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IPv6 Addressing – Status and Policy Report

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Director General, APNIC

Overview

- IPv6 deployment status
  - Allocations, Registration and Routing
  - Asia Pacific and Global comparison
- IPv6 policy status
  - Latest developments
  - Details of current policy

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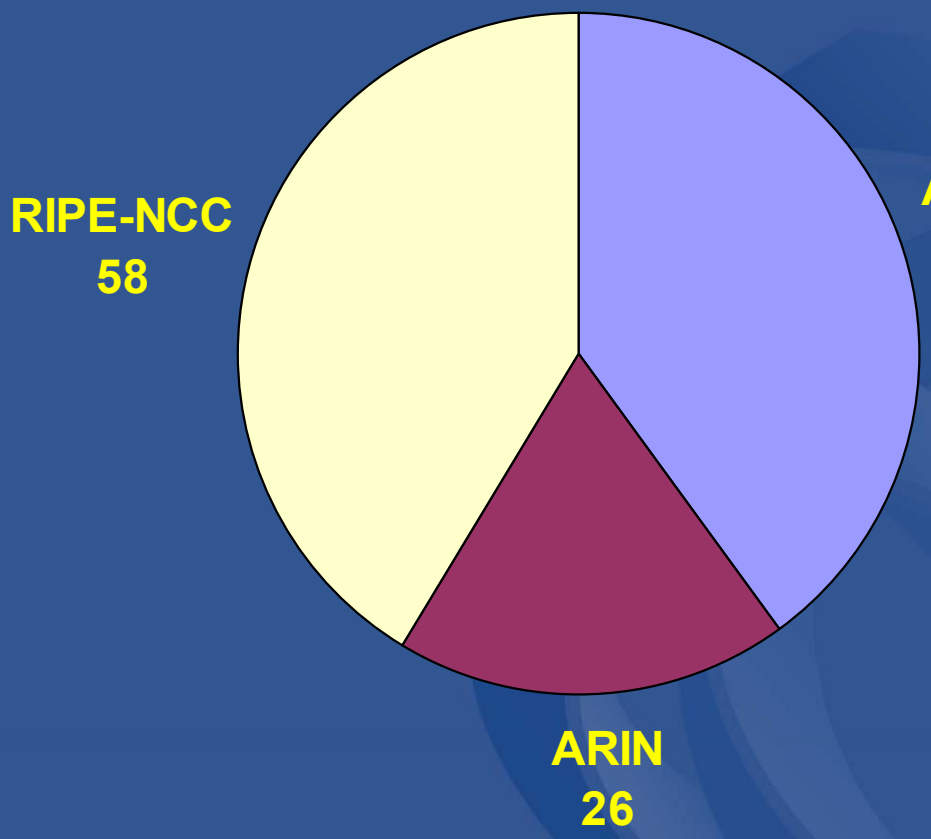
IPv6 Deployment Status

IPv6 Address allocations

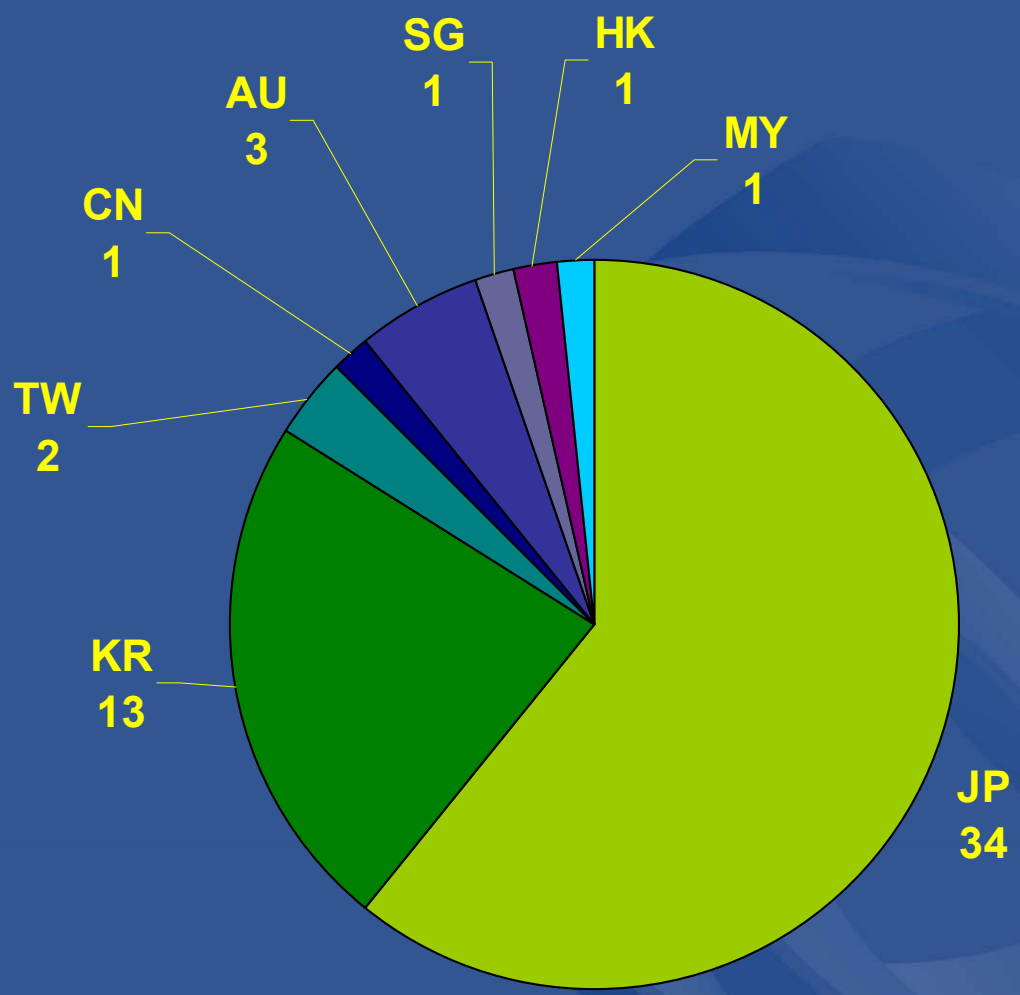
- IPv6 address allocations currently made according to the interim (1999) policy
- Allocation unit is /35

