Chapter 1.0 Introduction

Implementing network software is a norm in network-based technologies. As newer network technologies emerge, more implementation and testing processes are required. The x-kernel developed by Larry L. Peterson and Norman C. Hutchinson from the Department of Computer Science, University of Arizona was based merely on an operating system platform for implementing protocols in the user level. This type of implementation complements the traditional network implementation; of which is in the operating system kernel and not in the user level. The x-kernel is based on the Uniform Programmer Interface (UPI). This interface gives a minimal object-oriented environment for implementing network-based protocols. The x-kernel simulator, x-sim has the same properties and requires the same configuration techniques as the x-kernel, thus the discussion on the issues of implementing IPv6 in the x-kernel simulator is based on the x-kernel itself.

1.1 Overview

The first part of this dissertation is an overview of the x-kernel. Next is a review on the implementation environment and its programming interface of the x-kernel. After that, is a brief description of IPv6 module and its implementation in the traditional Berkeley Unix. Following on, are the implementation issues revolving around the x-kernel for the network protocol IPv6. Finally, a review on the issues of IPv6 module, of which can be remodeled from IPv4 module from the x-kernel itself for the x-kernel and its simulator. Also discussed are the configuration issues of IPv6 in the x-sim as compared with the IPv4 configuration.

The x-kernel distribution can be downloaded from (cs.Arizona.edu/xkernel) web site for free. Basically the x-kernel is supported on Unix workstations connected by Ethernet and in addition to that the x-kernel can be run as a simulator in a single Unix process as x-sim [13]. Several types of Unix flavor can be used as the operating system for the x-kernel, however in this context the Unix clone Red Hat Linux 6.0 was used for the IPv6 implementation.

1.2 Objectives

The main objectives of this dissertation are listed below

(i)   The first objective of this dissertation is to look at the x-kernel architecture in terms of OSI model.

(ii)   The second objective was to develop an understanding of how the new IPv6 can be implemented into the x-kernel.

(iii)   Thirdly was to understand the configuration issues surrounding the x-kernel.

1.2.1 Aims and Scope of Study.

Based on the objectives above the main aims of this dissertation are as follows:

(i)   The main aim for the first objective is to understand thoroughly the x-kernel workings in order to implement any new network protocols. The areas that are mainly focused are in the areas of programmability. To understand and structure program codes in which the network programs are able to work and executed. To look at existing network modules that are currently being used by the x-kernel. From the first objective the scope of study is limited to the

availability of evidence in terms of research that has been done on the x-kernel.

(ii)   To understand the potential of IPv6 being implemented into the x-kernel and its simulator. To hard code or modify the existing IP modules to suit IPv6 into x-kernel. To fully understand IPv6 as compared to IPv4. The scope of study is focused in terms of IP packet technology only, not considering in term of routing and other IP related networking technology.

(iii)   To understand the flexibility and reusability of the x-kernel software to implement network protocols. The configuring issues surrounding the x-kernel that can be manipulated in terms setting up so that it is able to complement the users requirements.

1.3 Research Methodology

This research is mainly a literature review on the topic of discussion. The use of the Internet facility and library material was the main source of information used in the survey of architectures, algorithms and approaches in development models. In depth reading and findings was done to able to understand the x-kernel. The x-kernel software was also tested to support findings.

1.4 Project Motivation

The x-kernel is a platform well suited for implementing, testing and comparing network protocols [3]. This gives a very good opportunity to look at the implementation issues of IPv6 in the x-kernel. The x-kernel has a set of routines that can be manipulated to

implement the IPv6. IPv6 is a new IP packet format that is has a vast and promising future in network technology. It has a lot of research areas to be explored and investigated, this sets a platform for the x-kernel to come into play.

Any protocol that is to be implemented into the x-kernel needs a thorough understanding of network protocol stacks like TCP/IP and structured programming languages such as C or C++.