EVALUATING IPv4 TO IPv6 TRANSITION FOR A SMALL ENTERPRISE IN NIGERIA

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Received 1 June 2017; accepted 15 July 2017

Abstract

The aim of the study is to investigate the deployment and implementation of the new generation IP that is the IPv6 in Nigeria for small companies. This is to give deep insight into the knowledge of IPv6 in general, transition methods and evaluate the ways to do transition from IPv4 network to IPv6, small companies in Nigeria required to easy migration without disrupting their business activities. In this study has investigated by using opinion Survey for us to get the resolutions on transition from IPv4 to IPv6 base on need of the company to identify company that can utilized. However, the development has through simulation deployment study and to investigate the differences between the IPv4 and IPv6 and to apply the transition to evaluate the effective transition method.

Keywords: *IPv6, IPv4, Transition, Dual Stack.*

1. Introduction

IPv4 has supported the growth of Internet to its current stage for over 20 years now. IETF started efforts to foster a successful IPv4 Protocol [1], which has been used from time. At the early stage of IPv4 when it was been originated, they used it in an environment that is more like a LAN environment i.e. closed and trusted. So no security was needed to protect the hosts and the entire network from attacks from outside. The Address Space is the total available number of addresses, which is 32 bits for IPv4. So as Internet grows this address space diminishes which created problem that in nearest future the IPv4 address space will be totally exhausted. It Lead to evolution of IPv6 that has 128 bits so as to create more space and improvement [3]. The Address Space is the total available number of addresses, which is 32 bits for IPv4. So as Internet grows this address space diminishes which created problem that in nearest future the IPv4 address space will be totally exhausted. It Lead to evolution of IPv6 that has 128 bits so as to create more space and improvement.

1.1. IPv6 Emergence

IPv6 addressed so many parts where IPv4 is deficient, which includes security part of the protocol and removing limitations that exist in IPv4. IETF started work on IPng to replace the current IPv4 that became been called IPv6; they focused on increasing the space, adding more extensions and adding more functionality during the development. This is to ensure the IPng can accommodate new features that will come with advancement coming up on the Internet.

It's expected as transition occurs from IPv4 to IPv6 they will coexist till the transition is complete for over numbers of years [4].

IPv6 is the future of the Internet that the next generation of the way the Internet will be is going to be based on. It is going to allow for more mobility of the Internet.

1.2. IPv6 Properties

IPv6 addresses are of length 128-bit and consist of binary numbers, which are represented in hexadecimals. IPSec is an inbuilt part of IPv6. Fragmentation is done only through the one sending. There is Packet flow identification that exists inside the IPv6 header using the Flow Label field. IPv6 header has no checksum field. IPv6 has no option field but has extension field available.

Address Resolution Protocol (ARP) is substituted with a task of Neighbor Discovery Protocol (NDP). Multicast Listener Discovery (MLD) messages substitutes IGMP. Broadcast messages do not exist in IPv6. A link-local scope "All nodes" multicast IPv6 address (FF02::1) is for broadcast alike function. In IPv6 Auto-configuration of addresses exist in which makes clients addressing very easy. The main setback that comes with IPv4 is that it has shortage of addressing capability. IPv6 abolished this setback through the provision of addressing capability of 128-bits. So therefore, it's very unlikely to exhaust IPv6 addresses capacity in an anticipated coming time. This is an enhancement in IPv6; which helps resolve the problem of addressing size capacity that exists in IPv4.

1.3. IP Relevance Overview

IP offers the resources for essential communication, which occurs between devices connected to the Internet. Internet is a packet-switched network that all information sending is achieved by transmitting little messages called packets that is then routed and transported to the definitive endpoint exclusively. Real information contains, the IP packet comprises messages about who sends and who receives packets. The source and destination of packet are defined with the IP addresses. IP address spots the uniqueness and position of a device in the network which hence makes it conceivable to route and convey the packet to the correct endpoint.

Deployment of current networks to IPv6 in the next years is a must Due to IPv4 running out. We need to understand what is happening as regards to change with IPv6 and the type of advantages it brings with it to the universe. Organizations all around need to be prepared for this transformation as well as the OS, Software and Applications that will be in use. Enhancements were done on the IPv4 that includes: Increase of the address space, Automatic configuration of devices for simpler management, inbuilt security using IPsec.

