SANOG

IPv6 Address Allocation Policies & Procedures

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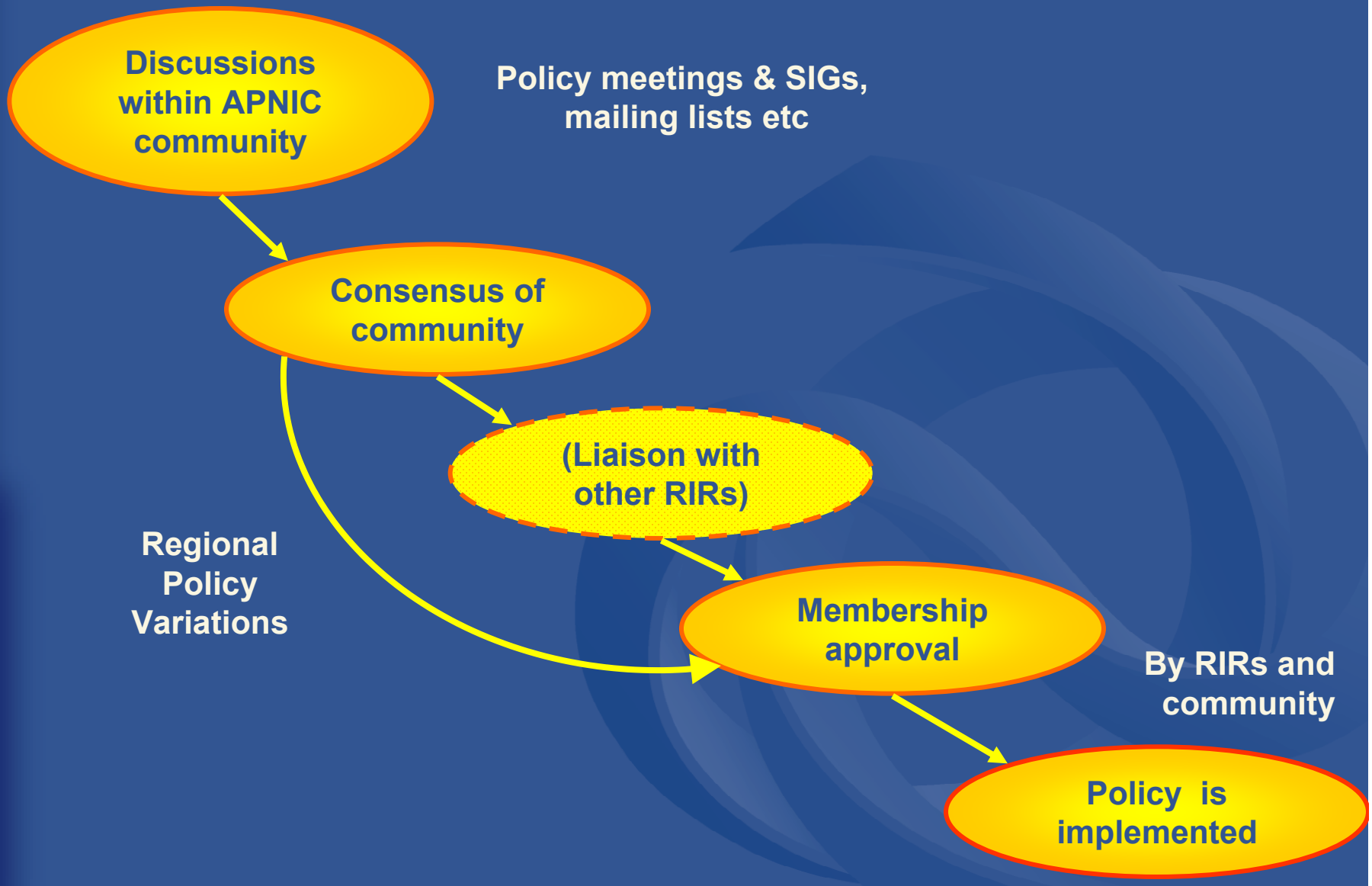
Overview

