ARIN Number Resource Policy Manual

Version 2004.1 -October 15, 2004

Abstract

This is ARIN's Number Resource Policy Manual (NRPM). It is available at: http://www.arin.net/policy/.

Contents

1. **Introduction**
   Addressing policies in the ARIN region are created in accordance with the "Internet Resource Policy Evaluation Process" (http://www.arin.net/policy/ipep.html). The status of current and historical policy proposals can be found on the "Policy Proposal Archive" page (http://www.arin.net/policy/proposal_archive.html).

   Each policy consists of a number of component parts separated by dots. The first figure to the far left and preceding the first dot (.), refers to the chapter number. The figure following the first dot indicates a policy section. Any subsequent figures are for the purpose of identifying specific parts of a given policy.
2. **Definitions**
   2.1. Internet Registry (IR) - An Internet Registry (IR) is an organization that is responsible for distributing IP address space to its members or customers and for registering those distributions.
   2.2. Regional Internet Registry (RIR) - Regional Internet Registries (RIRs) are established and authorized by respective regional communities, and recognized by the IANA to serve and represent large geographical regions. The primary role of RIRs is to manage and distribute public Internet address space within their respective regions.
   2.3. National Internet Registry (NIR) - A National Internet Registry (NIR) primarily allocates address space to its members or constituents, which are generally LIRs organized at a national level. NIRs exist mostly in the Asia Pacific region.
   2.4. Local Internet Registry (LIR) - A Local Internet Registry (LIR) is an IR that primarily assigns address space to the users of the network services that it provides. LIRs are generally ISPs, whose customers are primarily end users and possibly other ISPs.
   2.5. Allocate and Assign - A distinction is made between address allocation and address assignment, i.e., ISPs are "allocated" address space as described herein, while end-users are "assigned" address space.
     - Allocate - To allocate means to distribute address space to IRs for the purpose of subsequent distribution by them.
     - Assign - To assign means to delegate address space to an ISP or end-user, for specific use within the Internet infrastructure they operate. Assignments must only be made for specific purposes documented by specific organizations and are not to be sub-assigned to other parties.
   2.6. End-user - An end-user is an organization receiving assignments of IP addresses exclusively for use in its operational networks.
   2.7. Multi-homed - An organization is multi-homed if it receives full-time connectivity from more than one ISP and has one or more routing prefixes announced by at least two of its upstream ISPs.
3. **Directory Services**
   3.1. Bulk Copies of ARIN's WHOIS
      ARIN will provide a bulk copy of WHOIS output, including point of contact information, on the ARIN site for download by any organization that wishes to obtain the data providing they agree to ARIN's acceptable use policy. This point of contact information will not include data marked as private.

      [The Request Form for ARIN Bulk WHOIS Data, which contains the Acceptable Use Policy (AUP) for Bulk Copies of ARIN WHOIS Data, can be found at: http://www.arin.net/library/agreements/bulkwhois.pdf]
   3.2. Distributed Information Server Use Requirements
      The minimal requirements for an organization to setup a
      distributed information service to advertise reassignment information
      are:
        - The distributed information service must be operational 24 hours a day, 7 days a week to both the general public and ARIN staff. The service is allowed reasonable downtime for server maintenance according to generally accepted community standards.
        - The distributed information service must allow public access to reassignment information. The service may restrict the number of queries allowed per time interval from a host or subnet to defend against DDOS attacks, remote mirroring attempts, and other nefarious acts.
        - The distributed information service must return reassignment information for the IP address queried. The service may allow for privacy protections for customers. For residential users, the service may follow ARIN's residential privacy policy that includes displaying only the city, state, zip code, and country. For all other reassignments, the service shall follow ARIN's privacy policy for publishing data in a public forum.
        - The distributed information service may return results for non-IP queries.
        - The distributed information service must respond to a query with the minimal set of attributes per object as defined by ARIN staff.
        - The distributed information service may include optional attributes per object that are defined locally.

        - The distributed information service must return results that are up-to-date on reassignment information.

3.3. Privatizing POC Information

Organizations may designate certain points of contact as private from ARIN WHOIS, with the exception that, at the minimum, one point of contact must be viewable.

3.4. Routing Registry

3.4.1. Acceptable use policy

- The ARIN Routing Registry data is for Internet operational purposes only. This mirroring is only allowed by other routing registries.
- The user may only distribute this data using a WHOIS service unless prior, written permission from ARIN has been obtained.
- To protect those registered in the ARIN routing registry, ARIN may need to specify additional conditions on access permissions for this data in the future. The permission to access the data is based on agreement to the conditions stipulated in this document in addition to any others that may be added in the future.
- Please see the http://www.irr.net/docs/list.html URL for information about the replicated Routing Registry data.

4. IPv4

4.1. General Principles

4.1.1. Routability - Provider independent (portable) addresses issued directly from ARIN or other Regional Registries are not guaranteed to be globally routable. Therefore, ISPs should consider the following order of priority when requesting IP address space:

- Request IP address space from upstream provider
- Request IP address space from provider's provider
- Request IP address space from ARIN (not guaranteed to be globally routable)

4.1.2. Validity - IP address allocations are valid as long as the utilization and other relevant criteria continue to be met, and the yearly fee is submitted.

4.1.3. Invalidation - ARIN may invalidate any IP allocation if it determines that the requirement for the address space no longer exists.

4.1.4. Recall - In the event of address space recall, ARIN will make every reasonable effort to inform the organization that the addresses are being returned to the free pool of IPv4 address space.

4.1.5. Determination of IP address allocation size - Determination of IP address allocation size is the responsibility of ARIN.

4.1.6. CIDR bit boundaries - In an effort to ensure that Classless Inter-Domain Routing (CIDR) is implemented and utilized as efficiently as possible, ARIN issues blocks of addresses on appropriate "CIDR-supported" bit boundaries.

4.1.7. RFC 2050 - ARIN takes guidance from allocation and assignment policies and procedures set forth in RFC 2050. These guidelines were developed to meet the needs of the larger Internet community in conserving scarce IPv4 address space and allowing continued use of existing Internet routing technologies.

4.2. Allocations to ISPs (Requirements for Requesting Initial Address Space)

4.2.1. Principles

4.2.1.1. Purpose - ARIN allocates blocks of IP addresses to Internet Service Providers (ISPs) for the purpose of reassigning that space to their customers.

4.2.1.2. Annual Renewal - An annual fee for registered space is due by the anniversary date of the ISP's first allocation from ARIN. ISPs should take care to ensure that their annual renewal payment is made by their anniversary due date in accordance with the Registration Services Agreement. If not paid by the anniversary date, the address space may be revoked. Please review the Annual Renewal/Maintenance Fees Page for more details.

4.2.1.3. Utilization rate - Utilization rate of address space is a key factor, among others, in determining address allocation.

4.2.1.4. Slow start - Because the number of available IP addresses on the Internet is limited, many factors must be considered in the determination of address space allocations. Therefore, IP address space is allocated to ISPs using a slow-start model. Allocations are based on justified need, not solely on a predicted customer base.

4.2.1.5. Minimum allocation - In general, ARIN allocates IP address prefixes no longer than /20 to ISPs. If allocations smaller than /20 are needed, ISPs should request address space from their upstream provider. For multi-homed ISPs, ARIN allocates IP address prefixes no longer than /22. If allocations smaller than /22 are needed, multi-homed ISPs should request address space from their upstream provider.

4.2.1.6. Immediate need - If an ISP has an immediate need for address space, i.e., the need exists the day of the request, ARIN may issue a /20 if the organization, such as a new company, shows justification. However, these cases are exceptional.

