6.

Once the connection between GSM modem and computer was successful, the Ozeki Message Server is tested whether it can send SMS to the particular party.

4.2.3 Problem and challenge

There are some problems and challenges faced during the completion of the project.

4.2.3.1 Database

Problems faced with the database are as follows:-

- Access database unable to be connected with the application due to incompatibility issue.
- Less flexibility of data manipulation in the database due to IIS use

However the problem has been fixed by rebuilding the application using ASP VBScript. An attempt was successful since the database can be manipulated using Data Source Name (DSN) connection.

4.2.3.2 SMS Server software

- Ozeki Message Server 6 being used as a tool to send SMS from the application resides on the computer to the mobile phones. Before using it, the computer that has Ozeki Message Server resides in it needs to have the suitable serial port that can be linked with the GSM modem. Therefore, a problem arises whereby the laptop that is being used is not equipped with the necessary serial port. Thus, the whole application needs to be migrated to the other computer.

- The migration process triggers another problem as the web applications that has been successfully created and run on the laptop cannot be run successfully at the newly migrated computer. As a solution, the system was reconfigured according to the software specification of the new computer.

4.2.3.3 GSM modem

During the initial stage of the project, GSM modem was not available. Therefore, GSM phone GEO G1 equipped with the phone-to-PC cable was used. The trial has been put to use a computer to at least know whether the computer can establish connection with the GSM phone using Hyper Terminal. However it was unsuccessful.

The Sony Ericsson Z520i phone with Bluetooth technology succeeded at the first time but shows a symptom of inconsistency in terms of network connection. Therefore, the use of GSM modem needs to be reconsidered.

These problems have been resolved by using a serial cable provided by the specific vendor to connect the GSM modem with the computers. Only then, the connection was successfully being established and SMS can be sent to the particular parties.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

SMS messaging has been used by millions of people around the world in order to exchange information quickly and at low rate. SMS messaging is used for this project as a way to reach particular people at particular area only. The notification of possible disaster can be done effectively by reminding particular people at particular area only, in addition to the announcements by televisions and radios.

5.2 Recommendation

As the project duration is not very long, many things cannot be done in this project. For the further enhancement of the system, below are the suggestions to enhance the Seismic Activity Alert Using SMS system: -

- Improve the security of the system.
    - As the system involve lives, the system need to have high security level. It would be good if only the authorized user having the control to manage the system. Administrator should have his or her username and password in order to access the system. It will cause harm if the system can easily being hacked as when the system being hacked, the data will be changed and it will get worse if the level of predetermined level of disaster is being changed.

- Implement the DSS such as AI concept or Expert System
    - A DSS is an interactive computer-based system or subsystem intended to help decision makers use communications technologies, data, documents, knowledge and/or models to identify and solve problems, complete decision process tasks, and make decisions. .
    - It will be good if the system can be such an Expert System. Means, the system intelligently do what it supposed to do. Once the seismic data of the new seismic activity happened being fed into the system, the system should automatically calculate the possible area that are prone to the disastrous occurrence and effectively notify the communities.

All these two recommendations might increase the effectiveness of the system.

- Do the hardware part
    - Currently, the system receives the seismic data which is entered manually by the administrator. It would be good to have seismic model that equipped with the sensor to record the changes beneath the earth and feed the data to the system. Then, the system automatically does the notification to the particular people in the particular area that prone to the disastrous occurrence.

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APPENDICES

APPENDIX A: Screenshots of database in Microsoft Access 2003

APPENDIX B: Screenshots of Web Application

APPENDIX C: Screenshots of application received by user

APPENDIX D: Ozeki Message Server 6- SMS Server

APPENDIX E: GSM modem and its configuration

APPENDIX F: Codes

APPENDIX G: Project's duration

APPENDIX A

Screenshots of database in Microsoft Access 2003

A1- sensor_info table

sensor_info : Table

data_ID	sensor_ID	sensor_name	sensor_latitude	sensor_longitude
+	1	Kulim	05.22N	100.34E
+	2	Ipoh	04.35N	101.05E
+	3	Petaling Jaya	03.04N	101.42E
+	4	Kluang	02.01N	103.19E
+	5	Kuala Terengga	05.20N	103.08E
+	6	Kuching	01.33N	110.25E
+	7	Sibu	02.20N	111.50E
+	8	Bintulu	03.10N	113.00E
+	9	Kota Kinabalu	06.00N	116.04E
+	10	Tawau	04.20N	117.55E
+	11	Sandakan	05.53N	118.40E
+	12	Kudat	06.55N	116.55E
*	(AutoNumber)			

A2- area_info table

Microsoft Access - [area_info : Table]

File Edit View Insert Format Records Tools Window Help

area_ID	area_name	area_latitude	area_longitude	sensor_name	sensor_ID
1	Alor Setar	06.07N	100.22E	Kulim	
2	Bagan Serai	05.01N	100.32E	Kulim	
3	Baling	05.41N	100.55E	Kulim	
4	Bukit Mertajam	05.22N	100.28E	Kulim	
5	Butterworth	05.24N	100.23E	Kulim	
6	George Town	05.25N	100.20E	Kulim	
7	Gurun	05.49N	100.27E	Kulim	
8	Jitra	06.16N	100.25E	Kulim	
9	Kangar	06.27N	100.12E	Kulim	
10	Pulau Langkawi	06.25N	99.45E	Kulim	
11	Bagan Datoh	03.59N	100.47E	Ipoh	
12	Batu Gajah	04.28N	101.03E	Ipoh	
13	Bidor	04.06N	101.15E	Ipoh	
14	Bruas	04.30N	100.47E	Ipoh	
15	Cameron Highla	04.27N	101.22E	Ipoh	

Record: 1 of 19

Datasheet View

A3- data_info table

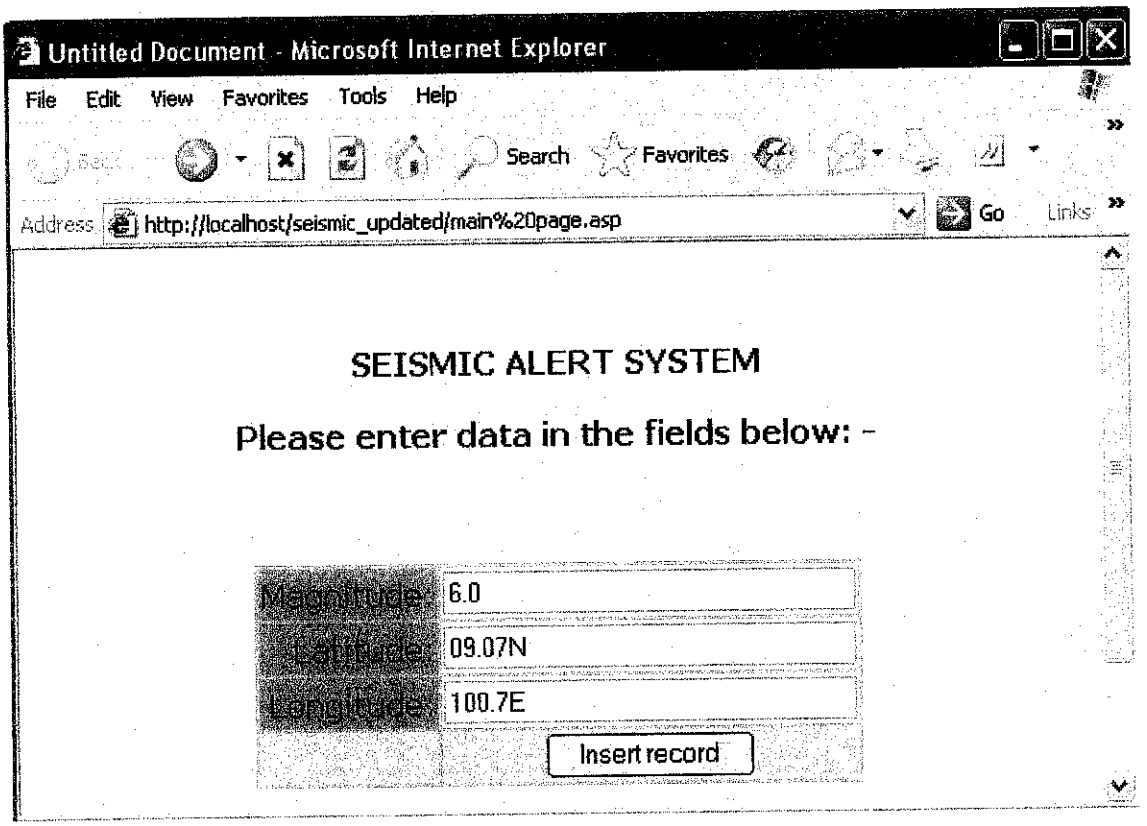
data_info : Table

data_ID	data_magnitude	data_latitude	data_longitude
1	4.3	01.40N	96.7E
2	6.0	2.2N	90.8E
3	7.0	8.8N	98.7E
6	7	7.7N	88.9E
7	6	6.6N	99.8E
8	7.2	6.7N	98.7E
9	7.0	2.2N	125.7E
AutoNumber			

