

# **VoIP OVER IPv6 TESTING**

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**FACULTY OF INFORMATION AND COMMUNICATION TECHNOLOGY  
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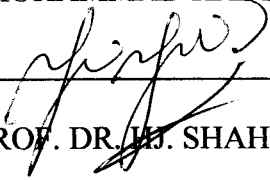
**2010**

## DECLARATION

I hereby declare that this project report entitled  
**VoIP OVER IPv6 TESTING**

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

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## **DEDICATION**

To my adorable parents, Noor Asiah Bt. Hj. Abdullah Bakty and Muhammad Kamaruddin Bin Muhammad Shah for their endless support and understandings have been profound throughout the difficult times of this course.

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## **ABSTRACT**

Current Information and Communication Technology (ICT) industry is introducing technologies that have been improved from previous successors. New technology, protocols and systems were introduced to consumers each and every year. There also improvements being done to current technologies to fulfill the requirement of current demand. IP address is one of them. IP address is a protocol that being used to connect computers from all over the world. Current IP address which is IPv4, is exhausting due to increase of computer users. New version of IP addressing called IPv6 was introduced to overcome this problem. It is still not widely used yet and that is the reason of choosing this protocol to be tested with VoIP application that supports IPv6.

## ABSTRAK

Industri Teknologi Maklumat dan Komunikasi semasa memperkenalkan teknologi yang dinaiktaraf daripada kejayaan sebelumnya. Teknologi, protocol dan sistem yang baru diperkenalkan kepada pengguna setiap tahun. Terdapat juga penambahbaikan dilakukan keatas teknologi semasa bagi memenuhi kehendak semasa. IP address adalah salah satu daripadanya. IP address adalah protokol yang digunakan untuk menghubungkan komputer dari seluruh dunia. IP address semasa iaitu IPv4, sedang berkurangan disebabkan penambahan pengguna komputer. Versi IP address yang baru dipanggil IPv6 telah diperkenalkan untuk mengatasi masalah ini. Ia masih belum digunakan secara meluas lagi dan atas dasar inilah protokol ini dipilih untuk diuji dengan aplikasi VoIP yang menyokong IPv6.

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**LIST OF ABBREVIATIONS**

VoIP	-	Voice over Internet Protocol
IPv6	-	Internet Protocol version 6
QoS	-	Quality of Service
SIP	-	Session Initial Protocol
GRE	-	Generic Routing Encapsulation
RTP	-	Real Time Protocol
UDP	-	User Datagram Protocol

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## **CHAPTER I**

### **INTRODUCTION**

#### **1.1 Project Background**

VoIP or voice over Internet Protocol is a system that allow user to communicate or make calls over Internet Protocol or IP. Main feature of this technology is sends voice data stream trough the IP network.

The implementation of VoIP can benefits all kind of users either personal use or corporate use. VoIP main advantage is to reduce cost of communications. It will be a great difference if VoIP is compared to traditional phone calls especially in cost.

A simple network consist of two computers as clients will be place at two different network will be setup. All connected interfaces will be configured with 128 bit IPv6 address. IPv6 have larger address range than IPv4 that only have 32 bit range. Each of the clients will be installed with VoIP application that can support IPv6 addressing.



## **1.2 Problem statements**

VoIP nowadays are operating on IPv4 protocol addresses. VoIP connects either using physical IP phone or software IP phone also known as softphone. This project will be using freeware softphone that are downloaded from the internet. There are a lot of softphone applications that can be downloaded from the internet but there are only a few softphone that support IPv6 protocols. Choosing the right softphone will be one of important steps in ensuring the successful of this project.

IPv6 is a new addressing protocol which is design to succeed IPv4 that are exhausting. IPv6 protocol is not widely used yet and there are still much more research is undergoing to discover the true ability and what is the new Internet Protocol is capable of. Not all devices such as routers and switches are supporting IPv6 protocol addressing or configurations. So, choosing the routers and switches in this project is crucial part too for ensure this project runs smoothly.

A lot of IT professionals around the globe have done research and testing on these two subjects. Testing of VoIP over IPv6 using dual stack mode, IPv6 tunneling, IPv4 tunneling and fully IPv6 network have been done. Some of them are successful and some are not. This project will use fully IPv6 network to run the testing.

