IPv4 versus IPv6: Frequently Asked Questions

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IPv6 became the Internet Standard Internet Protocol (IP) in July 2017, positioned to replace the fast-depleting IPv4. In this post, we'll answer common questions about IPv4 and IPv6 addresses.

What Is IPv4?

IPv4, short for "Internet Protocol version 4," has been the dominant IP version since 1981. It uses 32-bit binary numbers (represented as four decimal numbers separated by dots like 192.168.1.1) to identify each Internet-connected device uniquely.

IPv4 is divided into five network classes—A, B, C, D, and E—each with different address ranges for different network sizes.

When Will IPv4 Be Phased Out?

The Internet Assigned Numbers Authority (IANA) allocated the remaining IPv4 addresses in February 2011, officially depleting the pool of available IPv4 addresses. However, these IPs are still used to route a majority of Internet traffic through the protocol.

There is no definitive date when IPv4 will be phased out. Instead, users are gradually transitioning to the relatively newer IPv6 protocol.

Will IPv4 Addresses Still Work Once They Run Out?

All devices and networks that access the Internet using IPv4 addresses will continue to work as they do. We expect IPv4- and IPv6-based systems to coexist. But network operators and other entities that rely on Internet address assignments will find it more challenging and costly to obtain new IPv4 addresses to expand their networks.

What Is IPv6?

IPv6, short for “Internet Protocol version 6,” was introduced as the Internet Standard in December 1995 and became a Draft Standard in December 1998. Its commercial deployment, however, did not commence until 2006. Google and Facebook transitioned from IPv4 to IPv6 in June 2016.

In its full form, an IPv6 address consists of eight groups of four hexadecimal digits, separated by colons (:) like 2600:9000:2368:a000:001a:2a62:5300:0021. However, this can be shortened by removing leading zeros, making our example 2600:9000:2368:a000:1a:2a62:5300:21.

Who Created IPv6?

IPv6 was the brainchild of the Internet Engineering Task Force (IETF), an international group that develops Internet technical standards.

Where Are We Now in Terms of IPv6 Usage?

Internet users started the World IPv6 Launch back in June 2012. Companies like Google, Facebook, Microsoft Bing, and Yahoo! were the protocol’s earliest supporters. From 2012 to the present, IPv6 traffic has increased significantly. Below are some activities of some IPv6 supporters.

- Wikipedia made its core MediaWiki software IPv6-ready shortly after the World IPv6 Launch.
- Facebook gave all of its data center servers IPv6 addresses in 2017. By the end of 2023, Facebook reported 38% IPv6 adoption.

- Around 27.4% of Alexa's Top 500 servers supported IPv6 usage as of 13 February 2024.
- Google also reported that 43.42% of its traffic by 28 December 2023 was routed through IPv6.

Meanwhile, Akamai ranked each country in terms of IPv6 adoption. As of this writing, Tokelau topped the list, with 69% of IPv6 connections.

Country	IPv6 Adoption (%)	Country	IPv6 Adoption (%)
Tokelau	69%	Germany	59.40%
India	66.80%	Uruguay	57.60%
Montserrat	65.40%	Vietnam	56%
Malaysia	63.10%	Belgium	54.30%
France	60.30%	Saudi Arabia	54.10%

How Much Does Shifting to IPv6 Cost?

The amount depends on the nature of the organization. All new major operating systems (OSs), software, and hardware devices are IPv6-ready, so that should not add to costs. What will constitute the bulk of spending is training for network and system operators and adding IPv6 to management databases and documentation. Those running in-house-developed software are also likely to spend more.

Does Everyone Need to Transition to IPv6?

As more and more people shift to IPv6, native IPv6 access is not only likely to become the norm, but it's possible that more sites will predominantly support IPv6. And while there are translation mechanisms that allow IPv4 systems to access IPv6-only sites, these devices will not perform as well as IPv6-enabled hardware. Issues may also be hard to troubleshoot.

IPv4 users should also consider which of their services and devices may need IPv6 support in the future. Existing IPv4 address allocations may not be sufficient to support sudden increases in the volume of connected devices, such as IP-enabled wireless handheld products and the Internet of Things (IoT).

What Do Administrators Need to Do in Preparation for IPv6 Adoption?

