International Journal of Software & Hardware Research in Engineering
ISSN No: 2347-4890 Volume 2 Issue 10, October 2014

Challenges of Implementing IPv6 in Developing Countries

Author: Sunil Dhawan[1] ;Vikas Verma[2];

Research Scholar,Department of Computer Science, NIMS University, Jaipur[1]

Department of Computer Applications,Chandigarh Business School, Landran [2]

E-mail: sunildhawan007@gmail.com[1];vikas2005verma@yahoo.co.in[2]

ABSTRACT

In this paper, we describe the challenges and solutions to a very grave problem known as the implementation of IPv6. IPv4 has served us for a very long time but the problem is its capacity is getting used and would become obsolete in the coming future. Thus logical answer is move to a never standard that provides us piece of mind and reliability and capacity so that the inter network services can function. With every new standard we require newer resources and resources means monetary investment. Thus making up gradation to the newer standard a challenging task for countries like India, Thailand, Iran a difficult task. We would analyse the situation and pick out what are the main challenges which should be overcome and what could be the possible solutions.

General Terms

IPv6 Recognition and Implementation, IPv6 Security, IPv6 cost effectiveness

Keywords

IPv4,IPv6,IP security, IPv6 cost analysis.

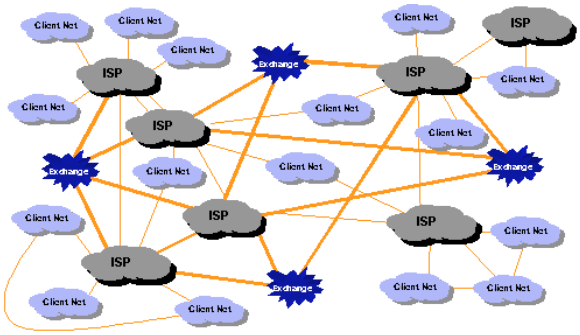
1. INTRODUCTION

Internet a global computer network providing a variety of information and communication facilities, consisting of interconnected networks using standardised communication protocols. Internet effects the way we live our life. On this network every device has an address known as an IP address that's like a phone no. A unique one for every device. From the beginning of internet we used IPv4 or 32 bit addresses. IPv4 was the first version of Internet Protocol to be widely used, and accounts for most of today's Internet traffic. There are just over 4 billion IPv4 addresses. While that is a lot of IP addresses, it is not enough to last forever. Thus the need of never 128 bit addresses known as IPv6. It provides us 340,282,366,920,938,463,463,374,607,431,768,211, 456 addresses[1] that is in contrast huge. Lack of awareness coupled with new vulnerabilities are likely to create security problems. When we type a website address, the computer breaks it up into a mix of unique 32 zeros and ones. This binary code identifies and locates the computer on which the website resides. Techies call it internet protocol (IP) and the one that got exhausted is version four — also known as IPv4. The new system — IPv6 — will have a mix of 128 zeros and ones. It will offer practically unending number of web addresses. The new standard allows greater number of addresses and as it does, organisations will face challenges adapting to the new system. In developing economies like India where the resources are scare there is ought to be difficulties in migration and deployment of IPv6 networks.

This paper perhaps helps security architects, network professionals and planners to find out what are the real challenges that are faced by their fellows out there in the real world in developing networks for developing nations and economies.

2. The Internet Structure

The right way of implementing anything is to know about that in the first place. Even in a business deal we try to find out the history of the business and its



associates before we want to deal with them. Thus before going into the implementation of the IPv6 we should go in for the internet structure. There are lots of devices like servers, routers, access points, switches, cpe. etc involved in setting up of internet forming end to end connectivity. An overview structure [2]of this can be like

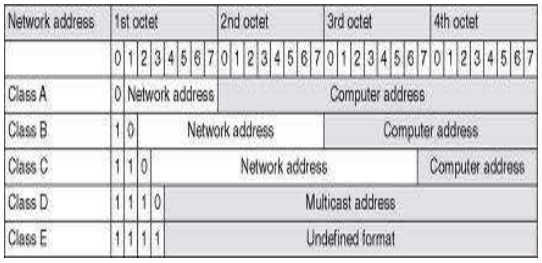
IJournals

© 2014, IJournals All Rights Reserved

this one in which multiple devices and entities are involved in providing a common platform for many services like e-mail, www, etc. Each device on this network has an address known as Internet Protocol address which is unique and this unique address is used by the other devices on the network to communicate. From the start of the internet services we used 32 bit IPv4 addresses thus having a limit that can be exhausted any moment or in the near future because we are adding more and more devices to the networks thus there are more devices than ip addresses in the world. e.g. in a county like India we have only 34 million internet addresses available for a population of 1.5 billion people. There are many devices and servers such as dhcp, dns servers which provides these ip addresses and domain name servers that translate the web addresses to ip and vice versa. Thus functionality depends on these addresses and unless this addressing sis kept alive by upgrading to a lager and secured standard we may find a situation where tons of devices could be laying unused for the lack of an ip address. Lets discuss the deployment differences and implementation architectures of both the ip address schemes.

