

# IPv6 Interim Policy Draft

ARIN IX

Las Vegas, Nevada

8 April 2002

# Overview

- Goals
- Key Issues Addressed
- FAQ
- Policy Summary
- Questions

# Review Process

- Oct 1999-Dec 2001
  - Feedback from RIR communities, IETF
  - Major progress Aug 2001 (Taipei)
  - Global mailing list created Oct 2001
- Dec 2001
  - NEW draft policy document for comment
- Special acknowledgements
  - JPNIC, WG chairs, IETF
  - V6 editorial committee

# Goals

- Goals
  - Achieve interim global policy
  - Encourage IPv6 deployment
- Goals today
  - Explain contents of new draft
  - Summarize discussions to date
  - Seek ‘workable consensus’

# Key Issues Addressed

- Provide a larger initial allocation
- Facilitate access to IPv6 addresses
- Consider previous deployment experience for allocation size
- Provide convenient 'utilization' method

# FAQ – Allocation Size

- Is there a minimum allocation size?
  - Yes, a /32
  - It will be allocated if you meet the criteria
- Is there a maximum allocation size?
  - No
  - Your actual need, based on IPv4 and/or IPv6 assignment history, will be considered

# FAQ – Allocation Criteria

- How do I get an IPv6 allocation?
  - Must satisfy criteria
    - Show ‘immediate need’ (up to 3 months) for 776 sites that would qualify for a /48
- Can I get more than a /32?
  - Yes, enough to enable you to provide IPv6 service to all of your IPv4 customers
    - No more than initial /32 will be given to requestors who cannot demonstrate previous assignment history

# FAQ - Allocation Criteria

- Why 776 sites?
  - This corresponds to the number of sites ‘used’ for a /36 with a HD ratio of 0.8
  - This was proposed to be the acceptable threshold for the minimum allocation
    - The draft noted that the threshold of 776 was open to discussion



# FAQ – Definitions

- What is a ‘site’?
  - An ‘end user’ who has a business relationship with a provider carrying traffic
    - E.g Consumer (dial up/cable/DSL)
    - E.g Enterprise (leased line)
- How do you measure ‘utilization’?
  - Count the number of /48s assigned. No need to consider usage within each /48

# FAQ – HD Ratio

- What is the ‘Host Density (HD)’ ratio?
  - In a hierarchical address plan, as the size of the allocation increases, the density of assignments will decrease
- Do I need to calculate HD ratio?
  - No, just use the table in the policy document
- Why do I need to know about it?
  - Defines the point at which you should come back to the RIR for more address space
  - Helps with measuring how much to allocate

# Example: HD Ratio 0.8

			64		
				776	10.9%
				135	1.5%
<b>32</b>	<b>16</b>	<b>65536</b>	<b>7132</b>	<b>10.9%</b>	
			5242		
			1677210		3.5%
		429	7296	5085	1.1%
		99511	7776	9498729	0.2%
		343720	3832	176736	0.4%

RFC3194 "The Host-Density Ratio for Address Assignment Efficiency"

# Subsequent Allocations

- Registration necessary to determine 'usage'
  - Count /48s assigned
  - Must meet HD ratio of  $\geq 0.8$
- Allocation size
  - At least 1 bit shorter prefix than previous allocation (larger block)
    - Eg. Organization will receive a single /31 prefix to expand the initial /32 allocation
  - May be larger
    - Allocations based on two year plan

# Assignments

- Global consensus
  - /48 generally
  - /64 only one subnet
  - /128 only one device connecting
- Multiple /48s
  - Should be reviewed by RIR/NIR (until experience is gained)
- ISP infrastructure
  - /48 per POP

# Other Issues

- LIR to ISP allocation
  - Policy determined by LIR
    - Must be able to meet HD ratio for subsequent allocations
    - LIR responsible for tracking all /48s
- DB registration
  - All /48 and shorter prefix allocations and assignments must be registered
- Existing /35 holders
  - Eligible to have /35 expanded to a single /32 prefix

# Summary of Draft

- Minimum allocation /32
  - Demonstrate need for /36 (776 sites)
  - Larger initial allocations possible with history
- Subsequent allocations
  - At least one bit shorter by default
  - Allocations for two year timeframe
- Realistic 'utilization' measure (HD ratio)
  - Determines when to request more addresses
  - Determines size of subsequent allocation