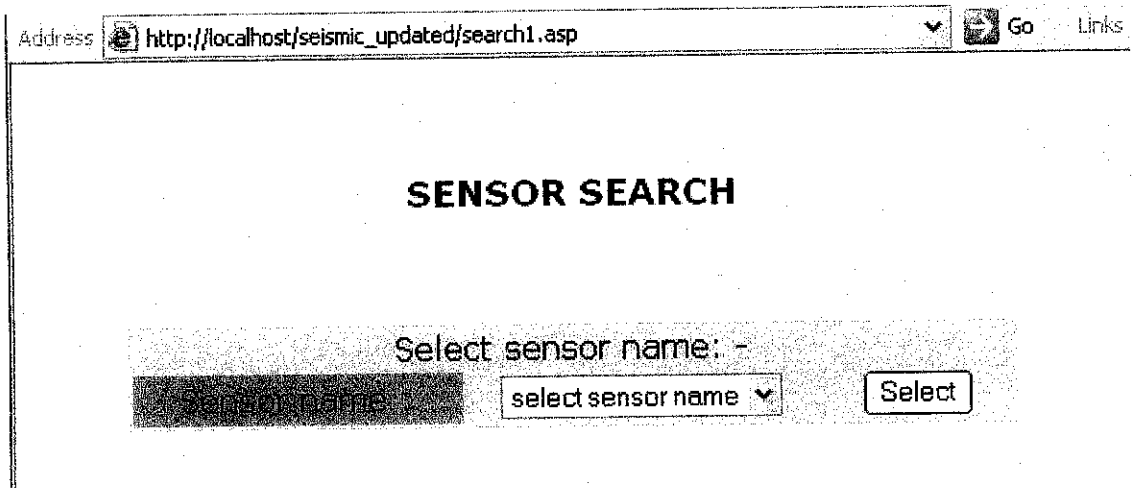
APPENDIX B

Screenshots of Web application

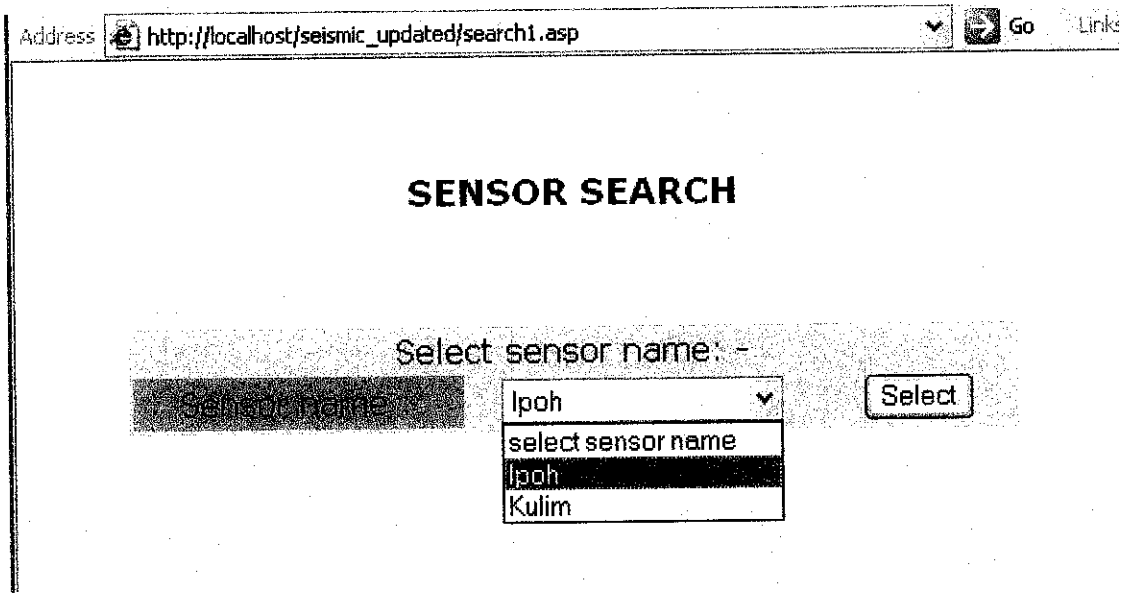
B1- Insert data page



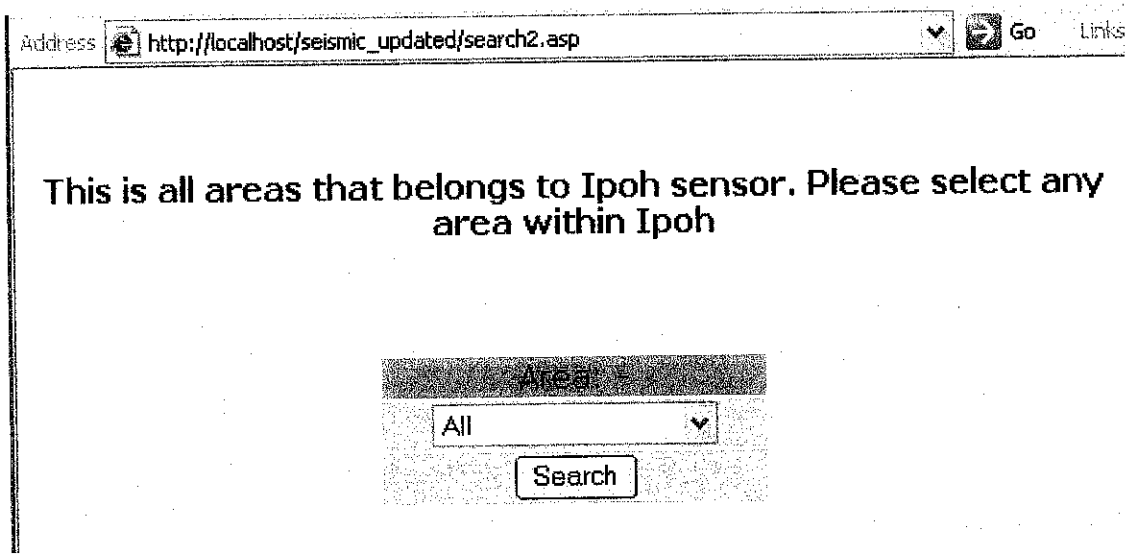
B2- Search for sensor page



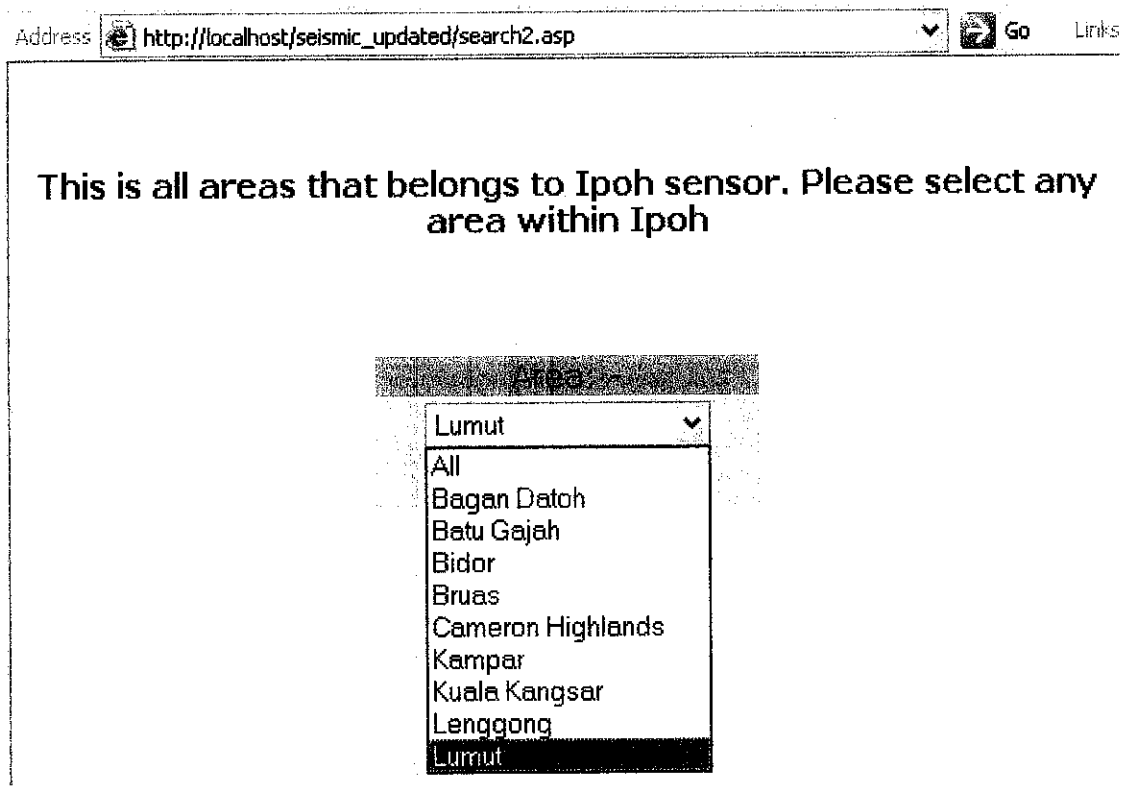
B3- Sensor location page



