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- Author:
  - **Adiel A. Akplogan**
  - **Ernest Byaruhanga**

1) Abstract

This document describes the guidelines for IPv4 address allocation and assignment in the AFRINIC service region (Africa and Part of the Indian Ocean) .They have been developed through an open, bottom up policy development process of AFRINIC's Policy Working Group.

2) Introduction

AFRINIC (The African Network Information Center) is a non-for-profit independent organisation serving as one of the five Regional Internet Registries (RIR's). Its service region incorporates the African continent and part of the Indian Ocean (Seychelles, Mauritius, Madagascar, Comoros). AFRINIC is responsible for the allocation of IP (Internet Protocol) address space, AS (Autonomous System) Numbers and management of reverse domain names within the region.

3) Scope

This document describes policies for the responsible management of unique IPv4 address space in the AFRINIC region. The policies in this document apply to all IPv4 allocations and assignments within the AFRINIC service region and must be implemented by all AFRINIC's Local Internet Registries.

This document does not describe policies related to IPv6, AS numbers, private addresses and in-addr.arpa domains. These policies can be found at http://www.afrinic.net/en/library/policies/current

It does not describe conditions of AFRINIC membership decribed at http://www.afrinic.net/en/services/rs nor does it examine the policies of the other Regional Internet Registries.

4) IPv4 address space

For the purpose of this document, IPv4 addresses are 32-bit binary numbers (used as identifiers in the IPv4 protocol) and are usually in three types:

a. Public/global IP addresses that are assigned to be globally unique according to the goals described in section 6 of this document.

b. Private IPv4 address space is set aside for use in private IPv4 networks. Anyone may use these addresses in their private networks without registration. Hosts with private IPv4 addresses cannot be reached from the internet unless enabled through NAT (Network Address Translation). Note that some Internet services may not work properly under NAT. See RFC 2993 for engineering / technical implications of using NAT. RFC1918 also describes the blocks set aside for private use.

c. IP ranges reserved for experiments: These are described in RFC3330 (http://www.ietf.org/rfc/rfc3330.txt). Some ranges are also reserved for multicast.

5) Hierarchy of address space distribution

IP addresses are distributed in an hierarchical structure in which IANA (The Internet Assigned Numbers Authority) allocates address space to AFRINIC, to be redistributed throughout the African region. AFRINIC allocates address space to Local Internet Registries (LIRs) and also delegates to them the authority to make assignments and sub-allocations. LIRs sub-allocate and assign address space to their customers in accordance with the policies and procedures described in this document.

6) Definitions

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

6.1 Internet Registry (IR)

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

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6.2 Regional Internet Registry (RIR)

Earlier, Regional Internet Registries (RIRs) were established under the authority and initiatives of the internet communities in their respective regions. Currently, the ICANN authorises establishment of RIRs 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.

Currently, there are four RIRs: APNIC, ARIN, LACNIC, RIPE NCC. AFRINIC is the fifth

6.3 Local Internet Registry (LIR)

A Local Internet Registry (LIR) is an IR that receives allocations from an RIR and primarily assigns address space to 'end-users'. LIRs are generally ISPs. Their customers are other ISPs and possibly end-users. LIRs must be members of AFRINIC.

6.4 Allocation

To "allocate" means to distribute address space to LIRs for the purpose of subsequent distribution.

6.5 Sub-Allocation

To "sub-allocate" means to distribute address space (by LIRs) to ISPs for the purpose of subsequent distribution.

6.6 Assignment

An assignment is an IP block given by an LIR to the end-users for their own usage. 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 organisations and are not to be sub-assigned to other parties.

6.7 PA (Provider Aggregatable) IP space

PA space is what has been allocated to LIRs from which they can assign or sub-allocate to end-users / downstream networks as non-portable block. If the end-user / downstream network changes provider, the address space assigned or sub-allocated by the previous service provider (LIR) should be returned and the network renumbered.

