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NETWORK MIGRATION AND PERFORMANCE ANALYSIS OF IPv4 AND IPv6

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Abstract

To take the place of IPv4 (Internet Protocol Version Four) a new version of the protocol introduced and that is called by Internet Protocol Version Six, it is the next generation designed. The presently important tasks, while taking into consideration performance concerns are migration process to IPv6, choosing most advantageous IPv6 transition mechanisms, interoperation of IPv4 and IPv6 networks. In this Research paper IPv6 characteristics and a tactics will evaluate and performance measurements to simplify migration and Optimization concerns for IPv6 networks.In this Research paper, it will be tried to present a groundwork examination of IPv6 in Network migration and performance analysis as compare to IPv4 in the network environments, in which determine that network migration process is a very essential footstep in shaping how the communication will occur and will support with or detract from the enforcement of IPv6 policies. This research will contain two main parts: a performance comparison of IPV6 and IPv4 in the internet and various types of network topologies, how network migration process can be segregate or the methodology of the network migration will given on the basis of research. After that on the basis of this, a tool can be developing for the network migration process.

Keywords: Internet Protocol Version Four(IPv4), Internet Protocol Version Six(IPv6), Router-to-Router,Tunneling.

Introduction

The population of the earth not reached 4.5 billion in 1977. ARPANET is the first network by which one hundred and eleven interconnected computing machines make up the connection. The population of the earth reached 6.6 billion in 2008 just after thirty years. Earth's population hits the highest point at 6.6 billion and the Internet. While in conflict about the duration range of existing space address of IPv4 and range address of the IPv4 is becoming limited in the future because with passage of time the users of internet growing day by day over the world, the community of internet forcefully chases a gigantic convergence of communication technologies (video, audio, data, and voice) over IP. Now a day Information movement and sharing is the game, and content can be called as king. So up gradation of the internet is much crucial to maintain enlargement as well as growth of upcoming future, to communicate all the devices and modules of the new global financial system, Will IPv6 offer the fire to oil the enlargement? Before debating the professional and convict of the new IP version.

Every function perform different task in the Bluetooth and other circumstances during the network traffic pass over dissimilar devices. When Bandwidth utilization increase then QOS has to face different dangerous problems (Wah-chun et al., 2003, Jiann-Liang et al., 2003).

Further more, the functionality, implementation, execution and working of IPv6 is examined in the research. To understand the nature of IPv6, I focused more on the architecture and network migration procedure of IPv6 in the networks domain. Keeping all these aspects in mind, these research thesis efforts to present a matter-of-fact evaluation of IPv6, at the same time making methodology of migration and also studied various chooses issues that connected with the migration procedure in the system. This methodology will develop in sort to assist the migratory steps of the system to examine and shorten migration process in the network as well over the internet.

My all conduct experiment was included on the base of two routers and two terminals. The NGtrans (Next Generation Transition Working Group) of IETF has suggested numerous transitions methods to allow the faultless mixing of IPv6 facilities and services into present Networks. His research mostly addresses the various tunneling transition mechanisms performance used in dissimilar networks and environments (K.Sankaranarayanan and D.Shalini Punithavathani., 2009).

Some main purpose and aims of the thesis are to calculate the performance of IPv4 and IPv6 in the Window environments as well as in the Linux platform and also calculated the transition mechanism performance old protocol version 4 to IPv6. Exact aims are:

i. To examine the IPv4 and IPv6 performance in platforms of Windows on same hardware;

ii. Secondly to nearby the dissimilar types of conversion from IPv4 to IPv6 protocol stacks.

There exist several reasons to performing this research in the field of protocols. First of all, the Department of Defense (DoD) has committed itself to full deployment and use of Internet Protocol version six (IPv6 by the 2008 fiscal year . Secondly, the internet now a days its beginning stages the transaction to IPv6. Finally, IPv6 has many new features and potential to improve IP services in various fields and applications. A clear determination of this potential is necessary before transitioning systems to IPv6.

One more objective of the study is

i. The tactic/methodology will be develop and make simpler the migration process to help in the set of connections and network migrator.

ii. My aims of this research is to carry out neutral presentation assessment among these two protocol versions that are much discussed over the world and after that experiments to purpose network migration methodology for transaction process, and also, evaluate performance on Window on the same hardware and under one and the same situations and setting.