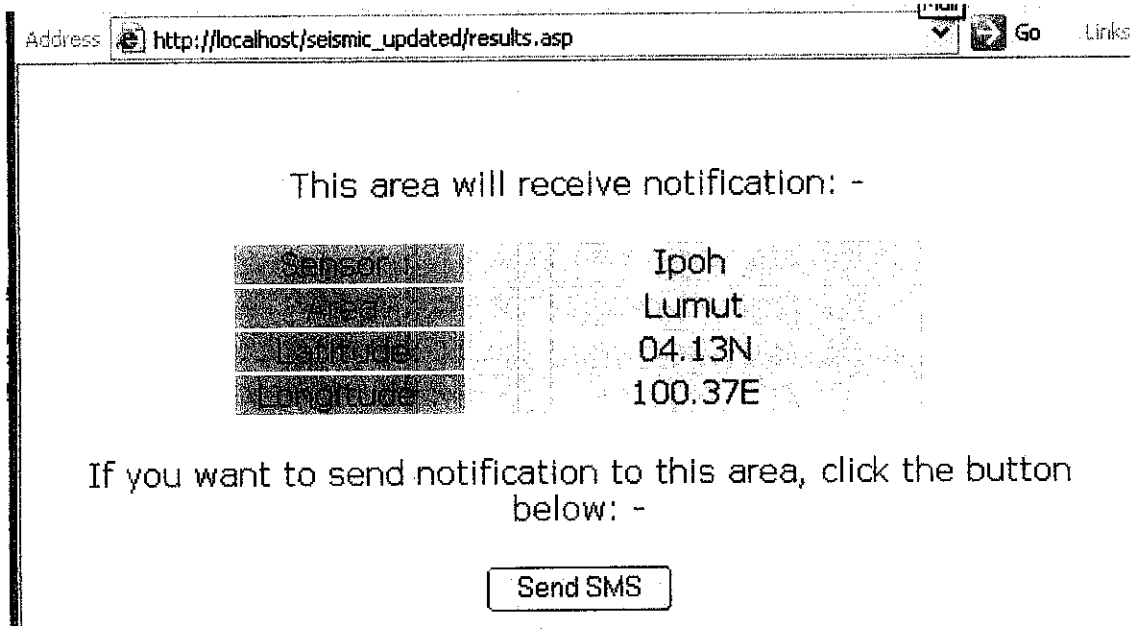
B4- Area selection page



B5- Area selection page (all area that belongs to selected sensor)



B6- Ready to send notification via SMS page



APPENDIX C

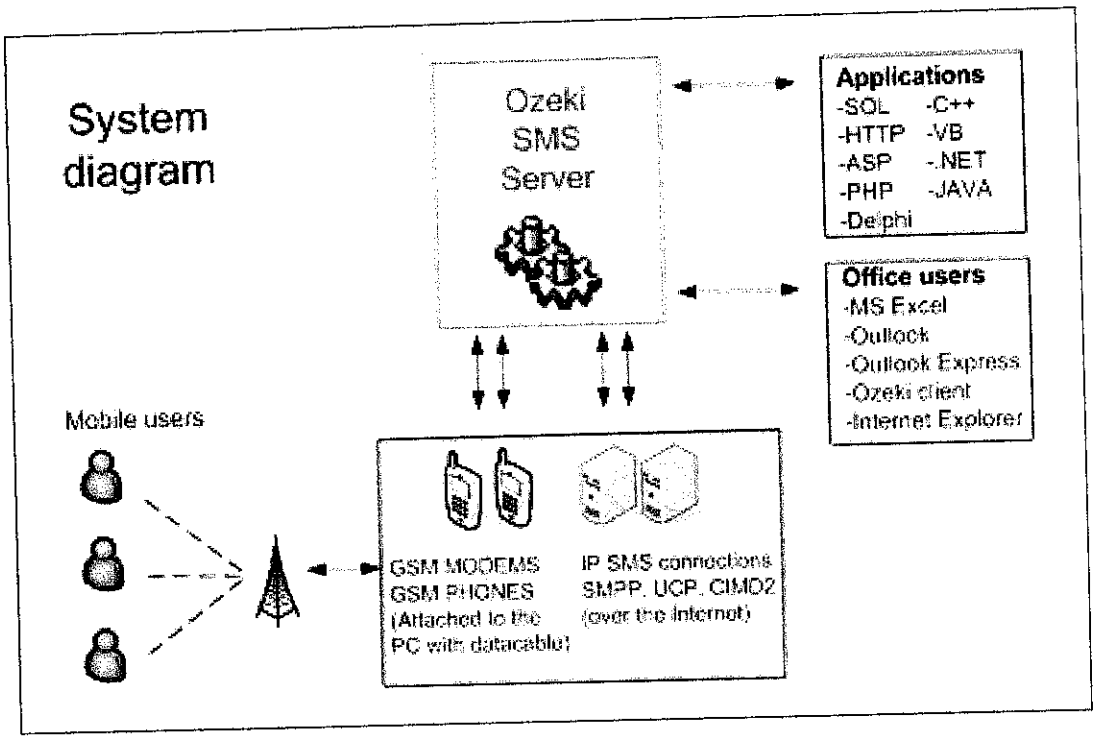
Screenshots of notification received by user