IPv6 Distribution - Global



Unit: /35 Prefixes

IPv6 Distribution - APNIC



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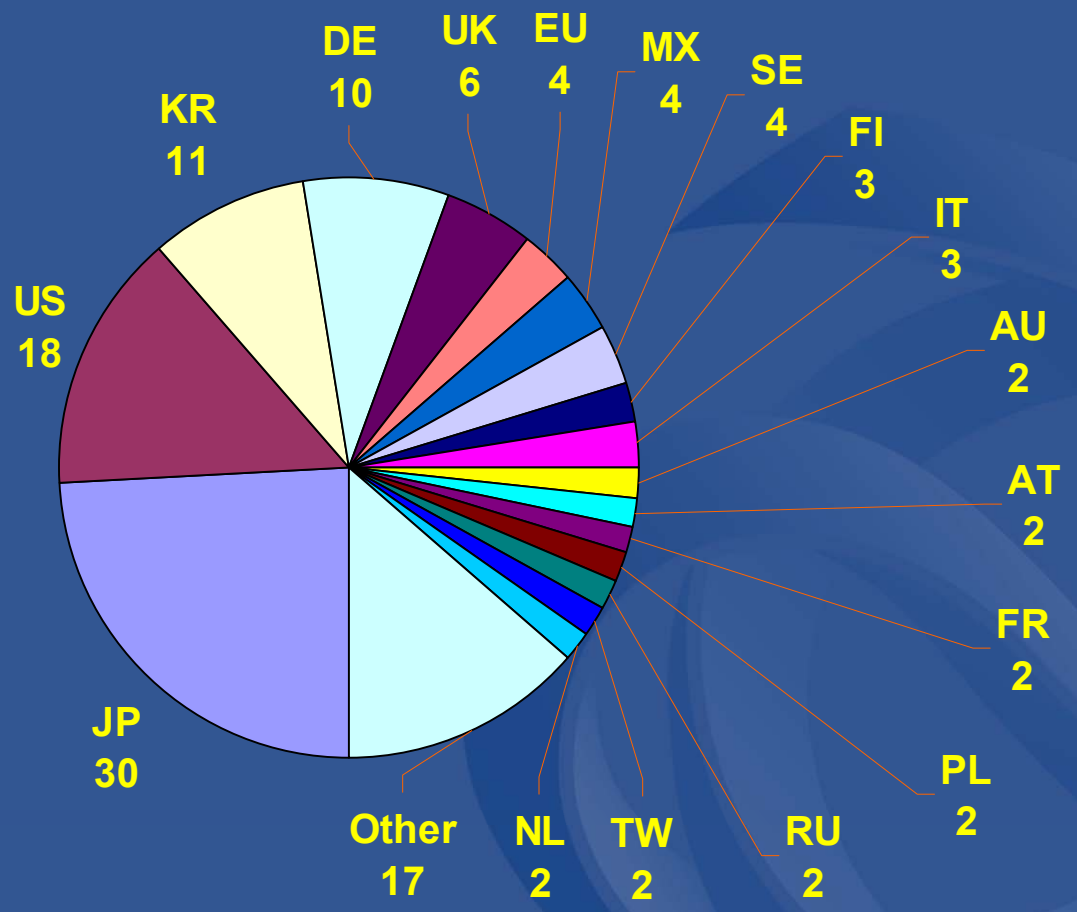
IPv6 Distribution – Global (2001)



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IPv6 Allocations - APNIC

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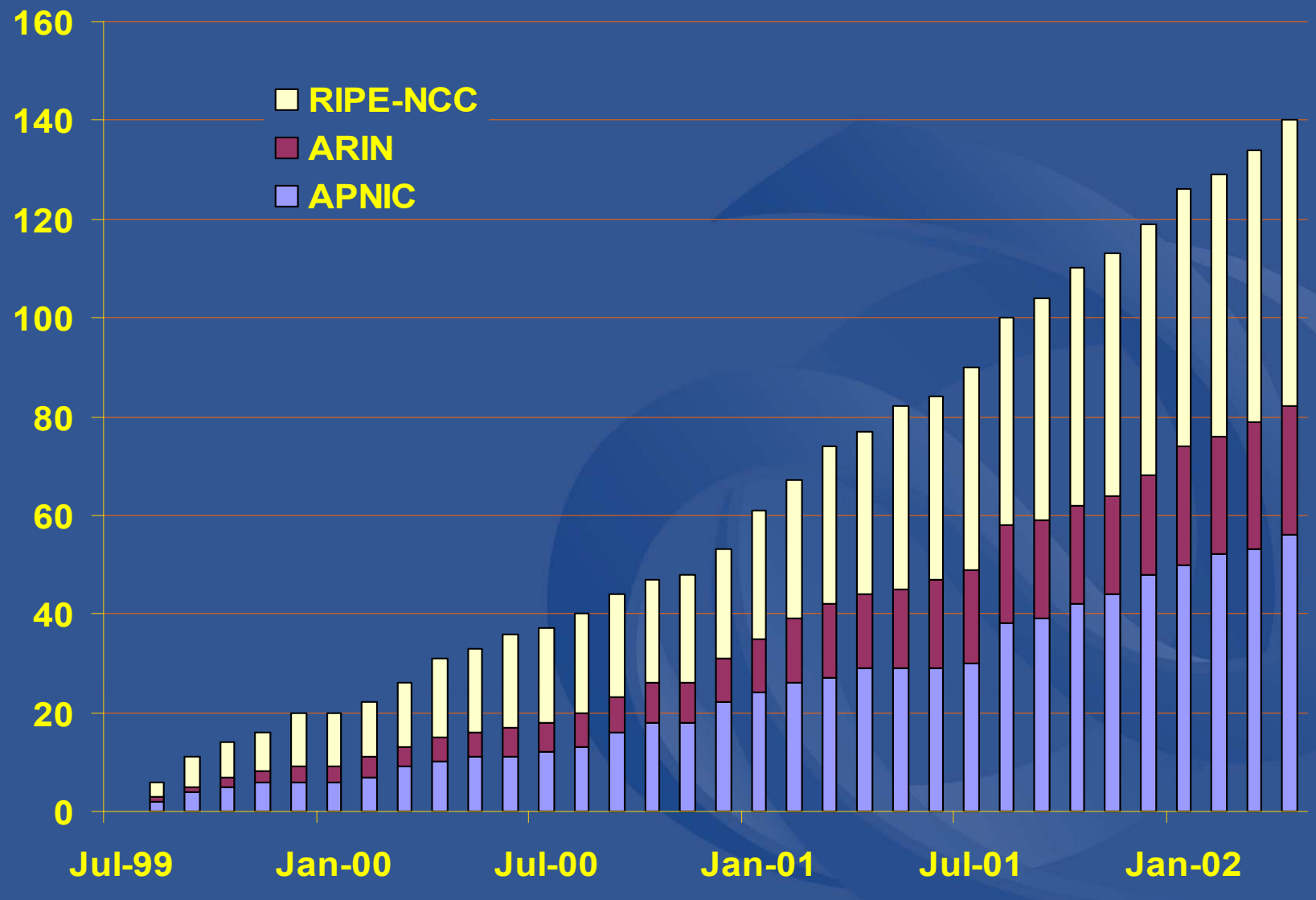
IPv6 Allocations - Global



