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A Comparative Study between IPv4 and IPv6

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Abstract: The addresses of Internet protocol (IP) are essential resource for the Internet. An internet protocol l(IP) uniquely identifies every computer and device connect to the internet. Every device connected to the internet has an address. And each IP address uniquely identifies that device. The addresses are still assigned by using Internet Protocol version 4 (IPv4). IPv4 is the most widely used protocol on the Internet, and its address space is. applications and easy operation. IPv4 had been designed to cover all the network interfaces, however with growth of the number of devices (mobile, computer, server, routers, etc.) the reserve of assigned addresses is finished. To solve the problem of insufficient addresses, the IETF designed the next generation IPv6 protocol to replace IPv4, IPv6 has been deployed for providing new services and for supporting the internet growth. This study compares the key specifications of IPv4 and IPv6, contrasts IPv4 and IPv6 header's fields, the structure of headers, explains advantages of IPv6 and disadvantages of IPv4, and why we are running out of IPv4.

Keywords: Include at least 4 keywords or phrases.

I. INTRODUCTION

A computer protocol is a set of rules and standards that define the format, timing, sequencing, and error handling of data communication between two or more devices in a computer network.

Computer protocols provide a common language and set of procedures that enable different devices and systems to communicate with each other. They ensure that data is transmitted and received accurately and efficiently, and they govern how data is transmitted over networks, including the Internet.

Protocols are used for a wide range of network communication tasks, including sending and receiving emails, transferring files, browsing websites, accessing remote servers, and managing network devices. They are essential for the proper functioning of computer networks and enable the exchange of information between different devices and systems.
Internet network protocols are critical to the functioning of the internet, and they allow us to communicate and exchange information with people and devices all over the world. As technology continues to evolve, new protocols are being developed and existing protocols are being updated to keep pace with the changing needs of the internet. These protocols are essential for the proper functioning of the internet and enable the exchange of information between different devices and systems.

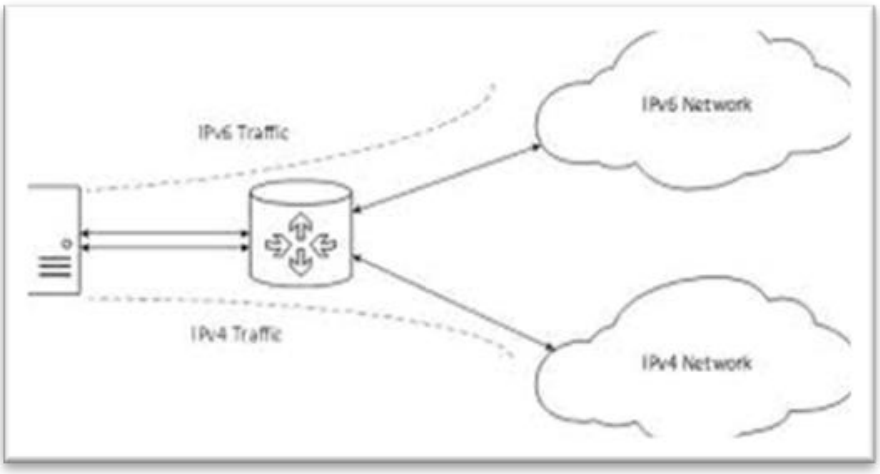

Fig. 1 IPV Technology

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II. TYPES OF INTERNET PROTOCOLS

There are many different types of internet protocols that are used for various purposes. Here are some of the most common ones:

Transmission Control Protocol (TCP): It is a connection-oriented protocol that ensures reliable delivery of data between devices over the internet. TCP breaks data into packets and sends them to the destination device, ensuring that they are received in the correct order. User Datagram Protocol (UDP): It is a connectionless protocol that provides fast, but less reliable, transmission of data between devices over the internet. UDP does not guarantee the delivery of packets, and they may arrive out of order. Internet Protocol (IP): It is a network layer protocol that provides the addressing and routing for data packets over the internet. IP is responsible for transmitting data from one device to another by breaking it into packets, adding source and destination addresses, and determining the best path to deliver the packets.

