An Overview of IPv4 To IPv6 Transition

Achyut R Kulkarni[1], Sumitha B[2]
[1, 2] Dept of Computer Science Engineering
[1, 2] Atria Institute of Technology

Abstract- *This paper investigates the primary obstructions that contrarily influence sending IPv6 in the Internet. Moreover, it presents the most recent components and conventions that permit a smooth progress to IPv6. This could be accomplished by merging the IPv6 protocol along-side with the IPv4 protocol until the IPv6 is fully deployed. The paper also presents cost-effective protocols that might lead to improve the transition process and encourage the ISPs and the end users to start using the IPv6 protocol.*

Keywords- IPv6 protocol, tunneling, translation, migrating to IPv6, IPv6 transition mechanisms.

I. INTRODUCTION

Internet Protocol version 6 (IPv6) is the most recent version of the Internet Protocol (IP), the communications protocol that provides an identification and location system for computers on networks and routes traffic across the Internet. IPv6 was developed by the Internet Engineering Task Force (IETF) to deal with the long-anticipated problem of IPv4 address exhaustion. IPv6 is intended to replace IPv4.

IETF has proposed mechanisms to enable using IPv6 alongside with IPv4 so that both protocols could communicate with each other. That to achieve a smooth transition to IPv6 and start of margining the IPv6 along-side with the IPv4.

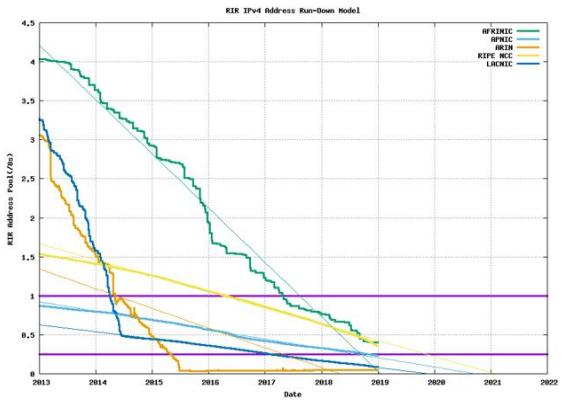
II. HISTORY

We all have seen the scientific progress in the technological field. This progress, in turn, has dramatically increased the number of internet users. Every internet user, host, and server are connected to the internet and identified by the Internet Protocol (IP) address. The commonly used IP address is the IPv4. IPv4 uses 32-bit address which provides approximately 4 Billion addresses. With the increase of the devices connected to the Internet and the Internet users IPv4 has been extremely exhausted.

The Internet Engineering Task Force (IETF) has proposed numerous answers for broaden the life of the IPv4, however these arrangements consistently will be a brief. At the point when the IPv4 is completely depleted, the ISPs will confront an issue of furnishing the web clients with new IP addresses. Additionally, utilizing the strategies to draw out the future of IPv4 which normally dependent on sharing the open IPv4 address among a few clients may cause numerous issues like firewall issues.

Unfortunately, IPv4 and IPv6 are not backward compatible with each other. That's mean IPv4 can't communicate with IPv6 and IPv6 can't communicate with IPv4. There is no flag day to the transition process from IPv4 to IPv6 for many reasons such as the portability of the infrastructure, the readiness of the ISPs, and end user. We will discuss these reasons in more details later in this paper.

III. METHODS TO CONSERVE IPv4 ADDRESS



The traditional mechanism which first used to conserve the remain public IPv4 addresses is the Network Address Translation NAT. It translates one public IPv4 address to a set of private IPv4 addresses. With the expansion of the web clients the NAT is not, at this point an adequate arrangement. There are some other incidentally arrangements have been proposed by the IETF to broaden the life of the IPv4 open locations. Which is: Large Scale NAT and Address plus Port.

A. Large Scale NAT

Large Scale NAT is a technique to conserve the availability of IPv4 addresses. Its mechanism translates the IPv4 public address in the ISP side into a private IPv4 address then it will be translated to another private IPv4 address in CPE to arrive the user after three translations. Thus, it has

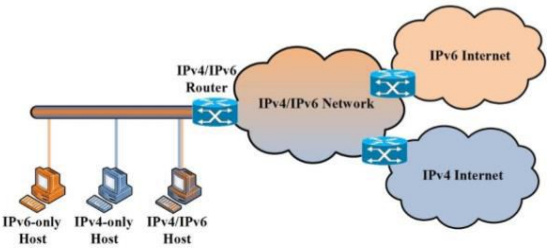
some disadvantages such as Geolocation will not work well, and the bad behaviors related to a user effect on all users who share the public IP address with that user.