# Questions?

- Presentation slides
  - <http://www.apnic.net/meetings/13/sigs/address>
- Draft policy document
  - <ftp://ftp.cs.duke.edu/pub/narten/global-ipv6-assign-2001-12-22.txt>
- Global-v6 mailing list
  - Subscribe <[majordomo@lists.apnic.net](mailto:majordomo@lists.apnic.net)>



# IPv6 Global Policy Discussion

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# Initial Allocation Size

- Minimum allocation: /32
  - Existing /35 too small given /48s assigned to end sites
  - Large enough for internal addressing plan
  - Allows /48 assignment to POP
- Can be larger, if justified
  - Demonstrate need (similar to subsequent allocations)
  - Justification can include existing IPv4 customer base
- Accepted by RIPE, APNIC
- Comments/Discussion?

# Criteria for Initial Allocation

- Original strawman proposal:
  - Show “immediate need” (i.e., within 3 months) of 776 customers
- Rejected by RIPE:
  - Too cumbersome, bar too high
  - Alternate proposal from floor: *any* LIR can obtain /32
  - New bootstrap period: each RIR hands out 2K /32s
  - Much mailing list discussion (e.g, allowing end sites to obtain /32 not good)
- Revised proposal presented at APNIC, accepted by APNIC, to be discussed by RIP

# Revised Initial Eligibility Proposal

- Requestor must be an LIR
- *NOT* for direct assignment to end sites
- Plan for assignment with expectation of 200 assignments over 2 years
- LIR provides connectivity for customers, aggregates routes for those customers
- See exact wording on distributed note
- Comments/Discussion?

# Lease-License Model of Allocations

- Addresses are “leased”, assignments not permanent
- Existing leases renewed so long as good-faith effort at meeting requirements
- RIRs reserve right to not renew
- Accepted by APNIC
- Comments/Discussion?

# Subsequent Allocations

- When utilization threshold reached:
  - Expand into one bit shorter prefix
  - Expansion of existing address block by one bit is the goal (not second non-aggregatable block)
  - Utilization measured in terms of /48 assignments
  - Shorter prefix possible, given justification
    - Evaluate two-year plan
  - Assignments must be registered in DBs, as in IPv4
- Comments/Discussion?

# Existing /35 Allocations

- A number of /35s have been assigned via existing 1999 IPv6 policy
- Holders of /35s immediately eligible to request /32
- Will be an expansion of existing block, not a new separate block
- Comments/Discussion?

# Assignment of Multiple /48s

- Some end sites will need more than a /48
- No experience with this (yet)
- Current proposal has requests for multiple (or additional) /48s reviewed at RIR level
- Intent is to get experience and set general guidelines
- RIR review won't be needed once guidelines have been established.
- No intention that /48 review by RIRs be permanent
- Comments/Discussion?



# Site Definition

- End user (subscriber) having business relationship with provider
- Provider advertises route for subscriber via its aggregate
- Note: Longer-prefixes can be advertised, but not *required* for reachability
- Comments/Discussion?

# Utilization vs. HD Ratio

- Confusion about difference between “utilization” vs. “Host-Density (HD) Ratio”
- Utilization:
  - Measures what percentage of an address block is assigned
  - Involves counting actual assignments vs. total theoretical possible assignments
  - E.g., of the 16 bits available, 5000 /48s have been assigned, resulting in  $5000/56K < 20\%$  utilization
  - ISPs will continue to measure utilization as in IPv4
  - HD Ratio is *NOT* a replacement for measuring utilization

# Host-Density (HD) Ratio

- Good indication of what utilization is “good” vs. “too inefficient” for an address block of a specific size
- Used to define the threshold at which point an additional allocation is justifiable
- A single utilization value doesn’t make sense
  - More levels in hierarchy imply lower overall utilization
  - E.g., end site assignments can be more efficient
- See RFCs 1715 and 3194

# HD Ratio

- Developed during early IPv6 discussions:
  - Question: what sort of utilization can be achieved in practice?
  - How big do IPv6 addresses need to be in order to number all sites AND have reasonable utilizations?
  - When applied to other numbering schemes (e.g., DECNET, telephone numbering plans, etc.) all schemes showed “pain” at roughly same HD Ratio value
  - “Best” measure/predictor so far for identifying a workable utilization

# Utilization Thresholds

- Use HD Ratio to construct utilization thresholds
- Require utilization corresponding to HD Ratio value of .80 to justify additional allocation
- .80 considered “reasonable”, higher values (e.g., .85) considered to be “painful”
- Reevaluate once experience obtained
- Threshold table shows actual utilization needed for a given sized address block
- Comments/Discussion?