4.2.2. Initial allocation to ISPs

4.2.2.1. Standard or non-multi-homed - Organizations that do not meet the requirements described in the multi-homed section below (section 4.2.2.2) must satisfy the following requirements:

4.2.2.1.1.   Use of /20 - The efficient utilization of an entire previously allocated /20 from their upstream ISP. This /20 allocation may have been provided by an ISP's upstream provider(s), and does not have to be contiguous address space. The organization must meet the requirement of efficient use of 16 /24s. For example, if an organization holds a smaller allocation, such as 12 /24s, from its upstream provider, the organization would not meet the minimum utilization requirements of a /20.

4.2.2.1.2.   Efficient utilization - Demonstrate efficient use of IP address space allocations by providing appropriate documentation, including assignment histories, showing their efficient use. ISPs must provide reassignment information on the entire previously allocated block(s) via SWIP or RWHOIS server for /29 or larger blocks. For blocks smaller than /29 and for internal space, ISPs should provide utilization data using the table format described in section 4.2.3.7.5.

4.2.2.1.3.   Three months - Provide detailed information showing specifically how a /20 will be utilized within three months.

4.2.2.1.4.   Renumber and return - ISPs receiving a new /20 may wish to renumber out of their previously allocated space. In this case, an ISP must use the new /20 to renumber out of that previously allocated block of address space and must return the space to its upstream provider.

4.2.2.2. Multi-homed - When prefixes are allocated which are longer than /20, they will be from a block reserved for that purpose. In order to receive an initial allocation from ARIN, multi-homed organizations must:

• When requesting a /22, demonstrate the efficient utilization of a minimum contiguous or noncontiguous /23 (two /24s) from an upstream.

• When requesting a /21, demonstrate the efficient utilization of a minimum contiguous or noncontiguous /22 (four /24s) from an upstream.

• When requesting a /20, demonstrate the efficient utilization of a minimum contiguous or noncontiguous /21 (eight /24s) from an upstream.

4.2.2.2.1.   Efficient utilization - Provide reassignment information for /29 and shorter prefix lengths using the Shared WHOIS Project (SWIP) or by providing the same information fields in an RWHOIS server. If additional address space is later requested, this information must be available at the time of the request. Utilization for blocks smaller than /29 can be documented using the format described in section 4.2.3.7.5.

4.2.2.2.2.   Three months - Provide information showing that the requested IP address space will be utilized within three months.

4.2.2.2.3.   Renumber and return - Agree that the newly requested IP address space will be used to renumber out of the current addresses which will be returned to their upstream provider(s).

4.2.2.2.4.   Additional requests following the initial allocation - To receive additional address space following the initial allocation, multi-homed organizations must have returned the original IP address space to its provider in its entirety and must provide justification for a new allocation as described above in the section titled Requirements for Requesting Initial Address Space.

4.2.3.   Reassigning Address Space to Customers

4.2.3.1. Efficient utilization - ISPs are required to apply a utilization efficiency criterion in providing address space to their customers. To this end, ISPs should have documented justification available for each reassignment. ARIN may request this justification at any time. If justification is not provided, future receipt of allocations may be impacted. In extreme cases, existing allocations may be affected.

4.2.3.2.   VLSM - To increase utilization efficiency of IPv4 address space, ISPs reassigning IP address space to their customers should require their customers to use variable length subnet mask (VLSM) and classless technologies (CIDR) within their networks. ISPs should issue prefix lengths longer than /24 wherever feasible.

4.2.3.3. Contiguous blocks - IP addresses are allocated to ISPs in contiguous blocks, which should remain intact. Fragmentation of blocks is discouraged. To avoid fragmentation, ISPs are encouraged to require their customers to return address space if they change ISPs. Therefore, if a customer moves to another service provider or otherwise terminates a contract with an ISP, it is recommended that the customer return the network addresses to the ISP and renumber into the new provider's address space. The original ISP should allow sufficient time for the renumbering process to be completed before requiring the address space to be returned.

4.2.3.4. Downstream customer adherence - ISPs must require their downstream customers to adhere to the following criteria:

4.2.3.4.1.   Utilization - Reassignment information for prior allocations must show that each customer meets the 80% utilization criteria and must be available via SWIP/RWHOIS prior to your issuing them additional space.

4.2.3.4.2.   Downstream ISPs - Customers must follow ARIN policy for ISPs.

4.2.3.5. ARIN approval of reassignments/reallocations

4.2.3.5.1. /18 - All extra-large ISPs making reassignments of a /18 or greater to a customer must first have these reassignments reviewed and approved by ARIN.

4.2.3.5.2. /19 - Small to large ISPs making customer reassignments of a /19 or greater must first seek ARIN's approval.

4.2.3.5.3. Required documentation for pre-approval requests

- Network engineering plans - Network engineering plans including subnets, host counts, and hosts per subnet, with projected utilization rates and associated confidence levels of those projections for one and two years,
- Deployment schedule - Deployment schedule for the network, including major milestones for each subnet,
- Network topology diagrams.

4.2.3.6. Reassignments to multi-homed downstream customers

Under normal circumstances an ISP is required to determine the prefix size of their reassignment to a downstream customer according to the guidelines set forth in RFC 2050. Specifically, a downstream customer justifies their reassignment by demonstrating they have an immediate requirement for 25% of the IP addresses being assigned, and that they have a plan to utilize 50% of their assignment within one year of its receipt. This policy allows a downstream customer's multi-homing requirement to serve as justification for a /24 reassignment from their upstream ISP, regardless of host requirements. Downstream customers must provide contact information for all of their upstream providers to the ISP from whom they are requesting a /24. The ISP will then verify the customer's multi-homing requirement and may assign the customer a /24, based on this policy. Customers may receive a /24 from only one of their upstream providers under this policy without providing additional justification. ISPs may demonstrate they have made an assignment to a downstream customer under this policy by supplying ARIN with the information they collected from the customer, as described above, or by identifying the AS number of the customer. This information may be requested by ARIN staff when reviewing an ISP's utilization during their request for additional IP addresses space.

4.2.3.7. Reassignment information

4.2.3.7.1. Customer organization information - ISPs are required to demonstrate efficient use of IP address space allocations by providing appropriate documentation, including assignment histories, showing their efficient use. SWIP and RWHOIS reassignments should show each client's organizational information.

4.2.3.7.2. /29s and larger nets - ISPs must provide reassignment information on the entire previously allocated block(s) via SWIP or RWHOIS server for /29 or larger blocks. For blocks smaller than /29 and for internal space, ISPs should provide utilization data using the format described in section 4.2.3.7.5.

4.2.3.7.3. Submit within 7 days - Any time an ISP receives a new block of address space, reassignment information should be submitted within 7 days of issuance of the new space. This information is used to demonstrate that the address space received is being efficiently utilized. Also, it will be reviewed to determine an ISP's and its downstream customers' utilization effectiveness if and when additional space is requested in the future.

4.2.3.7.4. Visible via WHOIS - This information must be visible via WHOIS prior to submitting a request for a new allocation. For further information on reassigning IP address space, please see RFC 2050.

4.2.3.7.5. Accounting for additional utilization - The following format should be used to provide the required information for utilization of blocks smaller than /29 and for describing internal networks:

City	Which IP Addresses Assigned	No. of Ports	No. of Dial-up Clients
City	Which IP Addresses Assigned	No. of Internal Machines	Purpose
Which IP Addresses Assigned		List URLs for Websites	

4.2.3.7.6. Residential Customer Privacy

To maintain the privacy of their residential customers, an organization with downstream residential customers may substitute that organization's name for the customer's name, e.g. 'Private Customer - XYZ Network', and the customer's street address may read 'Private Residence'. Each private downstream residential reassignment must have accurate upstream Abuse and Technical POCs visible on the WHOIS record for that block.

4.2.4. ISP Additional Requests
ISPs requesting additional address space from ARIN beyond their initial allocation should follow the guidelines described in the ARIN ISP Guidelines for Requesting Additional IP Address Space.

