



# IPv6 Allocation Policy Proposal

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# Outline

- Initial Address Needs
- Initial Allocation Size
- Subsequent Allocation
- Utilisation Rate



# Proposed Allocation Principles

- See summary at top of mail



# IPv6 Address Needs

- Recognise existing infrastructure where relevant
  - on assumption of transition to IPv6
  - or co-existence of IPv4 and IPv6 (dual-stack)
- Or evaluate immediate address needs
  - slow start mechanism applies to new networks



# Initial Address Needs

- How to determine initial IPv6 address needs?
  1. Organisation with existing IPv4 network
  2. Organisation with existing IPv6 network
  3. Organisation with IPv4 and IPv6 networks
  4. Organisation without existing network



# 1. Existing IPv4 Network

- Address needs assessed according to existing IPv4 infrastructure and customers
  - recognising demonstrated needs and experience
  - IPv4 track record when influential to IPv6 needs
  - for example
    - number of registered customer assignments
    - number of dialup ports or customers
    - homes passed by cable
    - addresses required for other IPv4 services



## 2. Existing IPv6 Network

- IPv6 address space from upstream ISP or 6BONE
- Address needs assessed according to existing IPv6 infrastructure and customers
  - assuming transition to PA IPv6 space
- Address needs determined by # of site assignments
  - either equivalent to current # of addresses held
  - or according to previous method (IPv4)



## 3. Existing IPv4 and IPv6 networks

- Assess networks separately
  - principles already described
- Total needs determined accordingly
  - sum of total address space needs





## 4. Organisation without Network

- Slow start mechanism
  - default initial allocation size
  - subsequent allocation size based on utilisation rate
- Address needs based on deployment plan
  - total leased line customer capacity
  - number of dial-up customers
  - number of homes passed

# Initial Allocation Size

- Currently:
  - initial allocation /35
  - based on IPv4 - 13 bits of site address space
  - slow start for all initial allocations ('one-size-fits-all')
- New Proposal:
  - allocation size depending on existing network
  - slow start mechanism
    - only for new networks
  - reduce minimum allocation
    - to ensure easy entry into the IPv6 industry

# Subsequent Allocations

- Subsequent allocation when utilisation rate reached
  - according to a defined Host Density (HD)-ratio factor
- Size of subsequent allocation
  - to satisfy 2 year requirement
  - at least 1 bit shorter
- Aggregatable allocations made on best effort basis
  - “binary chop”



# Utilisation Rate

- IPv4
  - 80% assigned
- Current IPv6 policy
  - 80% sub-allocated
- Proposed IPv6 policy
  - HD-ratio instead of %

# Utilisation Threshold – HD Ratio

- “Host Density Ratio” provides utilisation limit which decreases as address space grows:

$$HD - Ratio = \frac{\ln(assigned)}{\ln(available)}$$

- » assigned = number of end addresses assigned
- » available = total number of addresses available

- Based on H-Ratio defined in RFC1715 (1994)  
–draft-durand-huitema-h-density-ratio-02.txt

# Utilisation Threshold – HD Ratio

- Use HD Ratio to determine when an address block can be considered “utilised”

$$threshold = 2^{(site\_bits \times HD - Ratio)}$$

- threshold = site addresses to be utilised
- site\_bits = 48 – IPv6 prefix



# Example: HD Ratio = 0.9

$$threshold = 2^{(site\_bits \times 0.9)}$$

v6 prefix	Site addr bits	Total site addrs	Threshold	Util%
42	6	64	42	66.0%
36	12	4096	1783	43.5%
35	13	8192	3327	40.6%
32	16	65536	21619	33.0%
29	19	524288	140479	26.8%
24	24	16777216	3178688	18.9%
16	32	4294967296	467373275	10.9%
8	40	1099511627776	68719476736	6.3%
3	45	35184372088832	1554944255988	4.4%

