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A Review Issues of Implementation RIR in Network Technology IPv4 &IPv6 using One Probe

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Abstract- When new clients are continuously introduced to the Network IPv4 addresses are already outdated and redundant in IANA local web registries (RIRs). IPv4 records have been depleted previously. A correct approach to dealing with this problem is the Translation Approach. In this examination paper. I examined investigations presented in connection with the migration of resources and protocol transition systems in IPv4 and IPv6 between 2007 and 2018 and observed network safety issues, addresses them and detects them in the implementation of IPv6. Internet Protocol (IP) is used to identify and locate computers on the Internet. Currently, IPv4 still routes most Internet traffic. However, with the exhausting of IPv4 addresses, the transition to IPv6 is imminent, because, as the successor of IPv4, IPv6 can provide a larger available address space. Existing studies have addressed the notion that IPv6-centric next generation networks are widely deployed and applied. In order to gain a deep understanding of IPv6, this paper revisits several critical IPv6 performance metrics. Our extensive measurement shows that packet delay and loss rate of IPv6 are like IPv4 when the AS-level paths are roughly the same. Specifically, when the link utilization exceeds a threshold, for example, 0.83 in our study, variation of packet delay presents a similar pattern with the variation of link utilization.
Keywords: Security, Addressing, Error Detection, Wireless Networks, Design of IPv6 Network

Introduction

Version 6 of the internet protocol (IPv6) is the basic internet protocol of the new generation. Internet Protocol (IP) is a common internet language that must be understood by each Network-connected device. The current version of IPv4 (IP version 4), has several limitations that cannot be removed which hinder the further development of the Internet, such as depleted storage addresses, security problems and the non-accessibility of automatic configurations, in some situations. The first RFC that defines IPv6 was released at the end of 1995 and continuously tries to develop it. Internet Engineers Task Force. IPv6 has not been introduced entirely in the real world since 1995 due to certain problems such as the existence of alternate IPv4 implementations, the non-provision of suitable hardware, the financial cost needed for compatible devices, technology and security systems. Issues in the application of ipv6 should thus be evaluated and remedies must be sought for some issues. More data is quickly presented in this paper IPv4 and IPv6.

IPv4 is the first commonly adopted iteration of the Internet Protocol which primarily accounts for Internet traffic today. IPv4 addresses still occur in excess of 4 billion. Although there are many IP addresses, this is not enough to last indefinitely. The IPv6 is the Internet Protocol's sixth revision and IPv4's successor. Similar to IPv4, it includes the specific numeric IP addresses necessary for communicate with internet-enabled devices. But it makes one big difference: it uses 128-bit identifiers. We'll clarify in a moment why this is relevant.

A big difference is the number of IP addresses between IPv4 and IPv6. The number of IPv4 addresses is 4,294,1967,296. In contrast, 340,282,366,920,938,456 IPv6 addresses are available. The Internet techniques remain the same for both versions. Both versions are expected to continue to operate on networks simultaneously. To date, IPv4 and IPv6 help in the networks many networks use IPv6.

TABLE 1: Major Difference Between Ipv4 And Ipv6

Key	IPv4	IPv6
Deployment started in	1981	1999
Address Size	32-bit number	128-bit number
Address Format	Dotted Decimal Notation: 192.158.272.98	Hexadecimal Notation: FFFE:F201:0224:BB00: B123:4567:8001:ABCE
Prefix Notation	192.168.10.55/24	1FFE:F200:0034::/48
Number of Addresses	2^{32}= ~4,294,967,296	2^{128} = ~340,282,366,920,938,463,463,374,607,431,768,211,456

Review of IPv6

IPv6 Network Technology is becoming more and more prevalent, with people agreeing to changes to IPv4 Network Technology today. The literature review took place through research papers from numerous well-known publications including IEEE, Springer and Elsevier for the introduction of IPv6 network technology, and after reviewing research papers, I find that researchers in their research papers have discussed key issues, such as large address space, support for real time audio and video streaming as well as quality of service (QoS), extension headers, security issues, error detection and optimization issues.

TABLE 2: Issue wise paper reviews

Key Issue	No of Papers
Security issue	70
Address space	13
Extension header	29
Error detection	11
Optimization issues	2
QoS	10
Real time audio video	15

IPv6 Network Security concerns were discussed in 70 papers and it was found that security measurements taken in IPv6 for LAN and WAN cannot be implemented in Wireless Sensor Networks (WSN), as this was due to a reduced processing capacity and limited energy resource and impeded the implementation of IPv6 in WSN. When using IPv6 IPsec over low-powered Wireless Personal Area Networks (6LoWPAN) and reduces IPSec Headers to cut processing costs and improve energy efficiency, researchers have proposed an automated authentication header (AH) and encapsulating security fee (ESP) in paper [25]. In [29], it was proposed to secure the host address from different security attacks by generating random IPv6 addresses. Another Secure Address Validation Improvement (SAVI) solution proposed by the researchers [150] to provide validation verification of the IP address linking it on FCFS basis with the host's network switch port and MAC address providing a switch level binding panel. The SAVI was later accepted by the Internet Engineers Task Force (IEFT) [9] as a guide for spoofing attacks. [6] network forensics prototype system in IPv6 enframement for HTTP, FTP, SMTP & POP protocols, was designed and implemented by the researchers [11] for the vulnerability assessment of IPv6 and other researchers [15].