4.2.4.1. Utilization percentage (80%) - ISPs must have efficiently utilized all previous allocations and at least 80% of their most recent allocation in order to receive additional space. This includes all space reassigned to their customers. The reassignment information section of the ARIN ISP Network Request Template should be completed for all address blocks that have been allocated to your organization. In the template, line 1b. Assigned: information will be verified via SWIP/RWHOIS and 1c. Reserved: should be used to indicate internal network information. Please note that until your prior utilization is verified to meet the 80% requirement, ARIN can neither process nor approve a request for additional addresses.

4.2.4.2. Return address space as agreed - Return prior address space designated for return as agreed.

4.2.4.3. Three months - Provide detailed information showing specifically that the address space will be utilized within three months. When completing Section 7 of the ARIN ISP Address Request Template, please keep this in mind. Determination of the appropriate allocation to be issued is based on efficient utilization of space within this three-month time frame.

4.2.4.4. Six months - After a subscriber has been a member of ARIN for one year they may choose to request a six-month supply of IP addresses.

4.2.5. Web Hosting Policy - When an ISP submits a request for IP address space to be used for IP-based web hosting, it will supply (for informational purposes only) its technical justification for this practice. ARIN will analyze this data continuously, evaluating the need for future policy change.

4.2.6. Cable Address Space Policy
- In most cases, ISPs that have residential cable subscribers assign address space to their cable infrastructure to which their customers connect rather than to individual subscribers. This assignment information regarding each market area holding an address block should be entered via the SWIP template (or by using RWHOIS) with the network name used to identify each market area. Initial allocations are based on total number of homes that could purchase the service in a given market area.
- Using SWIP or RWHOIS, cable ISPs must show that they have reassigned at least 80% of their current address space, with a 50 to 80% utilization rate, in order to request additional addresses.
- Each assignment to a specific end-user (if holding /29 and larger blocks) requires the submission of a SWIP template or use of an RWHOIS server. Requesters will also be asked to provide detailed plans for use of the newly requested space.

4.3. End-users – Assignments to end-users
4.3.1. End-users - ARIN assigns blocks of IP addresses to end-users who request address space for their internal use in running their own networks, but not for sub-delegation of those addresses outside their organization. End-users must meet the requirements described in these guidelines for justifying the assignment of an address block.

4.3.2. Minimum assignment - In general, the minimum block of IP address space assigned by ARIN to end-users is a /20. If assignments smaller than /20 are needed, end-users should contact their upstream provider. For multi-homed end-users, the minimum block of IP address space assigned is a /22. If assignments smaller than a /22 are needed, multi-homed end-users should contact their upstream providers. When prefixes are assigned which are longer than /20, they will be from a block reserved for that purpose.

4.3.3. Utilization rate - Utilization rate of address space is a key factor in justifying a new assignment of IP address space. Requesters must show exactly how previous address assignments have been utilized and must provide appropriate details to verify their one-year growth projection. The basic criteria that must be met are:
- A 25% immediate utilization rate, and
- A 50% utilization rate within one year.

A greater utilization rate may be required based on individual network requirements. Please refer to RFC 2050 for more information on utilization guidelines.

4.3.4. Additional considerations - End-users may qualify for address space under other policies such as Immediate need [4.2.1.6] or Micro-allocation [4.4].

4.3.5. Non-connected Networks - End-users not currently connected to an ISP and/or plan not to be connected to the Internet are encouraged to use private IP numbers reserved for non-connected networks (see RFC 1918).

4.4. Micro-allocation - ARIN will make micro-allocations to critical infrastructure providers of the Internet, including public exchange points, core DNS service providers (e.g. ICANN-sanctioned root, gTLD, and ccTLD operators) as well as the RIRs and IANA. These allocations will be no longer than a /24 using IPv4 or a /48 using IPv6. Multiple allocations may be granted in certain situations. - Exchange point allocations MUST be allocated from specific blocks reserved only for this purpose. All other micro-allocations WILL be allocated out of other blocks

reserved for micro-allocation purposes. ARIN will make a list of these blocks publicly available. - Exchange point operators must provide justification for the allocation, including: connection policy, location, other participants (minimum of two total), ASN, and contact information. ISPs and other organizations receiving these micro-allocations will be charged under the ISP fee schedule, while end-users will be charged under the fee schedule for end-users. This policy does not preclude exchange point operators from requesting address space under other policies.

4.5. Multiple Discrete Networks

Organizations with multiple discrete networks desiring to request new or additional address space under a single maintainer ID must meet the following criteria:

- The organization shall be a single entity, and not a consortium of smaller independent entities.
- The organization must have been previously granted address space by an RIR. This policy does not apply to organizations with only legacy address space.
- The organization must have multiple (at least two) discrete multi-homed networks.
- The organization must have compelling criteria for creating discrete networks.
- The organization must show greater than 50% utilization of the last block of address space granted to them by the RIR.
- The organization must show greater than 50% utilization of all previously allocated address space.
- The organization must not allocate additional space to discrete network unless all the blocks allocated to that network show utilization greater than 80% individually and as a whole.
- The organization must apply for this policy to be applied to its existing account.

Some organizations have requirements for multiple discrete networks that need individual address allocations. Discrete networks must often have separate unique globally routable address space and will often grow at different rates. In order for organizations with multiple discrete networks to request additional address space under a single maintainer ID, the organization must use the following criteria:

- The organization should be a single entity, and not a consortium of smaller independent entities.
- This policy applies only to organizations that have been previously granted address space by an RIR. This policy does not apply to organizations with only legacy address space.
- The organization must have multiple (at least two) discrete multi-homed networks.
- The organization must have compelling criteria for creating discrete networks. Examples:
    - regulatory restrictions for data transmission
    - geographic distance and diversity between networks
    - autonomous multi-homed discrete networks
- The organization must apply for this policy to be applied to their account.

These organizations must adhere to the following guidelines when requesting additional address space:

- When applying for additional address space from an RIR for new networks or additional space for existing networks the organization must show greater than 50% utilization for the last block granted by the RIR and their allocations as a whole.
- The organization must not allocate additional space to a discrete network unless all the blocks allocated to that network show utilization greater than 80% individually and as a whole.
- The organization must not allocate a CIDR block larger than the current minimum assignment size of the RIR (currently /20 for ARIN) to a new network.
- The organization must not allocate an additional CIDR block larger than the current minimum assignment size of the RIR (currently /20 for ARIN) to an existing network, unless previous growth rates for that network indicate that it is likely to utilize a larger CIDR block before the time the organization will be requesting an additional block from the RIR.
- When allocating a block larger than the minimum assignment size to an existing network the organization should use the smallest allocation possible out of a larger reserved block. This requirement is to reduce the number of routes the organization will announce from that autonomous system.
- The organization must follow the policy of the granting RIR for allocations that are assigned or allocated to downstream networks. This includes record keeping of allocation requests and network utilization documents for audits by the RIR.
- Organizations with 'multiple maintainers' should request that this policy apply to their accounts, their existing allocations be merged, and that additional allocations will fall under this policy.
- The organization must record allocations or assignments down to the current RIR bit boundary (currently /29 for ARIN) and record them in an approved RIR public database.

- The organization must keep detailed records of how it has allocated space to each discrete network. This should include the block allocated, any reserved blocks, and date of allocation/reservation. The discrete network allocation information should also be present in a public database (Example: routing registry, RWHOIS, or SWIP).

4.6. Amnesty Requests

If an organization, whether a member or non-member, ISP or end-user, relinquishes a larger block of portable address space to ARIN, they may be allowed to receive a smaller block, /24 or shorter, in exchange. The organization will not be required to justify their use of the new, smaller block. The organization must return the block to be exchanged within 12 months. ARIN shall, at their discretion, determine whether the smaller replacement block shall be a subnet of the returned block, or a block allocated from some different range. If any of the relinquished blocks had associated maintenance fees, then the new block will be subject to the appropriate fees for that block size. Likewise those without maintenance fees shall remain so.