6.8 PI (Provider Independent) IP space

PI (or portable) space cannot be aggregated and can only be assigned by RIR through an LIR. PI space is expensive to route and might not be globally routable. Sub-allocations cannot be made from this type of address space by the end user or LIR.

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7) Goals of the Internet Registry System

7.1 Goals

It is AFRINIC's primary duty, as a custodian of a public resource, to ensure that for all Ipv4 allocations and assignments, the following goals are met:

- **Uniqueness** - In order that each host on the public internet can be uniquely identified, each public unicast IPv4 address must be globally unique.
- **Registration** - Every assignment and allocation of public Internet address space must be registered in the AFRINIC whois database. This is necessary to ensure uniqueness and to provide information for Internet trouble shooting at all levels.
- **Aggregation** - Distributing Ipv4 addresses in a hierachical manner permits the aggregation of routing information. This helps to ensure proper operation of internet routing, and to limit the expansion of Internet routing tables (RFC2519).
- **Conservation** - To maximize the lifetime of the public Internet address space resource, addresses must be distributed according to actual need and on the basis of immediate use. Therefore, stockpiling of address space and maintaining reservations must, in general, be avoided.

7.2 Conflict of goals

The goals of conservation and aggregation often conflict with each other. Some or all of the goals may occasionally be in conflict with the interests of individual IRs or end-users. Therefore, IRs evaluating requests for allocations and assignments must carefully analyze all relevant considerations and must seek to balance the needs of the applicant with the needs of the Internet community as a whole. These policies are intended to help IRs balance these needs fairly. Documenting the decision making process for each allocation or assignment helps ensure the process remains transparent and honest.

7.3 Documentation

In order to properly evaluate requests, an RIR must carefully examine all relevant documentation relating to the networks in question. Such documentation may include network engineering plans, subnetting plans, descriptions of network topology, and descriptions of network routing plans. All documentation should conform to a consistent standard and any estimates and predictions that are documented must be realistic and justifiable.

7.4 Fairness

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

8) Registration Requirements

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a) All communication with AFRINIC will be in English.

b) All allocations and assignments will be registered in an AFRINIC database. Any unregistered assignemnts / allocations / sub-allocaion will be considered invalid. The registration data (name, IP block/range, contacts, status, etc..) must be correct at all times. This is necessary to support network operations.

Allocation policies and guidelines

8.1 Introduction

AFRINIC allocates ranges of IPv4 addresses to Local Internet Registries (LIRs). LIRs reassign or sub-allocate that space to their customers.

An Allocation is a range of IPv4 addresses from which sub-allocations and assignments are made. All LIR's assigning address space allocated from AFRINIC are also advised to adopt a set of policies that are consistent with the policies described in this document.

Determination of IP address space allocation size is the responsibility of AFRINIC staff. In an effort to ensure that Classless Inter-Domain Routing (CIDR) is implemented and utilized as efficiently as possible, AFRINIC will issue blocks of addresses on appropriate"CIDR-supported" bit boundaries. (CIDR - "Classless Inter-Domain Routing", is exlained in RFC1517-1959, http://www.ietf.org/rfc.htm).

If an LIR plans to exchange or transfer address space, it needs to contact AFRINIC so that the changes are properly registered. The LIR remains responsible for all the allocations registered in the AFRINIC database until they have been transferred to another LIR or returned to AFRINIC. LIR's must ensure that all policies are applied.

8.2 First Allocation

a) AFRINIC's minimum allocation is /22 or 1024 IPv4 addresses.

b) The organisation must be an AFRINIC member in good standing, and

c) Must show an existing efficient utilization of IP addresses from their upstream provider. Justification may be based on a combination of immediate need and existing usage, in which case, the existing assignments must be renumbered into the LIR's new allocation.

The verification of previous efficient utilisation is based on assignments (and sub-allocations) registered in the RIPE, ARIN, LACNIC and APNIC databases and only these registered assignments will be considered valid.