C1- SMS received by people within the area

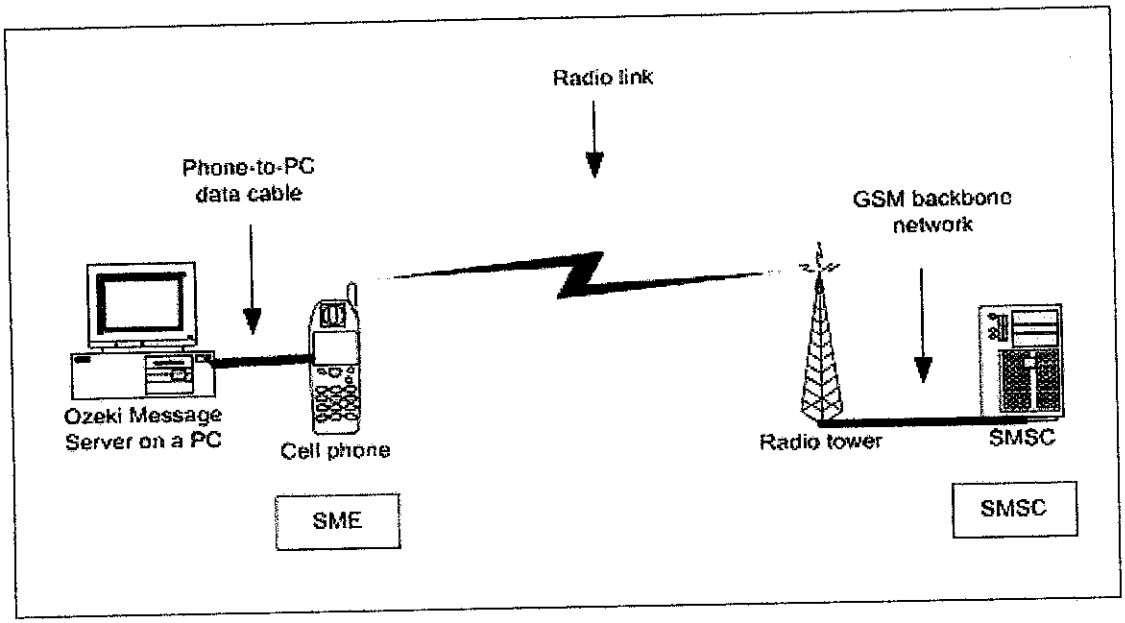
APPENDIX D

Ozeki Message Server 6- SMS Server

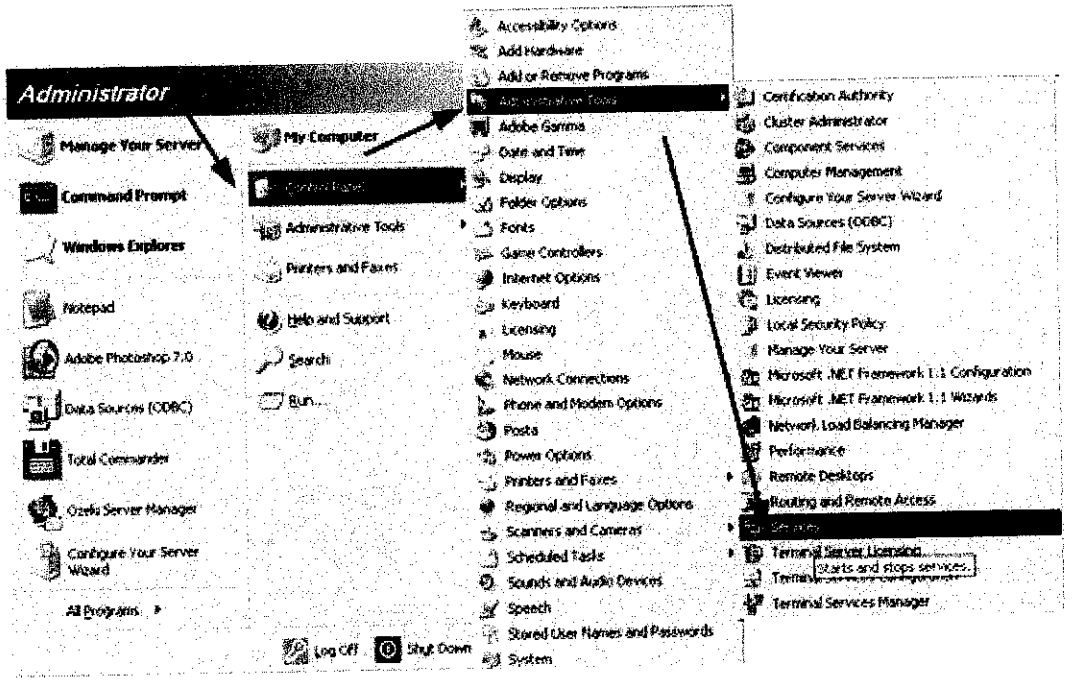
D1- Ozeki Message Server System Diagram



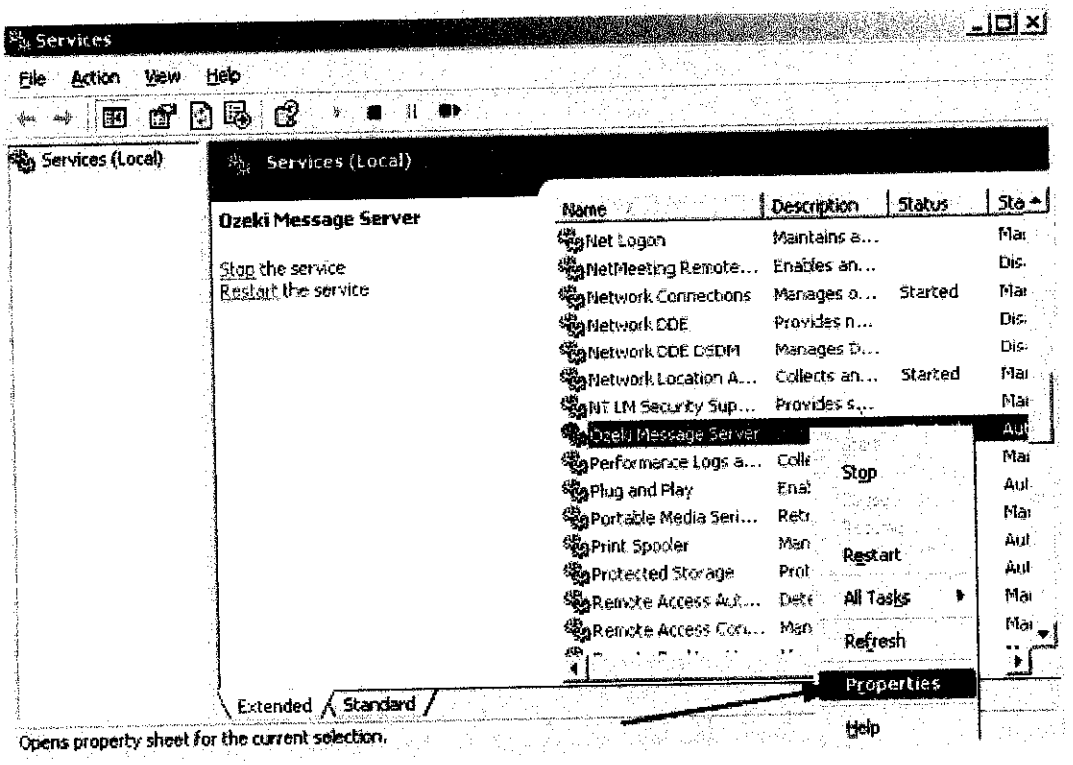
D2- Ozeki Message Server used with a mobile phone attached to the PC



D3- Starting Ozeki Server Manager

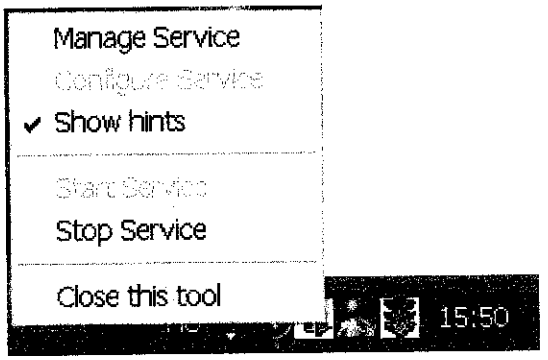


D4- Service Properties

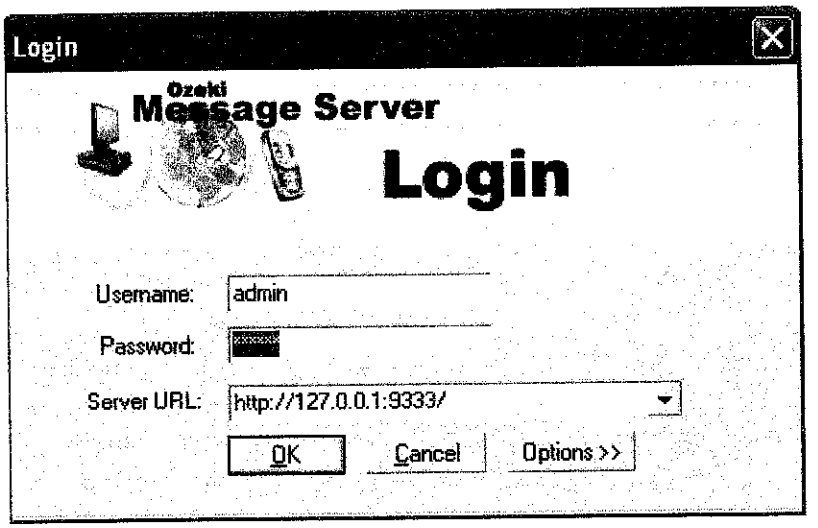


D5- Taskbar icon

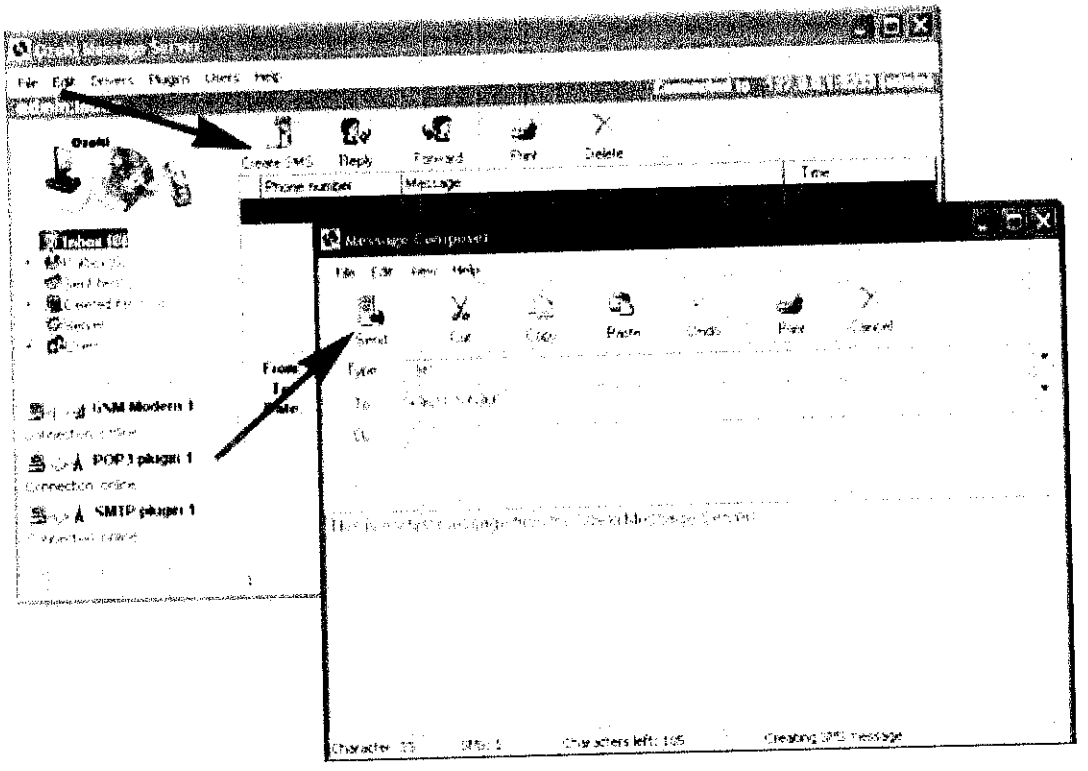
D6- Starting the Ozeki Message Server Monitor



