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"Survey on IPv4 and IPv6 Using Dual Stack, Tunneling and Translation"

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Abstract: The introduction of IPv6 has opened up several questions with reference to its adaption and transition from IPv4 to IPv6 and is one of the crucial issues being frequently discussed in networking community today. IPv6 provides many seamless features that makes it far better protocol as compared to its predecessor IPv4. It is a well-known fact that IPv4 is a standard at present and is currently been deployed in almost all the Internet architecture, hence the transition process from IPv4 to IPv6 is very challenging. In order to avoid the transition, or in actual sense to delay it, many techniques have been introduced such as **Dual stack**, **Tunneling** and **NAT**. The objectives of this survey paper are twofold. Firstly, to highlight the issues related with the transition from IPv4 to IPv6. Secondly, to find the transition mechanism that can be provided seamlessly to end users where they will be able to use all the services of IPv4.The purpose is to tackle the issues and challenges that are likely to be faced during the transition from IPv4 to IPv6. Cisco Packet Tracer is used for simulation and Dual Stack has been chosen as the transition mechanism for the test bed. Dual Stack allow both protocols to run simultaneously and the results show that it also provide seamless transition from IPv4 to IPv6.

Keywords: IPV4, IPV6, Dual stack Server, Tunneling, Translation.

I.INTRODUCTION

The basic rationale behind IPv6 development was to provide an extended address space so that the growing future networking needs could be fulfilled. The uninterrupted progressive growth of the global internet requires that its overall architecture evolve to accommodate new technologies, to support the growing number of users, applications, appliances and services. Among IPv6's unique benefits over IPv4 are increased address space, simpler "plug and play", network security, improved mobility and Quality of Service. These benefits are mutually interrelated. Increased address space lets networks globally address more and new types of devices, and removes the need for Network Address Translator (NAT). This provides host-to-host IPsec and allows other novel services to run within network previously hidden behind NAT. IPv6 was intended to be an evolutionary approach to global internet as opposed to a revolutionary approach. In IPv6 approach the existing IPv4-based technologies are integrated to form a unified whole. In response to the increasing address need, IPv6 has been developed to provide an extremely large number of addresses, guaranteeing supply well into the future.

II. LITERATURE SURVEY

[1] Migration to IPV6 from IPV4 by dual stack technique.

A dual stack network involves nodes that are capable of processing IPv4 and IPv6 traffic simultaneously. When a node within a dual stack network receives traffic, it is programmed to prefer IPv6 over IPv4 traffic. In the event that the traffic it receives is solely IPv4, then the dual stack node is capable of processing it as well .Dual stack networking is one of several solutions for migrating from IPv4 to IPv6, but it is also one of the most expensive. Dual stack networks are one of the many IPv4 to IPv6 migration strategies that have been presented in recent years. Below, we shall see how to setup a dual stack simulation on packet tracer.

[2] Performance evaluation of Tunneling Mechanisms in IPV6 transition.

Another approach is to use tunneling techniques on top of an existing IPv4 infrastructure and uses IPv4 to route the IPv6 packets between IPv6 networks by transporting these encapsulated in IPv4. Tunneling is used by networks not yet capable of offering native IPv6 functionality. It is the main mechanism currently