IPv6 are based and working together like on module over the internet and in larger network environments under dissimilar operating system. The big advantages that he calculated in his research, communication become more secure and safe due to the surety feature of the version four that it have in his architecture (Carolyn Duffy Marsan., 2010).

Materials and methods

During the research work, the three types tunneling are utilized in the experiments of the networks. The basic benefit of tunneling in the scenario is helping to understand the transition in the network from IPv4 to IPv6. It is utilized because most experiments of the research were based on the tunneling procedures. Therefore the concept of tunneling was very important to understand before the results discussion. The tunneling configuration that is used for IPv6/IPv4 nodes over an IPv4 infrastructure is following.

- Tunneling of Router-to-Router
- Tunneling of Host-to-Host

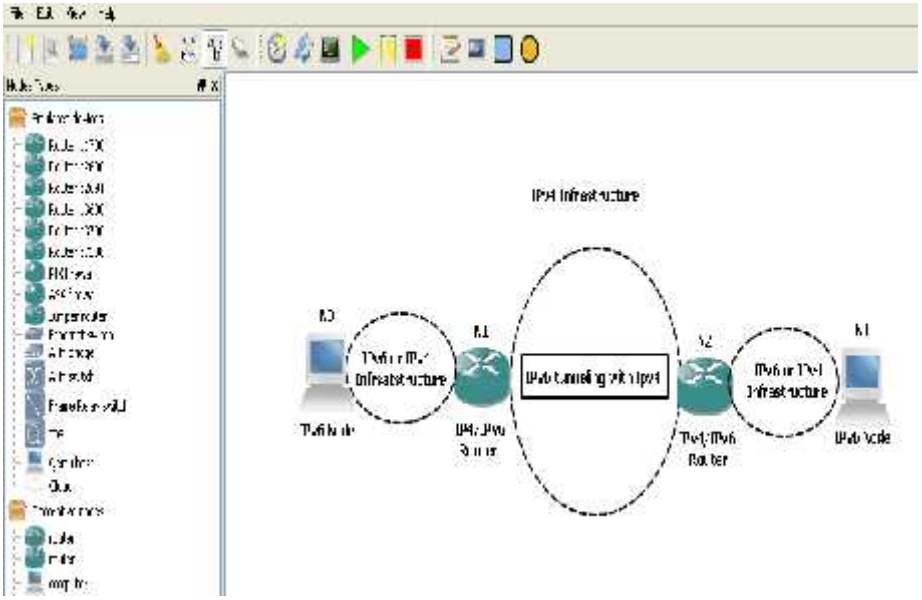
1. Tunneling of Router-to-Router

In this type of tunneling configuration, the basic two routers of the IPv6/IPv4 attached to IPv4 or IPv6 architecture directly over the infrastructure of IPv4. To span a logical link in the path among the destination and source, the tunnel endpoints is utilized for procedure.

Whenever the packets have to pass through IPv6/IPv4 router, there should be a tunnel interface to corresponding to the IPv6 traffic over IPv4 tunnel and also define routes so as to utilize the tunnel border. The following diagram is designed in the GNS3 software.

In GNS3 and Opnet IT Grue, many simulations are tested and drawn many diagrams to get the desired objectives.

Fig.1



Above diagram is described that in this scenario the data has to travel from the one side node of IPv6 to other side node of IPv6 that tunnels crossways an infrastructure of IPv4 organization to reach the IPv6 Internet. The IPv6-only has the two routing domains and using those domain tunnel crossways the IPv4 Internet. When one node of IPv6 is send on the network that packets has to travel through the 6to4 router and tunnels crossways the Protocol version four Internet to arrive at another 6to4 router communicate router.