4.7. Aggregation Requests

If an organization, whether a member or non-member, ISP or end-user, relinquishes a group of portable, non-aggregatable address blocks to ARIN, they shall be allowed to receive a block in exchange, /24 or shorter, but no more than the shortest block that could contain all of the returned blocks. Exchanged space shall be returned within 12 months. If the gain in the number of addresses is greater than 4096, the aggregation request must be evaluated by the ARIN in accordance with the current IPv4 allocation policy. If all of the previous address blocks were maintained in the ARIN database without maintenance fees, the replacement space shall be as well, but if any one of the returned blocks had associated maintenance fees, then the replacement block shall also be subject to maintenance fees.

4.8. Policy for the African Portion of the ARIN Region - Minimum Allocation. The minimum allocation size for ISPs from the African portion of the ARIN region is /22.

4.8.1. Allocation Criteria

- The requesting organization must show the efficient utilization of an entire previously allocated /22 from their upstream ISP. This allocation (/22) may have been provided by an ISP's upstream provider(s), and does not have to be contiguous address space. The organization must meet the requirement of efficient use of 4 /24s.
- A multi-homed organization must show the efficient utilization of an entire previously allocated /23 from their upstream ISP. This allocation (/23) may have been provided by an ISP's upstream provider(s), and does not have to be contiguous address space. The organization must meet the requirement of efficient use of 2 /24s.
- Utilization Reporting and Justification. All other ARIN policies regarding the reporting of justification information for the allocation of IPv4 address space will remain in effect.

5. **AS Numbers**

There are a limited number of available Autonomous System Numbers (AS Numbers), therefore, it is important to determine which sites require unique AS Numbers and which do not. Sites that do not require a unique AS Number should use one or more of the AS Numbers reserved for private use. Those numbers are: 64512 through 65535.

In order to be assigned an AS Number, each requesting organization must provide ARIN with verification that it has one of the following:

1. A unique routing policy (its policy differs from its border gateway peers)
2. A multi-homed site.

AS Numbers are issued based on current need. An organization should request an AS Number only when it is already multi-homed or will immediately become multi-homed. Details regarding requirements, fees, and applying for an AS Number can be found on the Guidelines for AS Numbers page.

6. **IPv6**

[Editor's note: *The IPv6 assignment and allocation policy document was adopted by the ARIN Board of Trustees on July 9, 2002. As part of the ARIN policy cataloging project of 2004, the IPv6 policy document was inserted into the ARIN Number Resource Policy Manual; the fact that it was once a stand alone document explains why the phrase "this document" occurs in this section.*]

Status of this Memo

This document was developed through joint discussions among the APNIC, ARIN, and RIPE communities.

Abstract

This document defines registry policies for the assignment and allocation of globally-unique IPv6 addresses to ISPs and other organizations. This document obsoletes the "Provisional IPv6 assignment and allocation policy document."

This document was developed jointly by the communities of APNIC, ARIN, and RIPE.

6.1. Introduction

6.1.1. Overview

This document describes policies for the allocation and assignment of globally-unique Internet Protocol Version 6 (IPv6) address space. It updates and obsoletes the existing Provisional IPv6 Policies in effect since 1999 (RIRv6-Policies). Policies described in this document are are intended to be adopted by each registry. However, adoption of this document does not preclude local variations in each region or area.

(RFC2373, RFC2373bis) designate 2000::/3 to be global unicast address space that IANA may allocate to the RIRs. In accordance with (RFC2928, RFC2373bis, IAB-Request), IANA has allocated initial ranges of global unicast IPv6 address space from the 2001::/16 address block to the existing RIRs. This document concerns the initial and subsequent allocations of the 2000::/3 unicast address space, for which RIRs formulate allocation and assignment policies. Because end sites will generally be given /48 assignments (RFC 3177, RIRs-on-48s), the particular emphasis of this document is on policies relating the bits within 2000::/3 to the left of the /48 boundary.

However, since some end sites will receive /64 and /128 assignments, all bits to the left of /64 are in scope.

This policy is considered to be an interim policy. It will be reviewed in the future, subject to greater experience in the administration of IPv6.

6.2. Definitions

The following terms and their definitions are of particular importance to the understanding of the goals, environment, and policies described in this document.

Responsibility for management of IPv6 address spaces is distributed globally in accordance with the hierarchical structure shown below.
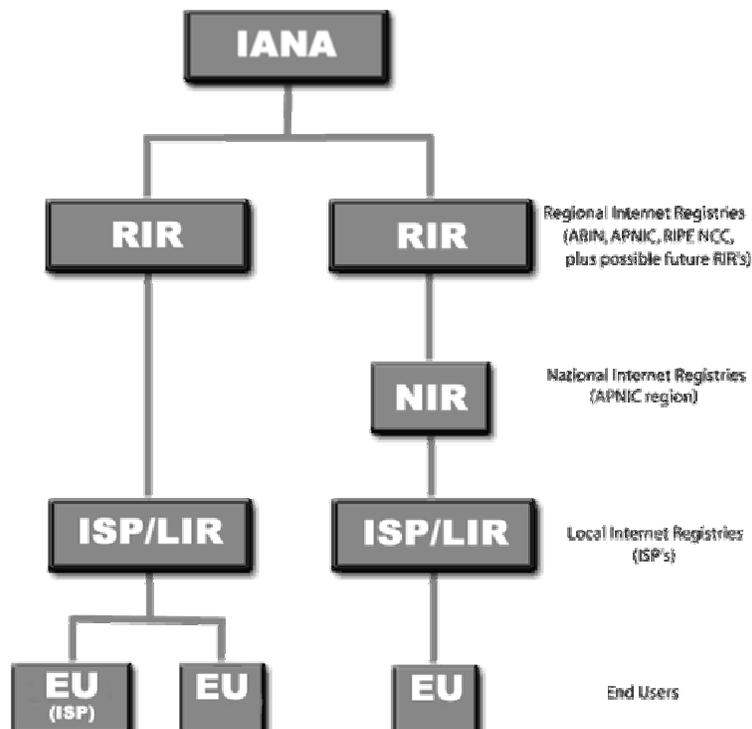
6.2.1. Internet Registry (IR)

An Internet Registry (IR) is an organization that is responsible for distributing IP address space to its members or customers and for registering those distributions. IRs are classified according to their primary function and territorial scope within the hierarchical structure depicted in the figure above.

6.2.2. Regional Internet Registry (RIR)

Regional Internet Registries (RIRs) are established and authorized by respective regional communities, and recognized by the IANA to serve and represent large geographical regions. The primary role of RIRs is to manage and distribute public Internet address space within their respective regions.

6.2.3. National Internet Registry (NIR)

A National Internet Registry (NIR) primarily allocates address space to its members or constituents, which are generally LIRs organized at a national level. NIRs exist mostly in the Asia Pacific region.

6.2.4. Local Internet Registry (LIR)

A Local Internet Registry (LIR) is an IR that primarily assigns address space to the users of the network services that it provides. LIRs are generally ISPs, whose customers are primarily end users and possibly other ISPs.

6.2.5. Allocate

To allocate means to distribute address space to IRs for the purpose of subsequent distribution by them.

6.2.6. Assign

To assign means to delegate address space to an ISP or end-user, for specific use within the Internet infrastructure they operate. Assignments must only be made for specific purposes documented by specific organizations and are not to be sub-assigned to other parties.

6.2.7. Utilization

Unlike IPv4, IPv6 is generally assigned to end sites in fixed amounts (/48). The actual usage of addresses within each assignment will be quite low, when compared to IPv4 assignments. In IPv6, "utilization" is only measured in terms of the bits to the left of the /48 boundary. In other words, utilization refers to the assignment of /48s to end sites, and not the number of addresses assigned within individual /48s at those end sites.

