UNIVERSITI TEKNOLOGI MARA

EMPIRICAL PERFORMANCE-COMPARISON OF E2E DUAL-STACK IP PROTOCOL METHOD OVER WIRED AND WI-FI BROADBAND ACCESS

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ABSTRACT

Due to the depletion of the current IPv4 address pool of Internet addresses and the desire to provide additional functionality and enhancement, an upgrade of the original version of the Internet Protocol (IP), called IPv6, has been standardized. This new version, called IP version 6 (IPv6), resolves unanticipated IPv4 design issues and takes the Internet into the 21st Century. IPv6 performance is still uncertain of several ISPs for the adoption IPv6 in their networks while maintaining the existing IPv4 addresses. Thus, it is very essential to evaluate the performance of E2E IPv6 network. This paper present the empirical performance of IPv6 over wired and Wi-Fi broadband access in comparison with IPv4. Real network environment used to provide a comparative performance of a comprehensive dual-stack IP method in one of the major fixed broadband provider in Malaysia. The real E2E Dual-Stack IP of a Client-Server test-bed for instance as an actual baseline from an end-user perspective for future research and guidelines for Dual-Stack implementation. Performance evaluation and comparison is based on RTT, FTP, IPerf performance test tool and High-throughput TCP test by using Ixia IxChariot test gear. Generally, performance-comparison results affirm that Dual-Stack IP method as a more reliable protocol to opt in a real network environment. In addition, IPv6 represent throughput higher than IPv4 and more robust in transaction rate based on RTT, FTP, IPerf and Ixia IxChariot measurement results.

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CHAPTER ONE

INTRODUCTION

1.1 RESEARCH BACKGROUND

IPv6 is the newest Internet Protocol (IP) or also called as IP next generation (IPng) designed to expand and improve the existing IP version 4 (IPv4). The main reason behind this transition from current IPv4 phase to IP version 6 is to mitigate IPv4 Public IP address depletion. On February 3, 2011, the Internet Assigned Numbers Authority (IANA) has announced that the unallocated IPv4 addresses projected pool was exhausted. Nevertheless, the transition phase is long and far thus, various networks and Internet Service Providers (ISP) will continue to operate on both IPv4 and IPv6 simultaneously in the present and the future. The end-state of the IP network would be the deployment of native IPv6. This is when all devices will be using 'IPv6-only' and broadband access users are sending 'IPv6-only' traffic across the provider's network. However, the exhaustion of IPv4 is still not yet can be determined due some other solution has been introduced.

Internet Engineering Task Force (IETF) outlined 3 main transition methods from IPv4 to IPv6 namely as Dual-Stack, Tunneling and Translation as shown in Figure 1.1. Dual-Stack is the best and should be the target transition mechanism [8]. Dual-Stack is the ability of a device to simultaneously support IPv4 and IPv6 in the same interface. At a data link layer, an interface will be configured with both IPv4 and IPv6 address. At the upper protocol layers, applications can use either IPv4 or IPv6 to communicate. Other nodes can communicate with the dual stacked devices using either IPv4 or IPv6. See Figure 1.2 for Dual-Stack devices can received both IPv4 and IPv6 packets.