## **1.3 Objective**

The current usage of VoIP is over IPv4 network. Some researches on how to implement VoIP over IPv6 have been made because of VoIP over IPv6 network is still new and there is still no complete implementation have been made yet. Below are the objectives that planned to have after project research and implementation:

- a. To develop IPv6 environment network in FTMK. IPv6 is the latest version of internet protocol that will used to replace current IPv4.
- b. To test VoIP application implementation over IPv6 network. Testing is important to ensure the reliability of the application during implementation.
- c. To propose the implementation of VoIP over IPv6 at FTMK

#### **1.4 Scope**

This project is going to implement new Internet Protocol which is IPv6. The completion of this project will improve the communication between staffs and the advantage of using VoIP over IPv6 network will clearly proven. Users who will involve in this project implementation are all staff in Fakulti Teknologi Maklumat dan Komunikasi that will be communicates with each other within the faculty. All staff means dean, lecturers, all staff in management and departments and also technicians.

#### **1.5 Project significance**

The testing of VoIP in IPv6 environment is to allow users to make calls using the Internet Protocol. This project significant will go to the faculty itself. The faculty which is FTMK, currently using VoIP over IPv4 and the university will upgrade the network into IPv6. This will also involved the faculty as one of the university components. This testing is appropriate according to the current situation.

This VoIP over IPv6 Testing project will be a fraction or part of the university IPv6 test bed. This project also will contribute to the networking society all around the world in studying VoIP or IPv6.

### **1.6 Expected Output**

When developing a project, a successful result is expected. From this project, a network that can perform VoIP over IPv6 network is expected to be setup. The packets that being transmit over the network will be analyze using network monitoring software. The content of the packets that being transports over IPv6 network and its advantages compared to previous Internet Protocol should be able to identify.

### **1.7 Conclusion**

For the conclusion of this chapter, further research by studying articles and journals about VoIP and IPv6 protocol need to be done. A simple network configured with IPv6 addresses will be setup to manage VoIP calls, identify all devices and techniques that required fulfilling the development of the project. Protocols that will be used in this project will be studied and getting used with.

Next chapter will discuss details about literature review and project methodology.

## **CHAPTER II**

### **LITERATURE REVIEW AND PROJECT METHODOLOGY**

#### **2.1 Introduction**

This chapter focuses on literature review and project methodology that describe and elaborate critical points and methods used in developing this project. Literature review is the process of collecting related data, analyze business processes, determine underlying patterns then conclude a conclusion that aims to review the critical points of current knowledge on this particular project. By doing literature review, the original concept of what is going to be developed can be clearly defined. As the project develops, it can see that researches done by doing literature review is able to help a lot during progress of the project. Theories, approaches and methods which are created and used by other people can be studied a new idea. All homework done to discover facts and findings related to the project will be used in order to seek more ideas for building this project.

The literature review usually precedes research proposals, methodology and result section. The goal is to bring readers or researchers up to date with current literature on a topic and form the basis for another goal for future research in the similar area.

A good literature review is characterized by a logical flow of ideas; current and relevant references with consistent, appropriate referencing style; proper use of terminology; and an unbiased and comprehensive view of the previous research on the topic.

A literature review can be just a simple summary of the sources, but it usually has an organizational pattern and combines both summary and synthesis. A summary is a recap of the important information of the source, but a synthesis is a re-organization, or a reshuffling, of that information. It might give a new interpretation of old material or combine new with old interpretations. Or it might trace the intellectual progression of the field, including major debates. And depending on the situation, the literature review may evaluate the sources and advise the reader on the most pertinent or relevant. ([http://www.unc.edu/depts/wcweb/handouts/literature\\_review.html](http://www.unc.edu/depts/wcweb/handouts/literature_review.html))

Besides that, this chapter also covers the methodology used to describe methods of the project. Methodology is a set of guidelines, standards and processes that involved and followed explicitly in order to produce a system. Thus, the process of achieving result can be studied and verified.

## **2.2 Literature Review**

A literature review is a body of text that aims to review the critical points of current knowledge and or methodological approaches on a particular topic. Literature reviews are secondary sources, and as such, do not report any new or original experimental work.

