

Messaging, Malware and Mobile Anti-Abuse Working Group

M³AAWG Technology Summaries

IPv6

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What IPv6 is:

Every device on the internet needs an address to communicate with other internet devices.

The original addresses, called IPv4, are 32-bit numbers, usually written as four decimal parts separated by periods, such as **198.51.100.1**. The supply of public IPv4 addresses has largely been exhausted, even though demand for internet addresses continues to increase.

IPv6 provides one way of meeting this growing demand.

IPv6 addresses are 128 bits, far longer than IPv4 addresses. They are written as colon-separated groups of hexadecimal numbers, such as **2001:DB8:437::123:9A**. There are so many IPv6 addresses that we'll likely never run out of them with current TCP/IP technology. Expanding the use of IPv6 is critical since new use cases like the Internet of Things (IoT) steadily create more objects that require unique internet addresses.

The backbone of the internet is largely running on IPv6. Major service providers such as Google and Amazon Web Services, as well as major ISPs such as Comcast (Xfinity) and Charter (Spectrum), routinely offer IPv6 to their customers. Nearly all mobile networks provide IPv6, and many are IPv6-only, with gateways to the IPv4 internet.

IPv6 addresses are usually treated as two halves. The first 64 bits are the network number, and the second 64 bits are the number of a host on that network. The 64-bit network number, in principle, could allow trillions of hosts per network.

Benefits of using IPv6:

- IPv6 is easier to manage than IPv4. Each network is the same size (64 bits), and computers usually configure themselves automatically to select an unused address on their network.
- Network Address Translation (NAT) and Carrier-Grade NAT (CGNAT) become unnecessary. Most home and small business users have a single public IPv4 address, which all devices share

using NAT, with a router translating from the local private IPv4 network to the public internet. With CGNAT, those users share a pool of IPv4 addresses, with a router at the ISP further translating the addresses. With IPv6, by contrast, customers get enough addresses that each device can have its own globally unique address, allowing simpler, more flexible communication with the internet.

IPv6 limitations:

- IPv6 is not backward compatible without a dual-stack setup or a separate device translating between the two protocols. A dual-stack device runs both IPv4 and IPv6 addresses in parallel, using IPv6 connectivity when it can reach resources with IPv6 addresses, and IPv4 connectivity to access resources that only have a legacy IPv4 address. Having a dual-stack requires additional software, which can be challenging for an IoT environment. Most computers support both IPv4 and IPv6; it's just a matter of the ISP or hosting provider supporting both types of connectivity.

References:

[The Internet Society's IPv6 Site](#)

[Hurricane Electric's IPv6 Site and Certification Program](#)

National Security Agency Cybersecurity Information Sheet, [IPv6 Security Guidance](#) (PDF)

A variety of sites, such as <https://test-ipv6.com>, can report on the sort of IP address your computer is using.

As with all documents that we publish, please check the M³AAWG website (www.m3aawg.org) for updates.