

## BORANG PENGESAHAN STATUS TESIS

JUDUL: Earthquake and Tsunami Warning System (ETWS)

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Tesis dimaksudkan sebagai Laporan Projek Sarjana Muda (PSM)

# **EARTHQUAKE AND TSUNAMI WARNING SYSTEM VIA SMS**

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This report is submitted in partial fulfillment of the requirements for the  
Bachelor of Computer Science (Computer Networking)


**FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY  
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2008**

## DECLARATION

I hereby declare that this project report entitled  
**EARTHQUAKE AND TSUNAMI WARNING SYSTEM (ETWS)**

is written by me and is my own effort and that no part has been plagiarized without  
citations.

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## **DEDICATION**

Specially dedicated to  
My beloved family members who have  
encouraged, guided and inspired me throughout my journey of education  
my friends, and my colleagues.

## ACKNOWLEDGEMENT

In the name of Allah the Almighty and most Merciful

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Last but not least, I would like to convey my special thanks to all my friends and everyone involved for helping and giving me advice and cooperation throughout my project.

## ABSTRACT

*Earthquake and Tsunami Warning System(ETWS)* is a system that is developed to provide SMS alert to residents who are living in disaster-risks areas. ETWS require the administrator to register all the residents whom living in the disaster-risks areas and make reports for future references. It will provide up-to-date official warning and predictions to the community about earthquake and tsunami. The warning will be automatically send to residents while the resident can register their application using SMS technology for immediate registration. The system will send SMS automatically when it receives information about disaster. Residents will receive an automatic warning if the disaster may happen in their areas.

## ABSTRAK

*Earthquake and Tsunami Warning System (ETWS)* adalah satu sistem yang berjalan mengikut masa sebenar akan dibangunkan untuk menyampaikan mesej berjaga-jaga dalam bentuk khidmat pesanan ringkas (SMS) kepada penduduk yang menetap di kawasan berlakunya bencana. *ETWS* memerlukan pentadbir sistem untuk mendaftar semua penduduk tersebut dan membuat laporan untuk rujukan di masa hadapan. Para penduduk juga boleh mendaftarkan permohonan mereka untuk menerima peringatan dari sistem melalui SMS. Sistem ini menyediakan perkhidmatan amaran tentang kemungkinan berlakunya tsunami dan gempa bumi. Sistem akan menghantar SMS secara automatik apabila mendapat maklumat tentang bencana. Penduduk akan menerima peringatan dari sistem jika di kawasan itu menunjukkan tanda-tanda bencana .

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## LIST OF ABBREVIATIONS

ETWS	-	Earthquake and Tsunami Warning System
SMS	-	Short Message Service
SDLC	-	System Development Life Circle
SMS	-	Short Message Service
UTeM	-	Universiti Teknikal Malaysia Melaka
GSM	-	Group Special Mobile
GUI	-	Graphical User Interface
PC	-	Personal Computer
PSM I	-	Projek Sarjana Muda I
PSM II	-	Projek Sarjana Muda II
RAM	-	Random Access Memory
URL	-	Uniform Resource Locator

## LIST OF APPENDICES

<b>APPENDIX</b>	<b>TITLE</b>
Appendix A	Project Schedule and Milestones
Appendix B	GSM Modem configuration
Appendix C	User manual

## CHAPTER I

### INTRODUCTION

#### 1.1 Project Background

The deadly earthquake and tsunami around the world has showed that how important it is to alert public before the natural disaster happen. Nowadays mobile phone has become necessary and almost all people in this world own one. , it has become a perfect tool for all sort of alert systems and provides method of quick alert distribution to the public. Overall this technology has such a huge potential, that it is very quickly adopted in many countries that have disaster threats. In Japan, cellular phone companies provide immediate notification of earthquakes and other natural disasters to their customers and in the event of an emergency, disaster response crews can locate trapped or injured people using the signals from their mobile phones. In New Zealand employees of an electricity distribution company receive alerts about fire threats to power lines via SMS. Dutch government uses cell broadcast to alert public about floods. Around the world, the SMS have become the main method for alerting people about the certain disaster or emergency. SMS system can alert people where ever they are as long as they have cell phone line.