Most often associated with academic-oriented literature, such as theses, a literature review usually precedes a research proposal and results section. Its ultimate

goal is to bring the reader up to date with current literature on a topic and forms the basis for another goal, such as future research that may be needed in the area.

### **2.2.1 Domain**

The domain for this project is Networking and Distributed Computing that covers the area of Internet Protocol version 6 and Voice over Internet Protocol.

### **2.2.2 Keyword**

#### **a. VoIP**

Voice over Internet Protocol (VoIP) is a general term for a family of transmission technologies for delivery of voice communications over IP networks such as the Internet or other packet-switched networks.

Internet telephony refers to communications services that are transported via the Internet, rather than the public switched telephone network (PSTN). The basic steps involved in originating an Internet telephone call are conversion of the analog voice signal to digital format and compression/translation of the signal into Internet protocol (IP) packets for transmission over the Internet; the process is reversed at the receiving end.

VoIP systems employ session control protocols to control the set-up and tear-down of calls as well as audio codecs which encode speech allowing transmission over an IP network as digital audio via an audio stream. Codec use is varied between different implementations of VoIP (and often a range of codecs are used); some implementations

rely on narrowband and compressed speech, while others support high fidelity stereo codecs. (OLIVEIRA, H. – Project report IPv6@ESTGLEiria: VoIP over IPv6, 2006)

b. IPv6

IPv6 is stand for Internet Protocol Version 6 which is designated to replace previous Internet Protocol Version 4 or IPv4 which is currently still widely used over the internet. It is an Internet Layer protocol for packet-switched internetworks. The main driving force for the redesign of Internet Protocol is the foreseeable IPv4 address exhaustion. IPv6 provide larger addresses than IPv4 where it uses 128-bit of address rather than 32-bit address on IPv4. (OLIVEIRA, H. – Project report IPv6@ESTGLEiria: VoIP over IPv6, 2006)

c. SIP (Session Initiation Protocol)

The Session Initiation Protocol is client-server signaling protocol. The sessions range from audio, video, instant messaging and many other formats. It was designed by IETF as a multimedia protocol that could take advantage of the IP service model architecture. Similar form to email address which uses Universal Resource Locators (URL) as address data format, a SIP address is a type of Uniform Resource Identifier (URI) called a SIP URI. SIP based on URL, so Domain Name System is needed and Telephony Routing over IP (TRIP) is used for routing the calls. (OLIVEIRA, H. – Project report IPv6@ESTGLEiria: VoIP over IPv6, 2006)

d. RTP (Real-Time Transport Protocol)

Real-Time Transport Protocol is end-to-end protocol and provides various mechanisms for the transmission of multimedia data such as video and audio streams. It

is network and transport protocol independent; however it used over UDP. RTP can be used over both unicast and multicast network services, where the network is responsible for transmitting the data to multiple locations. It is used by session protocols like SIP, H.323 and SCCP. (OLIVEIRA, H. – Project report IPv6@ESTGLEiria: VoIP over IPv6, 2006)

### **2.2.3 Previous Research**

#### **2.2.3.1 IPv6@ESTG-LEIRIA: VoIP over IPv6 by Hugo Oliveira, Antonio Pereira, Mario Antunes and Nuno Fonseca**

This article explained the VoIP architectures, QoS mechanism and its support for IPv6, and the implementation scenarios. During the implementation of the project, solutions using Open Source were investigated because Cisco or commercial versions did not support IPv6 in their voice solutions. All VoIP messages were analyze when using Cisco and Open Source VoIP solutions. GRE tunnel was chosen after a lot of IPv6 and IPv4 translation have been investigated (see Figure 2.1). Then encapsulation process was analyzed. QoS is investigated, analyzed and configured because voice traffic is sensitive to traffic on the network (see Figure 2.2). Two software applications used to sun the test for QoS. Chariot is to generate IPv4 streams and MGEN to generate IPv6 streams.

Native VoIP over IPv6 at the time of the project is still adolescent and only available in Open Sources. The VoIPv4 solutions are more stable than VoIPv6 because they have been in the industry for a long time period before IPv6 was introduced (see Figure 2.3). This project using SIP server from IPTTEL called SER and VOCAL. Both of this software is Open Source.

SIP message scenario refers Figure 2.4.