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IPv4 vs. IPv6

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What is IPv6?

IPv6 is the next generation Internet Protocol (IP) address standard intended to supplement and eventually replace IPv4, the protocol many Internet services still use today. Every computer, mobile phone, home automation component, IoT sensor and any other device connected to the Internet needs a numerical IP address to communicate between other devices. The original IP address scheme, called IPv4, is running out of addresses due to its widespread usage from the proliferation of so many connected devices.

What is IPv4?

IPv4 stands for Internet Protocol version 4. It is the underlying technology that makes it possible for us to connect our devices to the web. Whenever a device accesses the Internet, it is assigned a unique, numerical IP address such as 99.48.227.227. To send data from one computer to another through the web, a data packet must be transferred across the network containing the IP addresses of both devices.

Why Support IPv6? What are the benefits of IPv6?

IPv6 (Internet Protocol version 6) is the sixth revision to the Internet Protocol and the successor to IPv4. It functions similarly to IPv4 in that it provides the unique IP addresses necessary for Internet-enabled devices to communicate. However, it does have one significant difference: it utilizes a 128-bit IP address.

Key benefits to IPv6 include:

  No more NAT (Network Address Translation)

  Auto-configuration

  No more private address collisions

  Better multicast routing

  Simpler header format

  Simplified, more efficient routing

True quality of service (QoS), also called "flow labeling"

Built-in authentication and privacy support

Flexible options and extensions

Easier administration (no more DHCP)

IPv4 uses a 32-bit address for its Internet addresses. That means it can provide support for 2^32 IP addresses in total â around 4.29 billion. That may seem like a lot, but all 4.29 billion IP addresses have now been assigned, leading to the address shortage issues we face today.

IPv6 utilizes 128-bit Internet addresses. Therefore, it can support 2^128 Internet addresses— 340,282,366,920,938,463,463,374,607,431,768,211,456 of them to be exact. The number of IPv6 addresses is 1028 times larger than the number of IPv4 addresses. So there are more than enough IPv6 addresses to allow for Internet devices to expand for a very long time.

The text form of the IPv6 address is xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx:xxxx, where each x is a hexadecimal digit, representing 4 bits. Leading zeros can be omitted. The double colon (::) can be used once in the text form of an address, to designate any number of 0 bits.

With Dual-IP stacks, your computers, routers, switches, and other devices run both protocols, but IPv6 is the preferred protocol. A typical procedure for businesses is to start by enabling both TCP/IP protocol stacks on the wide area network (WAN) core routers, then perimeter routers and firewalls, followed by data-center routers and finally the desktop access routers.

ThousandEyes Support for IPv6

With IPv6 becoming more prevalent in cloud provider and consumer access networks, you may already be on the path to IPv6 deployment with your network and applications.

If you are looking to understand IPv6 in your environment there are three things you should be monitoring:

IPv6 DNS resolution

IPv6 traffic paths

IPv6 BGP prefixes and routes

ThousandEyes has support for IPv6 so that organizations can utilize IPv6 across all of their test types (web, network, voice, routing) and agent types (cloud, enterprise, endpoint).

ThousandEyes Cloud Agent support for IPv6 is provided on six continents allowing global coverage for organizations. ThousandEyes also supports the use of dual-stack IPv4 and IPv6 Enterprise Agents. Enterprise Agents can have both addresses assigned and executes tests based on a user-defined preference for only IPv4, only IPv6 or a preference for IPv6.

Additional Learning

» DNS (Domain Name System) (/learning/techtorials/dns-domain-name-system)

» AS (Autonomous System) (/learning/glossary/as-autonomous-system)

» ISP (Internet Service Provider) (/learning/glossary/isp-internet-service-provider)

Related Content

» Tips for Monitoring IPv6 Networks (/resources/monitoring-ipv6-networks-webinar)

» Monitoring IPv6 Networks (https://blog.thousandeyes.com/monitoring-ipv6-networks/)

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