Throughout this document, the term utilization refers to the allocation of /48s to end sites, and not the number of addresses assigned within individual /48s within those end sites.

6.2.8. HD-Ratio

The HD-Ratio is a way of measuring the efficiency of address assignment (RFC 3194). It is an adaptation of the H-Ratio originally defined in (RFC1715) and is expressed as follows:

$$HD = \frac{Log \text{ (number of allocated objects)}}{Log \text{ (maximum number of allocatable objects)}}$$

where (in the case of this document) the objects are IPv6 site addresses (/48s) assigned from an IPv6 prefix of a given size.

6.2.9. End site

An end site is defined as an end user (subscriber) who has a business relationship with a service provider that involves:

1. that service provider assigning address space to the end user
2. that service provider providing transit service for the end user to other sites
3. that service provider carrying the end user's traffic.
4. that service provider advertising an aggregate prefix route that contains the end user's assignment

6.3. Goals of IPv6 address space management

6.3.1. Goals

IPv6 address space is a public resource that must be managed in a prudent manner with regards to the long-term interests of the internet. Responsible address space management involves balancing a set of sometimes competing goals. The following are the goals relevant to IPv6 address policy.

6.3.2. Uniqueness

Every assignment and/or allocation of address space must guarantee uniqueness worldwide. This is an absolute requirement for ensuring that every public host on the Internet can be uniquely identified.

6.3.3. Registration

Internet address space must be registered in a registry database accessible to appropriate members of the Internet community. This is necessary to ensure the uniqueness of each Internet address and to provide reference information for Internet troubleshooting at all levels, ranging from all RIRs and IRs to end users.

The goal of registration should be applied within the context of reasonable privacy considerations and applicable laws.

6.3.4. Aggregation

Wherever possible, address space should be distributed in a hierarchical manner, according to the topology of network infrastructure. This is necessary to permit the aggregation of routing information by ISPs, and to limit the expansion of Internet routing tables.

This goal is particularly important in IPv6 addressing, where the size of the total address pool creates significant implications for both internal and external routing.

IPv6 address policies should seek to avoid fragmentation of address ranges.

Further, RIRs should apply practices that maximize the potential for subsequent allocations to be made contiguous with past allocations currently held. However, there can be no guarantee of contiguous allocation.

6.3.5. Conservation

Although IPv6 provides an extremely large pool of address space, address policies should avoid unnecessarily wasteful practices. Requests for address space should be supported by appropriate documentation and stockpiling of unused addresses should be avoided.

6.3.6. Fairness

All policies and practices relating to the use of public address space should apply fairly and equitably to all existing and potential members of the Internet community, regardless of their location, nationality, size or any other factor.

6.3.7. Minimized Overhead

It is desirable to minimize the overhead associated with obtaining address space. Overhead includes the need to go back to RIRs for additional space too frequently, the overhead associated with managing address space that grows through a number of small successive incremental expansions rather than through fewer, but larger, expansions.

6.3.8. Conflict of goals

The goals described above will often conflict with each other, or with the needs of individual IRs or end users. All IRs evaluating requests for allocations and assignments must make judgments, seeking to balance the needs of the applicant with the needs of the Internet community as a whole.

In IPv6 address policy, the goal of aggregation is considered to be the most important.

6.4. IPv6 Policy Principles

To address the goals described in the previous section, the policies in this document discuss and follow the basic principles described below.

6.4.1. Address space not to be considered property

It is contrary to the goals of this document and is not in the interests of the Internet community as a whole for address space to be considered freehold property.

The policies in this document are based upon the understanding that globally-unique IPv6 unicast address space is licensed for use rather than owned. Specifically, IP addresses will be allocated and assigned on a license basis, with licenses subject to renewal on a periodic basis. The granting of a license is subject to specific conditions applied at the start or renewal of the license.

RIRs will generally renew licenses automatically, provided requesting organizations are making a good-faith effort at meeting the criteria under which they qualified for or were granted an allocation or assignment. However, in those cases where a requesting organization is not using the address space as intended, or is showing bad faith in following through on the associated obligation, RIRs reserve the right to not renew the license.

Note that when a license is renewed, the new license will be evaluated under and governed by the applicable IPv6 address policies in place at the time of renewal, which may differ from the policy in place at the time of the original allocation or assignment.

6.4.2. Routability not guaranteed

There is no guarantee that any address allocation or assignment will be globally routable.

However, RIRs must apply procedures that reduce the possibility of fragmented address space which may lead to a loss of routability.

6.4.3. Minimum Allocation

RIRs will apply a minimum size for IPv6 allocations, to facilitate prefix-based filtering.

The minimum allocation size for IPv6 address space is /32.

6.4.4. Consideration of IPv4 Infrastructure

Where an existing IPv4 service provider requests IPv6 space for eventual transition of existing services to IPv6, the number of present IPv4 customers may be used to justify a larger request than would be justified if based solely on the IPv6 infrastructure.

6.5. Policies for allocations and assignments

    6.5.1.   Initial allocation

        6.5.1.1. Initial allocation criteria

To qualify for an initial allocation of IPv6 address space, an organization must:

a) be an LIR;

b) not be an end site;

c) plan to provide IPv6 connectivity to organizations to which it will assign /48s, by advertising that connectivity through its single aggregated address allocation; and

d) have a plan for making at least 200 /48 assignments to other organizations within two years.

        6.5.1.2. Initial allocation size

Organizations that meet the initial allocation criteria are eligible to receive a minimum allocation of /32.

Organizations may qualify for an initial allocation greater than /32 by submitting documentation that reasonably justifies the request. If so, the allocation size will be based on the number of existing users and the extent of the organization's infrastructure.

    6.5.2.   Subsequent allocation

Organizations that hold an existing IPv6 allocation may receive a subsequent allocation in accordance with the following policies.

        6.5.2.1. Subsequent allocation criteria

Subsequent allocation will be provided when an organization (ISP/LIR) satisfies the evaluation threshold of past address utilization in terms of the number of sites in units of /48 assignments. The HD-Ratio (RFC 3194) is used to determine the utilization thresholds that justify the allocation of additional address as described below.

        6.5.2.2. Applied HD-Ratio

The HD-Ratio value of 0.8 is adopted as indicating an acceptable address utilization for justifying the allocation of additional address space. Appendix A provides a table showing the number of assignments that are necessary to achieve an acceptable utilization value for a given address block size.

        6.5.2.3. Subsequent Allocation Size

When an organization has achieved an acceptable utilization for its allocated address space, it is immediately eligible to obtain an additional allocation that results in a doubling of the address space allocated to it. Where possible, the allocation will be made from an adjacent address block, meaning that its existing allocation is extended by one bit to the left.

If an organization needs more address space, it must provide documentation justifying its requirements for a two-year period. The allocation made will be based on this requirement.

    6.5.3.   LIR-to-ISP allocation

There is no specific policy for an organization (LIR) to allocate address space to subordinate ISPs. Each LIR organization may develop its own policy for subordinate ISPs to encourage optimum utilization of the total address block allocated to the LIR. However, all /48 assignments to end sites are required to be registered either by the LIR or its subordinate ISPs in such a way that the RIR/NIR can properly evaluate the HD-Ratio when a subsequent allocation becomes necessary.

6.5.4. Assignment

LIRs must make IPv6 assignments in accordance with the following provisions.

6.5.4.1. Assignment address space size

Assignments are to be made in accordance with the existing guidelines (RFC3177,RIRs-on-48), which are summarized here as:

- /48 in the general case, except for very large subscribers

- /64 when it is known that one and only one subnet is needed by design

- /128 when it is absolutely known that one and only one device is connecting.

RIRs/NIRs are not concerned about which address size an LIR/ISP actually assigns. Accordingly, RIRs/NIRs will not request the detailed information on IPv6 user networks as they did in IPv4, except for the cases described in Section 6.4.4 and for the purposes of measuring utilization as defined in this document.

