

PERFORMANCE STUDY OF GPRS IN MOBILE COMMUNICATIONS

HALIZA BINTI MAT HUSIN

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*To my beloved mother
and
my dearly loved fiancé ...*

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In the name of Allah, the Most Beneficent and Most Merciful.

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ABSTRACT

The General Packet Radio Service (GPRS) is a packet-switched enhancement of existing Global System for Mobile Communications (GSM) networks. It is developed to allow large amounts of data to be sent over cellular networks at speeds three to four times greater than conventional GSM systems. Because GSM is the most widely used mobile system in the world for most operators, GPRS is the easiest and most logical way of offering customers fast simultaneous data services, such as multimedia messaging, gaming, entertainment, and news. The success or otherwise of GPRS will be dependent on its ability to deliver the data speeds and services that the industry has been promising the subscriber. In order to measure the performance of GPRS, as seen by the subscriber, would then depending on many different factors. Thus, the aim of this project is to analyse the performance of GPRS services that network operators are promising to the subscribers and to discuss the measurement results of GPRS end-user application performance subject to various channel conditions. A detailed comparison between two GPRS networks, Maxis and Celcom for HyperText Transfer Protocol (HTTP) application and Packet Internet Groper (PING) application performance is provided.

ABSTRAK

GPRS ialah pembaharuan di dalam teknologi GSM menggunakan pensuisan berpaket (*packet-switched*). Ianya dibangunkan untuk membenarkan penghantaran sejumlah data yang besar melalui rangkaian selular pada kelajuan di antara tiga ke empat kali ganda berbanding teknologi GSM yang sedia ada. Oleh kerana GSM adalah sistem bergerak yang paling meluas digunakan di dunia oleh kebanyakan penyedia perkhidmatan, GPRS adalah servis yang paling mudah, pantas dan berkesan di dalam memberi perkhidmatan data seperti mesej multimedia, permainan interaktif, hiburan dan berita. Penentu kejayaan servis GPRS adalah bergantung kepada kebolehan untuk menghantar data pada kelajuan tinggi yang telah dijanjikan kepada pengguna. Pelbagai faktor mempengaruhi di dalam mengukur prestasi GPRS di kaca mata pengguna. Oleh itu, projek ini dijalankan adalah untuk menganalisa prestasi servis *GPRS* seperti yang dijanjikan oleh penyedia perkhidmatan dan juga untuk membincangkan prestasi *end-user application* di dalam pelbagai situasi rangkaian. Perbandingan prestasi GPRS secara terperinci di antara dua penyedia perkhidmatan iaitu Maxis dan Celcom untuk *HyperText Transfer Protocol (HTTP) application* dan *Packet Internet Groper (PING) application* juga turut dibincangkan.

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LIST OF ABBREVIATIONS

2G	-	2 nd Generation
3G	-	3 rd Generation
APN	-	Access Point Name
BSS	-	Base Station Subsystem
BTS	-	Base Transceiver Station
CS	-	Coding Scheme
ETSI	-	European Telecommunications Standards Institute
FTP	-	File Transfer Protocol
GGSN	-	Gateway GPRS Support Node
GMM	-	GPRS Mobility Management
GMSC	-	Gateway Mobile Switching Centre
GPRS	-	General Packet Radio Service
GSM	-	Global System for Mobile Communications
HLR	-	Home Location Register
HTTP	-	HyperText Transfer Protocol
IMSI	-	International mobile Subscriber Identity
ISDN	-	Integrated Services Digital Network
LLC	-	Logical Link Control
IP	-	Internet Protocol
MAC	-	Medium Access Control
MS	-	Mobile Station
MSC	-	Mobile Switching Centre

NSAPI	-	Network Service Access Point Identifier
PCU	-	Packet Control Unit
PDN	-	Public Data Network
PING	-	Packet Internet Groper
QoS	-	Quality of Service
RAI	-	Routing Area Identification
RF	-	Radio Frequency
RTD	-	Round Trip Delay
SGSN	-	Serving GPRS Support Node
TBF	-	Temporary Block Flow
TDMA	-	Time Division Multiple Access
VLR	-	Visitor Location Register

CHAPTER 1

INTRODUCTION

1.1 Introduction

The rapid growth of the Internet has prompted a need for wireless data access to the Internet. Although GSM systems provide a fixed rate data service, they result in inefficient use of bandwidth for data users due to bursty nature of data traffic.

The GPRS is a standard from the European Telecommunications Standards Institute (ETSI) on packet data in GSM systems [1]. By adding GPRS functionality to the existing GSM network, operators can give their subscribers resource efficient wireless access to external Internet Protocol (IP) based networks, such as the Internet and corporate intranets. The basic idea of GPRS is to provide a packet-switched bearer service in a GSM network. As impressively demonstrated by the Internet, packet-switched networks make more efficient use of the resources for bursty data applications and provide more flexibility in general.

This report will therefore examine the GPRS performance at application layer against a server reachable over a public IP network conducted using QVoice System. Performance results for HTTP and PING application are given for different GPRS networks. The measurement results obtained are analysed and compared to see how well each GPRS networks perform.

1.2 Objectives

The objective of this project is to analyse and benchmark the GPRS data application performance between Maxis and Celcom for HTTP and PING application conducted using QVoice System obtained experimentally on live GPRS networks.

1.3 Scope of Work

The scope of work of this project can be outlined as follows:

- i. To understand GPRS functionalities.
- ii. To review and address GPRS data performance.
- iii. To understand the affect of GPRS parameters to application performance.
- iv. To measure HTTP and PING performance on live GPRS networks.

- v. To analyse and examine performance measurements result for different GPRS networks.
- vi. To evaluate and benchmark the analysed results.

1.4 Outline of Thesis

The thesis comprises of seven chapters and the overview of all the chapters are given below.

- Chapter 1: This chapter gives the introduction to the project, objective and scope of work involved in accomplishing the project.
- Chapter 2: The literature review on GPRS Technology.
- Chapter 3: The fundamental processes required in the measurement of the end-user application for the project are discussed in this chapter
- Chapter 4: This chapter covers the experimental equipments utilized in the project.
- Chapter 5: The methodology used to conduct the measurement.
- Chapter 6: The measurement results, the analysis and the discussion are presented in this chapter.
- Chapter 7: Conclusion of the project and suggestions for future work are presented in this final chapter.

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