Nigeria compared to most developed countries has not taken advantage of the growth in technology when it comes to the IP. Internet Assigned Numbers Authority (IANA) allocated the concluding two blocks of addresses to the Asia Pacific Network Information Centre (APNIC) [1, 2]. Now it's known that the concluding IPv4 prefixes are now assigned both in Europe and in Asia, transition becomes of great importance. As at 31st January 2011, the collection of unused IPv4 addresses officially ran out [1].

Transition to IPv6 becomes a necessity when the IPv4 32-bit IP address space gets exhausted. IPv4 became insufficient, as huge amount of gadgets needs its own one or more distinctive IP address allocated to it. Several gaps and suggestions have been proposed for achieving transition of IPv6, but none of them have been implemented in Nigeria system. Therefore the research brings about the need for an effective way to transit to accommodate IPv6 in current existing network systems in an organization.

WLAN mobile networks, the integration of WLAN and mobile IPv6 was realized [12, 13] by IPv6 in WLAN could be increased in the number of users accessing the Internet via WLAN. Next generation heterogeneous cellular networks became significant and challenging domain for wireless mobile communication over the internet [14].

1.4. significant study

This study is significant in the sense it gives a better comprehension of IPv6 deployment and general understanding of the protocol, its given deployment of IPv4, and IPv6 as a case study hence be able to provide best answer to the research. Furthermore we are able to evaluate the most applicable methods to transit the organization current IPv4 network to IPv6 [5].

Transition to IPv6 related seems largely unattainable in developing Nations due to a host of factors. The IT Infrastructure system in most developing nations is saddled with high cost especially if the equipment in use needs to be completely swapped out. Urgent need to meaningfully do a transition to IPv6 and reliable means to do it is a key priority to the IT system in developing nations as the qualities of networks depends majorly on the timely acquisition, processing and without disrupting business activities. This study gives in-depth knowledge of existing system and proposes best way to implement the new technology.

IPv6 is important because the amount of assignable IP addresses could be generate [6], the IPv6 used 128 bits which is longer than IPv4, the IPv6 performance after the migration mechanism from IPv4 to IPv6 its given high performance which are double-stack protocol, ISATAP tunnelling and 6to4 tunnelling technique [7], IPv4 has limitation of building block of the Internet [8], The solution is IPv6, which addresses inherent problems due to increase overhead in IPv6 and its interaction with the operating system [9], IPsec in a IPv6 mobility environment is setup from scratch after handover time in mobile networks[10],

IPv6 adoption is growing significantly in the internet the adoption of the a website operator [11],

2. Methodology

A pilot study was carried out before the actual study, data collected and statistical techniques were used for the analysis of data. The author made use of the quantitative approach for this study. Research instrument is the questionnaires, which provided respondents with flexibility that allows the best chance of uncovering real important information regarding the professional technical perspective towards the deployment of the IPv6.

Justification is by Rosenbaum (2007); who stated that the act of asking questions is one of the best ways of gaining new research data. Questionnaires are used in research as tools for acquiring opinion of users about predefined questions (Owoseni & Imhanyehor, 2011).

Since it is often difficult to find the right way of communicating with users during the process of deployment of new system.

This study made use of descriptive statistics using a simple percentage followed by factor analysis to test the construct and content validity of the scale of measurement employed in the discussion on finding answers to the research questions.

2.1. Population

Population is defined as the group out of which a researcher selects a sample randomly (Tabachnick & Fidell, 2001). The population in this study refers to "professional who will deploy and make use of the IPv6 deployed for improving their business and online presence."

The total population involved in this study was 100 respondents. The target populations consisted of the

professionals, clients and organizations to use IPv6 deployed in Nigeria. This group was chosen because the aim of this research was to find ways of deploying IPv6 effectively.

2.2. Sampling

Sampling is defined as taking a part of a population and using them to represent the whole population (Byrne, 2002). The sample size for this study was 80 chosen according to (Sekaran Table 2007). This research work likewise involved surveying of a particular population and as a result, the author made use of purposive sampling whereby participants who did not meet the criteria were rejected and from there was able to select 81 respondents only for the needed use.