Administrators need to plan for IPv6 adoption the same way they would for any major service upgrade. They should audit their current IPv6 capabilities and readiness. They should also assess the level of IPv6 technical knowledge within their team and plan for staff development and training. Determining which services lose business opportunities because they are only IPv4-accessible is also helpful. It may also be necessary to identify legacy systems that cannot be upgraded and choose a replacement for them.

What Are the Main Differences between IPv4 and IPv6?

IPv4 uses 32 bits of recombined digits, resulting in around 4.3 billion possible IP addresses. On the other hand, IPv6 uses 128 bits or eight groups of four hexadecimal digits, allowing for 3.4 x 10^38 possible addresses. This address space is sufficient to satisfy the foreseeable demand. While IPv6 is not backward-compatible with IPv4-exclusive systems, its implementation can coexist on some devices and services.

Here are some of the main differences between IPv4 and IPv6.

- **The IPv6 address space is substantially bigger than that of IPv4:** Due to the larger number of bits that IPv6 uses compared to IPv4 (128 versus 32 bits, respectively), there are

consequently more IPv6 than IPv4 addresses. There are 340 billion billion billion billion (3.4 x 10 ^ 38) unique IPv6 addresses, while there are only about 4 billion unique IPv4 addresses.

- **IPv6 routing gives better end-to-end connectivity than IPv4:** Again, due to the size of the IPv6 address space, IPv6 does not require network address translation (NAT) to provide end-to-end connectivity. Hence, peer-to-peer (P2P) applications, such as voice over IP (VoIP) or media streaming work very well with IPv6. In this sense, IPv6 is faster than IPv4.
- **IPv6 allows device autoconfiguration:** IPv6 automates configuration by providing simple mechanisms. This plug-and-play auto-configuration feature is not available in IPv4.
- **IPv6 has simplified header structures that hasten routing:** IPv6 has a much simpler packet header structure that minimizes time and effort spent on header processing.
- **IPv6 is more secure for applications and networks:** IP Security (IPSec) is a primary IPv6 requirement, allowing it to provide better security than IPv4. IPSec has cryptographic protocols to secure data communication and key exchange.
- **IPv6 provides better quality of service (QoS):** IPv6's Flow Label field, which defines how routers should identify and handle packets, makes its QoS better than that of IPv4.
- I**Pv6 is faster than IPv4**: Because IPv6 does not use NAT, it is faster than IPv4. NAT allows carriers to use a smaller set of IPv4 addresses for a bigger number of IP addresses. That lessens the speed of website loading and other functions.