In the error detection paper [11] proposed improved CRC based Packet Recovery Mechanism for Wireless Network to reduced computation and resource consumption for CRC based Packet Recoveries. The paper proposed [9] CRC checking at Network Layer to reduce link layer processing overheads and increased the performance of link layer.

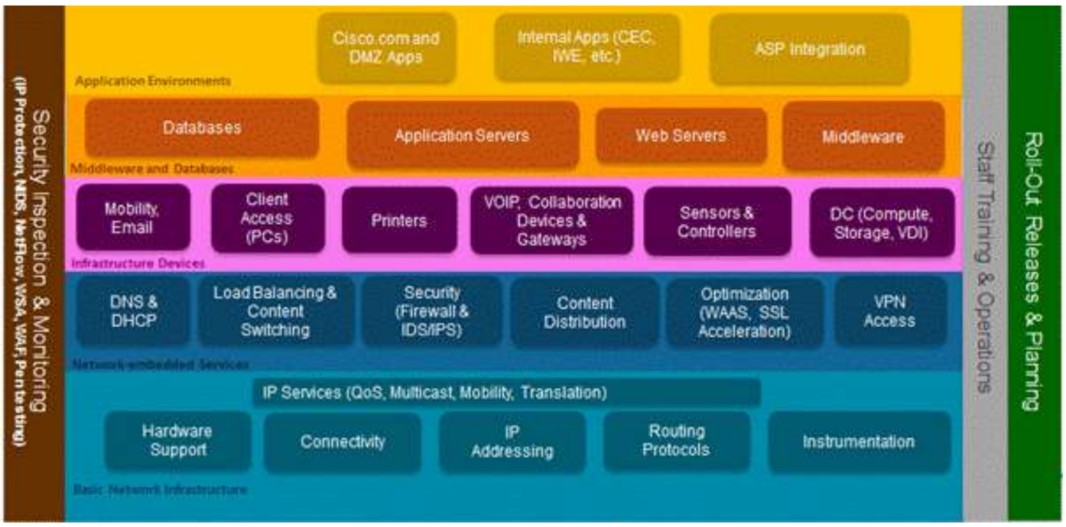

Fig 1. Framework of IPv6

In the Network Optimization paper [2] proposed Memory Management system to overcome the memory buffer overflow issue in implementation of IPv6 in WPAN. The paper [12] proposed IPv6 based Database Retrieval System for Wireless Sensor Networks using BLIP to establish connectivity.

Network Optimization

The different researchers suggested a review of the techniques and approaches to address IPv6 security, bug detection, and the Wireless Network. Based on our review, I found that most researchers have been working on the issue of security and addressing issues, large address space, support for real time audio and video streaming as well as quality of service (QoS), extension headers there is still scope for research in this area and testing the solution through real-world implementation. There is a great need for error detection techniques which should deliver high performance in the Ethernet network. Wireless network is becoming very popular in the current world and is involved in the life of each one. Different issues must be resolved in the mobile network in order to incorporate the IPv6 software of high performance and low power specifications.

The IP layer of the TCP/IP protocol stack is the most crucial piece of the whole Internet architecture. However, within ten years of IP going mainstream in the 1980s, the limitations of IPv4 in terms of scalability and capability became obvious. IPv4 requires several add-ons like ICMP and ARP to function. By the mid-1990s, a replacement scheme was developed. The move to IPv6 is necessary to accommodate the explosion of Internet requirements, Internet technology profile mandates that access via IPv4 and access via IPv6 have to coexist.

IPv6 offers these improvements over IPv4:

- More efficient routing without fragmenting packets
- Built-in Quality of Service (QoS) that distinguishes delay-sensitive packets
- Elimination of NAT to extend address space from 32 to 128 bits
- Network layer security built-in (IPsec)
- Stateless address auto-configuration for easier network administration
- Improved header structure with less processing overhead

IPV4 VS IPv6

- The 128-bits in the IPv6 address are eight 16-bit hexadecimal blocks separated by colons. For example, 2dfc:0:0:0:0217:cbff:fe8c:0.
- IPv4 addresses are divided into “classes” with Class A networks for a few huge networks, Class C networks for thousands of small networks, and Class B networks that are in between. IPv6 uses subnetting to adjust network sizes with a given address space assignment.
- IPv4 uses class-type address space for multicast use (224.0.0.0/4). IPv6 uses an integrated address space for multicast, at FF00::/8.
- IPv4 uses “broadcast” addresses that forced each device to stop and look at packets. IPv6 uses multicast groups.
- IPv4 uses 0.0.0.0 as an unspecified address, and class-type address (127.0.0.1) for loopback. IPv6 uses :: and ::1 as unspecified and loopback address respectively.
- IPv4 uses globally unique public addresses for traffic and “private” addresses. IPv6 uses globally unique unicast addresses and local addresses (FD00::/8).