2. Tunneling of Router-to-Host or Host-to- Router.

This scenario has two parts,

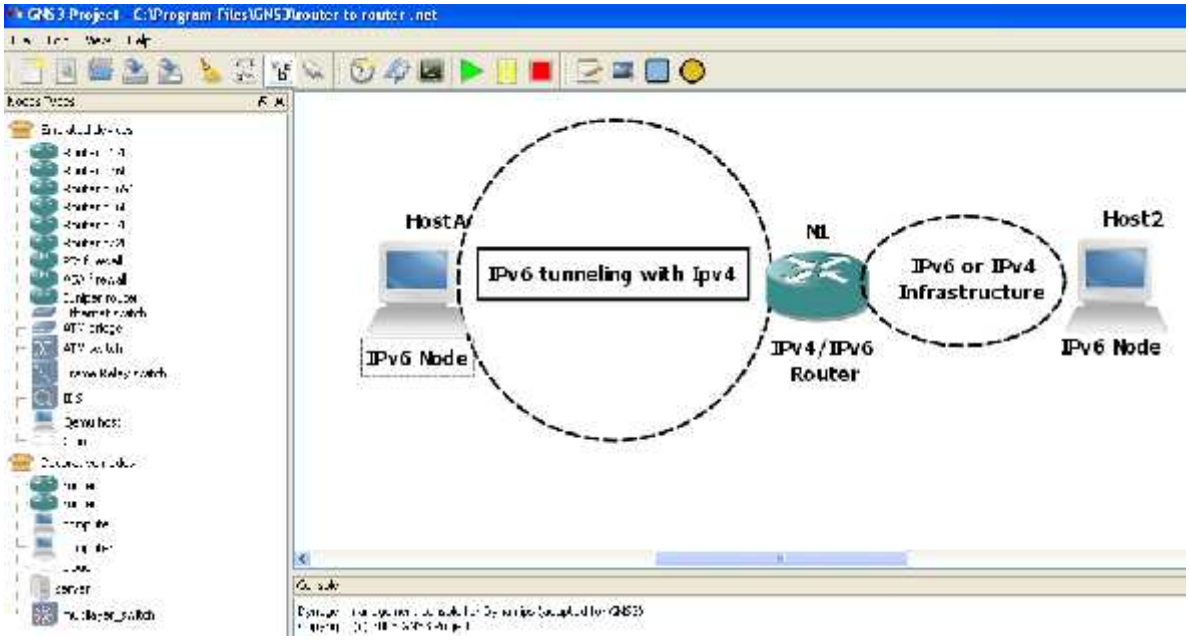
- Host-to-Router.

- Router-to-Host.

In the first scenario the tunneling of host-to-router pattern, a node of IPv6 or IPv4 that exist within an infrastructure or organization of IPv4 generate tunnel from the IPv6 over IPv4 to reach the destination route of an IPv6/IPv4. Every time the endpoints of tunnel utilize to span the first path section between the destination and source nodes. The IPv6/IPv4 behaves like a single hop the IPv6 above IPv4 tunnel stuck between the IPv6/IPv4 node and the IPv6/IPv4 router.

Below diagram briefly showing tunneling of the host-to-router (for data packets pass from Node A to Node B) and in the router-to-host (for data roaming from Node B to Node A).

Fig.2



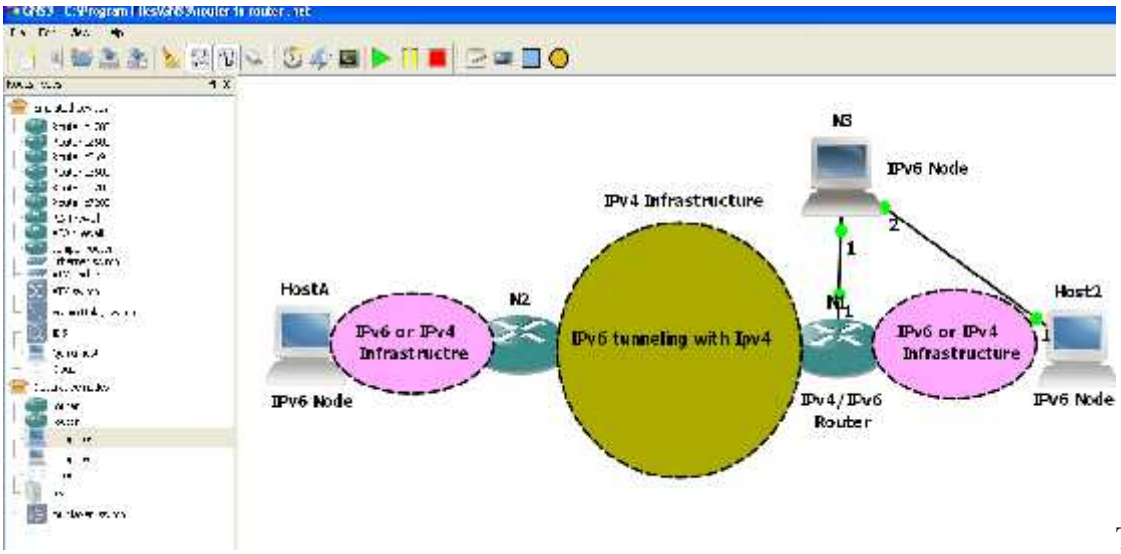
The tunneling configuration of host-to-host is that in an IPv4 infrastructure where an IPv6/IPv4 node resides within the infrastructure generates the tunnel of an IPv6 over IPv4 to arrive at the side of another IPv6/IPv4 node that existing within the similar infrastructure of IPv4. The endpoints of tunnel span the complete pathway between the destination nodes and source. The tunnel of IPv6 above IPv4 performs as a single hop among the IPv6/IPv4 nodes. Every time during communication an interface representing on every IPv6/IPv4 node, interface created the tunnel of IPv6 over IPv4. It worked as data sending from the based interface and then travel through the optional route and after that reach to the destination node or address.