D7- Ozeki Message Server login page



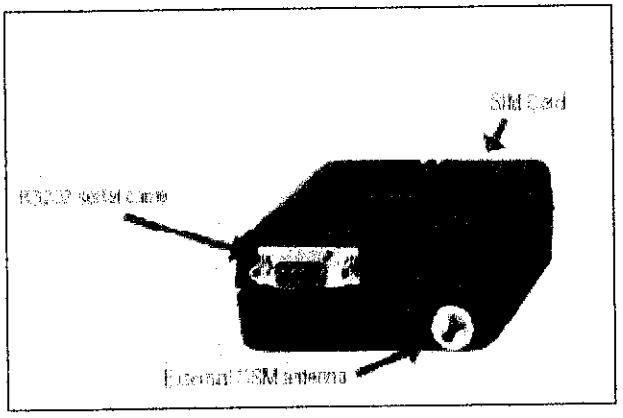
D8- Message Server Manager main form



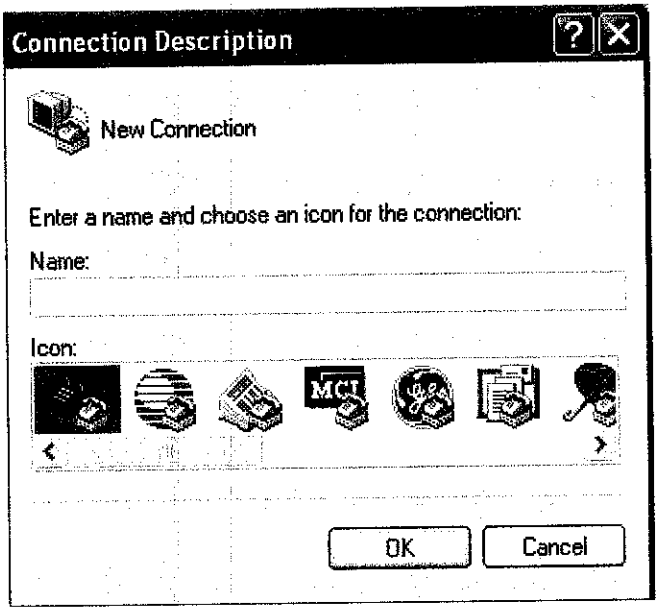
APPENDIX E

GSM modem and its configuration

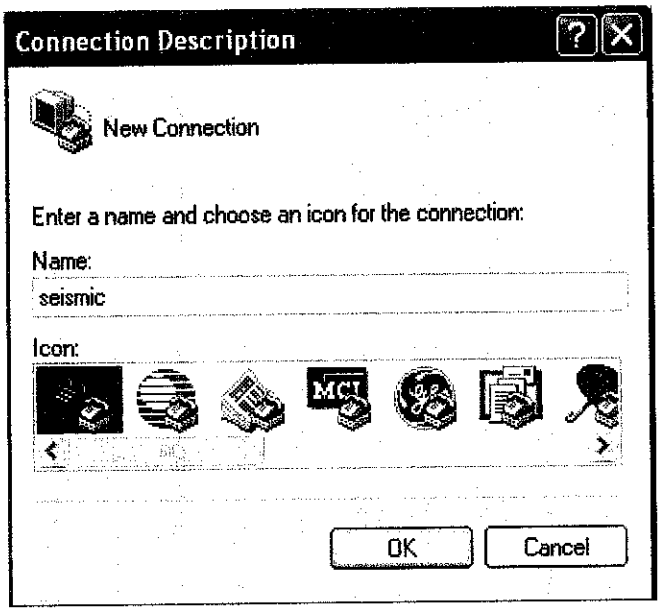
E1- GSM modem Siemens TC35



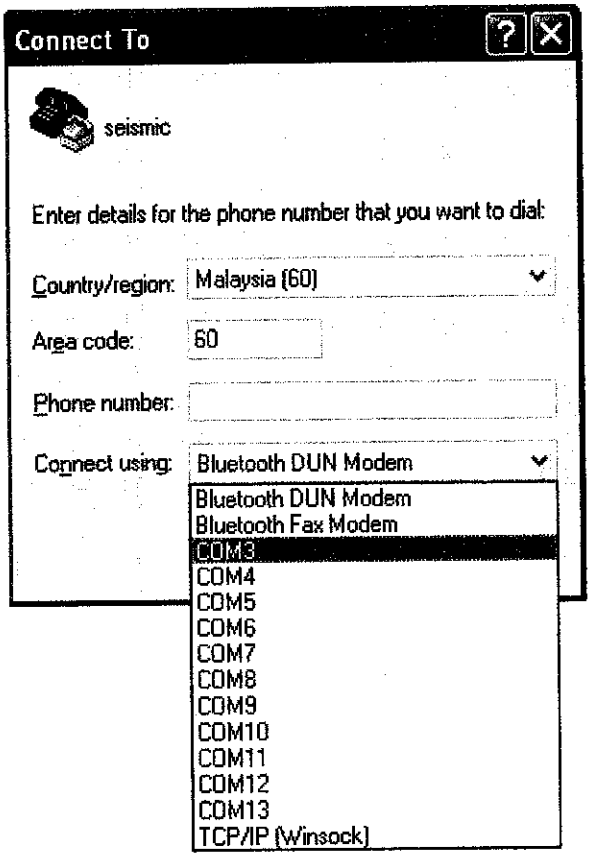
E2- Start Hyper Terminal configuration



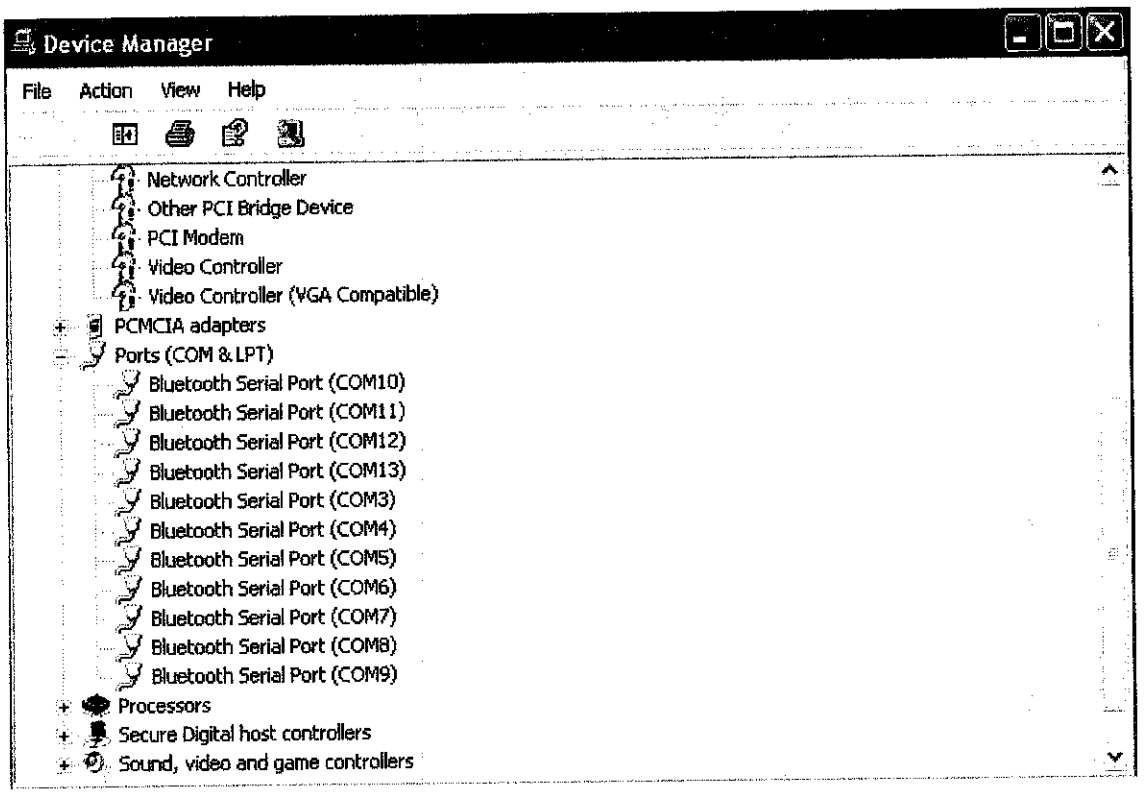
E3- Enter name of Hyper Terminal connection