B. Address Plus Port

It is a technique that increases the IPv4 addresses by multiplexing one public IPv4 address among several users using bits from the TCP/UDP headers.the intent of this method is to perceive the number of public IPv4 addresses without the need to translate it.

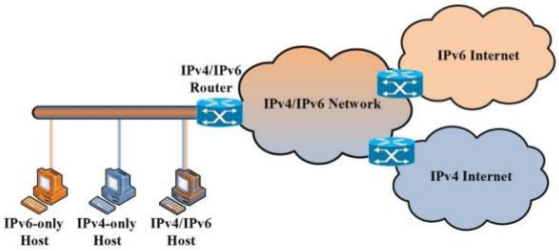
IV. BLOCK DIAGRAM

A. Dual-Stack Approach



Dual-Stack approach is the idea of implementing the IPv4 and the IPv6 protocol stacks in the dual stack devices. Also, providing the connectivity to both IPv4 and IPv6. The dual stack devices could be any device that connected to the internet (i.e. routers, infrastructure devices, and end-user devices)

B. Tunneling Approach



Tunneling approach is a mechanism that employs the existing IPv4 infrastructure to carry out the IPv6 traffic.The tunneling approach is useful when two IPv6 networks are separated with an IPv4 network. When an IPv6 packet from the first IPv6 network wants to reach the other IPv6 network, it will be encapsulated into IPv4 packets and transmitted throw the IPv4 network to its destination.

V. LIMITATIONS

1. Local Networking Changes
2. Confusion in the IP Schemes
3. Complexity in the Network Topology
4. Local Networking changes
5. Difficult to remember an IPv6 address

VI. ADVANTAGES

1. More Efficient Routing
2. More Efficient Packet Processing
3. Directed Data Flows
4. Support For New Services
5. More secure than IPv4
6. More Address space
7. Eliminate subnetting Word problem

VII. FUTURE SCOPE

IPv6 Security and Internet migration is the emerging area of research today which is being carried all over the world in multinational, corporate and government R&D organizations. In the initial chapter of this thesis we evaluated performance of IPv6 migration techniques and made an approach towards finding better technique among the existing migration techniques using the OPNET simulation environment.

Although, we only evaluated existing migration techniques, the future work in this area may be carried towards developing a better migration plan and techniques during the transition phase and evaluating it against current transition mechanisms. Focus is to be put on software side rather than upgrading existing hardware architecture which will be economical from implementation perspective. Similarly, evaluation and performance analysis of routing protocols and QoS models in IPv6 can be carried out.

One of the important aspects of implementation IPv6 is that it will remove any concern about the limitation of IP addresses. IPv6 uses 128-bit addresses, versus the 32-bit addresses used by IPv4. Compared to the total possible number of IPv4 addresses, 4.29 billion, IPv6 provides nearly 600 quadrillion addresses for every square millimeter on earth. That's 6×1023 addresses for every square meter of the earth's surface.

VIII. CONCLUSION

IPv6 and Internet Migration is the intricate convoluted problem today that demands time and large scale

investment of resources. The solution for IPv4 exhaustion is yet to be conceived by corporates as an arduous problem thereby putting themselves at risk of insufficient time and economic resources.

The major bottlenecks impeding the embracement of IPv6 is the infrastructural migration cost (software up-gradation, hardware costs, manpower training and network testing), ambivalent network performance of the new protocol and prospective security issues that might arise while deployment. Given the severity of problems in the current network scenario, IP migration process may be the only solution viable in the long run. Also IPv6 does provide substantial attributes and characteristics required by the modern day secure internet.

Though migration or transition between the two protocols is expected to take considerable amount of time, the transition mechanisms come into play for providing interoperability between the two protocols. Although, a number of transition techniques have been devised and standardized, developing an optimal one is still a hot research area and till date, no best feasible solution for transition plan has evolved.

IX. SUMMARY

The IPv4 address pool is almost exhausted. This led to the need to start the transition process to IPv6. The IETF has proposed many techniques to prolong the life expectancy of the IPv4. These solutions is considered a short term solutions. The transition to IPv6 is inevitable. The transition process relies on the ISPs to start deploying and offering the IPv6 connectivity across their access networks. The IETF has proposed many mechanisms to start the smooth transition to IPv6. These mechanisms can be categorized into three approaches: Dual-stack approach, Tunneling approach and translation approach.

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