## 1.2 Problem Statement(s)

The tsunami that struck south East Asia in 2004 has show that there are some problems about the current early warning system and cause many lives. The problems are:

- The earthquake and tsunami can cause very huge damage if there is no early warning from the Authority to the public.
- The method of alerting residents not too practical to implement in some of places and sometimes the device that could be used may not affordable to some of people

## 1.3 Objectives

The objectives for developing this project are:

- To develop an alert system that could be used to alert residents who are living in the earthquake and tsunami risk areas.
- To send a warning message to the residents via Short Message Service (SMS) and help resident prepare for earthquake and tsunami.
- To create a report based on the earthquake and tsunami warning



## 1.4 Scope

The scopes for developing this project are:

- This system will be developed using Microsoft Visual Basic 6.0. This software is used to design the system graphical user interface during implementation phase
- The SMS warning and registration procedure will be relayed by GSM modem.
- The resident can register to the system using mobile phone via SMS.
- The SMS warning can be directly send to the residents by admin via mobile phone.
- This system will use Microsoft Access database management application. All the residents' data will be store in the database.
- The admin can create report using the system.

## 1.5 Project Significance

The system will be going to help the community to have better preparation to face disaster like earthquake and tsunami. The disasters may costs the resident properties and lives. So with this system, the costs will reduced and many residents live can be saved.

This system will communicate with the SMS provider to send alerts to the residents. The reasons of using the SMS as a medium communication between application and the residents are its easy to use and more effective way compared to email services or mass media announcements. More over SMS has become trend for today communication.

## **1.6 Expected Output**

The expected outputs from this application are the alerts via SMS and the reports which are provided by the officer in charge. The system will send SMS to resident alerting the potential disaster.

This application may help the residents to have better preparations to face earthquake and tsunami while the authorities will be ready with an emergency situations and evacuation plan.

## **1.7 Conclusion**

Overall, Earthquake and Tsunami Alert System via SMS will be developed to ensure that natural disaster like earthquake and tsunami will inflict minimum damage to the communities. This system will be implemented to areas that have risks to earthquake and shoreline for tsunami.

From this chapter, the problem statement, objectives, scope, project significance and expected output are being identified in order to develop the application that will be used by the target users.

After finishing this chapter, it will bring to the second chapter that is the literature review and project methodology.

## CHAPTER II

### LITERATURE REVIEW AND PROJECT METHODOLOGY

#### 2.1 Introduction

This chapter will discuss about literature review and project methodology of the related project. Literature review is a collecting related data, analyze business processes, identify underlying patterns and create the conclusion. The project methodology means technique and type use to complete the project.

In order to develop a successful project, the current systems are collected. Three system that related to the Earthquake and Tsunami Warning System (ETWS) are searched and analyzed which are AlertSF in San Francisco, Tsunami Alarm System developed by Heindl Internet AG and 3M Future Ltd and Istanbul Earthquake Early Warning and Rapid Response System by GeoSIG. Studies of these systems are significant to develop a valid, reliable and efficient system.

Earthquake and Tsunami Warning System will be using is a System Development Life Circle (SDLC). Methodology is very important in developing the system. Choosing a right methodology will help to produce a better quality product, in terms of documentation standard, acceptability to the user, maintainability and consistency of software.

## **2.2 Facts and findings**

This section will be discussing about the domain of this project, the existing system and finally the other techniques that applicable used in to develop this project.

### **2.2.1 Domain**

The domain of this application is new networking and security alerts that can benefit the community who's living at the earthquake and tsunami risks area. This system will alert residents in those areas of potential danger from earthquake and tsunami. This system will be implemented in the earthquake and tsunami risk area to save lives, properties, businesses and reduce of costs that caused by the disasters.

