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Migration from IPv4 to IPv6

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Abstract

IPv4 addresses are already depleted in IANA and will be soon exhausted, as number of people using internet is increasing. Due to limitation of IPv4 addresses IPv6 address is the only next generation internet protocol. IPv6 is not commercially used because the migration techniques of IPv4 resources to IPv6 network has not been completely developed .In this research we have explained how the migration from IPv4 to IPv6 takes place .This research tries to find out a solution to reduce the hinders in IPv6 deployment and suggest an appropriate transition technique for migrating from IPv4 to IPv6.Various transition techniques are analyzed with Throughput ,Round Trip Time ,Jitter .The results show that Dual Stack Transition technique performs better than other tunnelling techniques because of low header processing.

***Key Words*:**IPv4, IPv6, Dual stack, Tunneling.

1 Introduction

In todays world two versions are available that are Internet Protocol version 4 and Internet Protocol version 6 . Internet Protocol provides support to establish support for routing of IP nodes using IPv4 or IPv6. Researchers are also working on how to implement IPv6 network. In previous method when there was not any implementation of this approach then route devices could not able to connect after 255 routers because there is a behavior of internet protocol address (IPV4) address they could ping up to 255 routers only and secondly IPv4 address are 4.3 billion and when these all address will used in future then it cannot use IPv4 because of limited numbers so there is a solution of ipv6 but this technique cant change the whole world network from ipv4 into IPv6 because billions of people are using IPv4 address and if they purchased IPv6 then they need to pay again for network.Migrating from IPv4 to IPv6 in an instant is impossible because of the huge size of the Internet and of the great number of IPv4 users.Organisation nowadays are dependent on internet so the cannot afford down time.

1.1 Internet Protocol Version 4

IPv4 is the Internet Protocol version 4.This protocol is widely being used by most of todays Internet traffic for communication of data over different networks. This version Internet Protocol is connection less protocol, mainly used for delivery of data between devices connected on a network.IPv4 has 32 bit address length, restricted nearly over 4 billion addresses. Dotted decimal notation is the address scheme used by IPv4.IPv4 consist of five classes (A, B , C ,D and E),and the fifth one is used for research purpose only. Every class has its own network and host part. Header is the starting field found in IPv4 packet which comprises of 20byte length. Due to shortage of IPv4 addresses, IPv4 are not capable to handle with the current internet. Hence IPv6 was mainly developed to resolve the addresses issues and also deals with the security issues.

1.2 1.2 Internet Protocol Version 6

IPv6 is the next generation internet protocol.IPv6 was developed by Internet Engineering Task Force to deal with the shortage of IPv4 addresses.IPv6 has 128 bit address length, and uses prefix notation. Internet protocol version 6 is seen as successor to IPv4 because it deals with the several drawbacks of IPv4 which are complicated and unavoidable such as exhausted address space, security issues, non availability of auto-configuration of IPv4 addresses. IPv6 has lots of IP addresses which are enough to last forever.IPv6 introduces a new type of addresses known as anycast, which can be used for delivering of packets to nearest group of host in a link.One finds easy to deal with IPv6 addresses and dynamic routing in IPv6 is easy as compared to IPv4.

2 Transition Techniques

IPv4 is totally different from and incompatible with IPv6, hence some transition techniques is needed to enable these two protocols so that they can communicate with each other. The transition from IPv4 to IPv6 is not something that it will be done overnight. A number of techniques have been developed to make the transition easy as possible. Basically till now there are three transition techniques (Dual stack, Tunnelling and Translation) which are explained below

2.1 Dual Stack Technique

The first transition technique is referred to as Dual Stack. The Dual Stack technique is most forthright means by this technique IPv4 and IPv6 can communicate with each other. While using this transition type, an organisation essentially does not transition to IPv6. The organisation creates an IPv6 network parallel to existing IPv4 network. As the name itself implies that dual stacking involves the implementation of stacks in IPv4 and IPv6 clients. Which means that the host itself can decide when a connection should be made using IPv4 or IPv6.The routers on both the side of the network must support both IPV4 as well as IPv6 and be configured parallel. When IPv4 routers communicate with an IPv4 router Dual Stack method uses an IPv4 network. Similarly when IPv6 communicates with IPV6 it uses an IPv6 network. This method is common for businesses who are looking to slowly convert their existing IPv4 devices to IPv6.

2.2 Tunneling Technique

The tunnelling method is another technique that enables the transition of packets from IPv4 toIPv6. The principles used in tunnelling are encapsulation and de-capsulation. When IPv4 header transfers IPv6 packets from source to destination in an IPv4 network encapsulation is used. In contrast, de-capsulation is used when the IPv6 or IPv4 host or router receives an IPv4packet that is addressed to one of its own IPv4 addresses. Packets are indentified by checking their source and destination address. Various tunnelling types are available. Which one to use depends on the specific implementation details.Some commonly available tunneling methods and their uses. The various Tunneling methods with their usage are as follows,

a) Manual: It only supports ipv6 traffic and provides point to point IPv6 link.

b) GRE:; Provides point to point IPv6 link supports various protocols, including IPv6.

c) ISATAP:. Designed to be used between devices inside the same site.