# Example: HD Ratio = 0.8

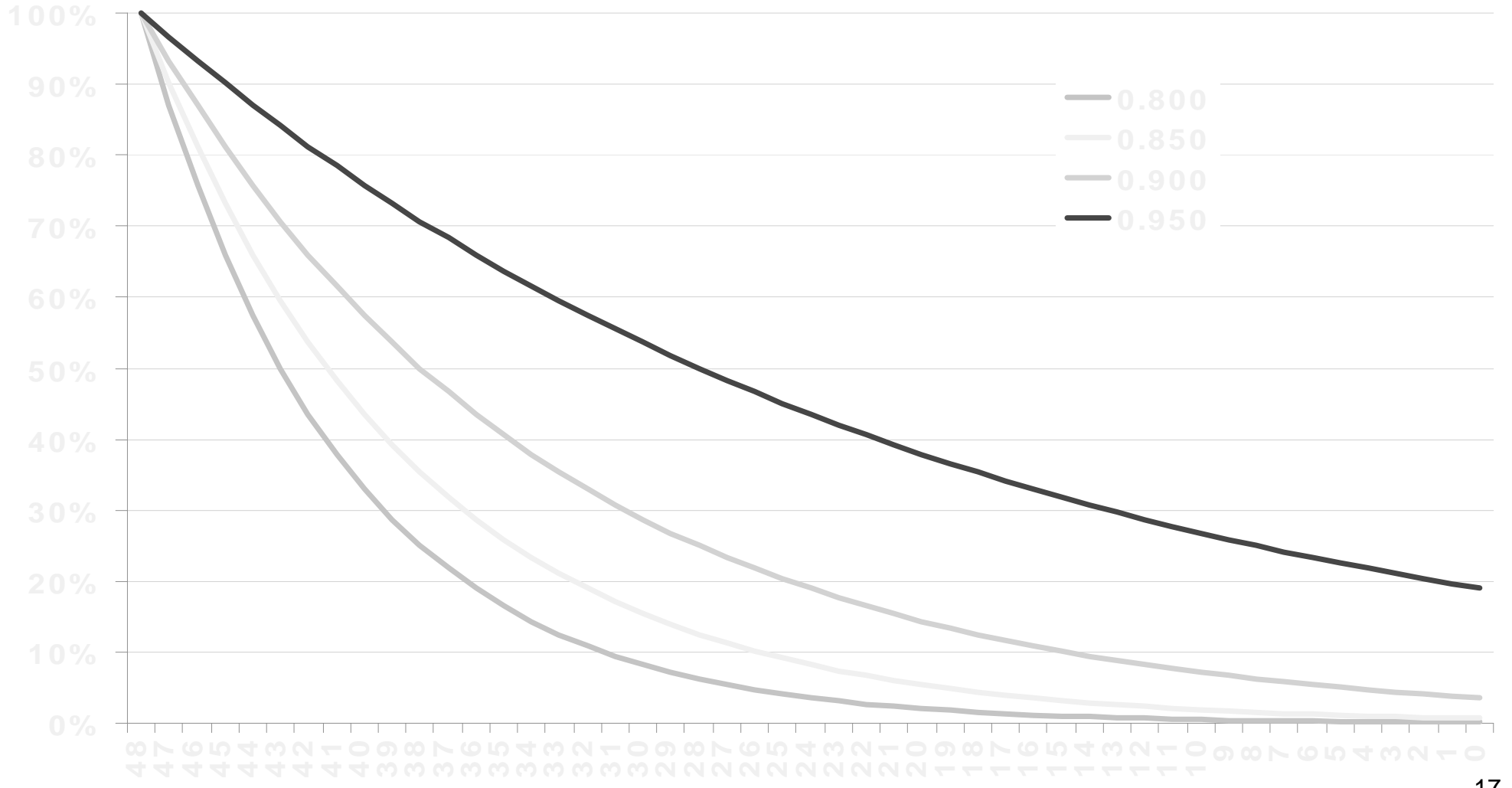
$$threshold = 2^{(site\_bits \times 0.8)}$$

v6 prefix	Site addr bits	Total site addrs	Threshold	Util%
42	6	64	28	43.5%
36	12	4096	776	18.9%
35	13	8192	1351	16.5%
32	16	65536	7132	10.9%
29	19	524288	37641	7.2%
24	24	16777216	602249	3.6%
16	32	4294967296	50859008	1.2%
8	40	1099511627776	4294967296	0.4%
3	45	35184372088832	68719476736	0.2%





# Choice of HD Ratio



# Qualification Criteria

- Assess prefix requirement based on address requirement and HD-Ratio
  - e.g. if require 12,000 /48s, prefix is /32
  - e.g. if require 200,000 /48s, prefix is /29
- Prefix is allocated if  $\geq$  minimum allocation
  - also if peering with 3 or more others
  - required to renumber from existing space?
  - other criteria as well?



