Faculty of Engineering

Performance of Real Time Traffic In The Ethernet And WLAN Using TCP And UDP Protocols.

Punitha Subbramaniam

Bachelor of Engineering with Honors
(Electronics & Telecommunications Engineering)
2009/2010

UNIVERSITI MALAYSIA SARAWAK

BORANG PENGESAHAN STATUS TESIS

Judul: **PERFORMANCE OF REAL TIME TRAFFIC IN THE ETHERNET AND WLAN USING TCP AND UDP PROTOCOLS.**

SESI PENGAJIAN: 2009/2010

Saya   **PUNITHA SUBBRAMANIAM**
                                  (HURUF BESAR)

mengaku membenarkan tesis * ini disimpan di Pusat Khidmat Maklumat Akademik, Universiti Malaysia Sarawak dengan syarat-syarat kegunaan seperti berikut:

1. Tesis adalah hakmilik Universiti Malaysia Sarawak.
2. Pusat Khidmat Maklumat Akademik, Universiti Malaysia Sarawak dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Membuat pendigitan untuk membangunkan Pangkalan Data Kandungan Tempatan.
4. Pusat Khidmat Maklumat Akademik, Universiti Malaysia Sarawak dibenarkan membuat salinan tesis ini sebagai bahan pertukaran antara institusi pengajian tinggi.
5. ** Sila tandakan (✔) di kotak yang berkenaan

      ☐ SULIT   (Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972).

      ☐ TERHAD   (Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/ badan di mana penyelidikan dijalankan).

      ☑ TIDAK TERHAD

                                           Disahkan oleh

        (TANDATANGAN PENULIS)   **(TANDATANGAN PENYELIA)**

Alamat tetap: 21A-1   JLN   THAMBY ABDULLAH SATU, OFF JLN

TUN SAMBANTHAN,5O470,K.L   **Dr Hushairi Hj Zen**
                                               Nama Penyelia

Tarikh: Tarikh:

CATATAN   *   Tesis dimaksudkan sebagai tesis bagi Ijazah Doktor Falsafah, Sarjana dan Sarjana Muda.
                   **   Jika tesis ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh tesis ini perlu dikelaskan sebagai SULIT dan TERHAD.

Performance of Real Time Traffic in the Ethernet and WLAN Using TCP and UDP protocols.

PUNITHA SUBBRAMANIAM

This project is submitted in partial fulfilment of
the requirements for the degree of Bachelor of Engineering with Honours
(Electronics and Telecommunications Engineering)

Faculty of Engineering
UNIVERSITI MALAYSIA SARAWAK
2009/2010

This Final Year Project attached here:

Title   : Performance of Real-Time traffic in the Ethernet and WLAN

                     Using TCP and UDP protocols.

Student Name   : Punitha Subbramaniam

Matric No   : 17115

has been read and approved by:

_____   _____

 Dr Hushairi Hj Zen   Date:

   (Supervisor)

"I hereby declare that I have read this thesis and in my
opinion this thesis is sufficient in terms of scope and quality for the
award of the degree of Engineering
(Electronics & Telecommunication)"

Signature : ………………………………………….

Name of Supervisor : Dr Hushairi Zen

Date : 17th May 2010

Signature : ………………………………

Name of Candidate : Punitha Subbramaniam

Date : 18th May 2010

Specially dedicated to my family, mum and dad for their support and eternal love. My warmest gratitude and dedication to my supervisor Dr Hushairi Hj Zen. To all my friends especially Yu Ka Chai, Chan Chen Hoong and Lee Liang Wei. Thanks a lot for helping.

ACKNOWLEDGEMENTS

Praise to the Almighty God, the Most Gracious and Most Merciful, Who has created the mankind with knowledge, wisdom and power. First of all, the author would like to express her deepest gratitude to Dr Hushairi Hj Zen for his continuous support, supervision and encouragement during the course of this project. The author would not have completed this project successfully without his assistance. The author is thankful to all friends for their advice and helpful cooperation during the period of this research. Appreciation is also acknowledged to those who have contributed directly or indirectly in the completion of this project. The author would also like to extend her appreciation to his family members, for their support, patience and endless love.

