IPv4 vs IPv6: What's the Difference?

What is IP?

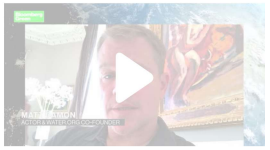
An Internet Protocol address is also known as IP address. It is a numerical label which assigned to each device connected to a computer network which uses the IP for communication.

IP address act as an identifier for a specific machine on a particular network. The IP address is also called IP number and internet address. IP address specifies the technical format of the addressing and packets scheme. Most networks combine IP with a TCP (Transmission Control Protocol). It also allows developing a virtual connection between a destination and a source.

What is IPv4?

IPv4 was the first version of IP. It was deployed for production in the ARPANET in 1983. Today it is most widely used IP version. It is used to identify devices on a network using an addressing system.

The IPv4 uses a 32-bit address scheme allowing to store 2^32 addresses whic considered the primary Internet Protocol and carries 94% of Internet traffic.



What is IPv6?

It is the most recent version of the Internet Protocol. Internet Engineer Taskforce initiated it in early 1994. The design and development of that suite is now called IPv6.

This new IP address version is being deployed to fulfill the need for more Internet addresses. It was aimed to resolve issues which are associated with IPv4. With 128-bit address space, it allows 340 undecillion unique address space. IPv6 also called IPng (Internet Protocol next generation).

KEY DIFFERENCE

- IPv4 is 32-Bit IP address whereas IPv6 is a 128-Bit IP address.
- IPv4 is a numeric addressing method whereas IPv6 is an alphanumeric a
- IPv4 binary bits are separated by a dot(.) whereas IPv6 binary bits are se
- IPv4 offers 12 header fields whereas IPv6 offers 8 header fields.
- IPv4 supports broadcast whereas IPv6 doesn't support broadcast.
- IPv4 has checksum fields while IPv6 doesn't have checksum fields
- IPv4 supports VLSM (Virtual Length Subnet Mask) whereas IPv6 doesn't

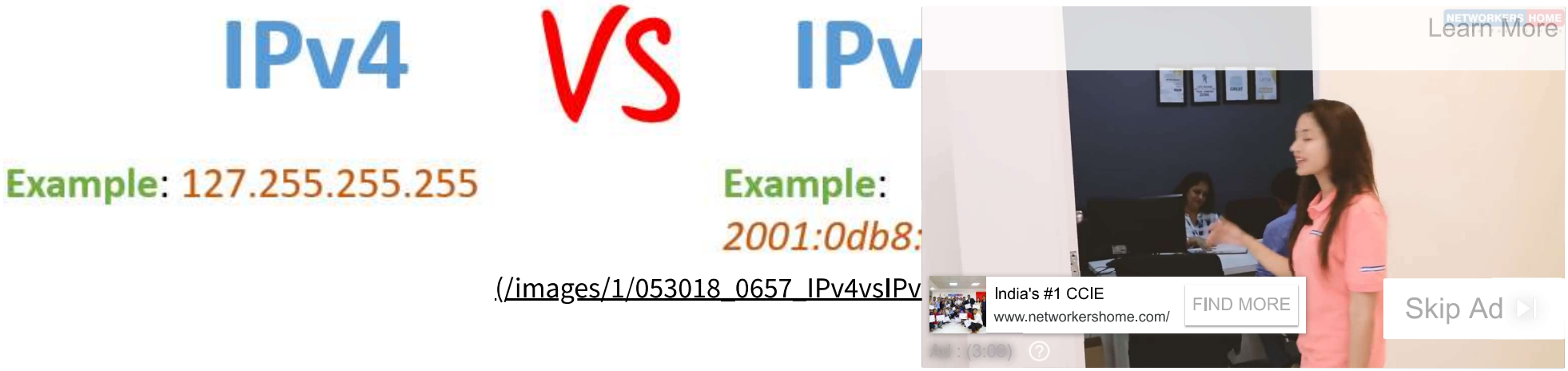
- IPv4 uses ARP (Address Resolution Protocol) to map to MAC address whereas IPv6 uses NDP (Neighbour Discovery Protocol) to map to MAC address.

