                   The Internet Numbers Registry System

Abstract

   This document provides information about the current Internet Numbers
   Registry System used in the distribution of globally unique Internet
   Protocol (IP) address space and autonomous system (AS) numbers.

   This document also provides information about the processes for
   further evolution of the Internet Numbers Registry System.

   This document replaces RFC 2050.

   This document does not propose any changes to the current Internet
   Numbers Registry System. Rather, it documents the Internet Numbers
   Registry System as it works today.

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1. Introduction

   The administrative structures of the Internet Numbers Registry System
   described in this document are largely the result of the interaction
   of operational practices, existing routing technology, number
   resource assignments that have occurred over time, and network
   architectural history. Further discussion and analysis of these
   interactions are outside the scope of this document.

   This document provides information about the current Internet Numbers
   Registry System used in the distribution of globally unique Internet
   Protocol (IP) address space and autonomous system (AS) numbers. It
   also describes the processes used for further evolution of the
   Internet Numbers Registry System. This document does not propose any
   changes to the current operation of this system.

   This document replaces RFC 2050. Since the publication of RFC 2050,
   the Internet Numbers Registry System has changed significantly. This
   document describes the present Internet Numbers Registry System.

2. Goals

   Internet number resources are currently distributed according to the
   following (non-exclusive) goals:

   1) Allocation Pool Management: Due to the fixed lengths of IP
       addresses and AS numbers, the pools from which these resources
       are allocated are finite. As such, allocations must be made in
       accordance with the operational needs of those running the
       networks that make use of these number resources and by taking
       into consideration pool limitations at the time of allocation.

   2) Hierarchical Allocation: Given current routing technology, the
       distribution of IP addresses in a hierarchical manner increases
       the likelihood of continued scaling of the Internet's routing
       system. As such, it is currently a goal to allocate IP addresses
       in such a way that permits aggregation of these addresses into a
       minimum number of routing announcements. However, whether IP
       addresses are actually announced to the Internet and the manner
       of their advertisement into the Internet's routing system are
       operational considerations outside the scope of the Internet
       Numbers Registry System.

   3) Registration Accuracy: A core requirement of the Internet Numbers
       Registry System is to maintain a registry of allocations to
       ensure uniqueness and to provide accurate registration
       information of those allocations in order to meet a variety of
       operational requirements. Uniqueness ensures that IP addresses
       and AS numbers are not allocated to more than one party at the
       same time.

   These goals may sometimes conflict with each other or with the
   interests of individual end users, Internet service providers, or
   other number resource consumers. Careful analysis, judgment, and
   cooperation among registry system providers and consumers at all
   levels via community-developed policies are necessary to find
   appropriate compromises to facilitate Internet operations.

3. Internet Numbers Registry System Structure

   The Internet Registry (IR) hierarchy was established to provide for
   the allocation of IP addresses and AS numbers with consideration to
   the above goals. This hierarchy is rooted in the Internet Assigned
   Numbers Authority (IANA) address allocation function, which serves a
   set of "Regional Internet Registries" (RIRs); the RIRs then serve a
   set of "Local Internet Registries" (LIRs) and other customers. LIRs
   in turn serve their respective number resource consumers (which may
   be themselves, their customers, "sub-LIRs", etc.)

   IETF

      The IETF specifies the underlying technical facilities and
      constraints of Internet numbers administered by the Internet
      Numbers Registry System. These specifications are aimed at
      enabling and protecting the long-term viability of the Internet,
      and adjustments to those specifications are made over time as
      circumstances warrant. The IETF has also reserved portions of the
      Internet number spaces and identifiers for future needs.

   IANA

      The Internet Assigned Numbers Authority (IANA) is a role, not an
      organization. For the Internet Numbers Registry System, the IANA
      role manages the top of the IP address and AS number allocation
      hierarchies. The Internet Corporation for Assigned Names and
      Numbers (ICANN) currently fulfills the IANA role in accordance
      with the IETF-ICANN "Memorandum of Understanding Concerning
      Technical Work of the Internet Assigned Numbers Authority", which
      was signed and ratified in March 2000 [RFC2860]. In addition,
      ICANN performs the IANA services related to the IP address space
      and AS numbers according to global number resource policies that
      have been developed by the community and formalized under a
      Memorandum of Understanding between ICANN and the Regional
      Internet Registries [ASOMOU] and documented in [ICANNv4],
      [ICANNv6], and [ICANNASN].