Hypertext Transfer Protocol (HTTP): It is a protocol used for communication between web servers and web clients. HTTP is used for retrieving and transmitting information between web browsers and web servers.

File Transfer Protocol (FTP): It is a protocol used for transferring files between computers over the internet. FTP allows users to upload and download files to and from remote servers. Simple Mail Transfer Protocol (SMTP): It is a protocol used for sending email messages between mail servers over the internet. SMTP is responsible for routing email messages between different email servers. Domain Name System (DNS): It is a protocol used for translating domain names into IP addresses. DNS maps domain names to IP addresses, making it easier for users to access websites and other internet resources. These protocols are essential for the proper functioning of the internet and enable the exchange of information between different devices and systems.

IPv4 stands for Internet Protocol version 4, and it is the fourth version of the Internet Protocol that is used to identify devices on a network and allow them to communicate with each other over the internet.

IPv4 addresses are 32-bit numbers that are divided into four octets separated by dots, such as 192.168.1.1. This addressing scheme provides a unique address for each device on a network, allowing them to communicate with each other.

IPv4 is used for many different purposes, including sending and receiving email, browsing the web, transferring files, and accessing remote servers. It is the most widely used version of the Internet Protocol and is still in use today, despite the introduction of newer protocols like IPv6. However, the limited number of available IPv4 addresses has led to the development of techniques like network address translation (NAT) to allow multiple devices to share a single IPv4 address. This has led to a gradual transition to IPv6, which uses a 128-bit address space and provides a much larger pool of unique addresses.

III. IPV 4

IPv4 stands for Internet Protocol version 4, and it is the fourth version of the Internet Protocol that is used to identify devices on a network and allow them to communicate with each other over the internet. IPv4 addresses are 32-bit numbers that are divided into four octets separated by dots, such as 192.168.1.1. This addressing scheme provides a unique address for each device on a network, allowing them to communicate with each other. IPv4 is used for many different purposes, including sending and receiving email, browsing the web, transferring files, and accessing remote servers. It is the most widely used version of the Internet Protocol and is still in use today, despite the introduction of newer protocols like IPv6. However, the limited number of available IPv4 addresses has led to the development of techniques like network address translation (NAT) to allow multiple devices to share a single IPv4 address. This has led to a gradual transition to IPv6, which uses a 128-bit address space and provides a much larger pool of unique addresses.

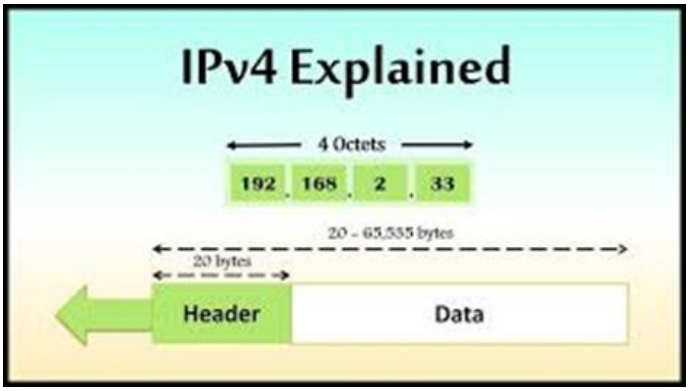

Fig. 2 IPV 4 Technology

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IV. IPV 6

IPv6 stands for Internet Protocol version 6, and it is the sixth version of the Internet Protocol that is used to identify devices on a network and allow them to communicate with each other over the internet. IPv6 addresses are 128-bit numbers that are divided into eight groups of four hexadecimal digits separated by colons, such as 2001:0db8:85a3:0000:0000:8a2e:0370:7334. This addressing scheme provides a much larger pool of unique addresses

than IPv4, allowing for the continued growth of the internet and the increasing number of devices that are connected to it. IPv6 is used for many of the same purposes as IPv4, including sending and receiving email, browsing the web, transferring files, and accessing remote servers. It also provides some additional benefits, such as improved security and more efficient routing, that make it a more reliable and secure protocol for internet communication.
However, the transition from IPv4 to IPv6 has been slow due to the need to upgrade infrastructure and devices to support the new protocol. Many devices still use IPv4, and the two protocols are often used together in a process called dual stack, which allows devices to communicate using either IPv4 or IPv6.