- IPv6 policy development process
- IPv6 address policies
  - Goals
  - Allocation criteria
  - Principles
- Subsequent allocation
  - Utilisation ratio
- Policy update
- Statistics

IPv6 policy development process



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IPv6 address policies

- Accordance with the Regional Internet Registry IPv6 policy document
  - http://www.apnic.net/policies.html

- Developed through joint discussions among the APNIC, ARIN and RIPE communities

IPv6 address policies - goals

- Internet is able to function and grow to the maximum extent possible
- Aggregation
  - Hierarchical distribution
  - Aggregation of routing information
  - Limiting no of routing entries advertised into the Internet
- Efficient address usage
  - Avoid wasteful practices
- Minimise Overhead
- Registration of addresses, Uniqueness, Fairness & consistency

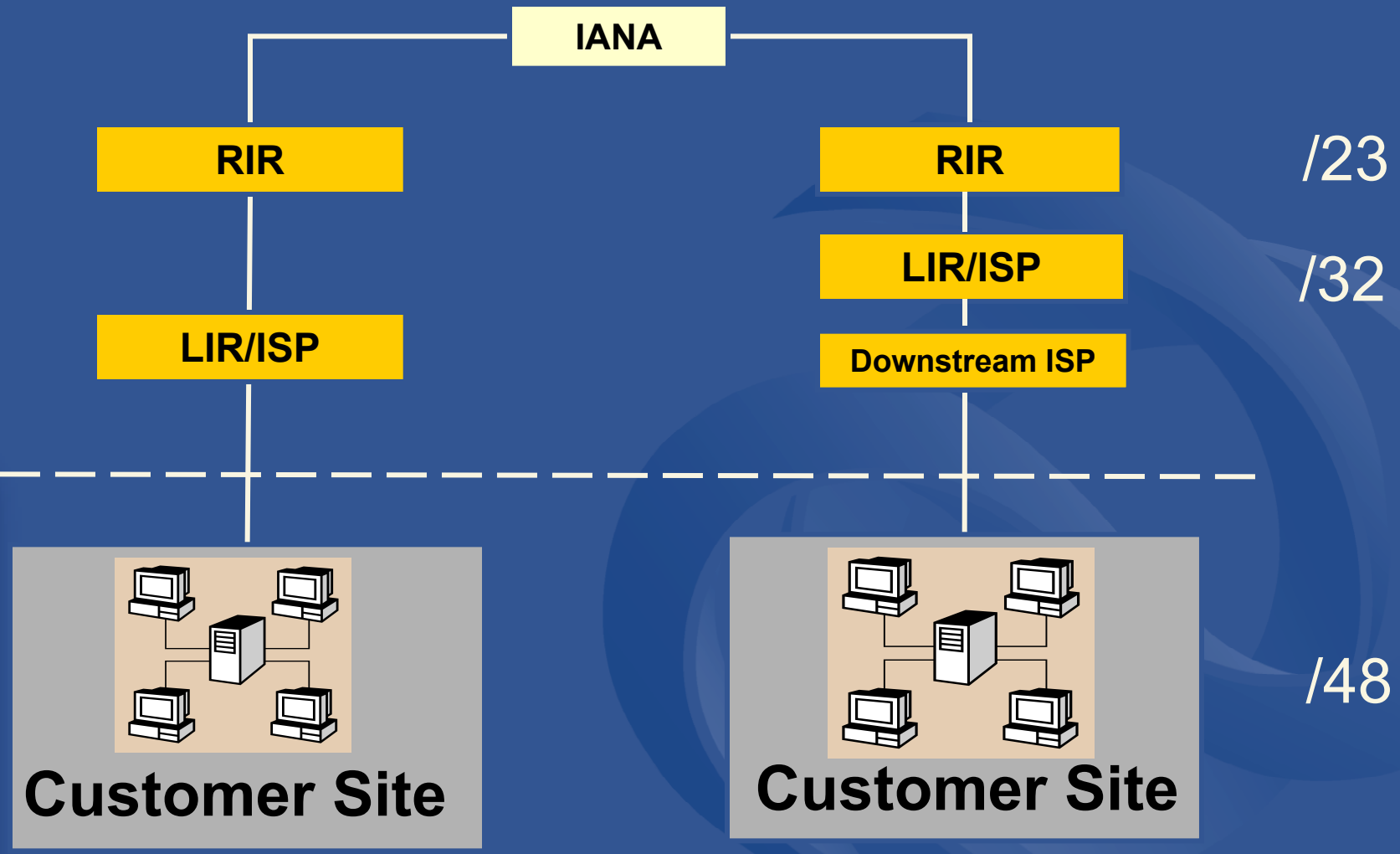
IPv6 address policies - principles

- Address space not to be considered freehold property
- 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

