COMPARING TCP-IPV4/ TCP-IPV6
NETWORK PERFORMANCE

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ABSTRACT

The Internet Protocol version 4 (IPv4) has been the backbone of the Internet since its inception. The growth and success of the Internet has accelerated the consumption of the IPv4 address space and hence its exhaustion is predicted very soon. Despite the use of multiple hidden and private networks to keep things going, a newer version of the protocol, Internet Protocol version 6 (IPv6), is proposed to solve this issue along with many other improvements as part of a better, newer design. For smoother transition and given the decentralized nature of the Internet, both of the protocol stacks, namely IPv4 and IPv6, are expected to be supported by the hosts and hence co-exist for a period of time. Many application programs, especially those involved in large data transfers, currently use the TCP/IP protocol suite. However, there have not been many attempts to leverage the existence of both Internet Protocol versions over a TCP connection.

This thesis, through a prototype, is an attempt to improve the network utilization by using either an IPv4 or an IPv6 protocol for a TCP connection based on end-to-end measured performance between two hosts. A measurement tool, named *netaware*, is developed as part of this thesis to measure the end-to-end network performance for both IPv4 and IPv6 protocols within a single tool. The tool measures two
performance parameters, namely the bandwidth and the latency in a multi-threaded environment. The tool utilizes a simple middleware application, also built as part of this thesis, to create and use socket connections for interprocess communication across the network between the two hosts. The middleware application is used as an intermediate level application to take care of creating IPv4 or IPv6 connections between the hosts, needed to transmit measurement and control data while measuring the performance parameters. The use of middleware application facilitates the construction of network applications by having an application developer to deal with minimal code to use either IP protocol. The network application may be a file transfer application or any other network application. The middleware application also provides the capability for TCP applications to switch between IPv4 and IPv6 network protocols on the fly, without impacting the application’s functionality. The input values for the parameters of the middleware application functions internally control the IP protocol to operate on and the switching technique for an application program. The aim is to enhance the network utilization by having an option of switching between the two IP protocols in order to provide better performance at some point of time. The prototype measurement tool measures the network performance to help decide on the preferred protocol. The preferred protocol can then be used to notify the application program using the middleware application to switch to the preferred protocol while in execution. The combination of the measurement tool to measure the performance for both IP protocols within a single tool and the middleware application’s ability to switch between the IP protocols at any point of time, based on measured performance, can help provide better network utilization.