LIST OF CONTENTS

CHAPTER 1 INTRODUCTION

CHAPTER 2 LITERATURE REVIEW

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

WLAN	Wireless Local Area Network
IEEE	International Standard Association
OSI	Open System Interconnection.
TCP	Transmission Control Protocol.
UDP	User Datagram Protocol.
NS-2	Network Simulator 2
FHSS	Frequency-Hopping Spread Spectrum
DSSS	Direct Sequence Spread Spectrum
BSS	Basic Service Set
IBSS	Independent Basic Service Set
AP	Access Point
DS	Distribution System
ESS	Extended Service Set
DCF	Distributed Coordination Function
CSMA/CA	Carrier Sense Multiple Access with Collision Avoidance
PCF	Point Coordination Function
FTP	File Transfer Protocol.
SMTP	Mail Transfer

NFS	Network File System
ACK	Acknowledgment
CWND	Congestion Window
SSTHRESH	Start Threshold Size
RTP	Real Time Protocol
TULIP	Transport Unaware Link Improvement
RWND	Receiver Window
NAM	Network Animator
*.TR	Trace File
QOS	Quality of Service

ABSTRACT

The WLAN industry has emerged as one of the fastest-growing segments of the communication trade. This project is aimed towards evaluating the real-time traffic performance in Wireless LAN (WLAN) and Ethernet using TCP and UDP protocol. Analysis is done to acknowledge the advantages and disadvantages of both protocols. Two different types of traffic are considered namely, voice and video. The evaluation was done using ns-2 simulator (version 2.34) running on Ubuntu. The metrics used in the evaluation are throughput (byte), delay (sec) and packet loss (%). Depending on graphs of these three metrics, the performance of TCP and UDP are evaluated, requirements are determined. Through this simulation study, a summary is made saying that the UDP protocol performs better and be accessed at a faster speed for different traffic types. Simulation results show that UDP performs better performance than legacy TCP. Depending on ITU-T requirements especially for delay and packet loss, the acceptable number of streams both for traffic type individually and with comparison with the TCP voice and video metrics of traffics can be determined under UDP protocol.

ABSTRAK

Industri rangkaian kawasan tempatan tanpa wayar (*WLAN*) merupakan industri yang pantas tersebar dalam pasaran komunikasi. Projek ini menilai perbezaan antara mekanisma capaian medium secara bertanding dan untuk menganalisis perlaksanaan trafik seperti video dan suara dalam rangkaian tempatan tanpa wayar dalam protokol TCP dan UDP. Analisis dijalankan untuk mengetahui kebaikan dan keburukan kedua-dua protokol. Suara dan video merupakan salah satu daripada trafik yang digunakan untuk projek ini. Projek berbentuk simulasi 2.34 yang beroperasi dalam sistem Ubuntu. Metrik-metrik yang digunakan dalam penafsiran ini adalah jumlah hasil proses (bait), masa lengah (saat) and jumlah kehilangan paket (%). Berdasarkan pada graf ketiga-tiga metrik ini, prestasi *TCP* dan *UDP* ditafsirkan, dan juga bilangan aliran ditentukan. Menerusi kajian simulasi ini, dapat disimpulkan bahawa *UDP* boleh menyediakan capaian medium yang berbeza untuk setiap jenis trafik. Hasil simulasi menunjukkan prestasi *UDP* adalah lebih baik berbanding dengan *TCP*. Berdasarkan keperluan *ITU-T (International Telecommunication Union- Telecommunication)* terutama untuk masa lengah dan jumlah kehilangan paket, bilangan aliran yang boleh diterima untuk jenis-jenis trafik secara individu dan juga kombinasi semua jenis trafik boleh ditentukan bagi model *TCP* dan *UDP*.

CHAPTER 1

INTRODUCTION

1.1   Background.

Telecommunication plays an important role in business, education, security and entertainment. The world without telecommunication is unbelievable. Wireless communication system is widely used today. It is defined in terms of standards and specifications. With the rapid growth of the wireless system, the market is becoming more and more competitive. There are wide ranges of wireless devices used for communications purposes. Wireless communication is becoming a popular method to connect mobile computers to the Internet and other networks.

Wireless communication could be classified as a cellular and a non-cellular system. It is known as an unbounded network which operates as an unguided system. The radio frequency band is a basic source of Wireless Communications [1]. Wireless

Local Area Network (WLAN) system is designed for data transmission and communications. It will be able to support voice and video services as well.

The WLAN industry has emerged as one of the fastest-growing segments of the communication trade. Due to this growth, WLANs are widely deployed as they are lower in cost, faster and simpler to set up and use in comparison with the previous generation products. In order to satisfy user's demand to access the Internet anywhere and anytime, WLAN in the infrastructure mode can provide network access in public areas, such as convention centers, campuses, airports and hotels.

Wireless LAN is also known as a crucial component of computer network [2]. The world of wireless LAN produced standardization and made it to be successful till now. IEEE 802.11 is the first wireless standard that defines the two major layers under the OSI (Open System Interconnection) model. This model was designed by the International Organization for Standardization (ISO) [1].

