Managing Internet Number Resources

Global Coordination and the Number Resource Organization (NRO)

The fundamental operation of the Internet and the services that it provides rely on the combined efforts of several key organizations. Among these organizations are the world's five Regional Internet Registries (RIRs), which work collaboratively with the countless stakeholders who rely on the Internet's secure, robust, and scalable infrastructure. The essential building blocks for this infrastructure include Internet Protocol (IP) addresses and Autonomous System (AS) numbers, or Internet number resources.

The RIRs are responsible for the regional management of Internet number resources. Collectively the RIRs formed the NRO to act as a coordinating body to provide global industry partners a single point of contact. The NRO also exists to protect the unallocated Internet number resource pool and to promote and protect the bottom-up policy development process.

The Regional Internet Registries (RIRs)

The Internet uses a system of numbers called IP addresses to work. Internet number resources (IPv4, IPv6 and Autonomous System (AS) Numbers) are assigned, allocated and managed by the five RIRs, which are not-for-profit, membership-based organizations charged with managing the distribution of these resources in their respective regions. Internet number resources are managed following community-defined technical and operational policies.

Each RIR community develops its own policies to manage Internet number resources, and works with the other RIR communities on policies that require global coordination.

- **AFRINIC**, serving Africa
- **APNIC**, serving the Asia Pacific region
- **ARIN**, serving Canada, many Caribbean and North Atlantic islands, and the United States
- **Lacnic**, serving Latin America and the Caribbean
- **RIPE NCC**, serving Europe, the Middle East and parts of Central Asia

Internet Number Resources

IP addresses are not owned as property. Regional Internet Registries (RIRs) delegate the right to use them based on need to Local Internet Registries (LIRs), National Internet Registries (NIRs), and Internet Service Providers (ISPs), who in turn provide them to consumers. The Internet community develops technical and operational policies that determine how addresses are delegated, and these policies are determined on a regional basis.

An Internet Protocol (IP) address is a numeric identifier that includes information about how to reach a network location via the Internet routing system. Every device directly connected to the Internet must have an IP address. Every IP address must be unique for these devices to connect to the Internet and to each other.

The Internet infrastructure is mainly composed of information-forwarding devices called routers. This infrastructure does not need to know what or who is communicating or the content of the communications; this is left to the programs and devices themselves. The Internet infrastructure only transports IP packets between devices, as identified by the associated IP addresses. This is often referred to as the "End-to-End Principle".

A specific IP address is not designed to identify:
- The geographic location of a network or device
- Who is using the IP address
- Where the user received the IP address
- Why the IP address is in use

IPv4 and IPv6 Addresses

The pool of IPv4 address space contains around four billion addresses. When the Internet was in its infancy, this seemed like a huge amount. But as the Internet expanded, demand for IPv4 addresses increased at an unprecedented level. As the IPv4 address pool approaches depletion, some of the regional communities are creating policy-guided mechanisms to allow for the transfer of IPv4 resources within, and sometimes between, regions.

Internet Protocol version 6 (IPv6) was designed by the Internet Engineering Task Force (IETF) to greatly expand the amount of IP addresses available. There are 2^{128} IPv6 addresses, or roughly 340 trillion, trillion, trillion. This vast number of addresses is expected to accommodate the anticipated expansion of the Internet and Internet-related services for decades to come.

	Internet Protocol version 4 (IPv4)	Internet Protocol version 6 (IPv6)
Deployed	1981	1999
Address Size	32-bit number	128-bit number
Address Format	Dotted Decimal Notation 203.0.113.76	Hexadecimal Notation 2001:DB8:0234:AB00:0123:4567:8901:ABCD
Prefix Notation	192.0.2.0/24	2001:DB8::/32
Number of Addresses	2^{32} = 4,294,967,296	2^{128} = 340,282,366,920,938,463,463,374,607,431,768,211,456

More Information

For more information on Internet number resources, see:
www.ripe.net/ip-addressing
NRO Home Page:
www.nro.net
NRO Statistics:
www.nro.net/statistics
NRO Memorandum of Understanding:
www.nro.net/documents/mou
NRO Mailing Lists:
www.nro.net/interact

AFRINIC:
www.afrinic.net
APNIC:
www.apnic.net
ARIN:
www.arin.net
Lacnic
www.lacnic.net
RIPE NCC:
www.ripe.net
ICANN Address Supporting Organization (ASO):
www.aso.icann.org

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APNIC
ARIN American Registry for Internet Numbers
lacnic
RIPE NCC