3. Setup For Experiment.

In these experiments, there was configured a set up of hardware and software to gain the required results. In the experiments two routers of dual stack internet protocol version 4 and 6 (IPv4/IPv6) worked, also two routers of the Cisco organization and model is 2811. In experiments, two matching and similar workstations were used. It attached those workstations in a straight line to the routers and was organized as separate systems and networks. It configured every router as they carried two networks. All the systems in the workstations of the networks were installed with Windows 2003 Server, Window 2007 and version 4 of Red Hat Linux. The Window 2007 has the both protocol stack of IPv4 and Ipv6 and standard protocol of IPv4 stack is used by Windows server 2003.

In the following diagram, the over all network design is described in one diagram. All types of the tunneling that are utilized during migration process is shown in the diagram. The router-to-router and host-to-host are designed in the diagram that is the following.

Fig.3



T

The configurations of the network for testing are given in next chapters, in which It is written about the appearance, result discussion and arguments of the experimental effect originate. At first in the experiments, there was installed the needed software on the network that including of at least two PCs associated to two separate routers with other essential accessories and equipments. All these experiments took in the Opnet IT Guru software tool because it could not afford such expensive routers and modules in the lab and no one also sponsor to me for purchasing and establishing the lab in real scenario. The experiments carried out by using the Opnet Guru. In experiments, first of all it tried to calculate the bandwidth utilization performance. Packets were broadcasted from one engine to another machine for both platforms at a variety of data mass that almost 61.44 MB. To calculate the round trip time

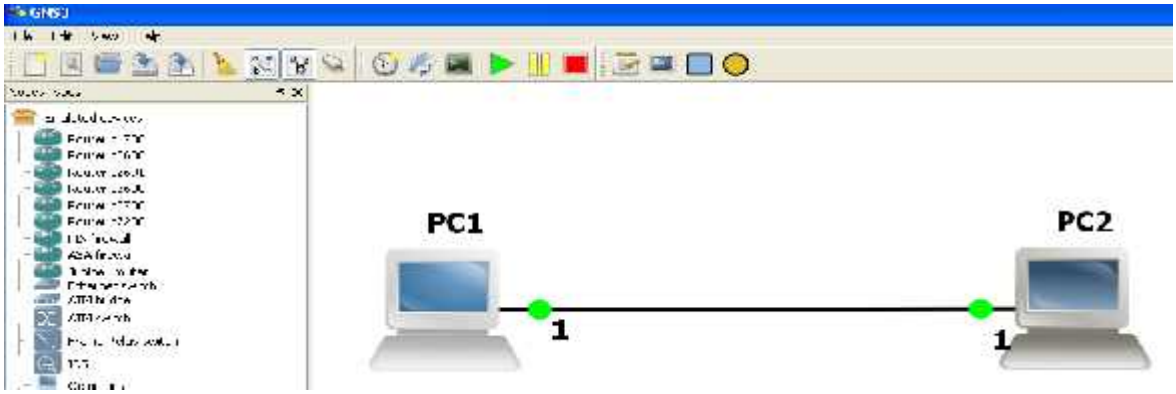
(latency) computation, the experiments were replicated until the desired result not gained. The tests and experiments for repeated to compute the exact results of the round trip time latency and bandwidth utilization during the data traveling from one station to another station through point-to-point and router-to-router within the networks of various workstation.

Results

To calculate the performance of the IPv4 and Ipv6 protocols, first of all consideration has been made over bandwidth utilization and round trip time performance metrics. Different procedures have been adopted to calculate the performance of these protocols stack. All These experiments conducted within the 60 seconds intervals and the sizes of the data were concerning 61.44 MB. Every test performs many times so that gets reliable outcomes.