This sampling technique allows the studying of a specific group of people and eliminates those who do not belong to the group. The author made use of 10 professionals within a company for the pilot study to test the questionnaire before the actual survey.

Table 1. dynamic routing protocol in IPv4 & IPv6

Dynamic Routing Protocol	**IPv4**	**IPv6**
IGP	RIPv2 IS-IS OSPFv2 EIGRP	RIPng IS-IS for IPv6 OSPFv3 EIGRP for IPv6
EGP	BGP	MP-BGP4

DIFFERENCE BETWEEN IPv4 and IPv6

IPv4	IPv6
1) IPv4 addresses are of length 32-bit.	IPv6 addresses are of length 128-bit.
2) IPv4 addresses consist of binary numbers denoted in decimals.	IPv6 addresses consist of binary numbers represented in hexadecimals.
3) IPSec support is optional in IPv4	IPSec is an inbuilt part of IPv6
4) Fragmentation is through the one sending and forwarding routers.	Fragmentation is through the one sending only.
5) There is no packet flow identification.	There is Packet flow identification exists inside the IPv6 header using the Flow Label field.
6) IPv4 header has Checksum field	IPv6 header has no checksum field
7) IPv4 header has Options fields	IPv6 has no option field but has extension field available.
8) Address Resolution Protocol (ARP) is to map IPv4 addresses to MAC addresses exist.	Address Resolution Protocol (ARP) is substituted with a task of Neighbor Discovery Protocol (NDP).

3. Results

In the figures as shown below, describe the result of deploy IPv6 in small companies in Nigeria.

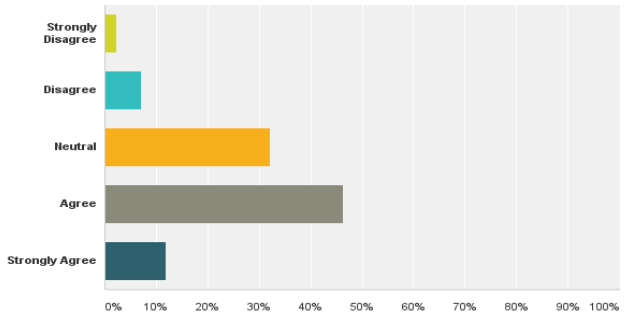

Fig 1: You have plans to deploy IPv6 services?

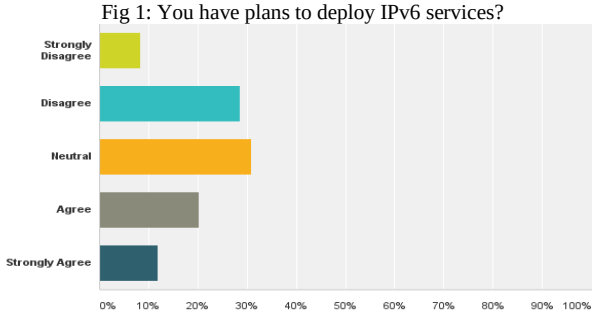

Fig 2: You are trained for the new IPv6 technology.

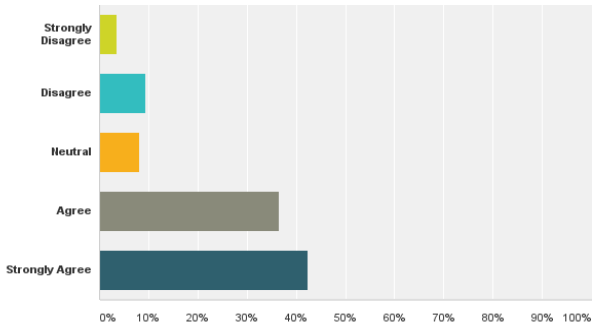

Fig 3: You know the difference between IPv4 and IPv6?

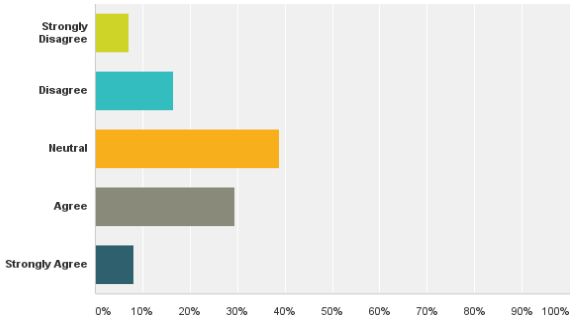

Fig.4: You think you will run out of public IPv4 address Space in your deployed networks.