# Example: HD Ratio 0.8

<b>IPv6 prefix</b>	<b>Site addr bits</b>	<b>Total site addrs in /48s</b>	<b>Threshold</b>	<b>Util%</b>
<b>42</b>	6	64	28	<b>43.5%</b>
<b>36</b>	12	4096	776	<b>18.9%</b>
<b>35</b>	13	8192	1351	<b>16.5%</b>
<b>32</b>	16	65536	7132	<b>10.9%</b>
<b>29</b>	19	524288	37641	<b>7.2%</b>
<b>24</b>	24	16777216	602249	<b>3.6%</b>
<b>16</b>	32	4294967296	50859008	<b>1.2%</b>
<b>8</b>	40	1099511627776	4294967296	<b>0.4%</b>
<b>3</b>	45	3518437208883	68719476736	<b>0.2%</b>

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# Global Document As Base

- Details of previously discussed issues are in Global Document
- Use the global document as basis for ARIN policies
- Comments/Discussion?

# Next Steps

- Revise and reissue global document (within week)
- Feedback on revised draft
- RIPE meeting April 29-May 3
- Seek rough consensus



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# An Overview of the 6bone Registry Process

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8 April 2002



# 6bone background

- Founded on 1 March 1996, the initial 6bone focus was on testing of IPv6 standards and implementations,  
while the current focus is more on testing of transition and operational procedures,  
and providing a way to test applications and getting early experience with IPv6
- The 6bone has used two completely different address architectures with IANA allocations from those respective spaces:
  - 1<sup>st</sup> **RFC1897** 5F/8 space, Jan 96, **deprecated**
  - 2<sup>nd</sup> **RFC2471** 3FFE/16 space, Dec 98

# 6bone "pTLA" prefix allocations

The current 6bone "pTLA" prefix plan is:

**3FFE:0000::/24 thru 3FFE:3F00::/24** (58 /24 pTLAs)  
[no new allocations here]

**3FFE:8000::/28 thru 3FFE:83F0::/28** (56 /28 pTLAs)  
[no new allocations here]

The new 6bone "pTLA" prefix plan is:

**3FFE:4000::/32 thru 3FFE:7FFF::/32**  
[provides for 16K /32 pTLAs]

Which leaves:

**3FFE:8400::/32 thru 3FFE:FFFF::/32** for future use

# 6bone "pTLA" prefix allocation process

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RFC2772 describes current backbone routing guidelines

- Common rules for various IPv6 prefixes
- routing guidance
- 6bone registry
- Guidelines for new sites
- Guidelines for new pTLAs
- Operations group and enforcement

three (3) months operational experience  
on the 6bone with fully operational:

6bone registry entries

BGP4+ peering with upstream

forward and reverse path DNS entries

IPv6 accessible web page(s) describing  
the requestor's services

# Requesting "pTLAs" 2of4

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Ability & intent to provide  
"production quality" 6bone backbone  
services:

2 folk (listed in the registry) to  
provide support

Common email handle (listed in the  
registry) for contact/support

## Requesting "pTLAs" 3of4

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MUST have a potential "user community" that would be served by its becoming a pTLA, e.g., the Applicant is a major provider of Internet service in a region, country, or focus of interest. Applicant must provide a statement and information in support this claim

# Requesting "pTLAs" 4of4

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**MUST commit to abide by the current 6Bone operational rules and policies as they exist at time of its application, and agree to abide by future 6Bone backbone operational rules and policies as they evolve by consensus of the 6Bone backbone and user community**



# Requesting "pTLAs" ..unwritten

- MUST have an AS number, or explicit authorization to use someone else's
- MUST NOT use your 6bone address for paid for service (it's ok to offer free trials to paying customers, but that's it)
- MUST give it up if usage changes, e.g., the organization/network stops experimenting (the pTLA does not stay with an individual, or survive a network)
- MUST eventually give it up altogether when 6bone 3FFE authorization ceases

# New policy discussions

1. requiring existing pTLA /24 and /28 holders to renumber to a new /32, unless justifying why it is not possible due to usage and/or address layout issues, within 6 months (12 months?) of the change in policy.