In point-to-point connection oriented test where more then two computers are linked from end to end directly by utilizing Unshielded Twisted Pair Ethernet cable.

Fig.4



Performance Results in Point-to-Point

In point-to-point connection oriented test where more then two computers are linked from end to end directly by utilizing Unshielded Twisted Pair Ethernet cable. The hardware combination was declared and written in the previous chapter. On the both machine it installed operating systems and IPv4 and IPv6 protocols stack. The IP has been configured addresses by using the Opnet tools and in GNS3.

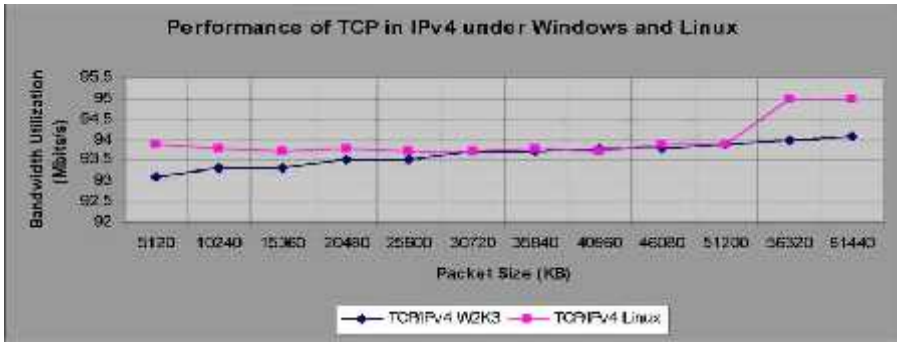
The Utilization of Bandwidth in Point-to-Point

After performing the experiments, the diagram explains that both working process of both protocol stack IPv4 and IPv6 under the platform of Window is very narrowly and closely. The diagram shows that the IPv6 gains 1% to 2% extra then IPv4 in such kind of data size or in the bigger data sizes. The diagram described that the performance of IPv4 under the platform of Window is a little bit improved than the other protocols of IPv6. In this diagram,

the blue line shows the working of TCP/IPv6 in the environments of Window and pink line points out the working performance of the TCP/IPv6 under the platform of the Linux system.

In the below diagram it is clearly visible that at first the performance of IPv4 working is better under the Linux environments as comparer to IPv4 under the environments of Window and when working of the IPv4 reach to the middle both come to very near. Lastly according to this diagram, again Linux gets almost 2% extra bandwidth. In these experiments I locate small performance dissimilarities between the both environments with same protocol stack of IPv4.

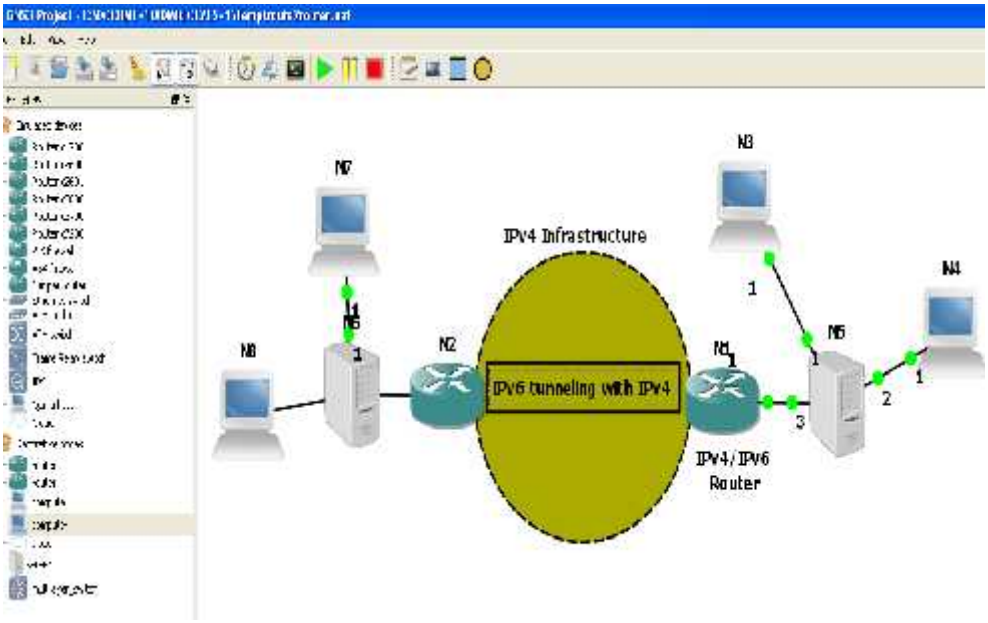
Fig.5



Performance Results In Router-To-Router.