The two major layers of the IEEE 802.11 standard defined are the physical layer and the data-link layer. This chapter introduces wireless and IEEE 802.11 standard and the rest of the chapters relate more into the transport layer of an OSI model and related to the protocol network.
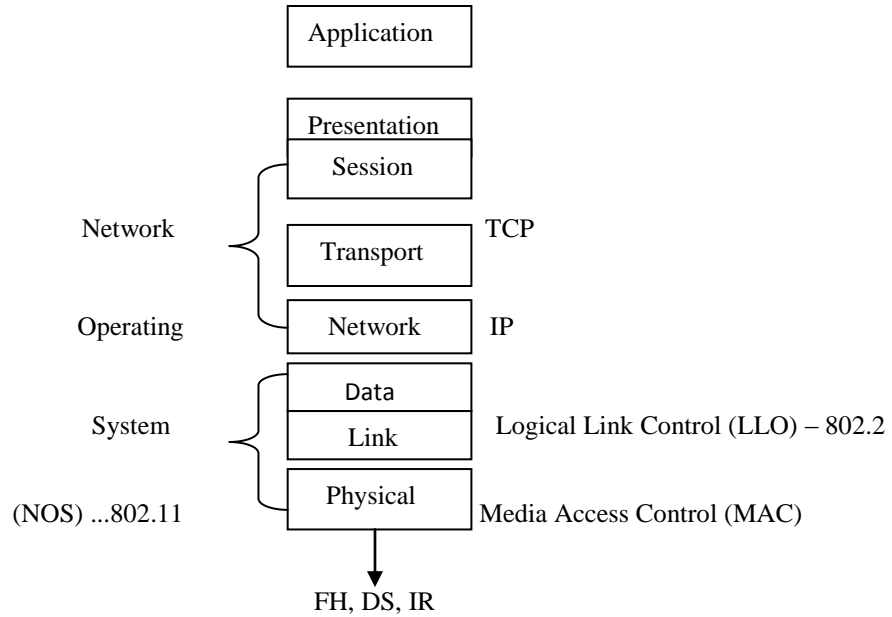
```
                    ┌─────────────┐
                    │ Application │
                    └─────────────┘

                    ┌─────────────┐
                    │ Presentation│
                    ├─────────────┤
                    │   Session   │
    Network      ⎰  └─────────────┘
                 ⎱  ┌─────────────┐   TCP
                    │  Transport  │
                    └─────────────┘
    Operating    ⎰  ┌─────────────┐   IP
                 ⎱  │   Network   │
                    └─────────────┘
                    ┌─────────────┐
                    │    Data     │
    System       ⎰  ├─────────────┤   Logical Link Control (LLO) – 802.2
                 ⎱  │    Link     │
                    └─────────────┘
                    ┌─────────────┐
    (NOS) ...802.11 │  Physical   │   Media Access Control (MAC)
                    └─────────────┘
                           │
                           ▼
                      FH, DS, IR
```

Figure 1.1: IEEE 802.11 and OSI model.

1.2   Problem Statement.

The usage of wireless communication has been increasing and growing rapidly with the introduction of more advanced technology. The IEEE 802.11 [1], MAC protocol is designed to provide an equal chance for each wireless station to access the channel. The IEEE 802.11 standard of WLAN has been further enhanced to the 802.11n standard. The WLAN technology keeps progressing and has been upgraded into a better standard. My thesis analyses the performance of real time traffic in Ethernet and WLAN using TCP (Transmission Control Protocol) and UDP (User Datagram Protocol) under Transport Layer of an OSI model [3].

The performance of real time traffic with TCP and UDP protocol is observed and the advantages and disadvantages are analysed. In a performance there would be many problem statements on why we are developing this thesis and how to solve the problem. Furthermore, from the previous analysis the problem is still occurring and my thesis is to make a hypothesis into the problem and find a solution to resolve it. Therefore, this thesis is carried out to analyze the performance of the real time in Ethernet and WLAN using both protocols and compare it with the previous analyses done.

Besides that, it is also carried out to identify ways and new methods to reduce the delay in the protocol while transmitting and receiving a data. The problems which still occur till now compared to previous analysis is that if the data is lost while transmitting, packet sizing, delay in sending the data due to heavy traffic, pending of data which causes the data to be expired that leads to waste of energy, time, money to resend of the same data [3].

1.3   Project Objectives.

The objectives of this project are:

     i.   To analyse the performance of the real-time traffic with TCP and UDP protocols.

    ii.   To make comparison between the performance of real-time traffic which is the voice and video in TCP & UDP protocols.