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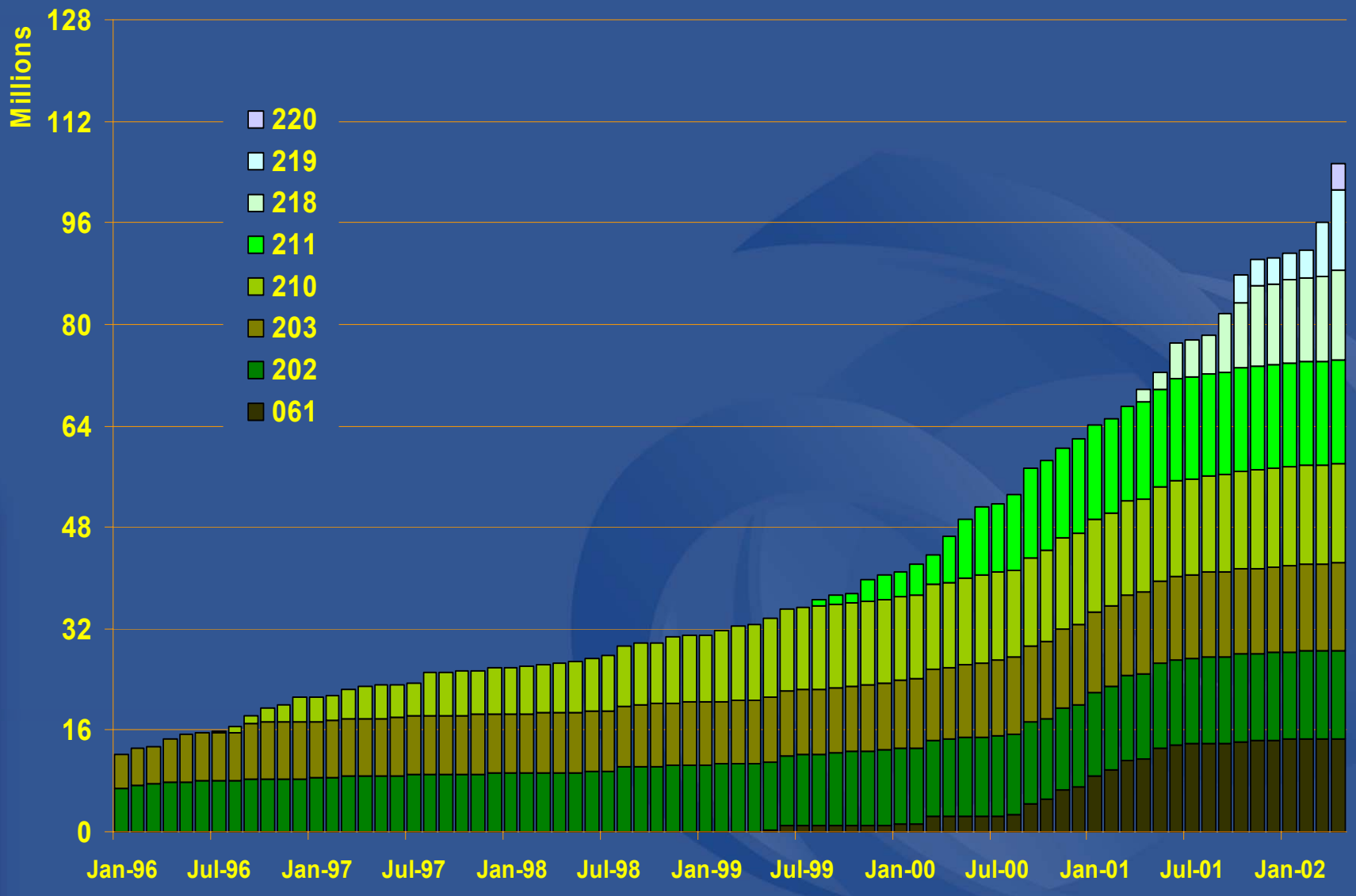
IPv4 Allocations - APNIC



