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Analysis of Transition Techniques from IPv4 to IPv6

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Abstract: ***The great expansion of the internet (increasing the devices, numerous internet service and applications), major changes in the overall architecture have required the use of new technologies. In this day became necessary to find a new version of internet protocol (Internet Protocol Version 6) in order to reach out to the product meets all of these requirements and enable a global environment where processing rules clasped all applications. This paper discusses ways to migrate from IPv4 to IPv6 these include Dual-Stack, Tunneling and translation. It uses OPNET simulation three ways to analyze three parameters of network performance delay, traffic dropped and response time.***

Keywords: IPv4, IPv6, Dual-Stack, tunneling, translation

1. Introduction

The Internet and development of high-speed broadband networks have posed the problem of inadequate IPv4 address space on the Internet. Moreover, this lack of address space has been made worse by the progress made toward a ubiquitous network society, in which various types of information equipment, mobile computers, and electrical information appliances communicate on the Internet. IPv6 was developed as a solution to this problem [1]. IPv6 can cover 340 trillion, trillion, trillion nodes whereas IPv4 is only capable of 4.3 billion nodes. The transition from IPv4 to IPv6 requires a smooth method without any disconnection or fault within the network. The IPv6 Internet is now in a transition phase from experimental research networks of global operational networks.

Internet Protocol version 6 (IPv6) came to meet the needs that enable us to get all the applications with high transparency and enable inside network environment rules. IPv6 makes important improvements to network topologies dynamically (exp. Peer to peer, client/server or mesh networks). Also, it improves most of networks functions like, notably in security, mobility, auto configuration, quality of service (QOS) and multicasting [2].
IPv6 is proposed to provide Internet with a larger address space and better performance [3].

2. The Transition Mechanisms

The transition between the IPv4 Internet today and the IPv6 Internet of the future will be a long process during both protocols coexists. A mechanism for ensuring smooth stepwise and independent changeover to IPv6 services is required. Such a mechanism must help the seamless coexistence of IPv4 and IPv6 nodes during the transition period. There are three types: Dual Stack, Tunneling and Translation (NAT-pt).

A. Dual Stack

The Dual Stack technique uses IPv4 and IPv6 within the same stack in parallel. The choice of protocol is decided by the administrator policies, along with what kind of service is required and which type of network is used. This technology does not make any change to the packet header and at the same time does not make encapsulation between IPv4 and IPv6 [4].

B. Tunneling

The tunnel idea works as a bridge to transfer packets between two similar networks over incompatible network [5]. In other words, the IPv6 will be as a part of IPv4, and the IPv6 data will flow by using IPv4 infrastructure, which will send it to the destination (IPv6) for processing. The tunnel is a virtual link between the two points to transfer data [6].

C. Translation

The translation technology changes the header and the payload of the IP from version 4 to version6 and vice versa. There are two ways for translation: stateless and tasteful. The stateless translation, there is no reference for the pervious packet during the conversion while the state full translation is related with the previous packets [7].

3. Method

We use OPNET simulation, software simulate three different methods in the transition from IPv4 to IPv6 (Dual Stack, Tunneling, NAT-PT). The parameters taken in this study are (delay, traffic dropped, and response time).

A. Simulation Environment Dual Stack

The below Figure.1 illustrate the Dual Stack Connections

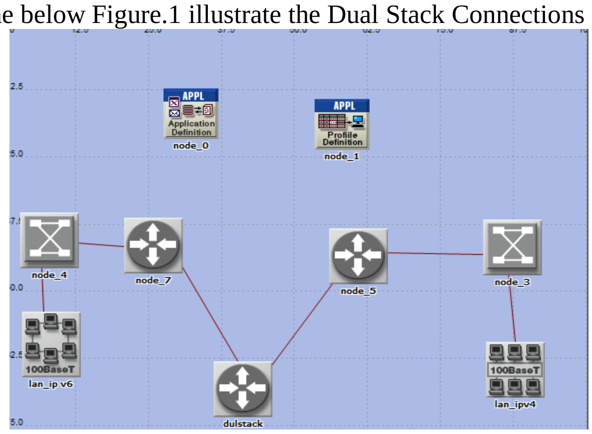

Figure 1: dual stack

B. Simulation Environment Tunneling

This Figure.2 shows the Tunneling technique ofIPv6 to IPv6 network, while the transit network use IPV4