3. IP ADDRESSING

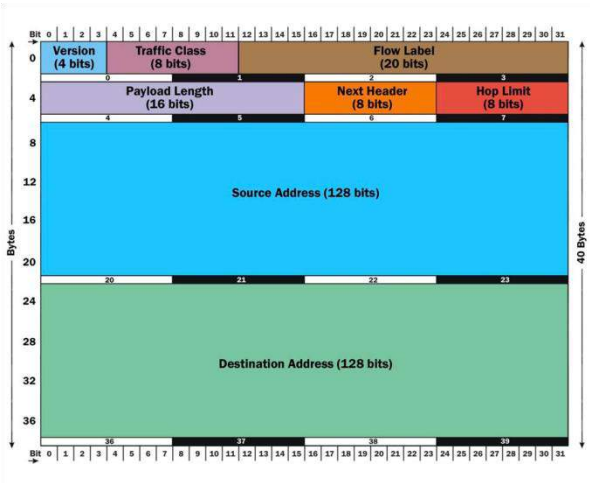
We have already discussed the importance of an ip address. Let's first take IPv4 for analysis. The Internet Protocol Version 4 (IPv4) is the first standardised version of the internet protocol. Although introduced in 1981, it is still relevant and is the dominant network protocol in use today. IPv4 uses 32-bit addressing system which translates to 4.3 billion addresses.[3] There are 6 billion mobile phones in use in the world today and by 2016, there will be over 10 billion mobile connected devices. Although IPv4 has served its purpose well so far, the exponential growth of the internet, associated network security threats and the encryption needs were not anticipated. The structure of IPv4 addressing scheme follows:



3.1. IPv4 Limitations

Some of the limitations that can ascertained from the research can be described as under:

- The ubiquity of the internet and the increasing number of servers, workstations and devices are rapidly leading to a scarcity of available public IPv4 addresses.[4]
- Lack of in-built network security.
- Lack of QoS at the upper and lower layers of data exchange.
- The IPv4 routing table is huge with over 85,000 routes a normal happening.1
- Lack of simplified header and structured approach to addressing.2
- Additional cost of security through non-standard measures.3
- Doesn't support mapping of all upper layer protocols.
- IPv4 based networks cannot differentiate time sensitive data payloads from non-time sensitive data payloads.



3.2. IPv6 Structure

The structure of IPv6 provides us packet headers that are actually simpler to deploy and manage compared to IPv4.

3.3. ThisIPv6 Advantages

With IPv6, everything from appliances to automobiles can be interconnected. But an increased number of IP addresses isn't the only advantage of IPv6 over IPv4. There are more good reasons to make sure your hardware, software, and services support IPv6.

- **More Efficient Routing-** IPv6 reduces the size of routing tables and makes routing more efficient and hierarchical. IPv6 allows ISPs to aggregate the prefixes of their customers' networks into a single prefix and announce this one prefix to the IPv6 Internet. In addition, in IPv6 networks, fragmentation is handled by the source device, rather than the router, using a protocol for discovery of the path's maximum transmission unit (MTU).
- **More Efficient Packet Processing-** IPv6's simplified packet header makes packet processing more efficient. Compared with IPv4, IPv6 contains no IP-level checksum, so the checksum does not need to be recalculated at every router hop. Getting rid of the IP-level checksum was possible because most link-layer technologies already contain checksum and error-control capabilities. In addition, most transport layers, which handle end-to-end connectivity, have a checksum that enables error detection.

IJournals

© 2014, IJournals All Rights Reserved

- **Directed Data Flows**- IPv6 supports multicast rather than broadcast. Multicast allows bandwidth-intensive packet flows (like multimedia streams) to be sent to multiple destinations simultaneously, saving network bandwidth. Disinterested hosts no longer must process broadcast packets. In addition, the IPv6 header has a new field, named Flow Label, that can identify packets belonging to the same flow.

- **Simplified Network Configuration-**Address auto-configuration (address assignment) is built in to IPv6. A router will send the prefix of the local link in its router advertisements. A host can generate its own IP address by appending its link-layer (MAC) address, converted into Extended Universal Identifier (EUI) 64-bit format, to the 64 bits of the local link prefix.