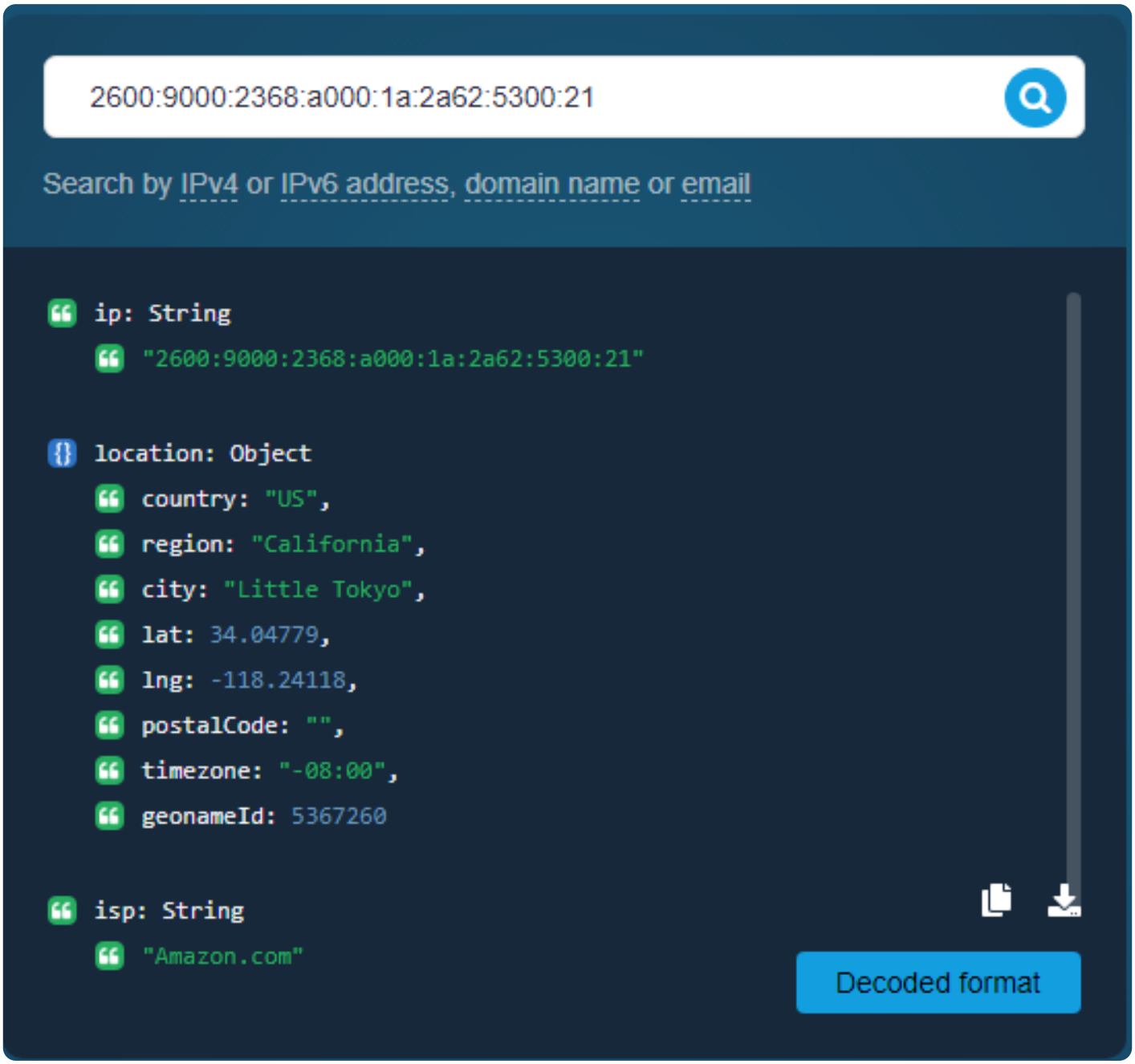
How Does IPv6 Compare with IPv4 Geolocation?

IP geolocation provides the physical location of a computer or device connected to the Internet, regardless of IPv4 or IPv6 usage. In recent years, available IPv6 geolocation lookup data has improved as the technology matured and data collection became more widespread.

Does IPv6 Have Geolocation?

Like IPv4, IPv6 does have geolocation data, although it has yet to be as precise as IPv4

