

MULTIPLAYER NETWORKED GAME OVER LAN AND QUALITY OF SERVICE ISSUES

ARIF AFFENDI BIN CHE HAMID



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

MULTIPLAYER NETWORKED GAME OVER LAN AND QUALITY OF SERVICE
ISSUES

ARIF AFFENDI BIN CHE HAMID

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(TANDATANGAN PENULIS)
ARIF AFFENDI BIN CHE HAMID
B2-03, JALAN SRI STULANG 1/1
TAMAN SRI STULANG
JOHOR BAHRU

Tarikh  13.7.2011


(TANDATANGAN PENYELIA)
EN. NOR AZMAN BIN MAT
ARIFF

Tarikh 13.7.2011

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I hereby declare this project report entitled
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STUDENT :  Date: 8-7-2011
(ARIF AFFENDI BIN CHE HAMID)

SUPERVISOR :  Date: 8/7/2011
(NOR AZMAN BIN MAT ARIFF)

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ABSTRACT

Multiplayer games, games that played by two or more persons that interact simultaneously over networks like Local Area Network and Internet. There is a reason why people love to do something like that, that is because it is fun thing to do and share with the others. But, in order to them get the satisfaction on playing with the other peoples, there is a major problem of networked-based multiplayer games which is network transmission delay. This delay causes difficulties to users and leads to paradoxical situations. Approaches to provide for a global consistent state of the game by introducing a local presentation delay have been proposed, however, these increase the application-level delay even more. Therefore, it is important to investigate the impact such delays can have on the performance of multiplayer games and the attractiveness of these games for the human players. Such a study is the purpose of this work. We concentrate on real-time games for the Internet where significant delays can occur. The evaluation is performed through measurements using a real-time based networked game.

ABSTRAK

Permainan bersama adalah jenis permainan yang dimainkan oleh dua atau lebih orang yang berinteraksi secara bersama melalui rangkaian seperti *Local Area Network* dan *Internet*. Terdapat sebab mengenai mengapa orang suka melakukan perkara tersebut, ini adalah kerana perkara tersebut adalah menyeronokan dan dikongsi bersama orang lain. Tetapi, untuk mencapai kepuasan dalam permainan bersama orang lain, terdapat masalah utama iaitu *Network transmission Delay*. *Delay* ini adalah menyebabkan kesukaran kepada pengguna dan membawa mereka ke arah paradoks. Pendekatan untuk menyumbangkan suasana konsisten secara global di dalam permainan dengan memperkenalkan *Local Presentation delay* telah diusulkan, namun, ini akan menyebabkan *Application-level Delay* dengan lebih lagi. Oleh sebab itu, adalah penting untuk mengkaji mengenai kesan seperti *delay* boleh ada pada keupayaan permainan bersama dan juga daya tarikan permainan ini untuk para pemain. Isu ini adalah tujuan ujikaji dijalankan. Kami memberi tumpuan kepada *real-time games* untuk *internet* dimana *delays* yang disignifikasikan boleh berlaku. Penilaian ini dijalankan mengikut ukuran menggunakan platform permainan *real-time* secara rangkaian.

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CHAPTER I

INTRODUCTION

1.1. Project Background

Over past few years, multiplayer games are becoming large part of today's digital entertainment. This rapid development in information and technology in all over the world makes networking is one of the most common issues. It's the evolution from a shared input model into LAN and worldwide network gaming. That is also because of new models introduced the common problems associated to group communications using internet. Users started to become more demanding with these evolutions of the network connections and the improvement of their capabilities. The technology is as challenging as it keeps changing time by time with more new application and technology need to be supported. That's the main concern involving network gaming are about the study of QoS (Quality of Service) parameters in this type of systems.

In the past, early multiplayer games used to be played by two players on the same machine. They are connected using either sharing the same input device such as keyboard, joystick or joy pad. After the evolutions, LAN (Local Area Network) games were emerged and those players can play on different machine that involved two or more computers across the local network. Besides, with the internet, users can play with or against another player anywhere around global.

In this project, QoS is the main focus. QoS is stand for Quality of Service. QoS is an industry-wide set of standards and mechanism for ensuring high-quality performance for critical applications. In case of network games, end-to-end communication delay, jitter and packet loss to a certain degree are the most important QoS attributes of the network.

This research is all about performing evaluation of QoS in networked games environment using real core network environment. Overall, this project will focus on to analyze how QoS behave under this following performance parameter such as a delay, jitter, and throughput and packet loss.