The SMS will be used as the human-machine interaction because of efficiency and well-known technology that can be used widely. The community will received the alerts via SMS which is more practical than e-mail. Generally, the community may have own mobile phone, so they will get the updates from the application. The SMS text messaging offers an accessible and cost effective facility for the general public to communicate with the council. The list of benefits to adding the technology to send and receive SMS into the public is endless.

### **2.2.2 Existing System**

The examples of existing systems are AlertSF in San Francisco, Tsunami Alarm System developed by Heindl Internet AG and 3M Future Ltd and Istanbul Earthquake Early Warning and Rapid Response System by GeoSIG. The details about the function and features are as:-

### 2.2.2.1 AlertSF

AlertSF is an emergency communication system used by governments, emergency management agencies and first responders to send emergency alerts, notifications and updates to your cell phone, pager, BlackBerry, PDA and/or e-mail account. In the event of an emergency, the City and County of San Francisco's emergency management personnel will send important alerts, updates and instructions right to your cell phone or mobile device using your device's text message (SMS) feature, and/or to your e-mail account(s). The diagram below show how AlertSF works (Roam Secure, 2007).

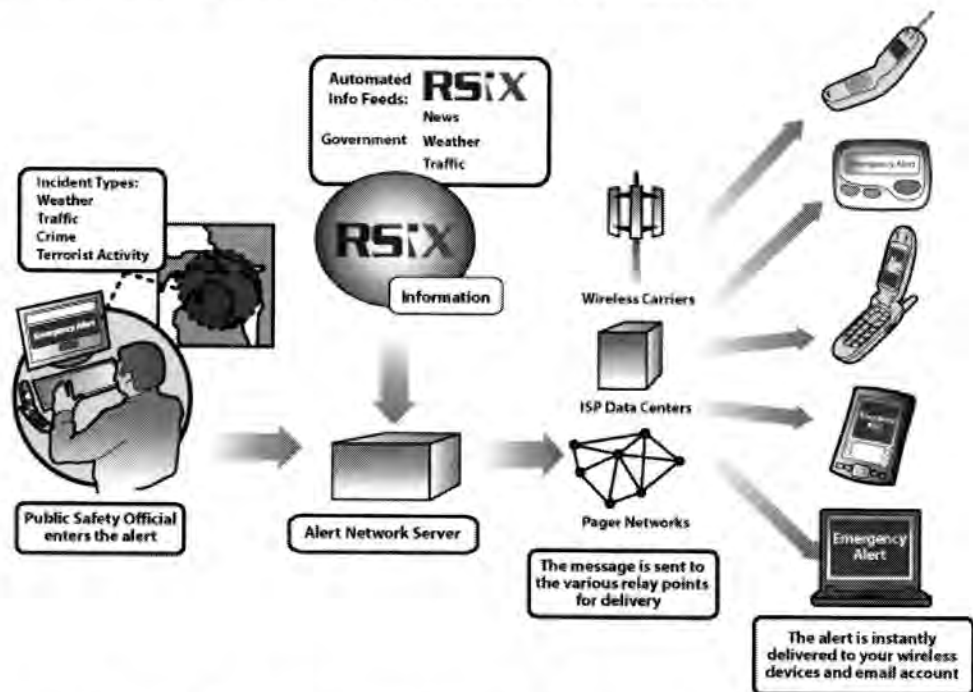


Figure 2.1: AlertSF Architecture (Roam Secure, 2007).

The City and County of San Francisco has designated authorized personnel who are responsible for generating alert messages in the event of an emergency. When an alert is sent, it travels directly to e-mail, pager, BlackBerry, cell phone or other available devices. Messages beamed to cell phone or mobile device arrive in seconds via the SMS (text messaging) network. The residents just have to register in order to receive the warning (Roam Secure, 2007).