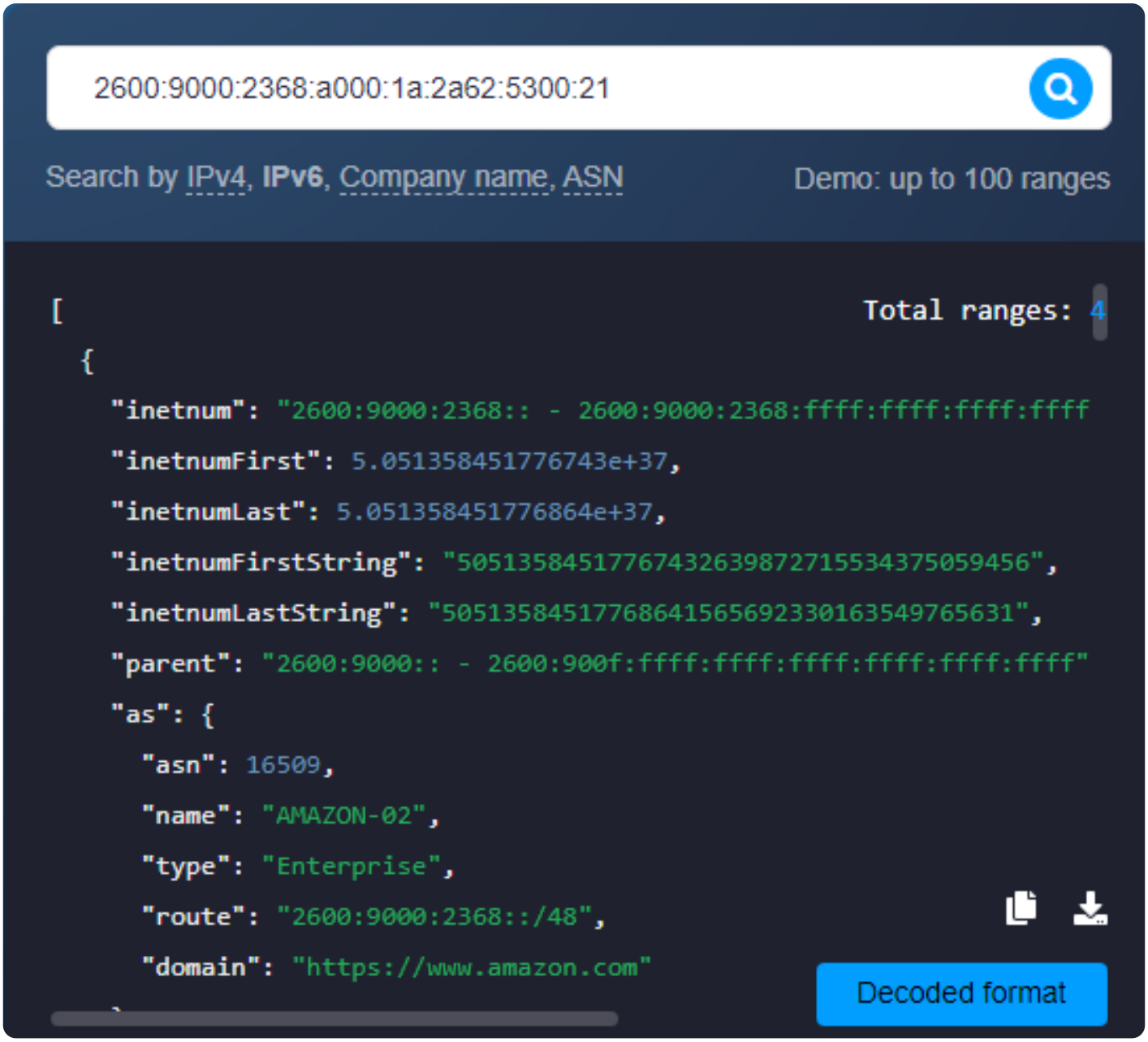
geolocation. However, IP Geolocation API can return the country, region, city, latitude and longitude coordinates, time zone, and Internet service provider (ISP) of IPv6 addresses. We'll demonstrate this using 2600:9000:2368:a000:1a:2a62:5300:21. IP Geolocation API revealed the IPv6 address was geolocated in Little Tokyo, California, and assigned to Amazon.



What Is an IPv6 Address Block?

An IPv6 address block refers to a series or contiguous group of consecutive IPv6 addresses. It's similar to an IPv4 subnet but on a much larger scale due to the vast IPv6 address space.

Our sample IPv6 address 2600:9000:2368:a000:1a:2a62:5300:21, for instance, belonged to the 2600:9000:2368::–2600:9000:2368:ffff:ffff:ffff:ffff:ffff block according to IP Netblocks API.



How Accurate Are IP Addresses?

IP addresses provide rough estimates of a device's exact location. The accuracy of IP geolocation data depends on several factors that can vary greatly depending on the specific technology used and context.

For example, IPv4 geolocation can pinpoint the city and country level locations of IPv4 addresses. Meanwhile, IPv6 geolocation can pinpoint an IPv6 address's location at the country, region, or continent level.

Privacy concerns can also affect how accurate IP addresses are. Some ISPs may be hesitant to share precise and detailed location data for both IPv4 and IPv6.

How to Obtain Geolocation Data for IPv4 and IPv6 Addresses?

Developers can obtain the most accurate IP geolocation data for both IPv4 and IPv6 addresses using WhoisXML API's IP geolocation services to get the country, time zone, region, city, and ISP, among others, for various applications.

IP Geolocation API provides the code necessary to acquire these details in most major programming languages for implementation on web interfaces or applications. On the other hand, IP Geolocation Database will suffice if users need to collect data for all IPv4 and IPv6 addresses in use.

It is also possible to obtain domain WHOIS data drawn from regional Internet registries (RIRs) and Border Gateway Protocol (BGP) feeds from IP Netblocks API and IP Netblocks Database. These IP geolocation, WHOIS, and routing details could prove useful for content personalization, location-based access, and security.

Check out how IP Geolocation API can help with your business processes. Sign up and test the API for free or contact us if you have any questions.