1.2. Problem Statement

There is several problems based on this topic and this is the factors that carried out this project. This project will overcome the analysis about those QoS problems. When it comes to QoS, there are the main parameters such as bandwidth, delay, and jitter. From the earlier, people only know play the game only on their computer and also at that time most of the game developers developed their game standalone. Here, there is no QoS problem or demand for run the application because they are only on standalone computers and users pay it alone. But, times change and people more demand. They play the game but they are not satisfied because they cannot share their happiness with their friends. So, because of that, games development were evolution most of the game after that were developed can be play by one or more persons but that is still standalone. Users need to share the input and output device such as keyboard, mouse, and monitor.

But they also can use the external input output device such as controller, joystick and so on. Here also there are not demanding QoS performance too much. That is because they are only on standalone computer.

But now a day, people are more demand and they still not satisfied with the current technology, the game must be shared but the equipment. Means, they want to play the same game but on the different computers. So when it comes to different computers, all the data that ran will get some issues to travel across network. Also for the game, there is two type of the game which is real-time based and turn-based type game. In this case delay, jitter and throughput is main concern in order to achieve the satisfaction in playing multiplayer games.

Based on users these days, they all want the fast and robust application with stable network performance and there isn't any interest about what lies under the graphical environment. So the only thing that is somehow visible to the client and that matters to them is nothing but the latency especially in real-time games. That makes the difference between hitting or missing a target In an FPS or narrowly missing or hitting an obstacle or a car in a driving simulator. The possibility to access latency values, in some cases, could even make it easier for a person to choose not to play the game. There are various technical problems reflected in gameplay derived from the main QoS parameters. For the developers, there is a need to deal with these problems, so they have to measure some features like latency/lag level and consequently jitter, appropriate transport protocols (TCP versus UDP), possibility of packet compression and aggregation, dead reckoning techniques and also multicast advantages.

1.3. Objective

There are several objectives that will achieve throughout this project. There are:

- i. To implement a networked multiplayer game application and running it in network environment within Local Area Network.
- ii. To analyze the QoS performance based on the parameter such as a delay, jitter, and throughput.
- iii. To test how far the games and network can affected by throughput, jitter and packet loss issues.

1.4. Scope

The scope is boundary of the project that will implement. Below are the scopes of this project:

- i. Type of networked game and monitoring tools that will be used in this project. This project will be using these :
 - a. Game
 - i. The Defend of the Ancient (DotA) – this games is the multiplayers strategy real-time game type.
 - b. Network monitoring tools
 - i. Wireshark - Wireshark is free software and is available for almost all types of UNIX and Unix-like systems and Windows (Ronnie Sahlberg, 2008).
 - ii. Jperf - a Java graphical interface to measure and graph the throughput, and is very simple, accurate and easy to use (Keith R. Parsons & Jared Griffith)

ii. Type of network

The project will implement at Local Area Network (LAN), two computers connected. Router will be configured to enable the connection in a LAN. One of those computers will be running as a server and another computer will be running as client.

iii. Platform of Operating System

This project that implement will configure and test at windows platform which is the operating system that will use are Microsoft Windows 7 Ultimate for both of them.

1.5. Project Significance

Even though the project was not done yet, the performance analysis will have some diagrams, table and graph based on the understanding on the function of the scenario implementation.

This project is about to test performance of QOS through the multiplayer networked game's session. The result will determine how the QoS functional and it will be analyzed and that will be the result of this project.

Benefits of analysis multiplayer networked game in several evaluation criteria can be applied. Users can know the something that happen back of the graphical interface and those problems that occurred. Then, the result of analyze performance of QOS can be use to do research about bandwidth, delay and jitter during game play for each client.

1.6. Expected output

Analysis of the QOS issues performance while the game play over Local Area Network consists of two levels. The first level is implementation a small network that can connect two computers and configured so that both computers communicate and can run the game. The second level is analyzing the performance parameters of throughput, delay, packet loss and jitter.

The expected output throughput, delay, jitter and packet loss while the game play can be trace and analyze. Furthermore by an analysis, the results will demonstrate by using graph that can show a detail performance about those parameters.

1.7. Conclusion

There are many aspects to consider when analyzing QoS performance while running multiplayer networked game. It requires a very high QoS performance to maintain the game and give satisfaction to the users. There are technical issues such as which protocol to use and methods of compression and aggregation of packets. There are more details which this analysis project does not go into but it should help give an overview of the issues that need to be dealt with when it comes to QoS performance analysis.

CHAPTER II

LITERATURE REVIEW AND PROJECT METHODOLOGY

2.1 Introduction

QoS stands for Quality of Service. It is quite hard to understand term since there is no fixed definition for it. Depending on where, how and why it is used, people have their different perspective and understand it. The most typical definition we have of QoS is the measure of performance in a data communications system. It also refers to a broad collection of networking technologies and techniques. The main objective of QoS is to provide guarantees on the ability of a network to deliver predictable results. The often scope of QoS are include availability (uptime), bandwidth (throughput), delay (delay) and also error rate (Bradley Mitchell, 2008).