- **Support For New Services-**By eliminating Network Address Translation (NAT), true end-to-end connectivity at the IP layer is restored, enabling new and valuable services. Peer-to-peer networks are easier to create and maintain, and services such as VoIP and Quality of Service (QoS) become more robust.[5]

- **Security-**IPSec, which provides confidentiality, authentication and data integrity, is baked into in IPv6. Because of their potential to carry malware, IPv4 ICMP packets are often blocked by corporate firewalls, but ICMPv6, the implementation of the Internet Control Message Protocol for IPv6, may be permitted because IPSec can be applied to the ICMPv6 packets.[6]

3.4. Challenges in IPv6 implementation

Even after discussing so many critical advantages of IPv6 there are some hefty challenges and points that can't be ignored in any case. The issue may range from inter connected devices to layer 3 devices which may not be compatible with the newer devices. Following are the major challenges faced by the network planners in up gradation of the existing system of IPv4 to IPv6:

- **Budgetary Prices-**Plenty of surveys discovered that the principal obstacle on IPv6 adaption is because of the shortage of funding. These viewers are afraid that the importance of upgrading the appliances to IPv6-ready hardware, training and even recruit the personnel through IPv6 working understanding could be expensive. Due to this, they would relatively keep utilising the prevailing IPv4 address.

- **Operating System Approach, Gadget and Package Help-**In their paper, Morton and Horton specify concerning the dearth of system and operating mode which helps IPv6 by default. From their examine, the users at the moment nonetheless worth Home windows XP which doesn't support IPv6 except few configurations had been made. Windows XP makes up virtually 70% from full operating systems in the world. The new version of Windows, Home windows 7 comprises already been revealed and IPv6 is supported via default. From this, there needs to be no problem as lengthy as users need toward usefulness IPv6 and no problem from working technique ought to exist.

- **Networking home equipment-** Networking home equipment also needs to help IPv6 with default as lengthy as they're using newest 3Com Netbuilder and Pathbuilder software system, Cisco IOS program and Nortel Networks BayRS applications. From the software program aspect, thereare nonetheless some IPv6 implementations which are nonetheless poor in fully supporting the full collection of options promised via IPv6.[7] It is because IPv6 is still in its advance section and it keeps evolving primarily based on the market needs.

- **IPv4 Transition toward IPv6-**The change from utilising IPv4 to IPv6 may very well be accelerated if there are mechanisms that assist in deploying IPv6 into IPv4 networks. However, this may be a double-edged sword the place a collection of organisations tend toward watch and wait till IPv6 reached its maturity earlier than they fully adapt their brand processes utilising IPv6 technology [8]. The flexibility of each IP protocols toward co-exist via each supplementary using twin-stack can even strengthen their beliefs that IPv4 still possess a long method to go earlier than it is removed completely.

- **Complexity and Efficiency Issues-**As lots of IT vendors are reluctant to absolutely change their network toward IPv6 only community, they opted to craft a network the place each IP protocol might be used. This is achievable utilising the twin stack manner. On the other hand, dual stack way makes use of double the amount of space and knowledge processing required toward run the network. This situation put appreciable stress on the CPU and delay can be visible within the network.

4. **Conclusion-** The real issue is lack of awareness among network professionals, security architects and staff. They are not well-versed with the security nuances of IPv6 and lack expertise to handle the new protocol. This would remain a real danger for several months till everyone is trained. Security devise support in handling IPv6 traffic will also play a major role.Although some blocks of IPv4 addresses are still with domain name registrars of countries including India, the price of such addresses is expected to spiral. So, it might become cheaper to get IPv6 addresses, pushing firms and other organisations to buy new protocol-linked addresses. Since the migration will be gradual, systems running both IPv4 and IPv6 will co-exist.Organisations that still use legacy smartphones and devices hooked to their system may face problems when they update to the new protocol. Their security software may suddenly treat all these devices as alien and reject them. Another big issue is Email. Emails

IJournals

© 2014, IJournals All Rights Reserved

are broken up into parts when on their way to the recipients. Every part consists of a header - a group of information on destination and how it should join with other parts when it has reached the recipient.The structure of headers under IPv6 and the procedures it uses to navigate these parts through the internet, lends to some security issues which rogues can target while transitioning from IPv4.

5. References:

[1] S. Deering and R. Hinden, "RFC 2460. Internet Protocol, Version 6 (IPv6) Specification," 1998.

2] G. Huston, "IPv4 Address Report," 2009, http://www.potaroo.net/tools/ipv4/index.html.

[3] Google, "Google ipv6 implementors conference," 2010, https://sites.google.com/site/ipv6implementors/2010/agenda.

[4] Ram Mohan, "Will U.S. Government Directives Spur IPv6 Adoption?," September 2010, http://www.circleid.com/posts/20100929_will_us_government_directives_spur_ipv6_adoption/.

[5] Wikipedia, "IPv6 deployment," 2012, http://en.wikipedia.org/wiki/IPv6_deployment#Deployment_by_country.

[6] Amogh Dhamdhere and Constantine Dovrolis, "Twelve Years in the Evolution of the Internet Ecosystem," IEEE/ACM Transactions on Networking, vol. 19, no. 5, 2011.

[7] Lixin Gao, "On Inferring Autonomous System Relationships in the Internet," IEEE/ACM Transactions on Networking, vol. 9, no. 6, 2001.

[8] David Meyer, "University of Oregon Route Views Project," http://www.routeviews.org/

IJournals

© 2014, IJournals All Rights Reserved