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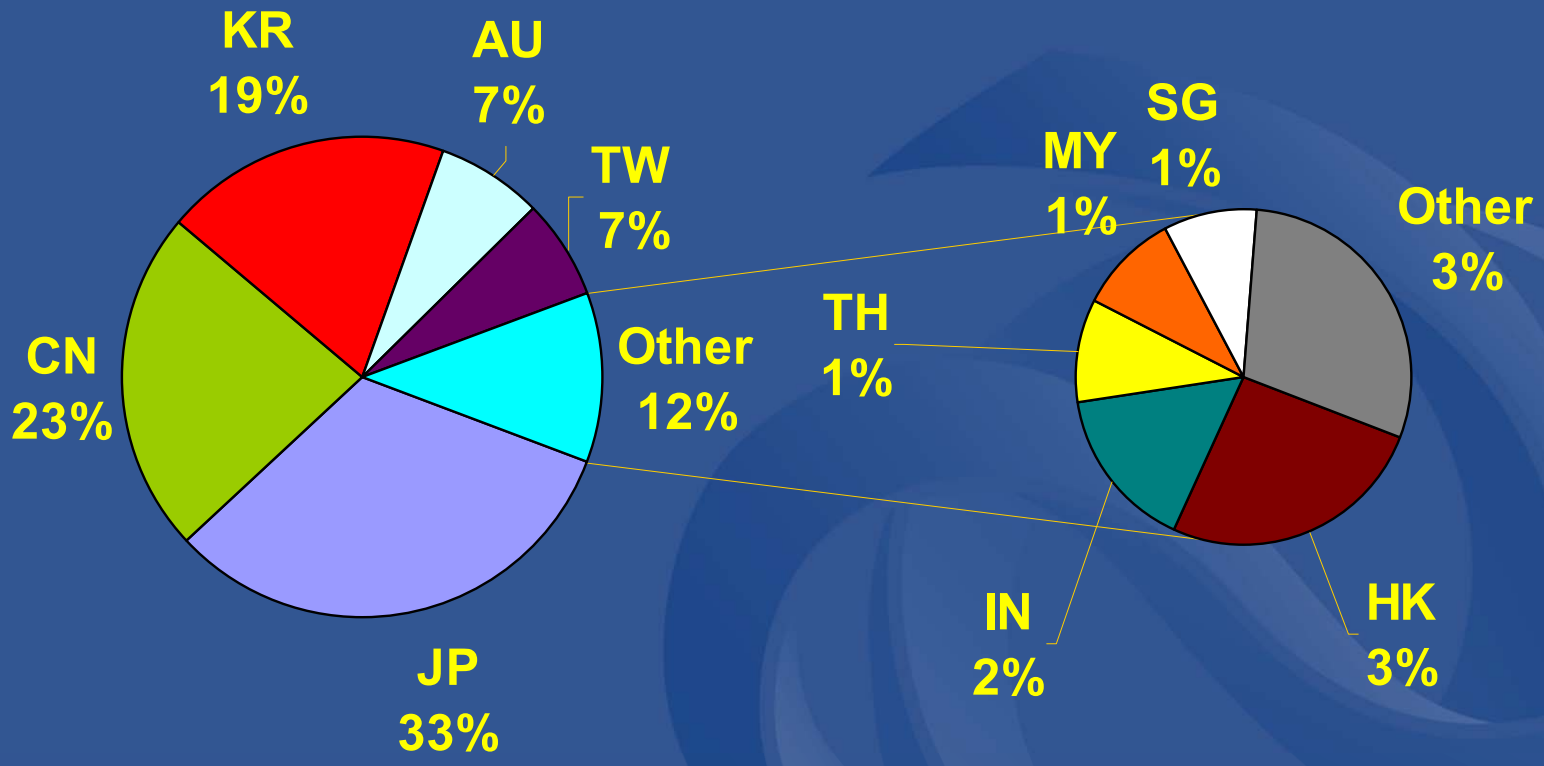
IPv4 Distribution - APNIC



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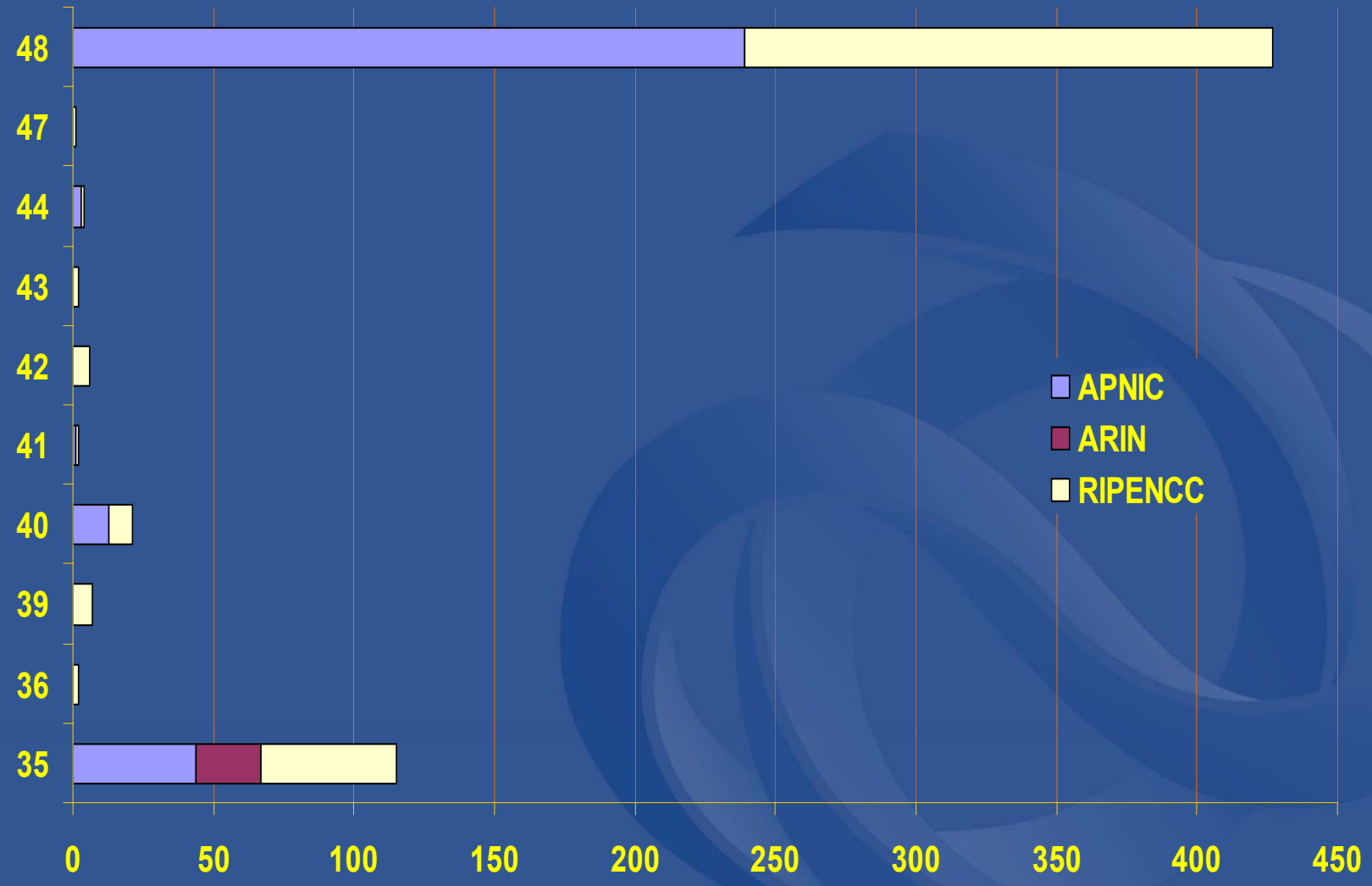
IPv6 Address registration