Features of IPv4

- Connectionless Protocol
- Allow creating a simple virtual communication layer over diversified devices
- It requires less memory, and ease of remembering addresses
- Already supported protocol by millions of devices
- Offers video libraries and conferences

Features of IPv6

- Hierarchical addressing and routing infrastructure
- Stateful and Stateless configuration
- Support for quality of service (QoS)
- An ideal protocol for neighboring node interaction



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Difference Between IPv4 and IPv6 Addresses

IPv4 & IPv6 are both IP addresses that are binary numbers. IPv4 is 32 bit binary number while IPv6 is 128 bit binary number address. IPv4 address are separated by periods while IPv6 address are separated by colons.

Both are used to identify machines connected to a network. In principle, they are the same, but they are different in how they work.

Basis for differences	IPv4	IPv6
Size of IP address	IPv4 is a 32-Bit IP Address.	IPv6 is 128 Bit IP Address.
Addressing method	IPv4 is a numeric address, and its binary bits are separated by a dot (.)	IPv6 is an alphanumeric address whose binary bits are separated by a colon (:). It also contains hexadecimal.
Number of header fields	12	
Length of header filed	20	
Checksum	Has checksum fields	

Basis for differences	IPv4	IPv6
Example	12.244.233.165	2001:0db8:0000:0000:0000:ff00:0042:7879
Type of Addresses	Unicast, broadcast, and multicast.	Unicast, multicast, and anycast.
Number of classes	IPv4 offers five different classes of IP Address. Class A to E.	IPv6 allows storing an unlimited number of IP Address.
Configuration	You have to configure a newly installed system before it can communicate with other systems.	In IPv6, the configuration is optional, depending upon on functions needed.
VLSM support	IPv4 support VLSM (Virtual Length Subnet Mask).	IPv6 does not offer support for VLSM.
Fragmentation	Fragmentation is done by sending and forwarding routes.	Fragmentation is done by the sender.
Routing Information Protocol (RIP)	RIP is a routing protocol supported by the routed daemon.	
Network Configuration	Networks need to be configured either manually or with DHCP	had several overlays to handle Internet growth, which require maintenance efforts.

Basis for differences	IPv4	IPv6
Best feature	Widespread use of NAT (Network address translation) devices which allows single NAT address can mask thousands of non-routable addresses, making end-to-end integrity achievable.	It allows direct addressing because of vast address Space.
Address Mask	Use for the designated network from host portion.	Not used.
SNMP	SNMP is a protocol used for system management.	SNMP does not support IPv6.
Mobility & Interoperability	Relatively constrained network topologies to which move restrict mobility and interoperability capabilities.	IPv6 provides interoperability and mobility capabilities which are embedded in network devices.
Security	Security is dependent on applications - IPv4 was not designed with security in mind.	IPSec(Internet Protocol Security) is built into the IPv6 protocol, usable with a proper key infrastructure.
Packet size	Packet size 576 bytes required, fragmentation optional	1208 bytes required without fragmentation
Packet fragmentation	Allows from routers and sending host	
Packet header	Does not identify packet flow for QoS handling which includes ksum options.	
DNS records	Address (A) records, maps hostnames	

Basis for differences	IPv4	IPv6
Address configuration	Manual or via DHCP	Stateless address autoconfiguration using Internet Control Message Protocol version 6 (ICMPv6) or DHCPv6
IP to MAC resolution	Broadcast ARP	Multicast Neighbour Solicitation
Local subnet Group management	Internet Group Management Protocol GMP)	Multicast Listener Discovery (MLD)
Optional Fields	Has Optional Fields	Does not have optional fields. But Extension headers are available.
IPSec	Internet Protocol Security (IPSec) concerning network security is optional	Internet Protocol Security (IPSec) Concerning network security is mandatory
Dynamic host configuration Server	Clients have approach DHCS (Dynamic Host Configuration server) whenever they want to connect to a network.	A Client does not have to approach any such server as they are given permanent
Mapping	Uses ARP(Address Resolution Protocol) to map to MAC address	
Combability with mobile devices	IPv4 address uses the dot-decimal notation. That's why it is not able for mobile networks.	

IPv4 and IPv6 cannot communicate with other but can exist together on the same network. This is known as **Dual Stack.**

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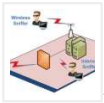

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