6.5.4.2. Assignment of multiple /48s to a single end site

When a single end site requires an additional /48 address block, it must request the assignment with documentation or materials that justify the request. Requests for multiple or additional /48s will be processed and reviewed (i.e., evaluation of justification) at the RIR/NIR level.

Note: There is no experience at the present time with the assignment of multiple /48s to the same end site. Having the RIR review all such assignments is intended to be a temporary measure until some experience has been gained and some common policies can be developed. In addition, additional work at defining policies in this space will likely be carried out in the near future.

6.5.4.3. Assignment to operator's infrastructure

An organization (ISP/LIR) may assign a /48 per PoP as the service infrastructure of an IPv6 service operator. Each assignment to a PoP is regarded as one assignment regardless of the number of users using the PoP. A separate assignment can be obtained for the in-house operations of the operator.

6.5.5. Registration

When an organization holding an IPv6 address allocation makes IPv6 address assignments, it must register assignment information in a database, accessible by RIRs as appropriate (information registered by an RIR/NIR may be replaced by a distributed database for registering address management information in future). Information is registered in units of assigned /48 networks. When more than a /48 is assigned to an organization, the assigning organization is responsible for ensuring that the address space is registered in an RIR/NIR database.

RIR/NIRs will use registered data to calculate the HD-Ratio at the time of application for subsequent allocation and to check for changes in assignments over time.

IRs shall maintain systems and practices that protect the security of personal and commercial information that is used in request evaluation, but which is not required for public registration.

6.5.5.1. Residential Customer Privacy (2003-3)

To maintain the privacy of their residential customers, an organization with downstream residential customers may substitute that organization's name for the customer's name, e.g. 'Private Customer - XYZ Network', and the customer's street address may read 'Private Residence'. Each private downstream residential reassignment must have accurate upstream Abuse and Technical POCs visible on the WHOIS record for that block.

6.5.6. Reverse lookup

When an RIR/NIR delegates IPv6 address space to an organization, it also delegates the responsibility to manage the reverse lookup zone that corresponds to the allocated IPv6 address space. Each organization should properly manage its reverse lookup zone. When making an address assignment, the organization must delegate to an assignee organization, upon request, the responsibility to manage the reverse lookup zone that corresponds to the assigned address.

6.5.7. Existing IPv6 address space holders

Organizations that received /35 IPv6 allocations under the previous IPv6 address policy (RIRv6-Policies) are immediately entitled to have their allocation expanded to a /32 address block, without providing justification, so long as they satisfy the criteria in Section 6.5.1.1. The /32 address block will contain the already allocated smaller address block (one or multiple /35 address blocks in many cases) that was already reserved by the RIR for a subsequent allocation to the organization. Requests for additional space beyond the minimum /32 size will be evaluated as discussed elsewhere in the document.

6.6. References

(RFC1715) "The H Ratio for Address Assignment Efficiency", C. Huitema. November 1994, RFC 1715.

(IAB-Request) "Email from IAB to IANA", http://www.iab.org/iab/DOCUMENTS/IPv6addressspace.txt.

(RFC2373) "IP Version 6 Addressing Architecture", R. Hinden, S. Deering. July 1998, RFC 2373.

(RFC2373bis) http://www.ietf.org/internet-drafts/draft-ietf-ipngwg-addr-arch-v3-07.txt.

(RFC2928) "Initial IPv6 Sub-TLA ID Assignments", R. Hinden, S. Deering, R. Fink, T. Hain. September 2000, RFC 2928.

(RFC3177) "IAB/IESG Recommendations on IPv6 Address". IAB, IESG. September 2001, RFC 3177.

(RFC3194) "The H-Density Ratio for Address Assignment Efficiency An Update on the H ratio", A. Durand, C. Huitema. November 2001, RFC 3194.

(RIRs-on-48) http://www.arin.net/policy/ipv6reassign.html,

(RIRv6-Policies)

http://www.arin.net/policy/ipv6.html
http://www.ripe.net/ripe/docs/ripe-196.html
http://www.apnic.net/docs/drafts/ipv6/ipv6-policy-280599.html

6.7. Appendix A: HD-Ratio

The HD-Ratio is not intended to replace the traditional utilization measurement that ISPs perform with IPv4 today. Indeed, the HD-Ratio still requires counting the number of assigned objects. The primary value of the HD-Ratio is its usefulness at determining reasonable target utilization threshold values for an address space of a given size. This document uses the HD-Ratio to determine the thresholds at which a given allocation has achieved an acceptable level of utilization and the assignment of additional address space becomes justified.

The utilization threshold T, expressed as a number of individual /48 prefixes to be allocated from IPv6 prefix P, can be calculated as:

$$T = 2^{((48-P)*HD)}$$

Thus, the utilization threshold for an organization requesting subsequent allocation of IPv6 address block is specified as a function of the prefix size and target HD ratio. This utilization refers to the allocation of /48s to end sites, and not the utilization of those /48s within those end sites. It is an address allocation utilization ratio and not an address assignment utilization ratio.

In accordance with the recommendations of (RFC 3194), this document adopts an HD-Ratio of 0.8 as the utilization threshold for IPv6 address space allocations.

The following table provides equivalent absolute and percentage address utilization figures for IPv6 prefixes, corresponding to an HD-Ratio of 0.8:

P	48-P	Total /48	Threshold	Util%
48	0	1	1	100.00%
47	1	2	2	87.10%
46	2	4	3	75.80%
45	3	8	5	66.00%
44	4	16	9	57.40%
43	5	32	16	50.00%
42	6	64	28	43.50%
41	7	128	49	37.90%
40	8	256	84	33.00%
39	9	512	147	28.70%
38	10	1024	256	25.00%
37	11	2048	446	21.80%
36	12	4096	776	18.90%
35	13	8192	1351	16.50%
34	14	16384	2353	14.40%
33	15	32768	4096	12.50%
32	16	65536	7132	10.90%
31	17	131072	12417	9.50%
30	18	262144	21619	8.20%
29	19	524288	37641	7.20%
28	20	1048576	65536	6.30%
27	21	2097152	114105	5.40%
26	22	4194304	198668	4.70%
25	23	8388608	345901	4.10%
24	24	16777216	602249	3.60%
23	25	33554432	1048576	3.10%
22	26	67108864	1825677	2.70%
21	27	134217728	3178688	2.40%
20	28	268435456	5534417	2.10%
19	29	536870912	9635980	1.80%
18	30	1073741824	16777216	1.60%
17	31	2147483648	29210830	1.40%
16	32	4294967296	50859008	1.20%
15	33	8589934592	88550677	1.00%
14	34	17179869184	154175683	0.90%
13	35	34359738368	268435456	0.80%
12	36	68719476736	467373275	0.70%
11	37	137438953472	813744135	0.60%
10	38	274877906944	1416810831	0.50%
9	39	549755813888	2466810934	0.40%
8	40	1099511627776	4294967296	0.40%
7	41	2199023255552	7477972398	0.30%
6	42	4398046511104	13019906166	0.30%
5	43	8796093022208	22668973294	0.30%
4	44	17592186044416	39468974941	0.20%

6.8. Appendix B: Background information

6.8.1. Background

The impetus for revising the 1999 Provisional IPv6 policy started with the APNIC meeting held in Taiwan in August 2001. Follow-on discussions were held at the October, 2001 RIPE and ARIN meetings. During these meetings, the participants recognized an urgent need for more detailed, complete policies. One result of the meetings was the establishment of a single mailing list to discuss a revised policy together with a desire to develop a general policy that all RIRs could use. This document does not provide details of individual discussions that lead to policies described in this document; detailed information can be found in the individual meeting minutes at the www.apnic.net, www.arin.net, and www.ripe.net web sites.