2.3 Translation Technique

The third transition technique is the translation approach, which enables mutual communication between IPv4 and IPv6. The basic function of this method is to translate the IP packets. This exchange method is used when a single IPv6 host communicates with a single IPv4 host. The concept of address translation is also not a new concept to most network engineers; this is because Network Address Translation (NAT) is implemented between different IPv4 networks in almost every residential household. The concept behind this type of NAT and the newer technologies that support address translation between IPv4 and IPv6 networks is similar.

3 Simulation and Results

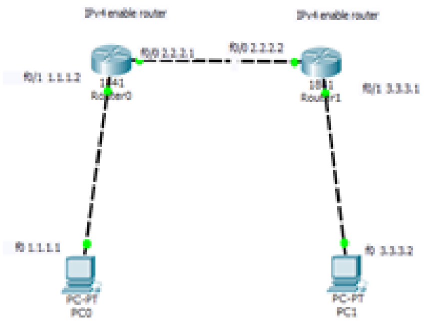

Figure 1: IPv4 Network Setup

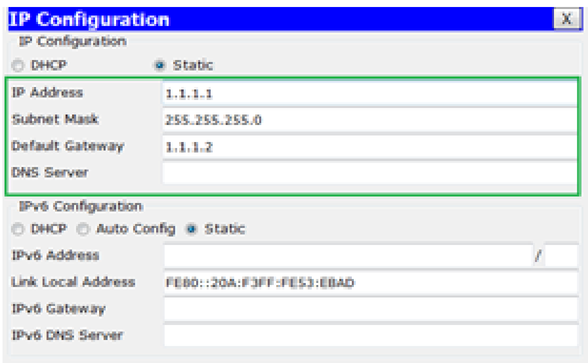

Figure 2.Assinging of IPv4 network to PC0

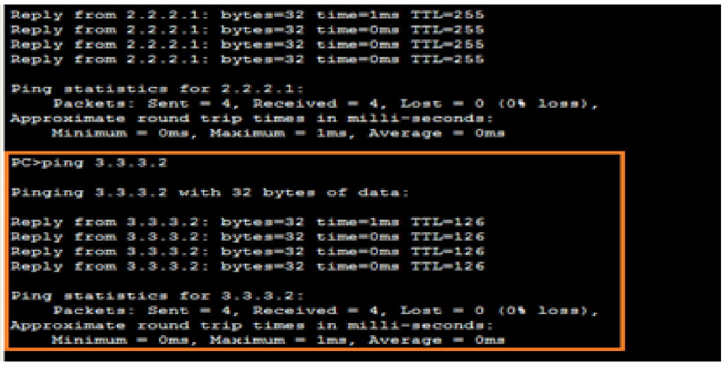

Figure 3.Pinging from PC0 to PC1

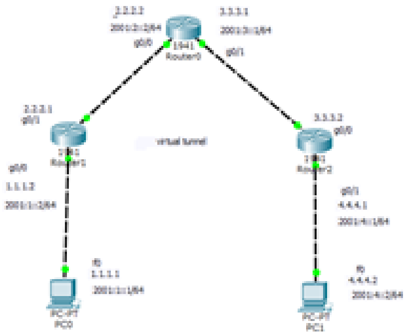

Figure 4.Setup for Tunneling Mechanism

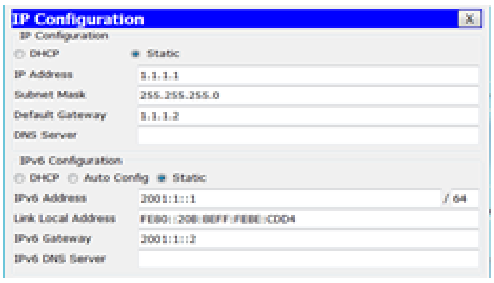

Figure 5: Assining of IPv4 and IPv6 addresses

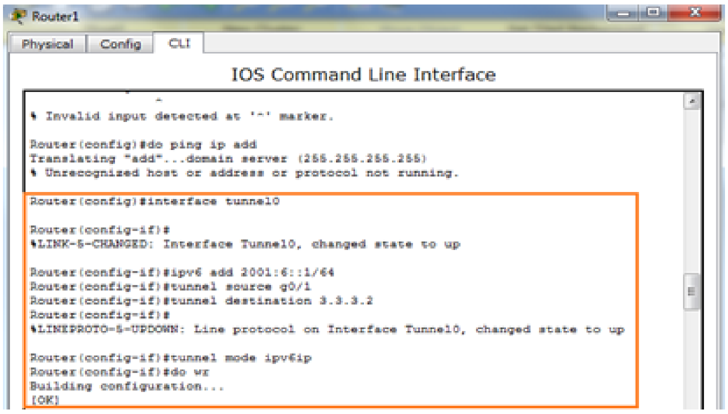

Figure 6.Router configuration for Tunnel Mechanism

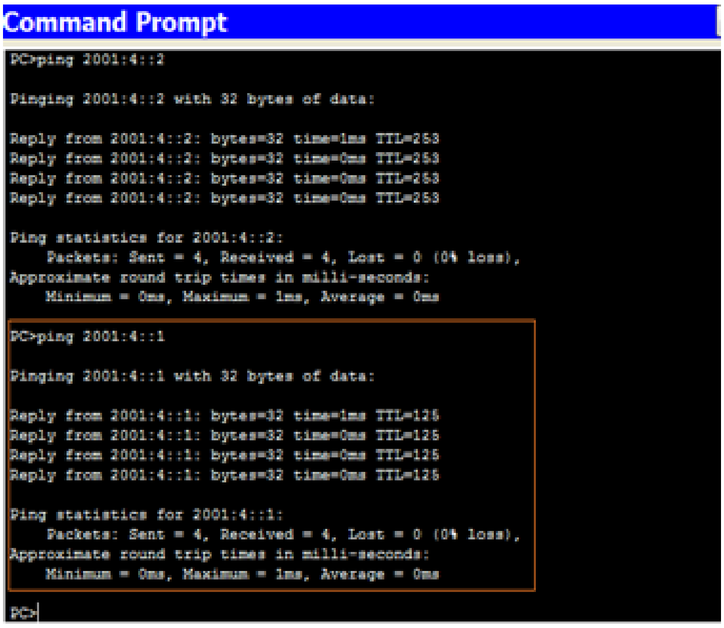

Figure 7.Result of Tunnel Mechanism

4 CONCLUSION

In our research we studied IPv4,IPV6, Transition techniques and their disadvantages and advantages.Iit was difficult to develop a IPv4 network as compared to IPv6. Dynamic routing is adifficult in IPv4 network but it is quite easy in IPv4. IPv4 route devices could not able to connect after 255 routers because there is a behavior of internet protocol address (IPv4) address they could ping up to 255 routers only and secondly ipv4 address are 4.3 billion and when these all address will used in future then it cannot use IPv4 because of limited numbers. With IPv4 resources depleted, ISPs must enter the IPv6 era. Countries such as China and India are already moving forward, changing their infrastructure to support the new IP protocol. This fact determined ISPs from around the world to make the first steps towards the feature-rich