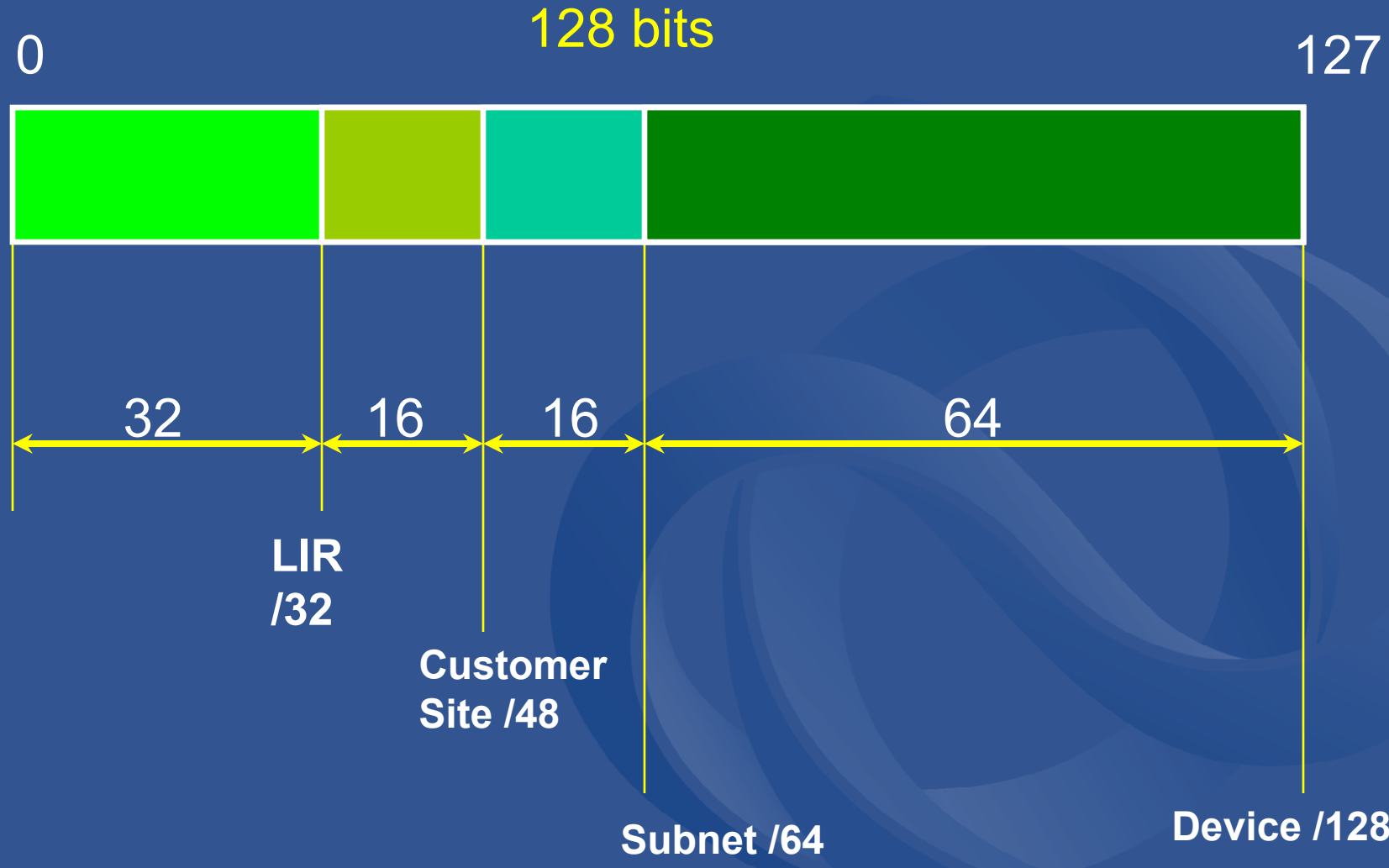
IPv6 address policies - principles

- Routability not guaranteed
  - No guarantee that any address allocation or assignment will be globally routable
- Minimum Allocation
  - To facilitate prefix-based filtering
  - Minimum allocation size is /32
- Consideration of IPv4 Infrastructure

IPv6 address management hierarchy



IPv6 addressing structure



IPv6 allocation policy

- 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 policy

- LIR to ISP allocation
  - No specific policy
  - Optimum utilization of the total address block allocated to the LIR