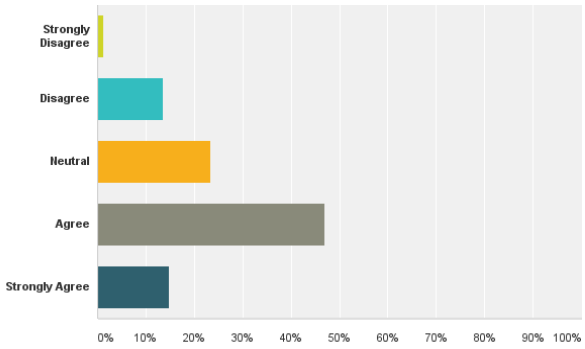

Fig 5: Your existing devices on your current network are IPv6 compliant.

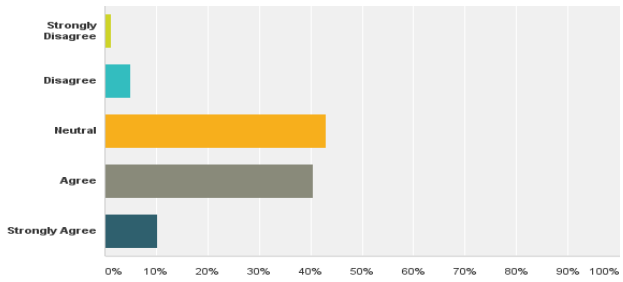

Fig 6: You get support from ISP to help in transition plans and process.

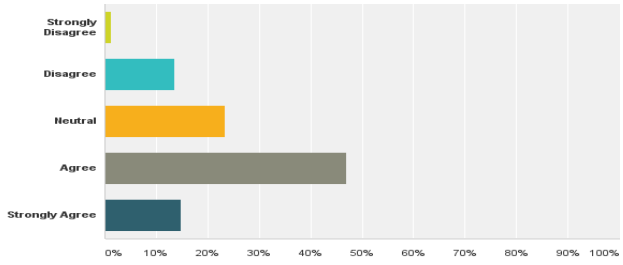

Fig 7: Your existing devices on your current network are IPv6 compliant.

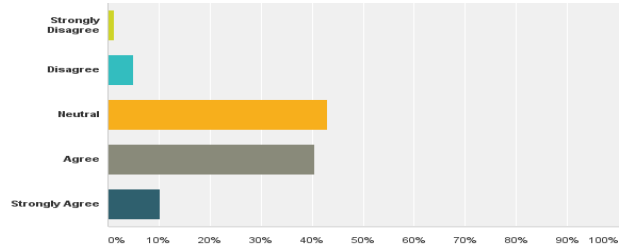

Fig 8: You get support from ISP to help in transition plans and process.

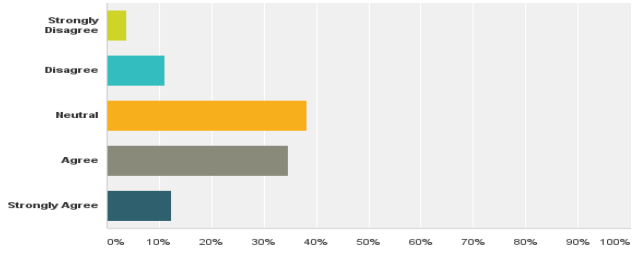

Fig 9: If required to change your hardware for transition from IPv4 to IPv6, they are expensive to change the hardware.

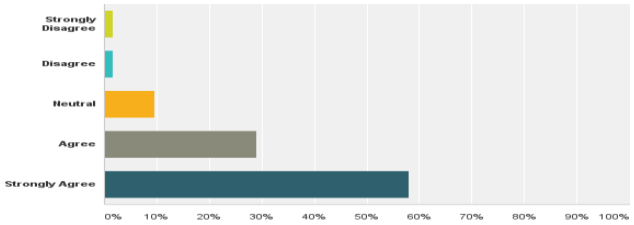

Fig 10: You highly concerned with the security of your network.

