IJCSEC- International Journal of Computer Science and Engineering Communications.
Vol.3, Issue 2, 2015, Page.787-792, ISSN: 2347–8586

# Ensuring interoperability between IPv6 and IPv4 Networks and Analysis on Quality in Network

**Nithya O [1], Venkatesh Kumar U[2]**

[1]PG Scholar, [2] Assistant Professor
Department of ECE,
Sri Krishna College of Technology, Coimbatore, India

***ABSTRACT***

When any organization wants to implement IPv6 network in their service area, it is not possible to implement all of a sudden in an entire area. It needs slowly migration from IPv4 to IPv6 without much affecting the Service. The Dual stack deployment using NAT and tunneling concept is proposed for this migration. While IPv6 deployment from the inside of the network leading to the edges with success, the transition remains an issue today. To fill this gap, we propose to provide the supporting tools and algorithms to enable this transition to become automatic and enable security features which is inbuilt with protocol. Based on a model of an IPv4 network, we design and implement ipv6 network and it supports auto configuration to the host and security is inbuilt with protocol.

***Keywords-****IPV4, IPV6, Routing, dual stack, NAT*

## I. INTRODUCTION

Over the last decade, IPv6 has established itself as the most mature network protocol for the future Internet. Its recent deployment in core networks of operators, its availability to end customers of multiple ISPs together with the availability of native access to large services like Google assess the increasing penetration of IPv6.While its deployment from the inside of the network leading to the edges is successful, the transition remains an issue today for many enterprises which see it as a tedious and error prone task for network administrators. To fill this gap, and to present the necessary algorithms and provide the supporting tools to enable this transition to become automatic. Based on a model of an IPv4 network, we design and implementation of ipv6 network and it supports auto configuration to the host and security is inbuilt with protocol. Enable the IPv6 protocol which enable the stateless auto configuration Also enable security features which is in built with IPv6 protocol.**I**Pv4 is an abbreviation of "Internet Protocol Version Four". It is also known as RFC 719. IPv4 was the fourth generation of Internet Protocol and was also the first version to be widely deployed. The Internet Protocol sits on the third layer of the OSI network model. This is also known as the network layer. The network layer is the first layer in the OSI which is software based.

The network layer or third layer of the OSI model deals with finding, routing and switching for end to end communications that are not directly connected to each other using a one physical link e.g. an Ethernet cable. The security features is not in built with IPv4, ISP uses ACL, fire wall or check point which enables the security in IPv4 network. The Internet Protocol is the most dominant protocol on the Internet today and usually runs on upper layer protocols such as the Transmission Control Protocol (TCP) and the User Datagram Protocol (UDP). IP networking is an example of connectionless networking service (CLNS).IPv4 address consists of 32 bits, 4 bytes that are a combination between zero and ones. The address consists of two parts, the network part and the host address part. Depending on which class the IP.

## II. RELATED WORK

Yehia et al.[1] have proposed the various routing protocols and evaluated them based on some performance metrics. This evaluation is performed theoretically and by using simulation. In [2] sunjian and fang ,have introduced the OSPF protocol for IPV6 which is also referred as OSPFv3 and they first introduced the knowledge of IPV6 and then implemented the OSPF over IPV6.In [3] horenoor,has introduced the implementation decision to be made when the choice is available between protocols that involve distance vector or link state or the combination of both. In this paper, it is shown that OSPF definitely performs better compared to RIP in terms of network convergence, latency and throughput. In [4] Bahk.s. & M. E1 Zarki describes about the various dynamic multipath routing algorithm for networks. In [5] Joseph davies has given detailed information for understanding IPV6 and its routing protocols. In [6,7,8]the authors have made the case studies in real time about use of the dynamic routing protocols. In [9,10] we have the tutorial for simulating the wide area network using GNS-3.

## III. Addressing format of IPv4.

Internet Protocol version 4(IPv4) is the fourth revision in the development of internet protocol (IP) and the first version of the protocol to be widely deployed. Ipv4 is still by far the most widely deployed internet layer protocol. It is a connectionless protocol for use on packet-switched link layer networks (Ethernet). It does not operate on best effort delivery model which does not guarantee delivery, nor does it assure proper sequencing or avoidance of duplicate delivery. These aspects including data integrity are addressed by an upper layer transport protocol such as the TCP. IPv4 uses 32 bit (4 byte) addresses which limits the address space to 4294967296(2^32) addresses. This reduces the number of addresses that may be allocated for routing on the public internet. As addresses are assigned to end users, an IPv4 address belongs to the amount of network and host bytes differ address has been developing. Network addressing changes by class full network design, classless inter-domain routing, and network address translation (NAT) have contributed to delay significantly the inevitable exhaustion which occurred on February 3 2011 when IANA allocated the last five blocks to the five regional internet registries (RIRs).This limitation stimulated the development of IPv6.

## IV. ADDRESSING FORMAT OF IPV6.

IPv6 or Internet Protocol Version 6 is the next generation protocol for the Internet. It's designed to provide several advantages over current Internet ProtocolVersion4 (IPv4).Both IPv6 and IPv4 define network layer protocol i.e., how data is sent from one computer to another computer over packet-switched networks such as the Internet. It is therefore also called the Next Generation Internet Protocol .Although IPv6 is the successor of IPv4, both protocol versions will continue to be data-oriented protocols for use in the Internet in the fourth coming years .IPv6 addresses the main problem of IPv4, that is, the exhaustion of addresses to connect computers or host in a packet-switched network. IPv6 has a very large address space and consists of 128 bits as compared to 32 bits in IPv4. Therefore, it is now possible to support 2^128 unique IP addresses, a substantial increase in number of computers that can be addressed with the help of IPv6 addressing scheme. In addition, this addressing scheme will also eliminate the need of NAT (network address translation) that causes several networking problems.