After performing the experiments of Point-to-Point, now took experiments on the basis of router-to-router setup. In these experiments, configured two routers that are attached to each other directly and one computer attached with each router through an unshielded twisted pair Ethernet cable. After configuring this router I installed the operating system on the machine and both IPv4 and Ipv6 protocols on the router as well as machine so that the result should gained. The IP has been given to the each machine with different subnet mask in the IPv4 and also configured IP scheme for the IPv6 for the WAN. It also described in my experiments with the help of diagram so that it can be understand easily. In it each machines attached directly to the router and each routers attached with the PC. It is good scenario to understand the performance of both protocols IPv4 and IPv6. The below diagram shows the connection between the routers and the machines

Fig.6

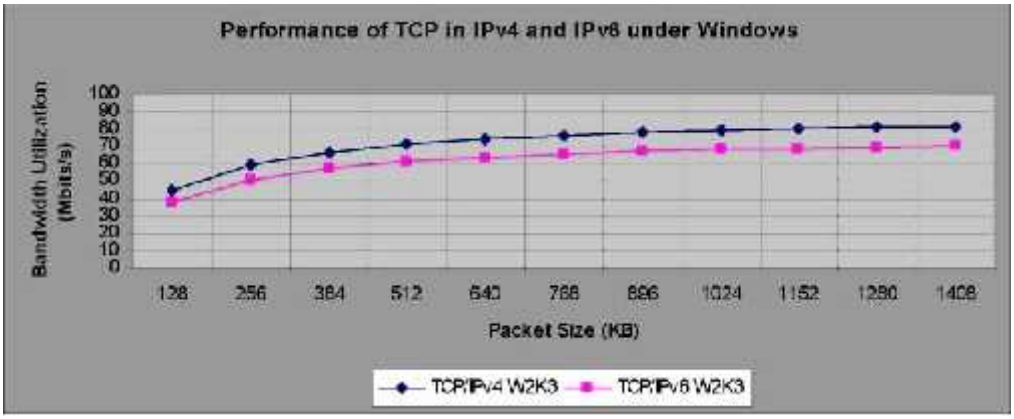


In this diagram Router-to-Router connection is established, and two PC are used in this test, these PC are attached with the router through the sunshield twisted pair cables directly. The both routers also attached to each other with the help of unshielded twisted pair cable directly. If system A has to communicate with the system B then it utilized the router that provided them route for their data. The following diagram also shows the connectivity.

Results of Bandwidth Utilization.

The below diagram 4.10 shows, the both protocols are very close to each other in platform of Window. The IPv4 is represented with blue line and the IPv6 is represented with the pink line so that the performance of both protocols is not mixed up. But in this diagram the performance are slightly more as compare to Poitn-toPoint connection that described in the above diagram. In it IPv6 gains almost 14 % more as compare to IPv4 but in Point-to-Point connection IPv6 gains only 1 to 2% more in this kind of data size or packets.