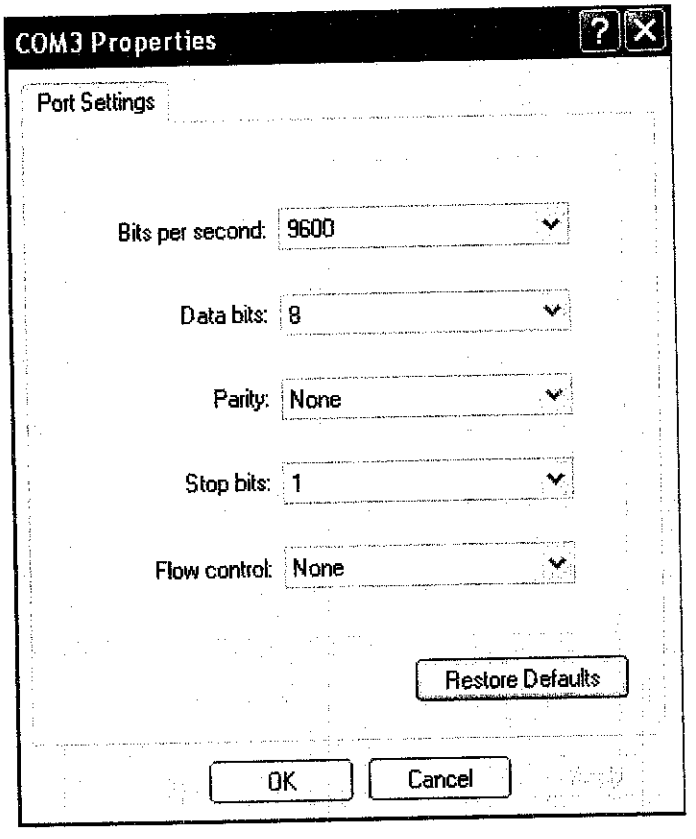
E4- Select port for the connection



E5- Availability of the port can be checked at the computer properties→ hardware → device manager



E6- Restore the defaults to ensure that it match the Ozeki Message Server setting



APPENDIX F

Codes

F1- Insert data page

```
<%@LANGUAGE="VBSCRIPT" CODEPAGE="1252"%>
<!--#include file="Connections/connSeismic.asp" →
<%
' *** Edit Operations: declare variables

Dim MM_editAction
Dim MM_abortEdit
Dim MM_editQuery
Dim MM_editCmd

Dim MM_editConnection
Dim MM_editTable
Dim MM_editRedirectUrl
Dim MM_editColumn
Dim MM_recordId

Dim MM_fieldsStr
Dim MM_columnsStr
Dim MM_fields
Dim MM_columns
Dim MM_typeArray
Dim MM_formVal
Dim MM_delim
Dim MM_altVal
Dim MM_emptyVal
Dim MM_i

MM_editAction = CStr(Request.ServerVariables("SCRIPT_NAME"))
If (Request.QueryString <> "") Then
  MM_editAction = MM_editAction & "?" &
Server.HTMLEncode(Request.QueryString)
End If

' □ditabl to abort record edit
MM_abortEdit = false

' query string to execute
MM_editQuery = ""
%>
<%
' *** Insert Record: set variables

If (CStr(Request("MM_insert")) = "form1") Then
```

```
MM_editConnection = MM_connSeismic_STRING
MM_editTable = "data_info"
MM_editRedirectUrl = "search1.asp"
MM_fieldsStr  = "data_magnitude|value|data_latitude|value|data_longitude|value"
MM_columnsStr =
"data_magnitude|',none,''|data_latitude|',none,''|data_longitude|',none,''"

' create the MM_fields and MM_columns arrays
MM_fields = Split(MM_fieldsStr, "|")
MM_columns = Split(MM_columnsStr, "|")

' set the form values
For MM_i = Lbound(MM_fields) To Ubound(MM_fields) Step 2
  MM_fields(MM_i+1) = CStr(Request.Form(MM_fields(MM_i)))
Next

' append the query string to the redirect URL
If (MM_editRedirectUrl <> "" And Request.QueryString <> "") Then
  If (InStr(1, MM_editRedirectUrl, "?", vbTextCompare) = 0 And Request.QueryString
<> "") Then
    MM_editRedirectUrl = MM_editRedirectUrl & "?" & Request.QueryString
  Else
    MM_editRedirectUrl = MM_editRedirectUrl & "&" & Request.QueryString
  End If
End If

End If
%>
<%
' *** Insert Record: construct a sql insert statement and execute it

Dim MM_tableValues
Dim MM_dbValues

If (CStr(Request("MM_insert")) <> "") Then

  ' create the sql insert statement
  MM_tableValues = ""
  MM_dbValues = ""
  For MM_i = Lbound(MM_fields) To Ubound(MM_fields) Step 2
    MM_formVal = MM_fields(MM_i+1)
    MM_typeArray = Split(MM_columns(MM_i+1),",")
    MM_delim = MM_typeArray(0)
    If (MM_delim = "none") Then MM_delim = ""
    MM_altVal = MM_typeArray(1)
    If (MM_altVal = "none") Then MM_altVal = ""
```

```
  MM_emptyVal = MM_typeArray(2)
  If (MM_emptyVal = "none") Then MM_emptyVal = ""
  If (MM_formVal = "") Then
   MM_formVal = MM_emptyVal
  Else
   If (MM_altVal <> "") Then
    MM_formVal = MM_altVal
   ElseIf (MM_delim = "'") Then  ' escape quotes
    MM_formVal = "'" & Replace(MM_formVal,"'","''") & "'"
   Else
    MM_formVal = MM_delim + MM_formVal + MM_delim
   End If
  End If
  If (MM_i <> Lbound(MM_fields)) Then
   MM_tableValues = MM_tableValues & ","
   MM_dbValues = MM_dbValues & ","
  End If
  MM_tableValues = MM_tableValues & MM_columns(MM_i)
  MM_dbValues = MM_dbValues & MM_formVal
 Next
 MM_editQuery = "insert into " & MM_editTable & " (" & MM_tableValues & ")
values (" & MM_dbValues & ")"

 If (Not MM_abortEdit) Then
  ' execute the insert
  Set MM_editCmd = Server.CreateObject("ADODB.Command")
  MM_editCmd.ActiveConnection = MM_editConnection
  MM_editCmd.CommandText = MM_editQuery
  MM_editCmd.Execute
  MM_editCmd.ActiveConnection.Close

  If (MM_editRedirectUrl <> "") Then
   Response.Redirect(MM_editRedirectUrl)
  End If
 End If

End If
%>
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN"
"http://www.w3.org/TR/html4/loose.dtd">
<html>
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1">
<title>Untitled Document</title>
<style type="text/css">
<!—
```

```
.style1 {font-family: Verdana, Arial, Helvetica, sans-serif}
.style4 {
        font-family: Verdana, Arial, Helvetica, sans-serif;
        font-size: 16px;
        font-weight: bold;
}
.style5 {
        font-size: 16px;
        font-weight: bold;
}
→
</style></head>

<body>
<p align="center" class="style1 style1"> </p>
<p align="center" class="style4">SEISMIC ALERT SYSTEM</p>
<p align="center" class="style4">Please enter data in the fields below: -</p>
<p align="center" class="style5"> </p>

<form action="<%=MM_editAction%>" method="POST" name="form1"
class="style1">

  <div align="center">
    <table align="center" bgcolor="#66FF99">
      <tr valign="baseline" bgcolor="#FFFFFF">
        <td align="right" nowrap bgcolor="#66CCFF">Magnitude:</td>
        <td><input type="text" name="data_magnitude" value="" size="32">
        </td>
      </tr>
      <tr valign="baseline" bgcolor="#FFFFFF">
        <td align="right" nowrap bgcolor="#66CCFF">Latitude:</td>
        <td><input type="text" name="data_latitude" value="" size="32">
        </td>
      </tr>
      <tr valign="baseline" bgcolor="#FFFFFF">
        <td align="right" nowrap bgcolor="#66CCFF">Longitude:</td>
        <td><input type="text" name="data_longitude" value="" size="32">
        </td>
      </tr>
      <tr valign="baseline" bgcolor="#FFFFFF">
        <td align="right" nowrap bgcolor="#99FFCC"> </td>
        <td bgcolor="#99FFCC"><input type="submit" value="Insert record">
        </td>
      </tr>
    </table>
    <input type="hidden" name="MM_insert" value="form1">
```

```
   </div>
</form>
<p align="center" class="style1"> </p>
<p align="center" class="style1"> </p>
</body>
</html>
```