- IPv6 addresses are registered in “whois” database of RIRs
  - Address should be registered before use
- Registration unit is /35 - /48

IPv6 Registrations - Global



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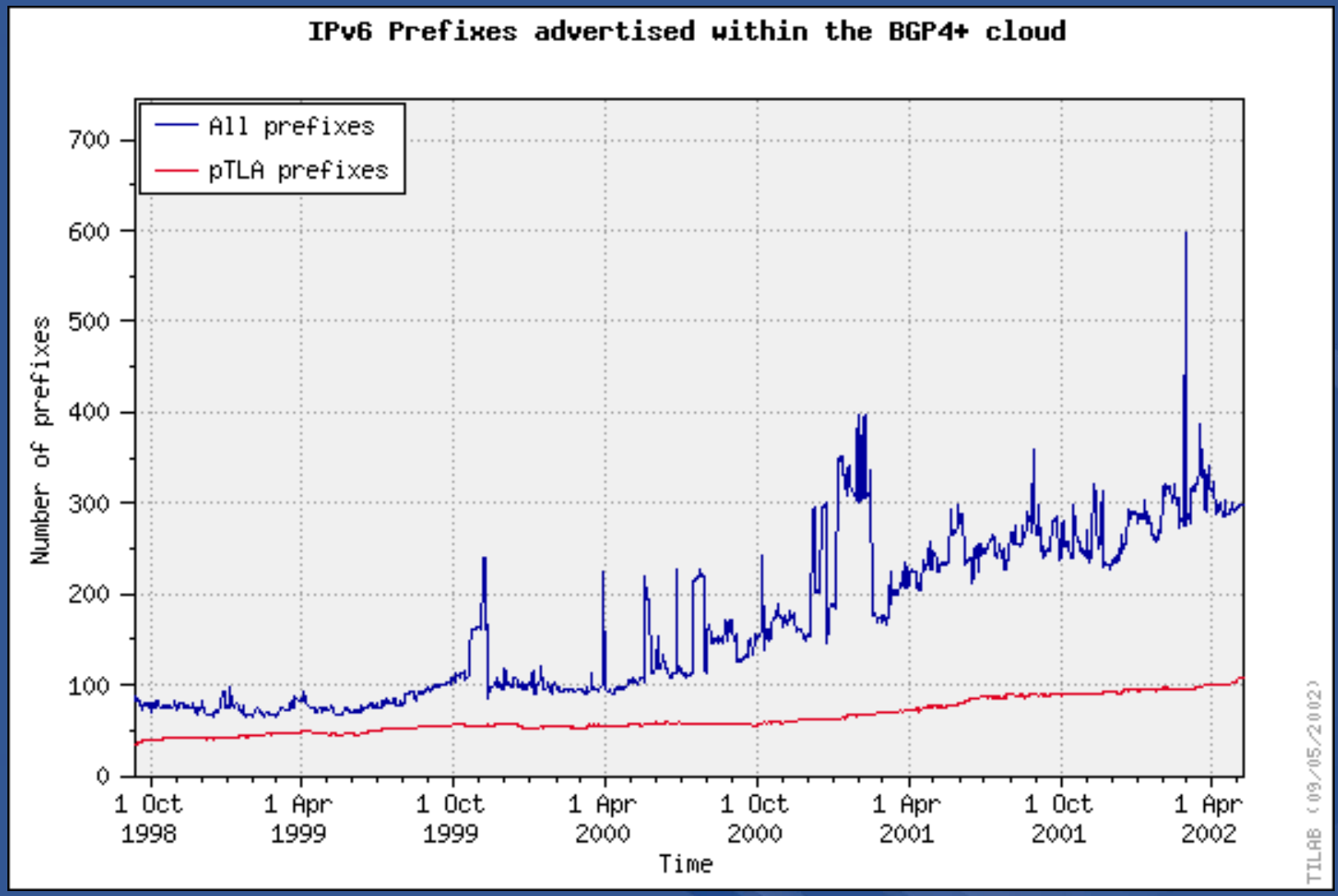
IPv6 Address routing

- IPv6 addresses may be allocated and registered without being used
- Routing tables reveal address space which is actually in use