8.3. Slow start mechanism for first allocations

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AFRINIC shall apply a slow start mechanism to all new LIRs. With respect to allocations made by AFRINIC, the first allocation an LIR receives will be the size of the minimum practical allocation described in Section 8.2 (a) unless otherwise justified.

The slow start policy is used by all RIR's to prevent allocations of large blocks of address space that may then remain substantially unassigned. AFRINIC implements the slow start mechanism in a consistent and fair manner for every LIR, and will apply the same principles and standards to every applicant for address space.

8.4 Additional Allocation

An LIR may receive an additional allocation when about 80% of all the address space currently allocated to it has been used in valid assignments and/or sub-allocations. A new allocation can also be made if single assignment or sub-allocation requires more addresses than those currently held by the LIR.

Reservations are not considered as valid assignments or sub-allocations. It may be useful for internal aggregation to keep some IP blocks free for future growth. These internal reservations are however not counted as valid usage and must be assigned or sub-allocated before requesting for an additional allocation.

AFRINIC will always try to allocate contiguous address ranges, allowing the LIR to minimise the number of route announcements it makes. However, it will not always be possible to allocate a range contiguous with the LIR's previous allocation.

8.5 Sub-Allocations

The minimum size of a sub-allocation is /24. It allows a reasonable number of small assignments to be made by a downstream ISP. An LIR may not sub-allocate IPv4 space above its suballocation window (see section 10.0 for sub-allocation windows).

LIR's may make sub-allocations to multiple downstream ISP's. (Downstream ISP's efficiently using a sub-allocation qualify to receive a /22 allocation should they want to become an LIR).

The LIR is responsible for ensuring that address space allocated to it, and subsequently, the address space that it sub-allocates, is used in accordance with the community's policies and guidelines.

LIRs are advised to make use of the slow-start mechanism when making sub-allocations to downstream ISPs. Here, the LIR ensures that the space sub-allocated is efficiently used and the LIR can also monitor and determine the ability of the downstream ISP to operate within the policies set by the community.

Sub-allocations form part of an LIR's aggregatable space. Therefore, an LIR should ensure that IP space is not retained by the downstream ISP if the reseller ceases to obtain connectivity from the LIR's network (sub-allocations are non-portable).

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9) Assignment policies and guidelines

LIR's must request approval from AFRINIC approval for all sub-allocations above their Sub-Allocation Window (see section 10.0 for SAW policy).

The following guidelines are intended to help LIRs and end-users in their search for equitable compromises:

9.1 Documentation

The information required by AFRINIC to justify an end-user's IP address requirements include addressing needs, network infrastructure and future plans. Such information is required when an LIR is requesting IP space for their end-users at the time of sending in the request. In order to ensure that previous sub-allocation are not duplicated, the current address space usage is also required. This information is essential in making the appropriate sub-allocation approvals, and the level of detail will depend on the size of the request and complexity of the network. The LIR should ensure that the necessary information is completed before making a sub-allocation request to AFRINIC. Request forms are available at http://www.afrinic.net/en/library/policies/current

When making sub-allocation from their SAW, LIR's should also ensure that such information is given by the end-user.

9.2 Network infrastructure (of LIR) vs End-User networks

IP addresses used solely for connecting an end-user to a service provider (e.g., point-to-point links) are considered as part of the service provider's infrastructure. Such addresses should only be registered as part of the service provider's infrastructure. When an end user has a network using public address space, this space must be registered with the contacts of the end-user. If the end-user is an individual rather than an organisation, the space may be registered with the contact information of the service provider but with the end-user referenced in the AFRINIC whois database object.

9.3 Utilisation

Immediate utilisation of assignments should be at least 25% of the assigned space. After one year, unless special circumstances are defined, it should be at least 50%.

9.4 Reservations not supported

End-users are not permitted to reserve address space based on long term plans. This violates

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the goal of conservation and fragments the address space when initial forecasts are not met. If an LIR wants to assign address space for customers, it must make the assignments from any unallocated or unassigned address space it currently holds. For the purposes evaluating allocation requests, space reserved by an LIR for other customers is considered unused.