  - All /48 assignments to end sites are required to be registered either by the LIR or its subordinate ISPs
- HD-Ratio when a subsequent allocation becomes necessary

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

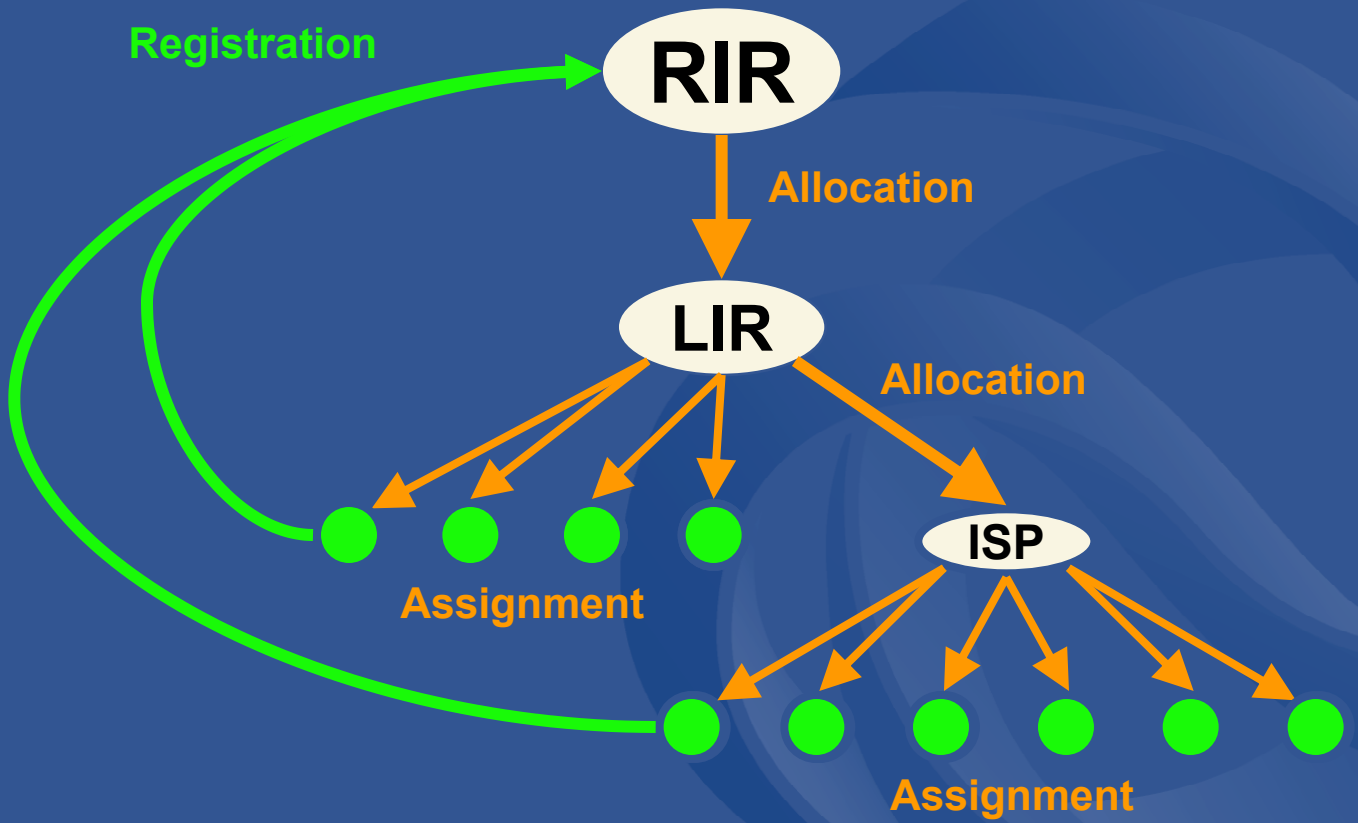
- /48 assignments per end site
  - /64 only one subnet
  - /128 only one device connecting
- Larger assignments - Multiple /48s
  - Some end sites will need more than one /48
  - Should be reviewed by RIR/NIR
  - Second opinion process
- ISP infrastructure
  - /48 per POP