# Qualification Criteria – option 2

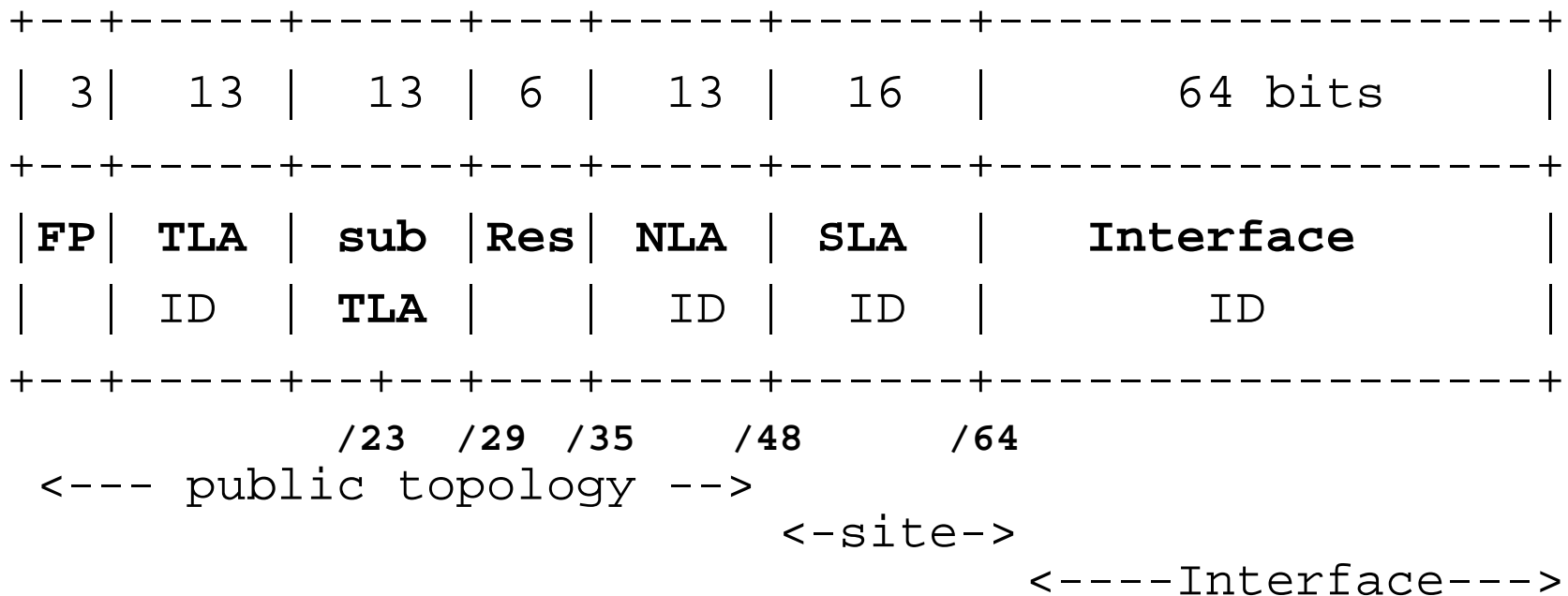
- Establish lower qualification threshold level for receiving minimum allocation?
- For instance...
  - Minimum allocation may be /32 (example)
    - 16 bit site address space, provides 64K sites
  - “Qualification threshold” may be /36 (example)
    - If organisation reaches threshold, /32 allocation is made
    - At HD Ratio 0.8 (18.9% of /36) this is 776 sites
  - Ratio of address requirement to initial allocation
    - In this example, ratio = 776:64K = 1:84