9.5 Validity of an assignment

Assignments remain valid as long as the original criteria on which the assignment was based are still in place and the assignment is registered in the AFRINIC database. An assignment is therefore invalid if it is not registered in the database and if the purpose for which it was registered has changed or no longer holds.

9.6 Re-numbering

This is replacing IP addresses on a one-to-one basis. Valid assignments can be replaced with the same number of addresses if the original assignment criteria are still met. The addresses to be replaced must still be in use. When a renumbering request exceeds the LIR's sub-allocation window, the request should be sent to AFRINIC for approval.

A period of three months is normally considered sufficient to migrate a network to the new IP space. Once a network has been renumbered, AFRINIC staff will remove the old assignment from the AFRINIC database. In case the three months period is not sufficient, the LIR should inform AFRINIC about the additional time they might take to completely renumber.

10) Sub-Allocation Window (SAW)

An sub-allocation window (SAW) refers to the maximum number of IPv4 addresses that the LIR may sub-allocate to the end-users without seeking approval from AFRINIC. The SAW size is expressed in CIDR notatation.

AFRINIC will review sub-allocation made by the LIR's using their SAW in to ensure that policies are followed correctly. LIR's should also ensure that documentation for sub-allocation made using the SAW be similar to that requested for larger requests.

Below are a few guidelines for the SAW:

10.1 All new LIRs have a SAW of zero. All sub-allocations will need prior approval by AFRINIC.

10.2 The LIR cannot make any sub-allocation to the end-user above their SAW in a 12 months period (1 year). At the end of a calendar year from the approval of an SAW, the SAW is refreshed for one more year. In case the LIR's SAW is exhausted for a particular end-user, approval must be sought from AFRINIC for any other sub-allocation to the same end-user.

10.3 LIR's are welcome to approach AFRINIC for a review of their SAW. They may also seek a second opinion from AFRINIC even for a sub-allocation that could be made with their SAW if they chose. Before a SAW is raised, the following will be considered:

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- All required documentation is normally presented.
- Previous sub-allocation assignments from this sub-allocation are all registered in the database correctly.
- Current SAW has not been misused/abused.

10.4 New LIR's are advised to train their contacts to handle address space assignments according to the policies and procedures in this document. If, due to inexperienced contacts at the LIR, errors due to poor judgement consistently happen, the SAW may be lowered or removed to allow AFRINIC staff to assist in training the LIR's staff in the AFRINIC community's policies

11) Record keeping by LIRs

LIR's must keep and maintain records of any documentation regarding assignments and sub-allocations to end users. It is needed for future reference when evaluating requests from the same organisation and for any audits by AFRINIC. These documents should be kept electronically for easier access. It's advisable that these records should include but not be limited to:

- The original request.
- Supporting documentation.
- Related correspondence between LIR and end-user.
- Decision of the assignment, and reasons behind any unusual decision.
- Role of person that made the decision.

12) Abbreviations

- AFRINIC African Network Information Centre
- APNIC Asia Pacific Network Information Centre
- ARIN American Registry for Internet Numbers
- SAW Sub-allocation Window
- IANA Internet Assigned Numbers Authority
- ICANN Internet Community for Assigned Names and Numbers
- IP Internet Protocol
- LACNIC Latin American and Caribbean Network Information Centre
- LIR Local Internet Registry
- PA Provider Aggregateable
- PI Provider Independent
- RIR Regional Internet Registry

13) Useful links

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- RFC documents: http://www.ietf.org/rfc.html
- IANA web site: http://www.iana.org

History

09.02.2004	Initial draft posted on AFRINIC Policy Working group (**policy-wg[at]afrinic.org** the pre-cursor to rpd) by Ernest Byaruhanga.
13.02.2004	Updated draft posted to **policy-wg[at]afrinic.org**. This is the first time the group is open to the community. Until now, it has been closed.