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 sites from /32

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

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

- Subsequent allocation results in a doubling of the address space allocated to it
- Where possible, the allocation will be made from an adjacent address block
  - Resulting in total IPv6 Prefix is 1 bit shorter
- Should be sufficient for 2 years requirement

Other conditions

- Existing /35 Allocations
  - A number of /35s have been assigned under interim IPv6 policy
  - Holders of /35s immediately eligible to request /32

Portable IPv6 assignments

- For IXPs
  - Demonstrate ‘open peering policy’
  - 3 or more peers
  - Portable assignment size: /48
    - All other needs should be met through normal processes
- Critical Infrastructure
  - Root DNS, ccTLD, IANA, RIRs/NIRs, but not IXPs
  - Assignment size is /32

IPv6 address allocation procedures

- IPv6 Allocations to RIRs from IANA
  - APNIC
    - 2001:0200::/23
    - 2001:0C00::/23
    - 2001:0E00::/23
  - ARIN
    - 2001:0400::/23
    - 2001:1800::/23
  - LACNIC
    - 2001:1200::/23
  - RIPE NCC
    - 2001:0600::/23
    - 2001:0800::/23
    - 2001:0A00::/23
    - 2001:1400::/23
    - 2001:1600::/23
    - 2001:1A00::/23
- IPv6 FAQ
  - http://www.apnic.net/faq/IPv6-FAQ.html

IPv6 address request form

- IPv6 Address Request form
  - http://www.apnic.net/apnic-bin/ipv6-subtla-request.pl

- Use by organisations requesting IPv6 allocations that they will use for addressing their own infrastructure and making assignments to customers

IPv6 address request form

- Information Required
  - Contact details
  - Structure of the organisation
    - In terms of how the IP addresses will be utilised
  - Peering relationships
    - Does the member have exterior routing protocol peering relationships
  - IPv6 service plan
  - Planned addressing structure
  - ISPs infrastructure
  - Customer assignments (IPv4 Customers)