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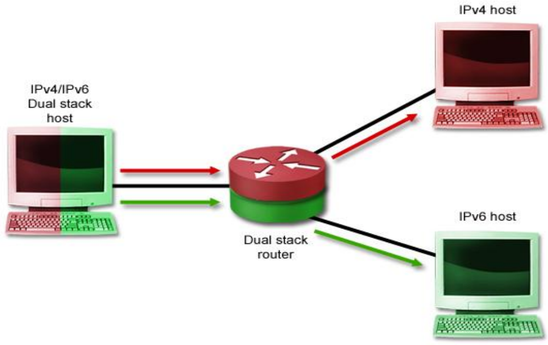
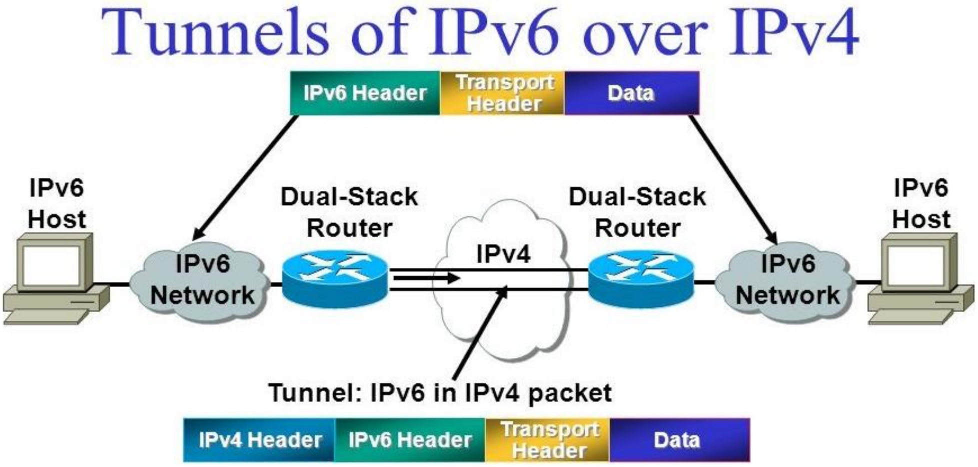
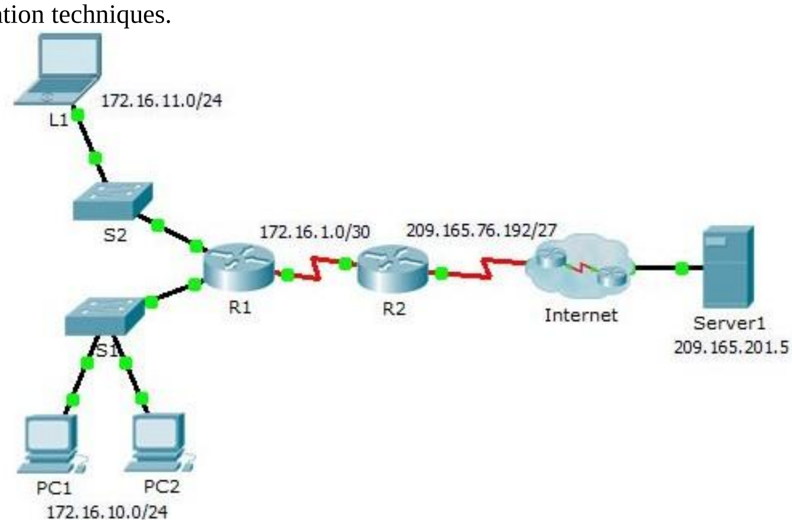


Being deployed to create global IPv6 connectivity. Manual, automatic, semi-automatic configured tunnels are available. Different types of tunneling techniques are 6over4, 6to4, ISATAP, TEREDO, tunnel brokers etc., Difference between 6to4 over 6over4 is that, 6to4 allows for automatic IPv6-to-IPv4 address translation, whereas 6over4 provides the advantage of using IP range allocated to you by ISP's. Below, we shall see how to setup 6over4 tunneling mechanism on packet tracer.



[3] Transition from IPV4 to IPV6: A Translation Approach.

The first method to be introduced to provide IPv6 translation services was Network Address Translation – Protocol Translation (NAT-PT). NAT-PT simply translates IPv6 packets into IPv4 packets. This mechanism have been deprecated by the IETF, because of its tight coupling with Domain Name System (DNS) and its general limitations in translation because of its complicated Header Formats in the protocol than IPv4 NAT. With the limitations of NAT-PT and the increasing urgency to migrate to IPv6, IETF proposed NAT64 as the successor to NATPT. NAT64, technology facilitates communication between IPv6-only and IPv4-only hosts and networks. NAT64 implementation requires two components, DNS64 (for DNS synthesis) and IP-Translator which translator synthesized-IPv6 addresses to IPv4 and put them on NAT. Translation techniques were intended to be used as a last resort. Dual-stack and tunneling techniques are preferable over translation techniques.