6.8.2. Why a joint policy

IPv6 addresses are a public resource that must be managed with consideration to the long-term interests of the internet community. Although regional registries adopt allocation policies according to their own internal processes, address policies should largely be uniform across registries. Having significantly varying policies in different regions is undesirable because it can lead to situations where "registry shopping" can occur as requesting organizations request addresses from the registry that has the most favorable policy for their particular desires. This can lead to the policies in one region undermining the efforts of registries in other regions with regards to prudent stewardship of the address space. In cases where regional variations from the policy are deemed necessary, the preferred approach is to raise the issue in the other regional registries in order to develop a consensus approach that all registries can support.

6.8.3. The size of IPv6's address space

Compared to IPv4, IPv6 has a seemingly endless amount of address space. While superficially true, short-sighted and wasteful allocation policies could also result in the adoption of practices that lead to premature exhaustion of the address space.

It should be noted that the 128-bit address space is divided into three logical parts, with the usage of each component managed differently. The rightmost 64 bits, the Interface Identifier (RFC2373), will often be a globally-unique IEEE identifier (e.g., mac address). Although an "inefficient" way to use the Interface Identifier field from the perspective of maximizing the number of addressable nodes, the numbering scheme was explicitly chosen to simplify Stateless Address Autoconfiguration (RFC2462).

The middle 16 bits of an address indicate the subnet ID. Per (RFC 3177, RIRs-on-48s), this field will often be inefficiently utilized, but the operational benefits of a consistent width subnet field were deemed to be outweigh the drawbacks.

The decisions to inefficiently utilize the bits to the right of /48 were made under the knowledge and assumption that the bits to the left of /48 would be managed prudently and that if done so, will be adequate for the expected lifetime of IPv6 (RFC3177).

6.8.4. Acknowledgment

The initial version of this document was produced by The JPNIC IPv6 policy drafting team consisting of Akihiro Inomata, Akinori Maemura, Kosuke Ito, Kuniaki Kondo, Takashi Arano, Tomohiro Fujisaki, and Toshiyuki Yamasaki. Special thanks goes out to this team, who worked over a holiday in order to produce an initial document quickly.

An editing team was then organized by representatives from each of the three RIRs (Takashi Arano, Chair of APNIC's Policy SIG, Thomas Narten, Chair of ARIN's IPv6 WG, and David Kessens, Chair of RIPE NCC's IPv6 WG).

The editing team would like to acknowledge the contributions to this document of Takashi Arano, John Crain, Steve Deering, Gert Doering, Kosuke Ito, Richard Jimmerson, David Kessens, Mirjam Kuehne, Anne Lord, Jun Murai, Paul Mylotte, Thomas Narten, Ray Plzak, Dave Pratt, Stuart Prevost, Barbara Roseman, Gerard Ross, Paul Wilson, Cathy Wittbrodt and Wilfried Woeber.

The final editing of this document was done by Thomas Narten.

6.9. IPv6 Reassignments policy

ARIN has adopted the reassignment guidelines recommended by the IAB/IESG pending future review based on operational experience. Those guidelines are as follows:

The IESG and the IAB recommend the allocations for the boundary between the public and the private topology to follow those general rules:
- /48 in the general case, except for very large subscribers.
- /64 when it is known that one and only one subnet is needed by design.
- /128 when it is absolutely known that one and only one device is connecting.

In particular, we recommend:
- Home network subscribers, connecting through on-demand or always-on connections should receive a /48.
- Small and large enterprises should receive a /48.
- Very large subscribers could receive a /47 or slightly shorter prefix, or multiple /48's.
- Mobile networks, such as vehicles or mobile phones with an additional network interface (such as bluetooth or 802.11b) should receive a static /64 prefix to allow the connection of multiple devices through one subnet.
- A single PC, with no additional need to subnet, dialing-up from a hotel room may receive its /128 IPv6 address for a PPP style connection as part of a /64 prefix.

Note that there seems to be little benefit in not giving a /48 if future growth is anticipated.

The above IAB/IESG recommendations are described in more detail in RFC 3177

6.10.   Micro-allocation - ARIN will make micro-allocations to critical infrastructure providers of the Internet, including public exchange points, core DNS service providers (e.g. ICANN-sanctioned root, gTLD, and ccTLD operators) as well as the RIRs and IANA. These allocations will be no longer than a /24 using IPv4 or a /48 using IPv6. Multiple allocations may be granted in certain situations. - Exchange point allocations MUST be allocated from specific blocks reserved only for this purpose. All other micro-allocations WILL be allocated out of other blocks reserved for micro-allocation purposes. ARIN will make a list of these blocks publicly available. - Exchange point operators must provide justification for the allocation, including: connection policy, location, other participants (minimum of two total), ASN, and contact information. ISPs and other organizations receiving these micro-allocations will be charged under the ISP fee schedule, while end-users will be charged under the fee schedule for end-users. This policy does not preclude exchange point operators from requesting address space under other policies.

7. Reverse Mapping

7.1. Maintaining IN-ADDRs

All ISPs receiving one or more distinct /16 CIDR blocks of IP addresses from ARIN will be responsible for maintaining all IN-ADDR.ARPA domain records for their respective customers. For blocks smaller than /16, and for the segment of larger blocks which start or end with a CIDR prefix longer than /16, ARIN can maintain IN-ADDRs through the use of the SWIP (Reallocate and Reassign) templates or the Netmod template for /24 and shorter prefixes.

7.2. Lame Delegations in IN-ADDR.ARPA

ARIN will actively identify lame DNS name server(s) for in-addr.arpa delegations associated with address blocks allocated, assigned or administered by ARIN. Upon identification of a lame delegation, ARIN shall attempt to contact the POC for that resource. The process of contact shall follow at least the following sequence until the lame delegation is repaired:
1. E-mail the POC associated with the in-addr.arpa delegation from the ARIN database.
2. E-mail the POC associated with the ASN(s) originating the route in the global routing table.
3. Telephone any POC associated with the ASN or ARIN records.
4. Send postal mail to any POC associated with the ASN or ARIN records. Request response within 30 days.

After completing the contact procedures listed above, and the lame delegation persists, and waiting for a minimum of 30 days following the postal mail being sent, ARIN shall update the resource record with text indicating:
1. That the delegation has been determined to be lame
2. The evaluation date of the lame delegation
3. That contact has been attempted unsuccessfully
4. The date record was updated

The record shall be further updated by removing the name server delegation(s).

8. Transfers

8.1. Transfers

IP address space assignments are non-transferable and are not assignable to any other organization unless ARIN has expressly and in writing approved a request for transfer. ARIN is tasked with making prudent decisions on whether to approve the transfer of all or part of an existing IP space assignment.

It should be understood that neither IP addresses nor ASNs are "sold" under ARIN administration. Rather, addresses are assigned to an organization for its exclusive use for the purpose stated in the request, provided the terms of the Registration Services Agreement continue to be met and the stated purpose for the addresses remains the same. IP address space is administered and assigned according to ARIN's current IP allocation and assignment guidelines.

IP address allocations or assignments are made, based on justified need, to organizations, not to individuals representing those organizations. Thus, if a company goes out of business, regardless of the reason, the point of contact (POC) listed for the IP number does not have the authority to sell, transfer, assign, or give the address space to any other person or organization. The POC must notify ARIN if a business fails so that the assigned address space can be returned to the pool of available addresses if a transfer is not requested and justified.

If a customer's network is located outside ARIN's geographic region, the organization must first contact the regional registry that has responsibility over that region. ARIN will accept only those transfer requests that have been previously approved by the appropriate regional registry (RIPE or APNIC) for IP and ASN records that are registered in ARIN's database but are for networks located outside ARIN's region.

8.2. Transfer Requirements

ARIN will consider requests for the transfer of IP space only upon receipt of evidence that the new entity has acquired the assets which had, as of the date of the acquisition or proposed reorganization, justified the current entity's use of the IP space. Examples of assets that justify use of IP space include, but are not limited to:

- Existing customer base that utilizes some or all of the IP space
- Qualified hardware inventory
- Specific software requirements.