For example, there is users are likely to see QoS being deployed over a campus where students in dorm play half-life over the campus LAN. QoS deployment in this case can favor traffic more the more important office data at the detriment of trivial network gaming, without however killing the latter. On the other hand, surfing the global Internet, there is most of the time no real QoS (unless your ISP has deployed QoS mechanisms). QoS is an important tool for multiplayer networked games success. Through the years QoS mechanisms have become more

and more sophisticated. Nowadays, QoS mechanisms can be set up for small LANs up to giant networks.

2.2 Literature Review

A literature review conducted at the start of the project will identify the most relevant research finding relating to qualitative issues being investigated in this research. Furthermore, a literature will provide needed context to the research topic, assist in the selection of optimal strategy and guide execution.

In order to analyze QoS performance on multiplayer networked games, a research has been conducted in order to help a better understanding about this project. The research was mainly conducted through the internet, journal and reference from books also done.

This chapter will review on previous effort and researches that had been carried out by various researches regarding QoS performance. Reviewing other works and attempts could lead some idea and information in order to understand the specified field and problems. The literature review can be done by searching, collecting, studying and analyzing relevant sources from book, journal, technical report, anonymous reference as well as web pages. Besides that, there were some extraction and drawing conclusion from the information and research that had gathered.

2.2.1 Domain

The main objective for this project is about analyzing QoS performance while running multiplayer game in real core network environment. QoS performance will be test by letting two players play the multiplayer game in the network. This project will be focus on analyze all the possible QoS parameters that stated on project's objectives such as delay, jitter and throughput.

2.2.2 Keyword

Below are the several terms that being used in this project.

2.2.2.1 Quality of Services (QoS)

QoS stands for Quality of Service. It is quite hard to understand term since there is no fixed definition for it. Depending on where, how and why it is used, people have their different perspective and understand it. The most typical definition we have of QoS is the measure of performance in a data communications system. It also refers to a broad collection of networking technologies and techniques. The main objective of QoS is to provide guarantees on the ability of a network to deliver predictable results. The often scope of QoS are include availability (uptime), bandwidth (throughput), delay (delay) and also error rate. QoS involves prioritization of network traffic. A network monitoring system must typically be deployed as part of QoS, to insure that networks are performing at the desired level.

2.2.2.2 Distinct Network Monitor

The Distinct Network monitor captures network traffic and translates the protocol negotiation of that traffic into simple English. It is perfect solution for understanding the type of network traffic that is going over the network as well as for pinpointing network problems. The Network Monitor may view statistics from various networks concurrently. The statistics captured and displayed are the following:

- a) The list of IP protocols and the total number of bytes and packets transmitted for each one.
- b) The list of application protocols showing how many bytes were sent and received for each protocol. Protocols are identified by port number. It also shows which IP addresses generated the traffic.
- c) Bandwidth usage over the specified time period using the number of sample specified.

2.2.2.3 Network Latency

Network latency or lag / delay refer to the time taken for a packet sent to travel from its source to its final destination. Latency is measured by sending a packet that is returned to the sender and the round-trip time is considered the latency.

The latency assumption seems to be that data should be transmitted instantly between one point and another (that is, with no delay at all). The contributors to network latency include:

- a. Propagation: This is simply the time it takes for a packet to travel between one place and another at the speed of light.
- b. Transmission: The medium itself (whether optical fiber, wireless, or some other) introduces some delay. The size of the packet introduces delay in a round trip since a larger packet will take longer to receive and return than a short one.

There have been many studies on the acceptable amount of lag for various types of game. Pantel and Wolf (2002) demonstrate that a delay of more than 100ms in a car racing game begins to affect the gameplay. Armitage G.J (2003) shows how players of Quake 3 prefer to select a server with a lag below 150-180ms. They also showed how players who played with a lag of 45ms on average achieved 1 point per minute more than players with a lag of 200ms. The acceptable level of lag tends to be quite subjective. Refer to table 2.1 shows that the range of latency and it impressions.

Table 2.1: Subjective Impression

Delay (ms)	User's impression
500	<ul style="list-style-type: none"> • This is unacceptable. • Users cannot control their character. • User's action and the game's reaction were not fit.
200	<ul style="list-style-type: none"> • Delay can still be tolerant • The characters can be control well • But the overall behavior is not realistic
100	<ul style="list-style-type: none"> • Still got delay but hardly to detect
50	<ul style="list-style-type: none"> • Users have the realistic in every game environment • Minor delay that surely hard to detect