Fig. 3 IPV 6 Technology

V. IPV4 VS IPV6

There are some key differences between IPv4 and IPv6 technology:

Address space: IPv4 uses 32-bit addresses, which provides a total of about 4.3 billion unique addresses, while IPv6 uses 128-bit addresses, which provides a much larger pool of unique addresses, approximately 340 undecillions.

Address format: IPv4 addresses are represented in dotted-decimal notation, while IPv6 addresses are represented in hexadecimal notation, with eight groups of four hexadecimal digits separated by colons. Header size: The IPv4 header is 20 bytes long, while the IPv6 header is 40 bytes long, which can impact network performance and throughput.

Routing: IPv4 uses traditional routing protocols, such as OSPF and BGP, while IPv6 uses the newer routing protocol, known as OSPFv3. Security: IPv6 includes built-in security features, such as IPsec, which are optional in IPv4.

Quality of Service: IPv6 includes built-in Quality of Service (QoS) features, which allow for better handling of real-time traffic, such as voice and video, than IPv4.

Backward compatibility: IPv6 is designed to be backward compatible with IPv4, which allows for a smooth transition to the new protocol, and devices can use either protocol, or both simultaneously. Overall, IPv6 is a newer and more advanced protocol than IPv4, with larger address space, better security and routing features, and built-in support for Quality of Service. However, IPv4 is still widely used, and the transition to IPv6 is ongoing and gradual.

VI. USE IPV4 OR IPV6

It is difficult to say which technology is better between IPv4 and IPv6 because both have their advantages and disadvantages, and their usefulness depends on the context in which they are being used.

IPv4 is a mature and well-established protocol that is widely supported by most devices and networks, and it has been used for several decades. However, it has a limited address space that has been exhausted in many regions, and it relies on workarounds such as Network Address Translation (NAT) to allow multiple devices to share a single address.

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IPv6, on the other hand, has a much larger address space, which provides a virtually unlimited number of unique addresses, and it includes built-in security and Quality of Service (QoS) features. However, it is a newer and less mature protocol that is not yet widely supported by all devices and networks, and the transition to IPv6 requires significant changes to the underlying infrastructure.

Ultimately, the choice between IPv4 and IPv6 depends on factors such as the specific requirements of the application, the compatibility with existing infrastructure, and the availability of technical expertise to support the protocol. In general, newer applications and networks are more likely to benefit from IPv6, while legacy systems and networks may continue to use IPv4.

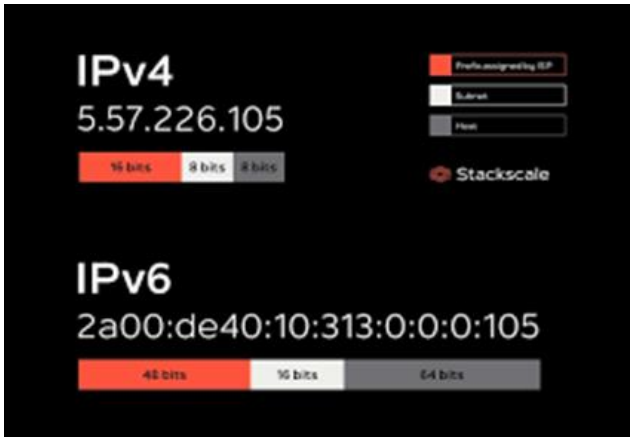

FIG.4 IPV4 VS IPV6 TECHNOLOGY

VII. CONCLUSION

In conclusion, Internet network protocols, such as IPv4 and IPv6, play a critical role in enabling communication and data transmission over the internet. IPv4 is a widely used protocol that has been in use for several decades and has limitations in terms of address space and security features. IPv6, on the other hand, is a newer protocol that provides a much larger address space and built-in security features. Both protocols have their advantages and disadvantages, and their usefulness depends on the context in which they are being used. As the demand for internet services continues to grow, the transition to IPv6 is ongoing and is expected to become the dominant protocol in the future. However, both protocols are likely to coexist for many years to come, and it is important for organizations and individuals to understand and be able to use both protocols.

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