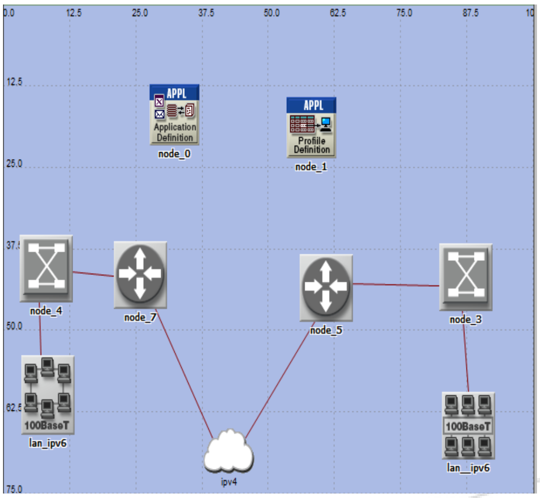

Figure 2: tunnel

C. Simulation environment NAT-PT

In this Figure.3 shows the NAT-PT, IPV4 to IPV6 dynamic NAT translation

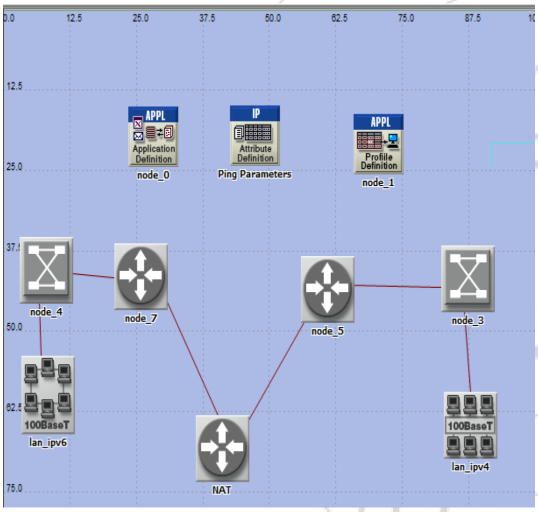

Figure 3: NAT- PT

4. Results and Analysis

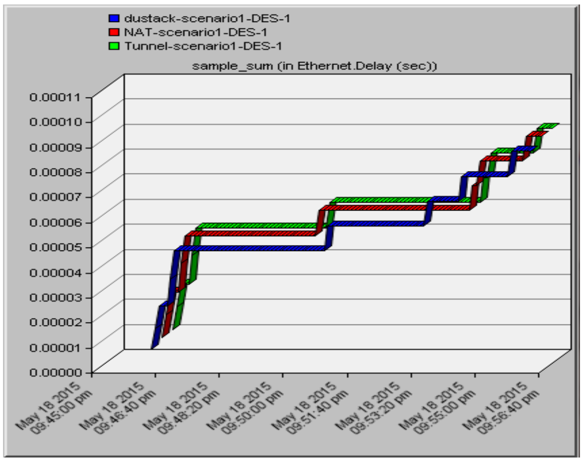

Figure 4: delay

In the above Figure 4, shows the delay of dual stack, tunneling, and NAT-PT, the result shows the tunneling is the highest delay. The dual stack is the lowest, so the dual stack is the best.

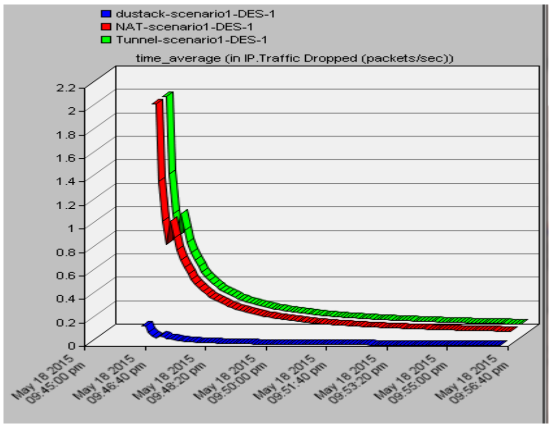

Figure 5: traffic dropped

When the queue was full there was not enough space for the new packets; this generated drop packets. In this figure5, we measured traffic dropped in dual stack, tunnel and NAT-PT , the result shows the traffic dropped of tunneling is the highest and dual stack is the lowest, so the dual stack is the best.

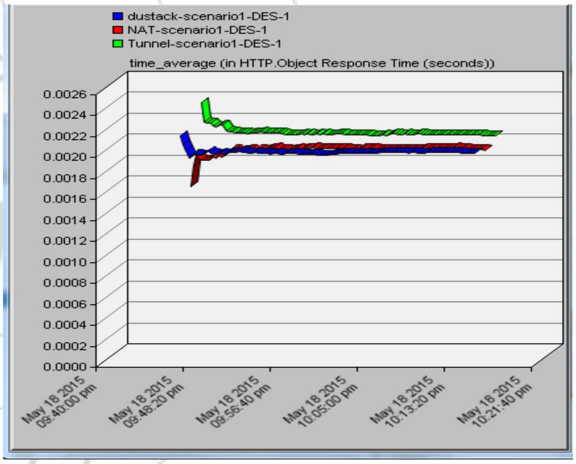

Figure 6: Response Time

Figure 6, shows response time in dual stack, tunneling and NAT-PT, we found

That response time of tunneling is the highest; the dual stack is lower than NAT P, so the dual stack is the best.

5. Conclusion

The global need for addresses and a better protocol leads to the implementation of IPv6. So this requires some sort of migration scenario from ipv4 to ipv6. This paper presents three transition mechanisms, Dual Stack, Tunneling and translation we have implemented the experiments by using OPNET simulator .And we measured the delay, traffic dropped and response time .we found that the tunneling has the highest delay, traffic dropped and response time, the NAT-PT has medium delay, traffic dropped and response time, the dual stack is the best technique because it has the lowest delay, traffic dropped and response time.

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