# Current (Old) format boundaries

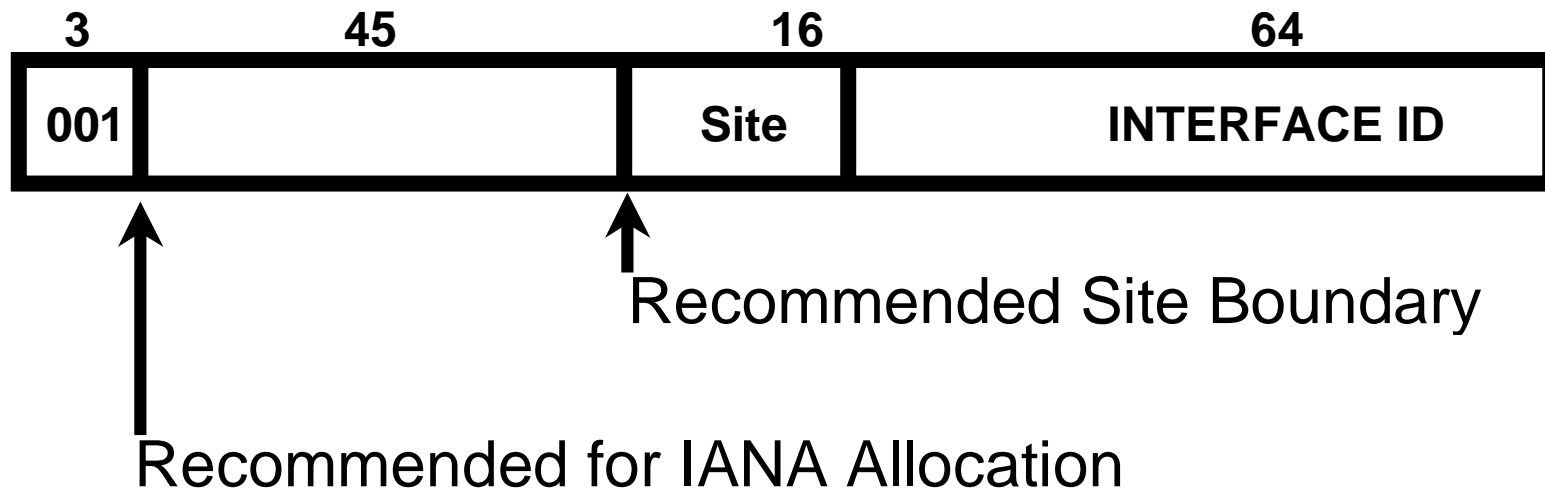
- *Will change after recent discussions between the IETF & the RIRs*



*(RFC 2374 - Mixes technology and policy)*



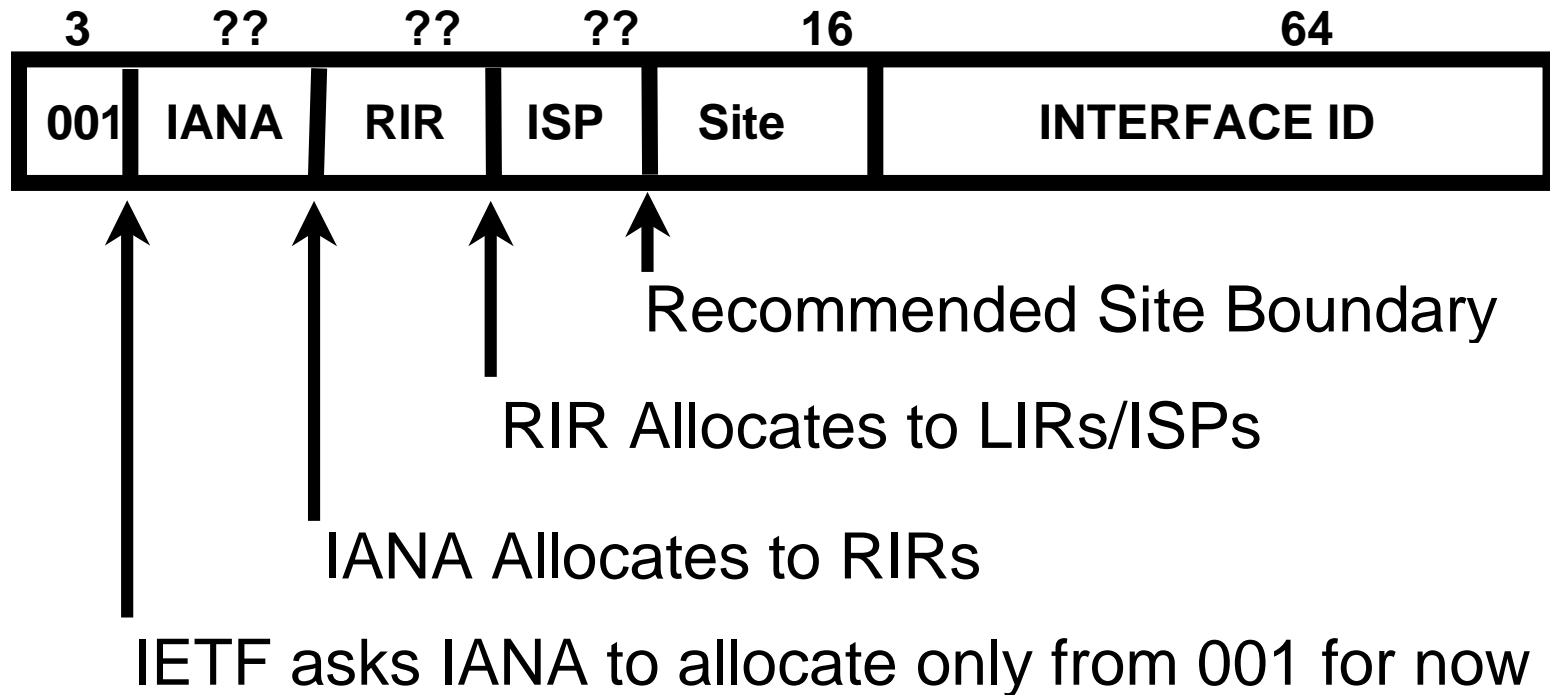
# New IPv6 Unicast Address: the Technology and Recommendations