IPv6 addresses are denoted by eight groups of hexadecimal quartets separated by colons I address may be reduced to a single zero or altogether omitted. Therefore, the following IPv6 addresses are similar and equally valid:

2001:cdba:0000:0000:0000:0000:3257:9652
2001:cdba:0:0:0:0:3257:9652
2001:cdba::3257:9652

## V. IMPLEMENTATION OF RIP IN IPV6

RIP is a dynamic, distance vector routing protocol based around the Berkley BSD application routed and was developed for smaller IP based networks. RIP uses UDP port 520 for route updates. RIP calculates the best route based on hop count. Like all distance vector routing protocols, RIP takes some time to converge. While RIP requires less CPU power and RAM than some other routing protocols. The RIP allows that routers update their routing tables at programmable intervals, generally every 30 seconds. One of the disadvantages of routers that use RIP is that constantly they are connected with routers neighboring to update his tables of routing, generating therefore a great amount of network traffic. As the number of jumps is only metric of routing used by the RIP, not necessarily it selects the fastest route towards its destiny. A metric one is a measurement unit that allows making decisions and next will learn that other protocols of routing use other metric ones in addition to the number of jumps to find the best route of data transfer.

### A.RIP CHARACTERISTICS

(1) Distance vector routing protocol
(2) It uses BELLMAN-FORD algorithm
(3) It metric is the number of jumps
(4) The maximum number of jumps is 15
(5) One updates every 30 seconds
(6) Not always it selects the fastest route for the packages
(7) It generates great amount of traffic of network with updates

**B.BASIC RIP CONFIGURATION**

```
router> enable
router# config t
router(config)#ipv6 unicast-routing
router(config)#ipv6 router rip bsnl
router(config-rtr)#exit
router(config)#interface ethernet 0
router(config-if)# ipv6 enable
router(config-if)# ipv6 rip bsnl enable
router(config-if)# ipv6 address 2001:1111::1/56
router(config-if)# no shut
router(config-if)# exit
```

## VI. IMPLEMENTATION OF OSPF IN IPV4

In 1988, the group: Internet Engineers Task Force (IETF) began to develop a new protocol of routing. Then they developed the Open Shortest Path First protocol (OSPF). Open Shortest Path First (OSPF) is an adaptive routing protocol for Internet Protocol (IP) networks. It uses a link state routing algorithm and falls into the group of interior routing protocols, operating within a single autonomous system (AS). OSPF is an interior gateway protocol that routes Internet Protocol (IP) packets solely within a single routing domain (autonomous system). It gathers link state information from available routers and constructs a topology map of the network. The topology determines the routing table presented to the Internet Layer which makes routing decisions based solely on the destination IP address found in IP packets. OSPF was designed to support variable-length subnet masking (VLSM) or Classless Inter-Domain Routing (CIDR) addressing models. OSPF detects changes in the topology, such as link failures, very quickly and converges on a new loop-free routing structure within seconds. It computes the shortest path tree for each route using a method based on Dijkstra's algorithm, a shortest path first algorithm.

### A. OSPF CHARACTERISTICS

(1) Fast detection of changes in the topology and very fast reestablishment of routes without loops.
(2) Low overload, use updates that inform about changeson routes.
(3) Division of traffic by several equivalent routes.
(4) Routing according type of service.
(5) Use of multi-send in local area networks.
(6) Subnet and Super-net mask.
(7) Authentication

**B. BASIC OSPF CONFIGURATION**

router> enable
router# config terminal
router(config)#host name router
router(config-rtr)#exit
router(config)#interface ethernet 0/0
router(config-if)# ip add 10.0.0.1 255.0.0.0
router(config-if)# no shutdown
router(config)# router ospf 10
router(config-router)# network 10.0.0.0 0.255.255.255 area 0
router(config-route r)#router-id 1.1.1.1
router(config)# no shut
router(config-if)# exit

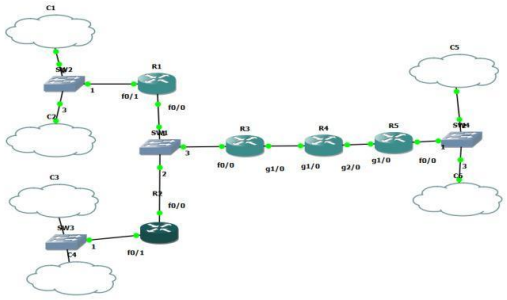


Fig 6.4 Topology of Tunneling Mechanism.

**VII. Experimental Results:**

Two IPv6 networks are converged through IPv4 network using tunneling concept. In his i have used manual tunneling concept. I am going to implement auto tunneling and dual stack tunneling .Performance of these tunneling are performed by wire shark. Using manual tunneling interoperability of IPv6 and IPv4 have been checked.IPv6 network routes using RIP protocol.IPv4 network routes using OSPF.

**VIII. Conclusion and future work.**

A Sophisticated Network Simulator Software package for the load balancing between routers was developed in GNS3. Inter operability of IPv6 network and IPv4 network are analyzed using manual tunneling. It builds a permanent virtual link between IPv6 and IPv4 networks. It forms a static tunneling. It is manually configured it's not scalable but has a secured communication. The objective of this project has been realized with the implementation and successful validation of the Simulator. Future scope is enabling security features which are in built with IPv6 protocol. And also try to deploy IPv6 using dual stack and auto tunneling and analyzing the performance using wire shark.

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