### 2.2.2.2 Tsunami Alarm System by Tsunami Institute

The Tsunami Alarm System works everywhere in the world covered by the GSM network assuming that subscribers mobile telephone is logged into a GSM network in the country where they are staying. Even in the poorest developing countries and in remote areas, the GSM network is usually just as well-developed as in highly developed countries, such as Europe or the USA. When subscribers travel in areas accessible to tourists, they should not encounter any problems with the reception of mobile phone signals. The following principle applies: Wherever they can use their mobile telephone for calls, their Tsunami Alarm System will also be able to receive tsunami warnings (Tsunami Institute, 2007).

The Tsunami Alarm System receives earthquake and tsunami warning information from a multiplicity of seismic measuring stations and tsunami warning stations from different countries all over the whole world. As a subscriber, you can be sure that your Tsunami Alarm System does not miss any warnings and that any tsunami warning will result an alarm being sent to your mobile telephone as soon as possible (Tsunami Institute, 2007).

When we send a tsunami alarm to our subscribers, it is particularly important that it does not go unnoticed. Therefore we send 3 SMS back-to-back. In this way, you become aware of the message on your display at any time of day or night and you will be able to ascertain when and where the Tsunami is expected. The Tsunami Alarm System reliably ensures that our subscribers and other people you may want to warn can apply life-saving measures several minutes before the arrival of a destructive tsunami (Tsunami Institute, 2007).

### 2.2.2.3 Istanbul Earthquake Early Warning and Rapid Response System

This system was implemented in Istanbul which is Turkish capital with more than 12 Million people and generates more than 20% of the GDP of the country. This system was developed because that the probability of 62% of occurrence of a magnitude 7.5 earthquake in the next 30 years in the city. So early warning is essential to safely shutdown of lifelines and important industrial facilities and to rapidly response for seismic disaster management and relief. This system also helps structural monitoring for historical and vital structures. A part from benefit the city, this system also developed to contribute to the scientific area such as a better understanding of the seismic hazard on the less-known western portion of the North Anatolian Fault and comprehensive risk mitigation studies and disaster scenarios depending on regional real earthquake data. The system is use by Kandilli Observatory and Earthquake Research Institute (GeoSIG Ltd, 2002).

The system consist of revolutionary GSS Multichannel Data Acquisition instruments for 12 on-line, 100 dial-up and 40 off-line stations, 3 spread spectrum repeaters utilized to overcome telemetry distances more than 100 km and topography, 4 auxiliary centers are installed as reporting centers for the disaster managers, system reports and alarms designed to be transmitted via GSM, SMS, Spread Spectrum and Internet, 2 redundant data acquisition and processing centers, completely designed and furnished from scratch, uninterrupted operation provided by hi-tech equipment such as UPS, power generator, RAID, lightning protection, mobile workstations for off-line data acquisition and system maintenance and state-of-the-art software GeoDAS software with special modules to cope with the system requirements (GeoSIG Ltd, 2002).

### 2.2.3 Technique

Software development technique use to develop this system is structure programming. Structured programming is a subset of procedural programming that enforces a logical structure on the program being written to make it more efficient and easier to understand and modify. Structured programming frequently employs a top-down design model, in which developers map out the overall program structure into separate subsections. A defined function or set of similar functions is coded in a separate module or sub module, which means that code can be loaded into memory more efficiently and that modules can be reused in other programs. After a module has been tested individually, it is then integrated with other modules into the overall program structure.

Program flow follows a simple hierarchical model that employs looping constructs such as "for," "repeat," and "while." Almost any language can use structured programming techniques to avoid common pitfalls of unstructured languages. Unstructured programming must rely upon the discipline of the developer to avoid structural problems, and as a consequence may result in poorly organized programs. Most modern procedural languages include features that encourage structured programming.

## 2.3 Project Methodology

The project methodology used to develop this system will be System Development Life Cycle (SDLC). This methodology was chosen because it fits the approach for developing the system which relies on techniques that produce deliverables intended. SDLC presents guidance for selecting appropriate methods, techniques and tools based on the specific requirements for the project. With this approach, project is desired to move consecutively according to steps planned for each phase. The phases involved for this project are requirements planning, analysis, design and implementation.