IPv6 Routing Table



Source: http://net-stats.ipv6.tilab.com/bgp/graphs/

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IPv6 Policy Status

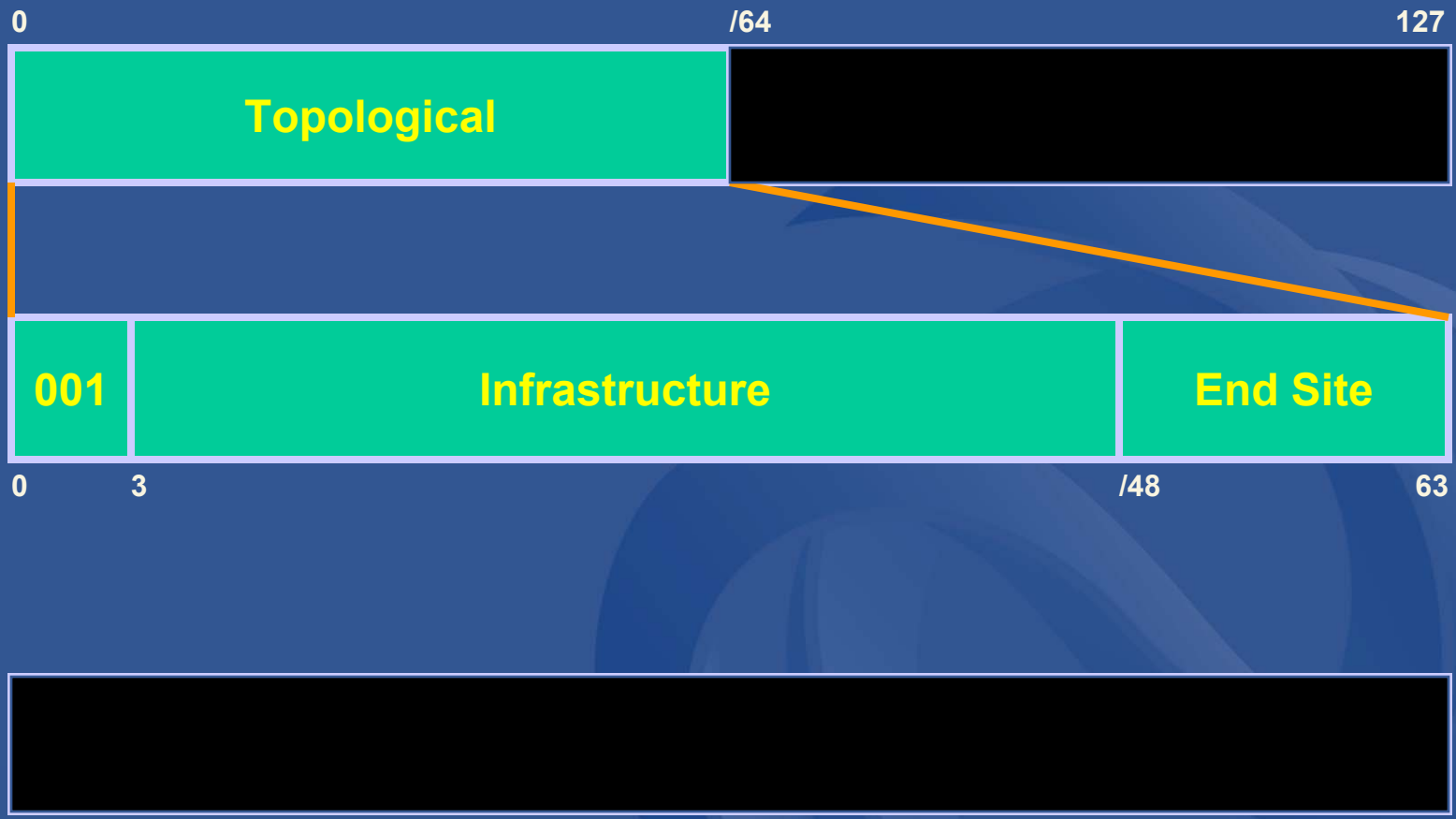
IPv6 Global Policy - History

- First interim policy published in 1999
- Policy review underway during 2001
- Latest draft approved in all regions
  - APNIC: Bangkok, March 2002
  - ARIN: Las Vegas, April 2002
  - RIPE NCC: Amsterdam, May 2002
- New global policy now established
  - To be implemented in coming months
- Public mailing lists and documentation
  - http://www.apnic.net

IPv6 Global Policy - Details

- Addressing structure overview
- Initial allocation criteria
- Subsequent allocation criteria
- Utilisation requirements
- Address assignment
- Other conditions

IPv6 Address Structure

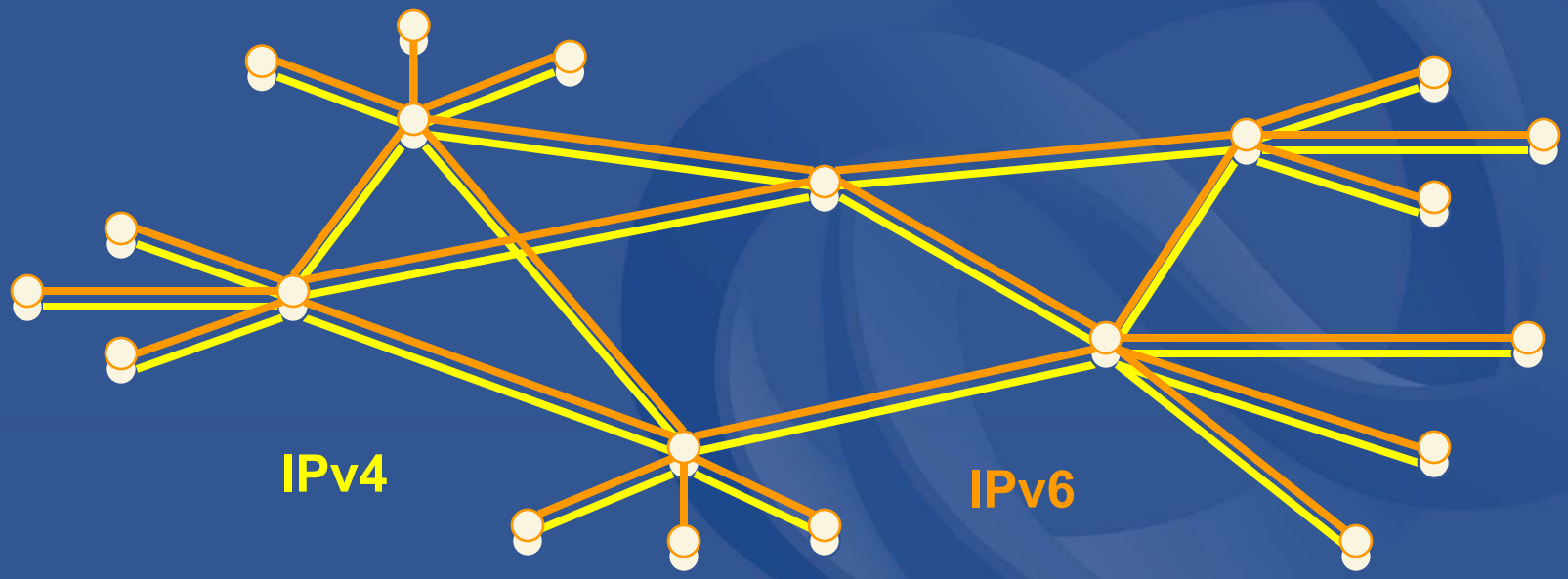


IPv6 Allocation Criteria

- Initial allocation size is /32
  - Allocated to any IPv6 LIR (ISP) planning to connect 200 End Sites within 2 years
  - This is the default initial allocation to “new” ISPs (“slow start” policy)
  - Provides 16 bits of site address space
- Larger initial allocations can be made if justified according to:
  - IPv6 network infrastructure plan
  - Existing IPv4 infrastructure and customer base