[4] Communication Method between IPV4 server and IPV6 network in virtual machine environment.

The primary network layer protocol on which the operation of most computer networks is based, including the Internet is the Internet protocol version 4 (IPv4). Due to the limitations of this protocol, it is becoming increasingly widespread use of the Internet protocol version 6 (IPv6). The IPv6 implements some new features not available in IPv4. The paper provides a short overview of the key features of IPv6 and discussed the possible levels of network virtualization. The research environment to testing the level of support for IPv6 protocol by virtualization environments is proposed. The results of tests conducted using the proposed research environment for Hyper-V virtualizer are presented.

[5] State management in IPV4 to IPV6 Transition.

The transition of the Internet from IPv4 to IPv6 is urgent and inevitable. A series of IPv6 transition solutions have been proposed by the Internet Engineering Task Force; yet most of them have not seen success in real world, and some were even obsoleted. Nowadays IPv6 transition solutions are still continuously being worked out. The major difference among these solutions is the state management, which is an essential function and has a profound influence on many aspects of networking, such as addressing, provisioning, and network performance. In this article, we present a comprehensive survey on IPv6 transition solutions from the perspective of state management. We first briefly review the basic rationale of IPv6 transition solutions, highlighting the necessity of state management. Then we study various types of state management adopted by typical IPv6 transition solutions, focusing on their impacts on aspects of networks. Based on the above analyses, we summarize the. Applicability of different types of state management, and discuss their state-of-the-art application directions that may lead to potential future research directions in the IPv6 transition process.

[6] Performance analysis of IPv4/IPv6 transition techniques.

A router can be installed with both IPv4 and IPv6 addresses configured on its interfaces pointing to the network of relevant IP scheme. The Dual Stack Router, can communicate with both the networks. It provides a medium for the hosts to access a server without changing their respective IP versions. In a scenario where different IP versions exist on intermediate path or transit networks, tunneling provides a better solution where user's data can pass through a non-supported IP version. This is another important method of transition to IPv6 by means of a NAT-PT (Network Address Translation – Protocol Translation) enabled device. With the help of a NAT-PT device, actual can take place happens between IPv4 and IPv6 packets and vice versa. A host with IPv4 address sends a request to an IPv6 enabled server on Internet that does not understand IPv4 address. The NAT-PT device can help them communicate. When the IPv4 host sends a request packet to the IPv6 server, the NAT-PT device/router strips down the IPv4 packet, removes IPv4 header, and adds IPv6 header and passes it through the Internet. When a response from the IPv6 server comes for the IPv4 host, router does vice versa.

III.CONCLUSION

Based on our interviews and research, native Dual-Stack is the technology that companies should consider for their deployment. It keeps both IPv4 and IPv6 running at the same time. When the network is fully transitioned to IPv6, operators can stop supporting IPv4. The two protocols must be supported until native IPv6 is the only protocol in use. The cost of 11 operation for Dual-Stack is more than single stack for operators because they have to support both stacks. If it is difficult for operators to move directly to native IPv6, then they can go implement transition technologies. According to our findings, the next best transition technology to deploy in the network is NAT64. Some of the companies are planning to run NAT64 in their network and then move to native IPv6 when all the applications and content is available on IPv6. If the SP's access network is not IPv6 ready, then they should plan to deploy 6rd in their network. NAT444 allows customers to run IPv4 services after the exhaustion of IPv4 addresses. However, this is not a viable long-term solution. Additionally, the implementation of NAT444 will require investment in a NAT logging infrastructure.

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