   Regional IRs

      In order to promote distribution of the Internet number resource
      registration function, RFC 1366 proposed delegating responsibility
      to regional bodies. (Note: RFC 1366 was replaced by RFC 1466,
      which was replaced by RFC 2050.) These bodies became known as the
      Regional Internet Registries (RIRs). The RIRs operate in
      continent-sized geopolitical regions. Currently, there are five
      RIRs: AfriNIC serving Africa, APNIC serving parts of Asia and the
      Pacific region, ARIN serving North America and parts of the
      Caribbean, LACNIC serving Latin America and parts of the
      Caribbean, and RIPE NCC serving Europe, parts of Asia and the
      Middle East. The RIRs were established in a bottom-up fashion via
      a global policy process that has been documented as the ICANN
      "Internet Consensus Policy 2" [ICP-2], which details the
      principles and criteria for establishment of Regional Internet
      Registries. The RIRs also conduct regional number policy
      development used in the administration of the number resources for
      which they are responsible.

Local IRs

> Local Internet Registries (LIRs) are established through a
> relationship with the body from which they received their
> addresses, typically the RIR that serves the region in which they
> operate, a parent LIR, or other number-allocating entity. In
> cases where LIRs span multiple regions, those LIRs have
> established relationships with multiple RIRs. LIRs perform IP
> address allocation services for their customers, typically ISPs,
> end users, or child LIRs (also known as "sub-LIRs").

4. Internet Numbers Registry Technical Considerations

   As a result of the system of technical standards and guidelines
   established by the IETF as well as historical and operational
   constraints, there have been technical considerations regarding the
   services provided by the Internet Numbers Registry System as it
   evolved. These technical considerations have included:

   1) Reverse DNS: In situations where reverse DNS was used, the
       policies and practices of the Internet Numbers Registry System
       have included consideration of the technical and operational
       requirements posed by reverse DNS zone delegation [RFC5855].

   2) Public WHOIS: The policies and practices of the Internet Numbers
       Registry System have included consideration of the technical and
       operational requirements for supporting WHOIS services [RFC3013]
       [RFC3912].

   As the Internet and the Internet Numbers Registry System continue to
   evolve, it may be necessary for the Internet community to examine
   these and related technical and operational considerations and how
   best to meet them. This evolution is discussed in the next section.

5. Internet Numbers Registry Evolution

   Over the years, the Internet Numbers Registry System has developed
   mechanisms by which the structures, policies, and processes of the
   Internet Numbers Registry System itself can evolve to meet the
   changing demands of the global Internet community. Further evolution
   of the Internet Numbers Registry System is expected to occur in an
   open, transparent, and broad multi-stakeholder manner.

   Per the delineation of responsibility for Internet address policy
   issues specified in the IETF/IAB/ICANN MOU [RFC2860], discussions
   regarding the evolution of the Internet Numbers Registry System
   structure, policy, and processes are to take place within the ICANN
   framework and will respect ICANN's core values [ICANNBL]. These core

values encourage broad, informed participation reflecting the
functional, geographic, and cultural diversity of the Internet at all
levels of policy development and decision making, as well as the
delegation of coordination functions and recognition of the policy
roles of other responsible entities that reflect the interests of
affected parties. The discussions regarding Internet Numbers
Registry evolution must also continue to consider the overall
Internet address architecture and technical goals referenced in this
document.

The foregoing does not alter the IETF's continued responsibility for
the non-policy aspects of Internet addressing such as the
architectural definition of IP address and AS number spaces and
specification of associated technical goals and constraints in their
application, assignment of specialized address blocks, and
experimental technical assignments as documented in RFC 2860. In
addition, in the cases where the IETF sets technical recommendations
for protocols, practices, or services that are directly related to IP
address space or AS numbers, such recommendations must be taken into
consideration in Internet Numbers Registry System policy discussions
regardless of venue.

6. Summary of Changes since RFC 2050

Since RFC 2050 was published, the Internet and the Internet Numbers
Registry System have undergone significant change. This document
describes the Internet Numbers Registry System as it presently exists
and omits policy and operational procedures that have been superseded
by ICANN and RIR policy since the publication of RFC 2050.

One particular change of note is that RFC 2050 defined an appeal
process and included:

    If necessary, after exhausting all other avenues, the appeal may
    be forwarded to IANA for a final decision. Each registry must, as
    part of their policy, document and specify how to appeal a
    registry assignment decision.

The RIRs have developed consensus-based policies for appeals, and
over time, they have become accepted by the respective RIR
communities. As a result, the ability to further appeal to IANA is
no longer appropriate.

7. Security Considerations

It is generally recognized that accuracy and public availability of
Internet registry data is often an essential component in researching
and resolving security and operational issues on the Internet.

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