IPv6 Allocation Criteria

- Existing ISP infrastructure
  - Policy assumes that transition is inevitable
  - Large IPv4 ISPs will receive IPv6 allocations consistent with the scale of existing networks



IPv6 Assignments

- Default assignment /48 for all End Sites
  - Providing /16 bits of space for subnets
- End Site defined as an end user of an ISP where:
  - The ISP assigns address space to the end user
  - The ISP provides Internet transit service to the end user
  - The ISP advertises an aggregate prefix route that contains the end user's assignment
  - ISP POPs (Points of Presence) are also defined as End Sites

IPv6 Assignments

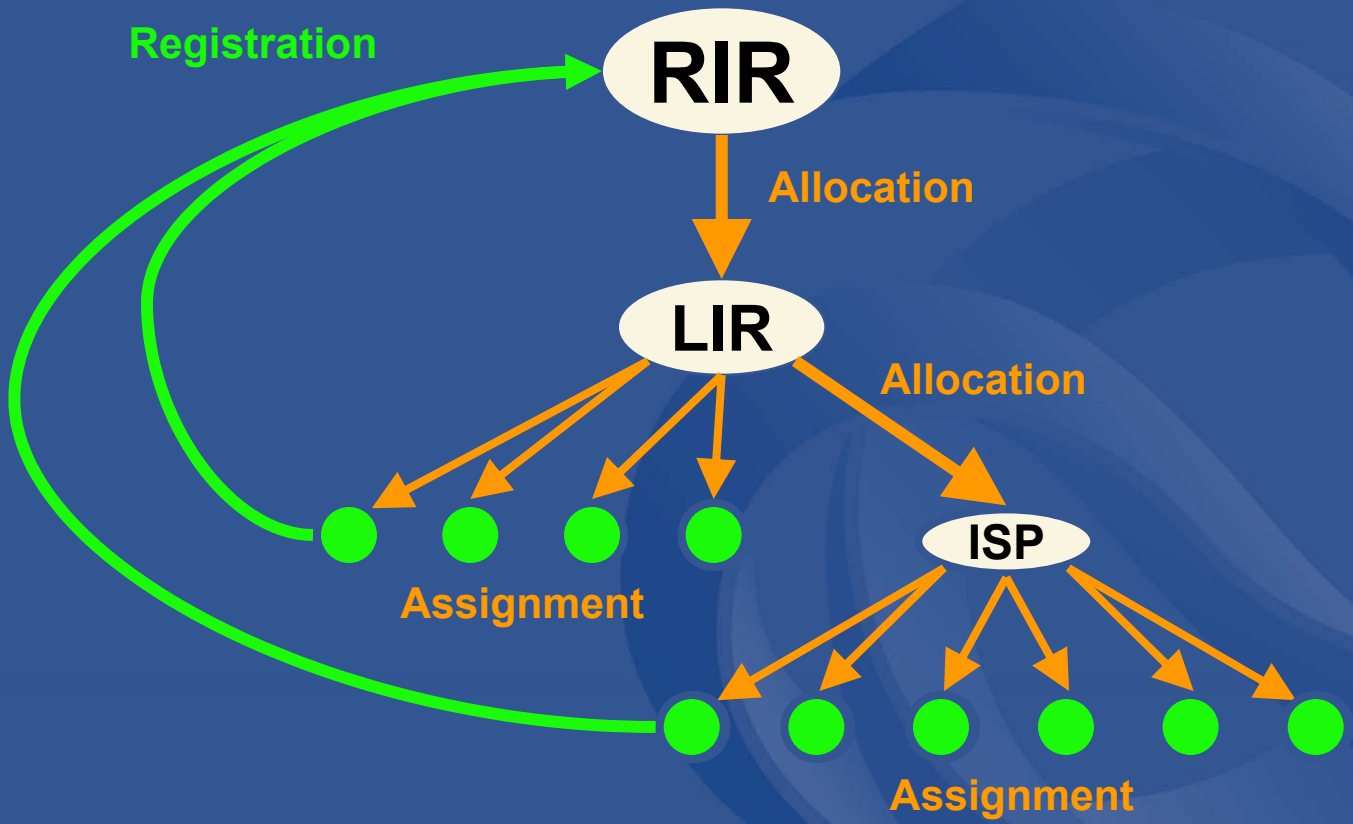
- Larger assignments: Multiple /48s
  - Some end sites will need more than one /48
  - Requests for multiple (or additional) /48s should be reviewed at RIR level
- Smaller assignments: /64
  - Single subnet devices should receive /64 only
  - E.g. mobile phone
- Smaller assignments: /128
  - Devices with no subnets should receive /128 only
  - E.g. remote sensor

IPv6 Assignments

- IPv6 assignments to End Sites used to determine utilisation of IPv6 address blocks
  - Intermediate allocation hierarchy not considered
  - All assignments must be registered
  - Utilisation determined from registrations
- Intermediate allocation and assignment practices are the responsibility of the LIR…

IPv6 Registration

- LIR is responsible for all registrations



IPv6 Utilisation Requirement

- Subsequent allocation may be requested when IPv6 utilisation requirement is met
- Utilisation of IPv6 address space is measured differently from IPv4