IPv6, but there is still a long way to go. Given the transition mechanisms we overlooked in this study, dual stack is the viable solution for an ISP to migrate gradually to IPv6. It offers the possibility for hosts to reach content in both networks because of its ability to run the two protocols at the same time. Tunneling is not the way to go for an ISP because the protocol overhead increases the latency in the network. Another drawback would be the administration of so many tunnels in an, already congested, service provider network. In this paper we created a sample of an ISPs network for the purpose of experimenting with IPv6 features and better understanding the steps of the migration, along with its transition mechanisms. We were able to test and debug on live equipment which gave us a better view of a real implementation when the time comes.

References

[1] M.J. Jones, The History of IPv4 And Beginning of IPv6, available online:http://www.termpaperwarehouse.com/essayon/ The-History-Of-Ipv4-And-Beginning/150545, April 17, 2014.

[2] D.G. Chandra, M. Kathing, D.P. Kumar, A Comparative Study of IPv4 and IPv6, IEEE International Conference on

Communication Systems and Network Technologies, 286-289 (2013).

[3] IETF [RFC 1752]. The Recommendation for the IP Next Generation Protocol, January 1995.

[4] IT CONNECT, IPv6 Next Generation Internet Protocol, available online: http://www.washington.edu/itconnect/connect/uwnetworks/network-addresses/ipv6/, July 9, 2013.

[5] P. Wu, Y. Cui, J. Wu, J. Liu, C. Metz,Transition from IPv4 to IPv6: A state-of-the-Art Survey, IEEE Communications Surveys Tutorials, Vol. 15, No. 3, 1407-1424 (2013).

[6] IETF [RFC 4213]. Basic Transition Mechanisms for IPv6 Hosts and Routers, October 2005.

[7] E. Gamess, N. Morales, Implementing IPv6 at Central University of Venezuela, Proceedings of the 4th International IFIP/ACM Latin American Conference on Networking (LANC07), 43-51 (2007).

[8] H. Ning, IPv6 test-bed networks and RD in China, Proceedings of the 2004 International Symposium on Applications and the Internet Workshops (SAINT2004), 105-111 (2004).