Fig.7

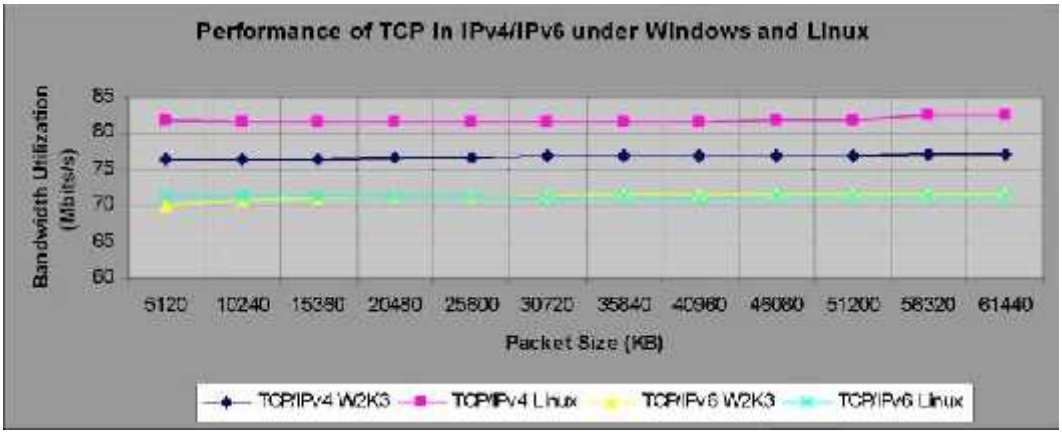


This result demonstrates the performance of IPv4 and Ipv6 by utilizing bandwidth. The output of performance shown in the shape of graph that make easy to understand the scenario. The IPv4 is better then IPv6 according to the test output. In it IPv6 got 19 % more overhead then the IPv4 and it is increased in router-to-router experiments because in Point-to-Point experiments it was only 3% more over headed then the IPv4.

Under Window and Linux results.

This diagram briefly described an image of generally presentation of IPv4 and IPv6 beneath Linux and Windows. While, IPv6 performs not as good as in comparison to IPv4 in the platforms of both Window and Linux due to overhead constraint. One more things, the IPv4 also not so good under the both platform and its nature of architecture and structures where they utilized.

Fig.8



In this diagram 4.11 the blue line show the performance of the IPv4 in Window, the pink show IPv4 in Linux, The yellow shoe the performance of IPv6 in Window and the last is shown the performance of the IPv6 in the Linux. This diagram show that the both protocols are very close to each other in performance by utilization of bandwidth. In it Pv6 almost 7% more acquires in the area of smaller data size. One more result is shown in the below diagram 4.12. The diagram 4.12 shows the result of bandwidth utilization of UDP performance of the IPv4 and IPv6.

Conclusion

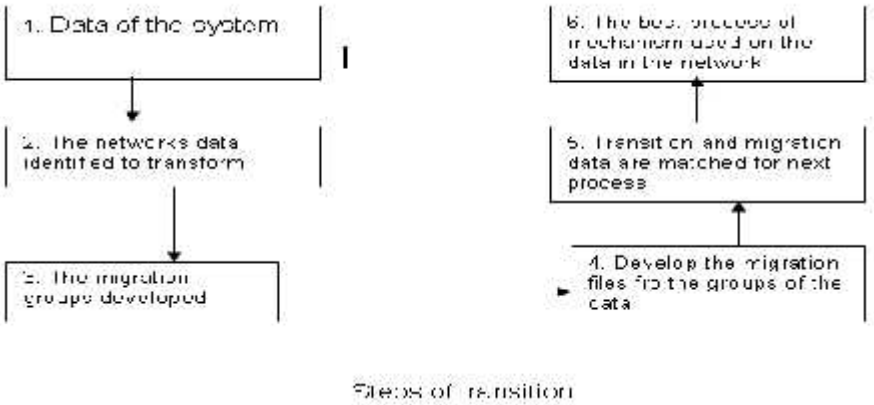
After performing various experiments and analyzing all results, it comes to know that over all the performance of the router-to-router tunneling is superior then the host-to-host tunneling. The router devices support the architecture of IPv6 and have all capabilities to facilitate the communication over the network. In all tests the It notice that host-to-host gains

more head then the router-to-router tunneling in the both platform Windows and the Linux. Linux performs better then the Windows platform. One main reason of better performance of the router is that it works on the layer3 of OSI N/W model and supports all the features of routing.

Methodology

It found that the router-to-router tunneling is better the straight communication of the IPv6 router-to-router tunneling as results described in the above diagram 5.9. The Protocol Version Six router-to-router direct tunneling is much poor as compared to the router-to-router tunneling of the IPv4/IPv6. The following steps purposed in the methodology that is more necessary for the migration process in the environments of IPv4 to IPv6; on the basis of this the process could be easily moved.

Fig.9



Steps of transition

On the basis of these migration steps, a tool can be developed in future. It also performed the experiments are performed in the platform of Linux through host-to-host and router-to-router tunneling, the packet size that utilized is 5120kb to 61440kb values as described in this chapter and also show in the result diagram that place in below. In this Linux operating system, the performance of the router2router is again better as compare to the host2host tunneling same as in Window in this experiment. The host tunneling gains the 15% extra over head as compare to the router-to-router tunneling. The router-to-router tunneling is also better then the direct IPv6 router-to-router tunneling infrastructure. In this case, again the direct version router-to-router tunneling of IPv6 is poor as compare to the router-to-router tunneling.

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