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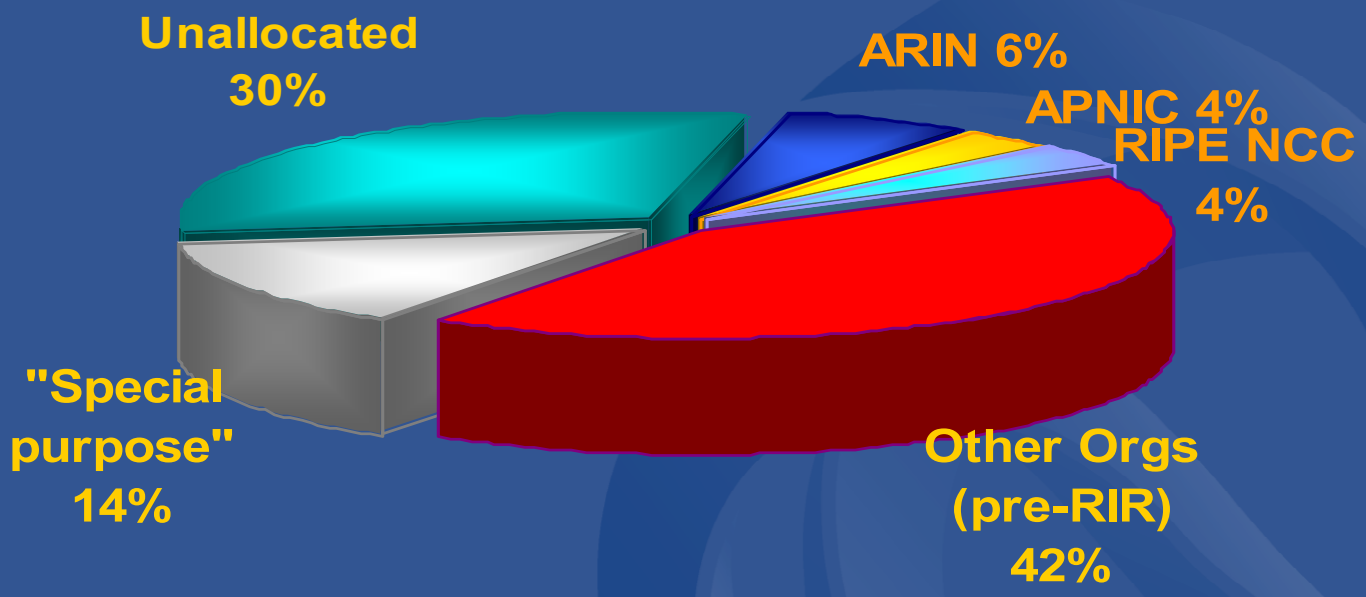
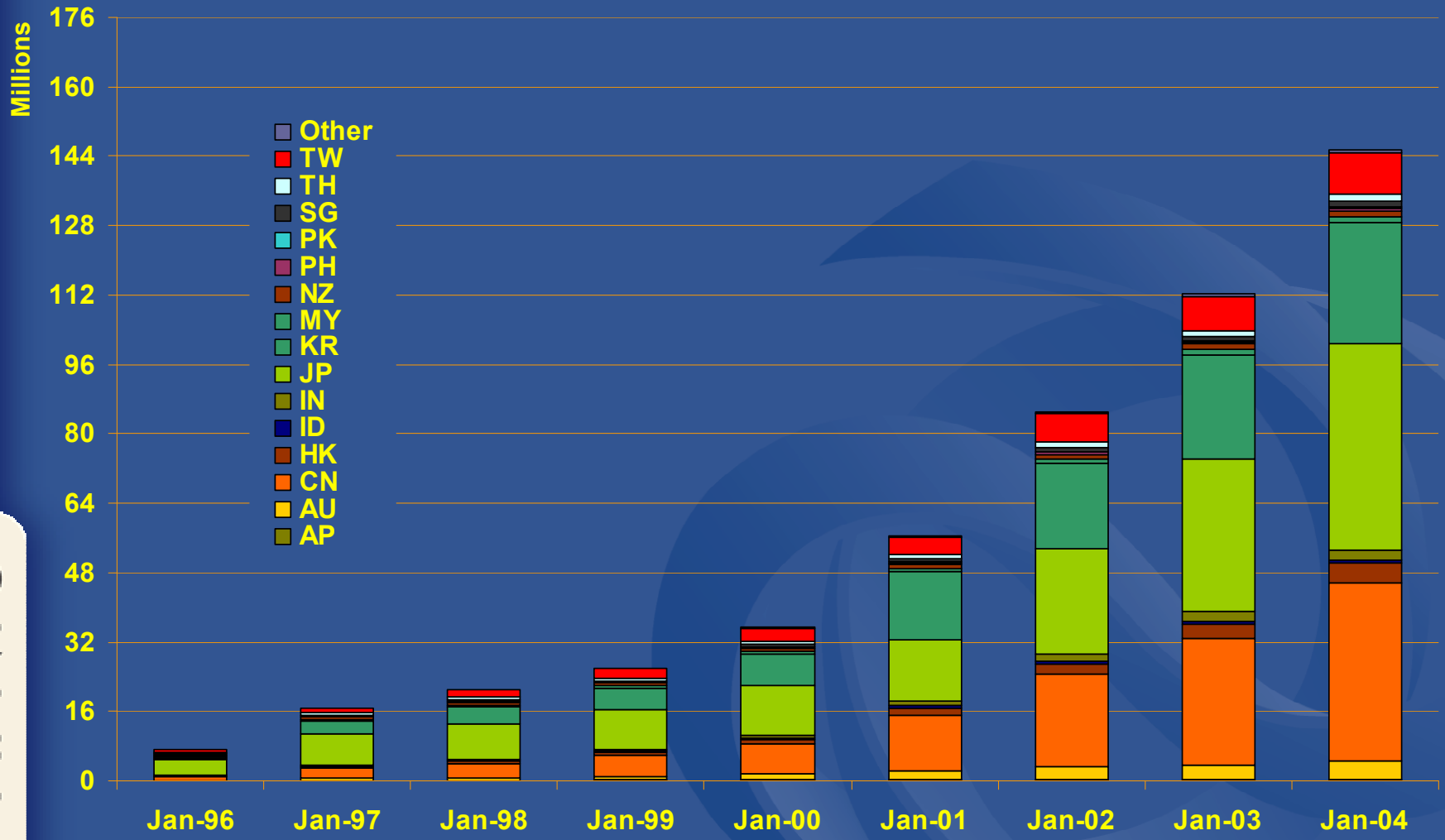
Statistics