F2- Search for Sensor page

```
<%@LANGUAGE="VBSCRIPT" CODEPAGE="1252"%>
<!--#include file="Connections/connSeismic.asp" →
<%
Dim rsSearch_sensor_name
Dim rsSearch_sensor_name_numRows

Set rsSearch_sensor_name = Server.CreateObject("ADODB.Recordset")
rsSearch_sensor_name.ActiveConnection = MM_connSeismic_STRING
rsSearch_sensor_name.Source = "SELECT DISTINCT sensor_name  FROM area_info"
rsSearch_sensor_name.CursorType = 0
rsSearch_sensor_name.CursorLocation = 2
rsSearch_sensor_name.LockType = 1
rsSearch_sensor_name.Open()

rsSearch_sensor_name_numRows = 0
%>
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN"
"http://www.w3.org/TR/html4/loose.dtd">
<html>
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1">
<title>Untitled Document</title>
<style type="text/css">
<!—
.style1 {font-family: Verdana, Arial, Helvetica, sans-serif}
.style2 {
        font-family: Verdana, Arial, Helvetica, sans-serif;
        font-weight: bold;
        font-size: 18px;
}
→
</style>
</head>

<body>
 <p align="center" class="style2"> </p>
 <p align="center" class="style2">SENSOR SEARCH </p>
 <form action="search2.asp" method="post" name="Sensor_Search" class="style1"
id="Sensor_Search">
   <p align="center"> </p>
   <div align="center">
    <table width="454" bgcolor="#99FFCC">
      <tr>
```

```
      <td colspan="3"><div align="center">Select sensor name: - </div></td>
    </tr>
    <tr>
      <td width="166" bgcolor="#66CCFF">Sensor name : </td>
      <td width="177"><select name="sensor_name" id="sensor_name">
        <option value="">select sensor name</option>
        <%
While (NOT rsSearch_sensor_name.EOF)
%>
        <option
value="<%=(rsSearch_sensor_name.Fields.Item("sensor_name").Value)%>"><%=(rsSe
arch_sensor_name.Fields.Item("sensor_name").Value)%></option>
        <%
 rsSearch_sensor_name.MoveNext()
Wend
If (rsSearch_sensor_name.CursorType > 0) Then
 rsSearch_sensor_name.MoveFirst
Else
 rsSearch_sensor_name.Requery
End If
%>
      </select></td>
      <td width="95"><input type="submit" name="Submit" value="Select"></td>
    </tr>
    </table>
  </div>
  <p align="center"> </p>
 </form>
 <p align="center" class="style1"> </p>
 <p align="center" class="style1">  </p>
 <p align="center" class="style1">  </p>
</body>
</html>
<%
rsSearch_sensor_name.Close()
Set rsSearch_sensor_name = Nothing
%>
```

F3- Area selection page

```
<%@LANGUAGE="VBSCRIPT" CODEPAGE="1252"%>
<!--#include file="Connections/connSeismic.asp" →
<%
Dim rsArea_menu__MMColParam
rsArea_menu__MMColParam = "1"
If (Request.Form("sensor_name") <> "") Then
 rsArea_menu__MMColParam = Request.Form("sensor_name")
End If
%>
<%
Dim rsArea_menu
Dim rsArea_menu_numRows

Set rsArea_menu = Server.CreateObject("ADODB.Recordset")
rsArea_menu.ActiveConnection = MM_connSeismic_STRING
rsArea_menu.Source = "SELECT DISTINCT area_name  FROM area_info  WHERE
sensor_name = '" + Replace(rsArea_menu__MMColParam, "'", "''") + "'"
rsArea_menu.CursorType = 0
rsArea_menu.CursorLocation = 2
rsArea_menu.LockType = 1
rsArea_menu.Open()

rsArea_menu_numRows = 0
%>
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN"
"http://www.w3.org/TR/html4/loose.dtd">
<html>
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1">
<title>Untitled Document</title>
<style type="text/css">
<!—
.style1 {font-family: Verdana, Arial, Helvetica, sans-serif}
.style2 {
        font-family: Verdana, Arial, Helvetica, sans-serif;
        font-weight: bold;
        font-size: 16px;
}
.style3 {font-size: 16px}
→
</style>
</head>
```

```
<body>
 <p class="style1"> </p>
 <p align="center" class="style2">This is all areas that belongs to <%=
Request("sensor_name") %> sensor. Please select any area within <%=
Request("sensor_name") %></p>
 <form action="results.asp" method="post" name="search_area" class="style1"
id="search_area">
  <p align="center" class="style3"> </p>
  <table width="200" align="center">
   <tr>
    <td bgcolor="#66CCFF"><div align="center">Area: - </div></td>
   </tr>
   <tr>
    <td bgcolor="#99FFCC"><div align="center">
     <select name="area_name" id="area_name">
      <option value="%">All</option>
      <%
While (NOT rsArea_menu.EOF)
%>
      <option
value="<%=(rsArea_menu.Fields.Item("area_name").Value)%>"><%=(rsArea_menu.Fi
elds.Item("area_name").Value)%></option>
      <%
 rsArea_menu.MoveNext()
Wend
If (rsArea_menu.CursorType > 0) Then
 rsArea_menu.MoveFirst
Else
 rsArea_menu.Requery
End If
%>
     </select>
    </div></td>
   </tr>
   <tr>
    <td bgcolor="#99FFCC"><div align="center">
     <input name="Search" type="submit" id="Search" value="Search">
     <input name="sensor_name" type="hidden" id="sensor_name" value="<%=
Request("sensor_name") %>">
    </div></td>
   </tr>
  </table>
  <p> </p>
  <p> </p>
</form>
 <p class="style1">  </p>
```

```
</body>
</html>
<%
rsArea_menu.Close()
Set rsArea_menu = Nothing
%>
```

F4- Ready to send notification via SMS page

```
<%@LANGUAGE="VBSCRIPT" CODEPAGE="1252"%>
<!--#include file="Connections/connSeismic.asp" -->
<%

Set rsResults = Server.CreateObject("ADODB.Recordset")
rsResults.ActiveConnection = MM_connSeismic_STRING
rsResults.Source = "SELECT * FROM area_info"
rsResults.CursorType = 0
rsResults.CursorLocation = 2
rsResults.LockType = 1
rsResults.Open()

rsResults_numRows = 0
%>

<%
Dim rsResults
Dim rsResults_numRows
%>

<%
Dim strMsg
Dim strReceiver
Dim strRequest
Dim strUrl

        ' Retrieve the posted items from the HTTP-SMS gateway
   strUrl = "http://localhost:9333/ozeki?"
   strRequest = "login=admin"
   strRequest = strRequest+"&password=abc123"
   strRequest = strRequest+"&action=sendMessage"
   strRequest = strRequest+"&messageType=GSMSMS"
   strRequest = strRequest+"&recepient="+Server.URLEncode("+60193398183")
   strRequest = strRequest+"&messageData="+Server.URLEncode("Seismic Activity has
been detected at your area, please be alert for further information, this message is brought
to you by Seismic Unit, Malaysian Meteorological Service, Ministry of Science,
Technology and Innovation")

   strUrl = strUrl+strRequest

   'Create InternetExplorer
   'Dim WebBrowser: Set WebBrowser = CreateObject("InternetExplorer.Application")
```

```
  'WebBrowser.Navigate strUrl

  'Do While WebBrowser.busy
  'Loop
  'WebBrowser.Quit

  'Display message info to the user
  'Response.Write("The message has been sent . " + chr(13))
%>


<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 4.01 Transitional//EN"
"http://www.w3.org/TR/html4/loose.dtd">
<html>
<head>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1">
<title>Ready to Send Notification</title>
<style type="text/css">
<!--
.style1 {font-family: Verdana, Arial, Helvetica, sans-serif}
-->
</style>
</head>

<body>
<p align="center" class="style1"> </p>
<p align="center" class="style1">This area will receive notification: - </p>
<div align="center">
 <table width="355">
   <tr>
     <td width="113" bgcolor="#66CCFF" class="style1">Sensor : </td>
     <td width="226" bgcolor="#99FFCC"
class="style1"><%=(rsResults.Fields.Item("sensor_name").Value)%></td>
   </tr>
   <tr>
     <td bgcolor="#66CCFF" class="style1">Area: </td>
     <td bgcolor="#99FFCC"
class="style1"><%=(rsResults.Fields.Item("area_name").Value)%></td>
   </tr>
   <tr>
     <td bgcolor="#66CCFF" class="style1">Latitude: </td>
     <td bgcolor="#99FFCC"
class="style1"><%=(rsResults.Fields.Item("area_latitude").Value)%></td>
   </tr>
   <tr>
     <td bgcolor="#66CCFF" class="style1">Longitude : </td>
```