8.3. Documentation Requirements

In evaluating a request for transfer, ARIN may require the requesting organization to provide any of the following documents, as applicable, plus any other documents deemed appropriate:

- An authenticated copy of the instrument(s) effecting the transfer of assets, e.g., bill of sale, certificate of merger, contract, deed, or court decree
- A detailed inventory of all assets utilized by the requesting party in maintaining and using the IP space
- A list of the requesting party's customers that used portions of the assigned IP space.

If further justification is required, the requesting party may be asked to provide any of the following, or other supporting documentation, as applicable:

- A general listing of the assets or components acquired
- A specific description of acquisitions, including:
  - Type and quantity of equipment
  - Customer base
- A description of how address space is being utilized
- Network engineering plans, including:
  - Host count
  - Subnet masking
  - Network diagram
  - Reassignments to customers

Transfer procedures and other information can be found on the Guidelines for IP / AS Number Transfers page.

9. Mailing Lists

9.1. Mailing List AUP

ARIN's mailing lists are made available to gain input from the IP community and to facilitate discussions regarding IP address policy issues. Any discussions posted to these lists must relate to the issues and policies generally considered to be current and relevant, affecting a broad scope of users and networks.

The following guidelines have been established to allow for effective exchange of information in a responsible way by interested parties. These guidelines must be strictly adhered to in order to keep the mailing lists an effective open forum.

- All correspondence must relate specifically to IP policy issues. Postings not directly related to IP addressing policies are prohibited.
- Independent issues not affecting the larger IP community are not appropriate, nor are comments of a personal nature.
- Use or distribution of others' comments for any purpose other than to discuss relevant issues pertaining to IP policies is not permissible.
- Any unprofessional or confrontational comments showing a lack of respect, such as using foul or abusive language or attacking someone's character, will not be tolerated.
- Overuse of the privilege, flooding of email messages, forwarding of bulk email, or any other form of spamming is strictly prohibited.
- Marketing of products or advertising of any kind, whether for business or employment purposes, is not allowed.
- The promotion of political views is not appropriate.
- Attempts to obtain email addresses for any purpose other than for which the list was designed is prohibited.

Violators of any of the above guidelines will be contacted and asked to adhere to the policy. If a user persists in violating the policy, the individual will be taken off the list. Thank you for your participation and cooperation.

9.2. Member Mailing List AUP

ARIN's member mailing list (arin-discuss@arin.net) is designed to host discussions regarding IP address policy issues and other factors affecting ARIN. Any discussions posted to this list must 1.) relate to the issues and policies generally considered to be current and relevant, affecting a broad scope of users and networks and/or 2.) relate to ARIN matters.

The following guidelines have been established to allow for effective exchange of information in a responsible way by all ARIN members. These guidelines must be strictly adhered to in order to keep this mailing list an effective open forum.

- All correspondence must relate specifically to IP policy issues or ARIN business. Postings not directly related to these topics are prohibited.
- Independent issues not affecting the larger IP community are not appropriate unless ARIN-specific, nor are comments of a personal nature.
- Use or distribution of others' comments for any purpose other than to discuss relevant issues pertaining to IP policies is not permissible.
- Any unprofessional or confrontational comments showing a lack of respect, such as using foul or abusive language or attacking someone's character, will not be tolerated.
- Overuse of the privilege, flooding of email messages, forwarding of bulk email, or any other form of spamming is strictly prohibited.
- Marketing of products or advertising of any kind, whether for business or employment purposes, is not allowed.
- The promotion of political views is not appropriate.
- Attempts to obtain email addresses for any purpose other than for which the list was designed is prohibited.

Violators of any of the above guidelines will be contacted and asked to adhere to the policy. If a user persists in violating the policy, the individual will be taken off the list. Thank you for your participation and cooperation.

10. Global Number Resource Policy

10.1.　　　　　[Editor's note: This is a proposed global number resource policy.]
IANA to RIR Allocation of IPv4 Address Space

This document describes the policies governing the allocation of IPv4 address space from the IANA to the Regional Internet Registries (RIRs). This document does not stipulate performance requirements in the provision of services by IANA to an RIR in accordance with these policies. Such requirements should be specified by appropriate agreements among the RIRs and ICANN.

1. Allocation Principles

- The IANA will allocate IPv4 address space to the RIRs in /8 units.
- The IANA will allocate sufficient IPv4 address space to the RIRs to support their registration needs for at least an 18 month period.
- The IANA will allow for the RIRs to apply their own respective chosen allocation and reservation strategies in order to ensure the efficiency and efficacy of their work.

2. Initial Allocations

Each new RIR shall, at the moment of recognition, be allocated a new /8 by the IANA. This allocation will be made regardless of the newly formed RIR's projected utilization figures and shall be independent of the IPv4 address space that may have been transferred to the new RIR by the already existing RIRs as part of the formal transition process.

3. Additional Allocations

A RIR is eligible to receive additional IPv4 address space from the IANA when either of the following conditions are met.

- The RIR's AVAILABLE SPACE of IPv4 addresses is less than 50% of a /8 block.
- The RIR's AVAILABLE SPACE of IPv4 addresses is less than its established NECESSARY SPACE for the following 9 months.

In either case, IANA shall make a single allocation of a whole number of /8 blocks, sufficient to satisfy the established NECESSARY SPACE of the RIR for an 18 month period.

3.1 Calculation of AVAILABLE SPACE

The AVAILABLE SPACE of IPv4 addresses of a RIR shall be determined as follows:

AVAILABLE SPACE = CURRENTLY FREE ADDRESSES + RESERVATIONS EXPIRING DURING THE FOLLOWING 3 MONTHS - FRAGMENTED SPACE

FRAGMENTED SPACE is determined as the total amount of available blocks smaller than the RIR's minimum allocation size within the RIR's currently available stock.

3.2 Calculation of NECESSARY SPACE

If the applying Regional Internet Registry does not establish any special needs for the period concerned, NECESSARY SPACE shall be determined as follows:

NECESSARY SPACE = AVERAGE NUMBER OF ADDRESSES ALLOCATED MONTHLY DURING THE PAST 6 MONTHS * LENGTH OF PERIOD IN MONTHS

If the applying RIR anticipates that due to certain special needs the rate of allocation for the period concerned will be greater than the previous 6 months, it may determine its NECESSARY SPACE as follows:

A) Calculate NECESSARY SPACE as its total needs for that period according to its projection and based on the special facts that justify these needs.

B) Submit a clear and detailed justification of the above mentioned projection (Item A).

If the justification is based on the allocation tendency prepared by the Regional Internet Registry, data explaining said tendency must be enclosed.

If the justification is based on the application of one or more of the Regional Internet Registry's new allocation policies, an impact analysis of the new policy/policies must be enclosed.

If the justification is based on external factors such as new infrastructure, new services within the region, technological advances or legal issues, the corresponding analysis must be enclosed together with references to information sources that will allow verification of the data.

If IANA does not have elements that clearly question the Regional Internet Registry's projection, the special needs projected for the following 18 months, indicated in Item A above, shall be considered valid.

4. Announcement of IANA Allocations

When address space is allocated to a RIR, the IANA will send a detailed announcement to the receiving RIR. The IANA will also make announcements to all other RIRs, informing them of the recent allocation. The RIRs will coordinate announcements to their respective membership lists and any other lists they deem necessary.

The IANA will make appropriate modifications to the "Internet Protocol V4 Address Space" page of the IANA website and may make announcements to its own appropriate announcement lists. The IANA announcements will be limited to which address ranges, the time of allocation and to which Registry they have been allocated.

Appendix A - Change Log

The Change Log can be found at:
http://www.arin.net/policy/nrpm_changelog.html