Result on One Probe

One Probe is a reliable and metric-rich path monitoring method based on TCP. We use HTTP/One Probe, which sends legitimate HTTP GET request in the TCP data probes to induce HTTP response messages to measure delay, packet-loss rate, and packet reordering rate. Each probe of OneProbe consists of two customized back-to-back packets, applied to measure the performance of the forward link. When probes arrive at remote ends, they will induce remote endpoints to send back two back-to-back packets, which are used to measure the performance of the reverse link. In this study, the values of the forward link and reverse link are merged to evaluate packet-loss rate and packet reordering rate. When using OneProbe, we should set some parameters with appropriate values.

Based on One Probe, we design a probing method, which can persistently evaluate the interdomain performance of an IPv6 network. Our probing method mainly contains three phases, that is, obtaining URLs, classifying URLs, and probing.

(1) **Obtaining URLs**. We first find the URLs that meet the requirements of OneProbe. To guarantee the accuracy of probing, the object of each URL is well over 10 Kbytes. Because of probing such kind of URLs, we can induce enough response packets. We download top 1 M websites from Alexa and obtain desirable URLs by crawling these websites. In addition, to make comparison between IPv4 and IPv6, only the URLs supporting both IPv4 and IPv6 access are chosen in our study.
(2) **Classifying URLs**. For the sake of analysis, we divide the URLs into five groups in terms of the five Regional Internet Registries (RIRs (RIR is an organization that manages the allocation and registration of IP addresses and autonomous system numbers. RIR divides the world into five RIRs, including African Network Information Center (AFRINIC), American Registry for Internet Numbers (ARIN), Asia-Pacific Network Information Centre (APNIC), Latin America and Caribbean Network Information Centre (LACNIC), and Réseaux IP Européens Network Coordination Centre (RIPENCC))), that is, APNIC, ARIN, AFRINIC, LACNIC, and RIPENCC. To this end, we explore the addresses of these destination URLs, and match this address to the prefixes that have been assigned to the five RIRs.
(3) **Probing**. Our probing host locates in CERNET2. To avoid cross impact caused by too many synchronous probing packets, we choose no more than 15 URLs from each RIR randomly and launch no more than 15 One Probe processes synchronously at each time. Note that these URLs belong to different websites and servers. For each RIR, we use OneProbe to probe the destination URLs enabled with both IPv6 and IPv4 for 10 minutes (5 minutes for IPv6, 5 minutes for IPv4) in one polling cycle. It costs 50 minutes to probe all the five RIRs one after another. Therefore, we denote an hour as a polling cycle.

After evaluating 150 research papers, we noticed that Seven fundamental issues had been solved in engineering, including security, bug fixing, QoS, Error detection, real time audio video, large address space, extension header and the Wireless Sensor Network. In the implementation of IPv6, the researchers provided various solutions that were discussed of this paper above. After the literature review, some shortcomings were found in the research papers and more analysis was needed to be done. Security Solutions, addressing solutions, bug detection & fixing solutions, and wireless network sensor solutions may include the identified fields of research. In addition, it was found that to refine the research field of the areas mentioned above, the literature survey will be continued until the typical selection area is identified and finalized.

Conclusion

IPv6-centric next generation network is experiencing fast development. But our understanding of IPv6 cannot keep up with the growth of IPv6. In this paper, we propose a probing method, which can persistently measure the interdomain performance of an IPv6 network. We collect one-week measurement data and revisit several critical performance metrics for the studied IPv6 network. Our main findings include () packet delay and loss of IPv6 being similar to its counterpart of IPv4 when the AS-level paths are roughly the same. Packet delay presents a strong correlation with the link utilization. When the link utilization exceeds a threshold, for example, 0.83 in our study, variation of packet delay presents a similar pattern with the variation of link utilization; () the performance of middle-as and the length of middle-as are the dominant reasons for the differences (in delay and packet-loss rate) between IPv6 and IPv4. In addition, packet delay does not affect the value of packet-loss rate, but if packet delay of a path is large, packet-loss rate of that path is more likely to fluctuate over time; () few IPv6 probes are out-of-order and the reordering rate is , which is much lower than the rate of 0.79% in IPv4 world.

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