IPv6 Utilisation Requirement

- Under IPv4, address space utililsation measured as simple pecentage:

$$Utilisation = \frac{assigned}{available}$$

- IPv4 utilisation requirement is 80%
  - When 80% of address space has been assigned or allocated, LIR may receive more
  - E.g. ISP has assigned 55000 addresses of /16

$$\frac{assigned}{available} = \frac{55{,}000}{65{,}536} = 84\%$$

IPv6 Utilisation Requirement

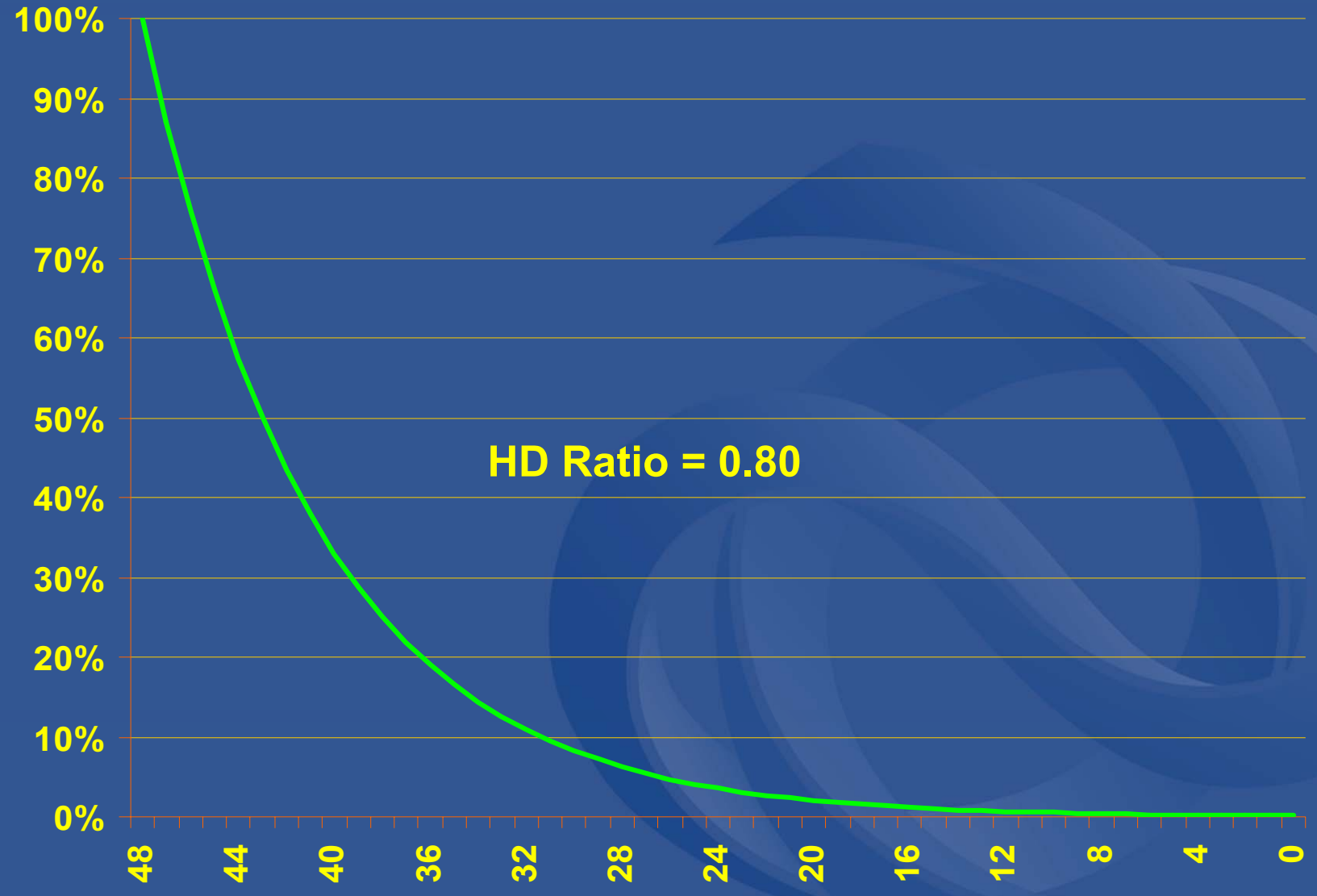
- Under IPv6 utilisation will be measured according to HD-Ratio (RFC 3194):

$$Utilisation_{HD} = \frac{\log(assigned)}{\log(available)}$$

- IPv6 utilisation requirement is HD=0.80
  - Measured according to assignments only (intermediate allocations are ignored)
  - E.g. ISP has assigned 10000 addresses of /32

$$\frac{\log(assigned)}{\log(available)} = \frac{\log(10,000)}{\log(65,536)} = 0.83$$

IPv6 Utilisation Requirement



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IPv6 Utilisation Requirement

- HD Ratio utilisation requirement of 0.80

v6 prefix	Total site addresses	Utilisation requirement	Util%
42	64	28	43.5%
36	4096	776	18.9%
35	8192	1351	16.5%
32	65536	7132	10.9%
29	524288	37641	7.2%
24	16777216	602249	3.6%
16	4294967296	50859008	1.2%
8	1099511627776	4294967296	0.4%
3	35184372088832	68719476736	0.2%

Subsequent Allocation

- Subsequent allocation can be made when HD = 0.80 is reached
- Other address management policies should also be met
  - Correct registrations
  - Correct assignment practices etc
- Subsequent allocation size is at least double
  - Resulting IPv6 Prefix is 1 bit shorter
  - Should be sufficient for 2 years requirement

Other conditions

- License model of allocation
  - Allocations are not considered permanent, but always subject to review and reclamation
  - Licenses renewed automatically while addresses in use, consistent with policies
- Existing /35 Allocations
  - A number of /35s have been assigned under interim IPv6 policy
  - Holders of /35s immediately eligible to request /32

IPv6 Policy - Summary

- New policy is subject to review
  - Policy will evolve as experience gained
  - Does not preclude other policies being developed
  - Need immediate follow-on work in some areas
- RIRs starting implementation work now
  - Allocation to be made under the new policy in coming months
- Public mailing lists and documentation
  - http://www.apnic.net


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Thank You
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