IPv4 Depletion and IPv6 Deployment FAQs

The central pool of available IPv4 addresses managed by the Internet Assigned Numbers Authority (IANA) was depleted on 3 February 2011, when each Regional Internet Registry (RIR) received one final /8 allocation of IPv4 address space (equal to 16.8 million addresses).

Since that time, the RIRs (AFRINIC, APNIC, ARIN, LACNIC and the RIPE NCC) have allocated IPv4 address space to their members in accordance with their community-based regional policies, and will continue to do so until their pools of available IPv4 addresses have been depleted.

This document answers the most relevant questions about what IPv4 exhaustion means for all Internet stakeholders, including Internet Service Providers (ISPs), network operators, vendors, regulators, governmental organizations and end users.

1. What is IPv4?

Internet Protocol version 4 (IPv4) is a system of addresses used to identify devices on a network. IPv4 addresses are 32-bit numbers. This means that there are 2^{32}, or just over four billion, possible addresses. When the commercial Internet was in its infancy, the pool of around four billion IPv4 addresses seemed huge and no one predicted its rapid growth. Over time, it has become clear that more addresses than this will be required to ensure ongoing growth of the Internet.

2. What does "IPv4 depletion" mean?

It means that the central pool of available IPv4 addresses managed by the IANA (www.iana.org/numbers) is empty. As of February 2011, most of the four billion IPv4 addresses available have been allocated for use or reserved for a specific technical purpose.

3. Will the Internet still work when there are no IPv4 addresses left?

Yes. The Internet will continue to work and the IPv4 addresses already in use will continue to function.

4. Why can't we just make more IPv4 addresses?

IPv4 allows for a maximum of just over four billion unique addresses (for example: 10.142.131.235). It is limited by the number of unique number combinations that can be created in this format.

5. Can I still get IPv4 address space from my RIR?

As long as the RIRs still have available IPv4 address space, they will continue to distribute it in accordance with their regional policies.

We cannot predict how long each RIR's pool of IPv4 address space will last.

6. I am an Internet user. How will IPv4 depletion affect me?

Internet users won't notice the effect of IPv4 depletion in the foreseeable future.

However, in the future there may be parts of the Internet that you cannot reach if the website or service is an IPv6-only network and your Internet Service Provider (ISP) does not provide its customers with IPv6 addresses.

7. What is IPv6?

To account for the massive expansion in Internet-enabled services and devices, a new system of addressing had to be introduced to ensure enough unique IP addresses were available. The Internet Engineering Task Force (IETF) developed the new protocol, IPv6, which allows for 2^{128}, or roughly 340 trillion trillion trillion, unique IP addresses. IPv6 addresses are 128-bit addresses, expressed in hexadecimal notation (for example: 2001:DB8:8::260:97ff:fe40:efab).

This huge number of addresses is expected to accommodate the predicted expansion of the Internet and Internet-related services well into the future.

IPv6 was introduced in 1999 and has been in use ever since. This means that the core standards are stable and have been extensively tested in research and operational contexts.

8. Why is IPv4 depletion such a "hot topic" when there are plenty of IPv6 addresses that can be used instead?

IPv4 addresses and IPv6 addresses are not automatically compatible with each other, so network operators need to make investments to ensure that this can happen. Some network operators are not prioritizing the investment to make their software and hardware IPv6-ready.

The RIRs and other industry partners are working hard to ensure that everyone is aware of IPv4 depletion and the importance of preparing for the widespread adoption of IPv6 on the Internet.

9. What can I do?

Government organizations: Coordinate with industry to support and promote awareness and educational activities. Adopt regulatory and economic incentives to encourage IPv6 adoption. Require IPv6 compatibility in procurement procedures. Officially adopt IPv6 within your government agencies.

Broadband access providers: Your customers want access to the entire Internet, and this means IPv4 and IPv6 websites. Offering full access requires running IPv4/IPv6 transition services and is a significant engineering project. Multiple transition technologies are available, and each provider needs to make its own architectural decisions.

Internet service providers: Implement a plan that will allow your customers to connect to the Internet via IPv6 and IPv6/IPv4, not just IPv4. Businesses are beginning to ask for IPv6 over their existing Internet connections and for their co-located servers. Communicate with your peers and vendors about IPv6, and confirm their timelines for production IPv6 services.

Internet content providers: Content must be reachable to future Internet customers. Plan on serving content via IPv6 in addition to IPv4 as soon as possible.

Enterprise customers: Email, web, and application servers must be reachable via IPv6 in addition to IPv4. Open a dialogue with your ISP about providing IPv6 services. Each organization must decide on timelines, and investment level will vary.

Internet equipment vendors: There was probably limited demand for IPv6 in the past. Demand for IPv6 support will become mandatory very, very quickly. Introduce IPv6 support into your product cycle as soon as possible.

Find out more about IPv4 depletion and IPv6 deployment from your local RIR:

AFRINIC (Africa)
http://www.afrinic.net/IPv6/index.htm

APNIC (Asia Pacific)
http://www.apnic.net/community/ipv6-program

ARIN (North America)
https://www.arin.net/knowledge/v4-v6.html

LACNIC (Latin America and the Caribbean)
http://portalipv6.lacnic.net/en

RIPE NCC (Europe, the Middle East and Central Asia)
http://www.ipv6actnow.org

The Number Resource Organization (NRO)

Formed by the Regional Internet Registries (RIRs) to formalise their cooperative efforts, the NRO exists to protect the unallocated number resource pool, to promote and protect the bottom-up policy development process, and to act as a focal point for Internet community input into the RIR system.

AFRINIC The Internet Numbers Registry for Africa · APNIC · ARIN American Registry for Internet Numbers · lacnic · RIPE NCC

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