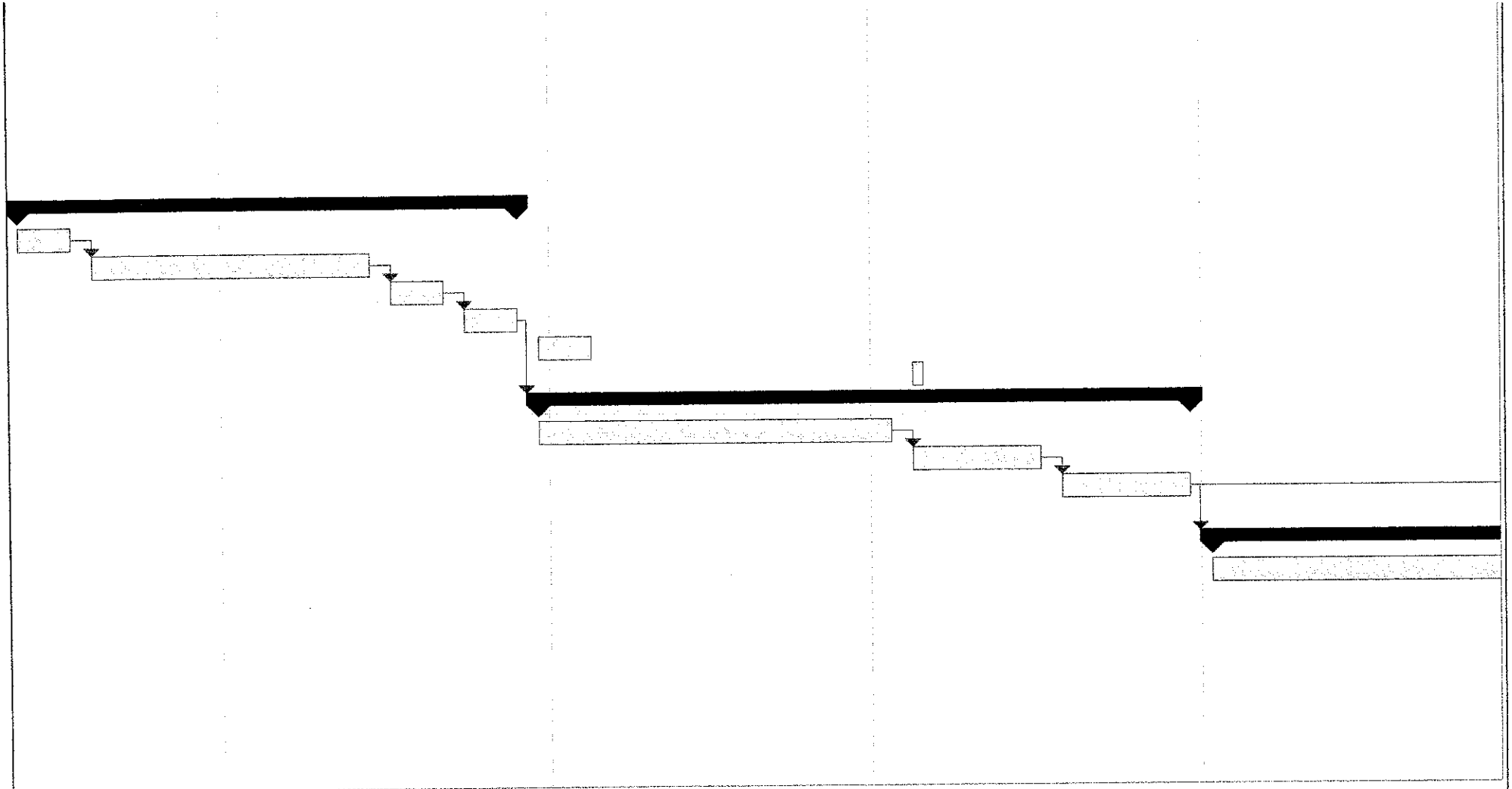
```
    <td bgcolor="#99FFCC"
class="style1"><%=(rsResults.Fields.Item("area_longitude").Value)%></td>
   </tr>
  </table>
</div>
<p align="center" class="style1">If you want to send notification to this area, click the
button below: - </p>
<p align="center" class="style1">
  <input type="submit" name="Submit" value="Send SMS">



</p>
</body>
</html>
<%
rsResults.Close()
Set rsResults = Nothing
%>
```

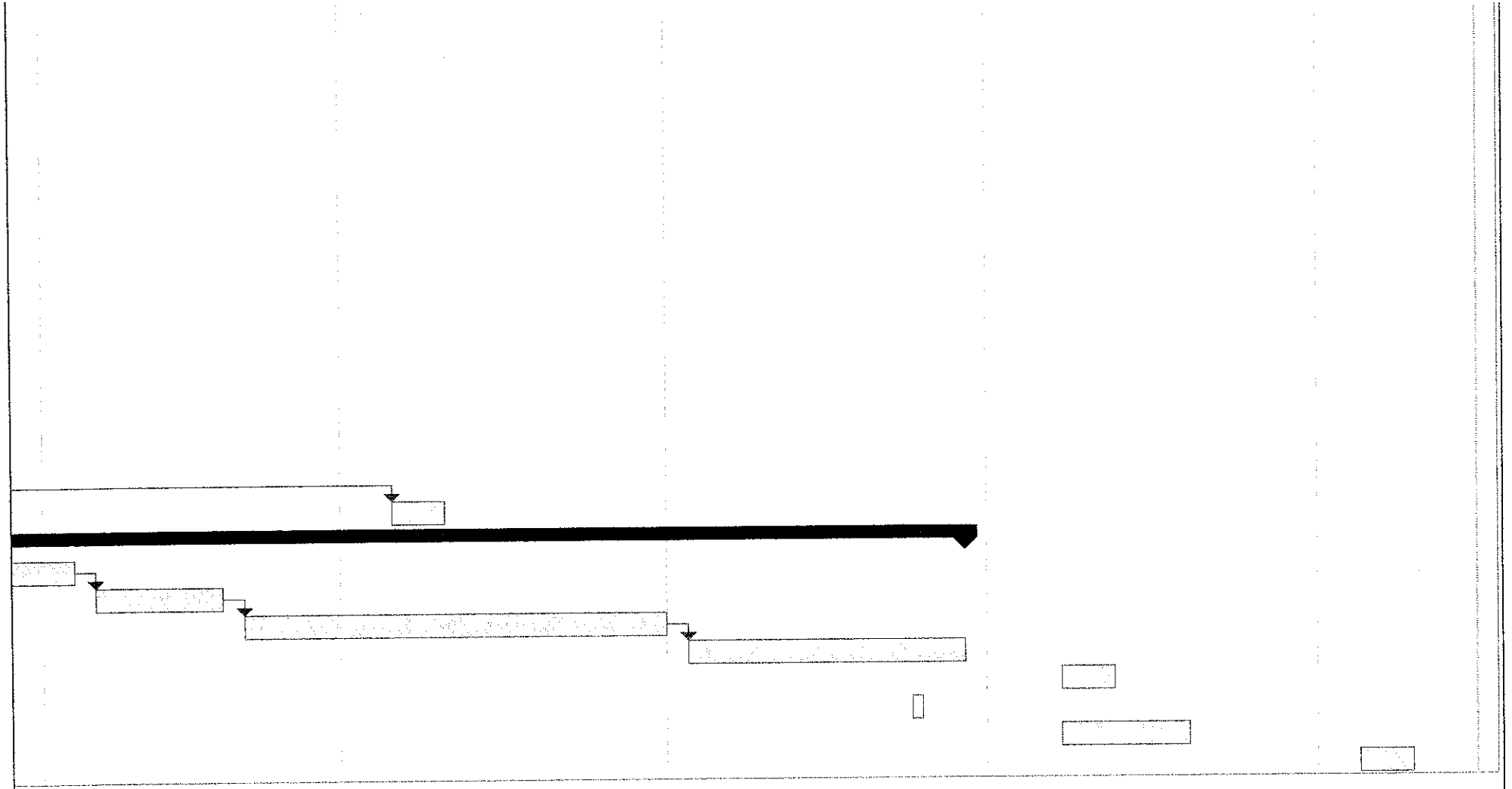
APPENDIX G

Project's duration



Project: duration fyp
Date: Fri 6/16/06

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	



Project: duration fyp
Date: Fri 6/16/06

Task		Milestone		External Tasks	
Split		Summary		External Milestone	
Progress		Project Summary		Deadline	