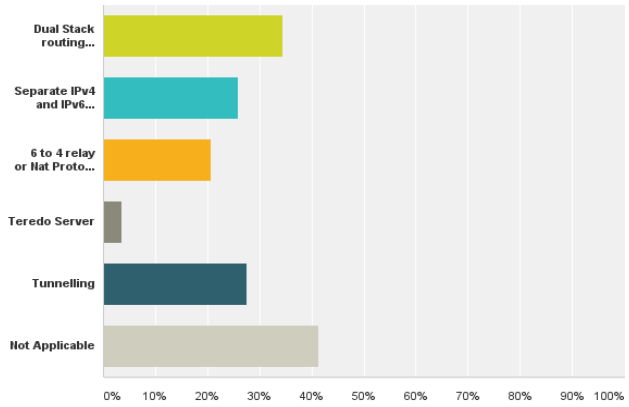

Fig 11: Do you think using IPv6 makes your network faster and routing more efficient?

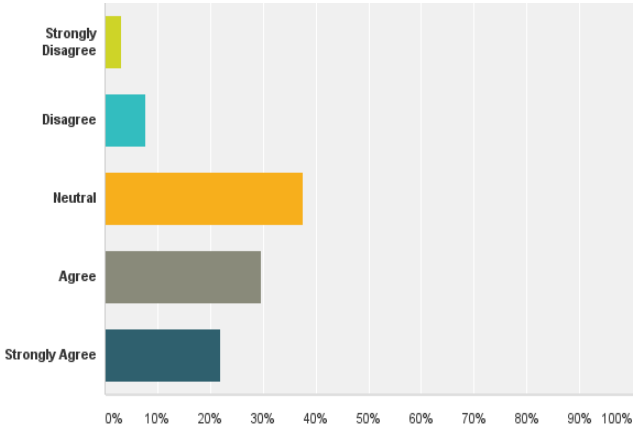

Fig 12: Do you think using IPv6 makes your network faster and routing more efficient?

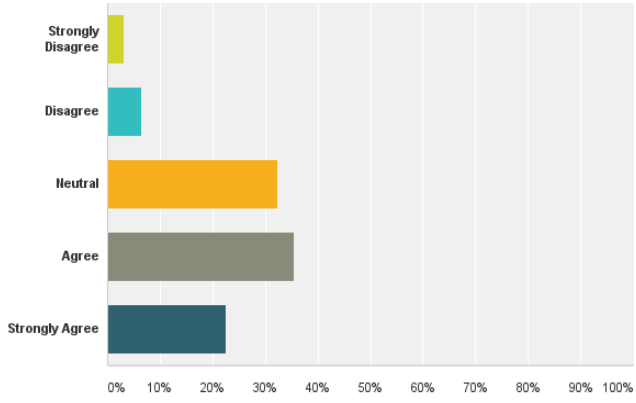

Fig 13: IPv6 gives you the prospect of rearrange your entire topology.

4. Conclusions

After the research is completed, the paper focused on how able to know the following: Reasons companies are not yet migrated. What these companies need to do for easy migration without disrupting their business activities.

For Migration to occur successfully in a business organization, the best way without disrupting the day-to-day activities is gradual migration, by running IPv4 and IPv6 side by side on a network. Then as time goes on when migration is fully done, the IPv4 is much unplugged from their system. This Process is Dual Stacking, I.E. Running the two Internet protocol side by side. Therefore, you will run a routing protocol for IPv4 and a routing protocol for IPv6 when having a dual stack.

However, most business management executives will prefer the use of this dual stack if its required to adopt the transitioning. Otherwise, the incompatibility of IPv4 and IPv6 is due to the fact, which would be to enforce the deployment of IPv6, so the IPv4 will totally phased out. To give maximize advantages that comes with the IPv6. to stay using it for a very Long time because the address space feels inexhaustible.

5. Future Research

The future research shows that the into penetration test of security of deployed IPv6 and comparing it with IPv4 to see how advanced it is to know the area of security improvement needed. Cloud Networking and also the integration of cloud system as servers while still maintaining the use of IPv6 where necessary.

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