*My take:*

*don't do it; it has too many adverse affects. We should get our experience renumbering another less painful way*

# New policy discussions

2. encouraging pTLA holders to apply for a production sTLA allocation when they move to a fully production mode; requiring those charging for service to also apply for a production sTLA allocation; requiring the pTLA to be released within 6 months (12 months?) of acquiring a sTLA unless justifying why the pTLA allocation is still needed/required.

*My take:*

*do make the policy that when a pTLA holder gets an sTLA they give back their pTLA if it isn't needed, but let periodic re-justification enact policy*

# New policy discussions

3. pTLA holders should not assign pTLA based allocations to paying customers except for early test/trial purposes. paying customers should always receive RIR based allocations when service is not for test/trial purposes.

*My take:*

*do make the policy that charging for services that are pTLA-based is not allowed, but let pTLA holder offer free IPv6 services over pTLA to paying customers*

# New policy discussions

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4. requiring a restatement of pTLA usage and continuing need every 2 years.

*My take:*

*enforce a re-justification of requirement every 24 months (12 too short from users and my perspective)*

# New policy discussions

5. requiring the return of a pTLA when it is no longer used by the original requesting entity. this is the de facto policy, but has not been stated previously.

*My take:*

*make the official policy that when original need for pTLA is gone, or original entity is not using pTLA, that it be returned. let periodic re-justification enact policy.*

# Ongoing work

- We are reviewing the routing guidelines yet again (round 3)
- Discussion ongoing on hardening, BGP route filtering, tunnel path quality..
- Registry work ongoing (courtesy of David Kessens & Nokia, and an excellent web interface for making changes, courtesy of Viagenie)
- Lifetime and home of the 6bone still a valid topic... you will have to give up those 3FFE prefixes eventually

# New issues

- What constitutes reasonable experimentation on the 6bone?
  - Anycast address allocations
  - Entirely new address structures
  - Real experimental (non-reliable) trials
- ip6.arpa transition
  - working with the registries on this now (RFC3152 pertains)



## ... and related comments

- As an aside, though the pTLA request rate is steady and higher than it was, it is hardly a land rush (3-5 per month vs. 1-3 per month)
- We have less pTLAs than RIR-allocated subTLAs (116 pTLAs vs. 136 sTLAs)
- Of late the RIR request rate to verify pTLA status for sTLA validation is << than the total sTLA rate (10% or so?)
- Doubt that it matters if 6bone pTLA prequalification is removed (after all, it was to help RIRs to start up, not to help pTLAs get sTLAs)

# 6bone - a continuing need

- A common occurrence for those considering IPv6 today is that there is (almost) no production traffic yet  
*(and probably won't be for years)*
- There needs to be a way for networks to try IPv6 in a real wide area way without the network folk in an organization having to convince management to commit to production service, which getting a production prefix from the RIRs implies

## 6bone - a continuing need

- A corollary to the above is that many don't mind experimenting by being just a leaf or intermediate network, but currently have a real problem finding enough geographically sensible (i.e., traffic path sensible) choices to tunnel to.
- Expecting folks who have production prefixes to offer that as a free service is not reasonable. So we need enough 6bone top level prefixes to create a decent base for intermediate and end-site addressing.

End

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Take a look:

[www.6bone.net](http://www.6bone.net)

Thanks for listening!

# also

- Also:
- It is de facto policy that if you have no ASN, you don't get a pTLA  
*no reason to change this*
- Non-standard 6bone usage will still require a special proposal to the list
- We need to think about how long we want the 6bone to last, and elucidate our need for it as an experimental testing network

Please send in your cards and letters on this topic, to me or the 6bone list