**Technology is what can be Hard-Coded in Routers**

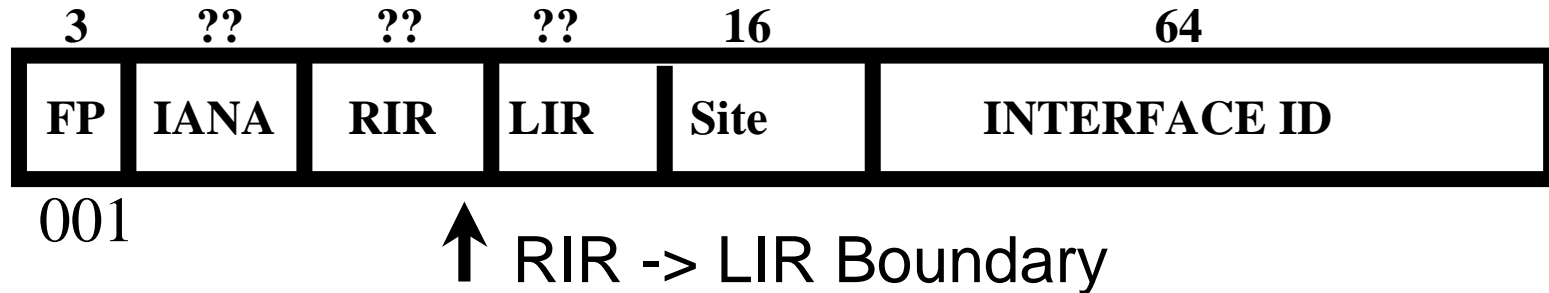


# IPv6 Unicast Address: the Policy Space



<http://www.ripe.net/presentations/ipv6-taipei2001/index.html>

# New Policy Developments



- Slow Start
  - minimum initial allocation (size TBD)
  - subsequent allocation based on usage rate
  - based on current practice (in IPv4)
- Sub-allocations to downstream ISPs
  - based on need
  - size TBD





# Policy Developments Summary

- IETF/IAB input to all RIRs:
  - /48 to all end users
  - Exception: no need for multiple subnets - /64
- Under discussion:
  - Removing current policy boundaries
  - Initial allocation size, Utilisation
  - Extension of bootstrap phase
  - IPv6 addresses to Internet Exchange Points
- Close co-ordination between RIRs



# Latest Policy Proposals

## - hot of the press -

- Recognise existing infrastructure
  - IPv4 and IPv6
- Reduce existing minimum allocation for new orgs.
  - to ensure easy entry into IPv6 industry
- Slow Start Mechanism
  - only for new networks
  - minimum allocation size can be exceeded where requirement is shown



# Presentations & Discussion Papers

- RIR Allocation Statistics  
<http://www.aso.icann.org/rirs/stats/index.html>
- IAB/IESG Addressing recommendations  
<http://www.ietf.org/internet-drafts/draft-iesg-ipv6-addressing-recommendations-03.txt>
- IPv6 Presentations at last RIPE Meeting  
<http://www.ripe.net/ripe/meetings/archive/ripe-39/index.html>
- IPv6 Addressing policy and technology  
<http://www.ripe.net/presentations>



# Pointers & References

- IPv6 Allocation Policies

<http://www.ripe.net/ipv6.html>

<http://www.ripe.net/ripe/docs/ripe-196.html>

- RIPE Meetings & Mailing lists

<http://www.ripe.net/meetings/ripe/index.html>

<http://www.ripe.net/ripe/wg/lir/index.html>

<http://www.ripe.net/ripe/wg/ipv6/index.html>

- RIPE Documents & FAQ

<http://www.ripe.net/ripe/docs/>

<http://www.ripe.net/ripenncc/faq/registration/qa7.html>

# Questions



**<http://www.ripe.net/presentations>**