IPv4 allocations - global



IPv4 growth in Asia Pacific



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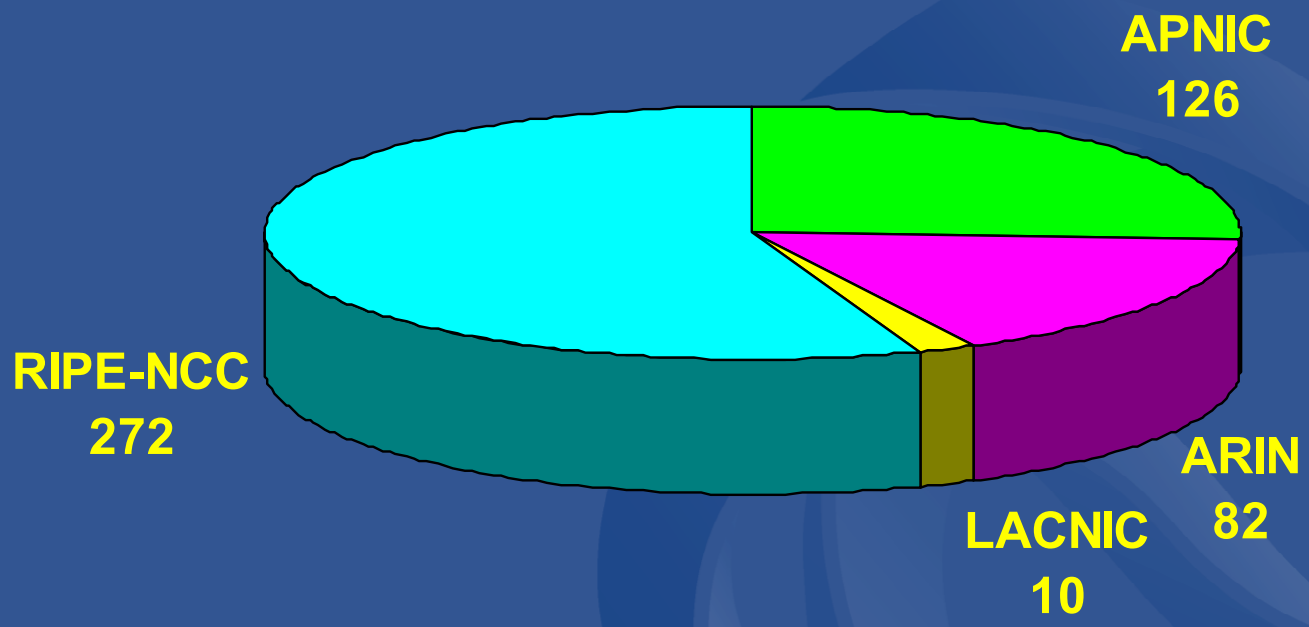
IPv6 Allocations - Global



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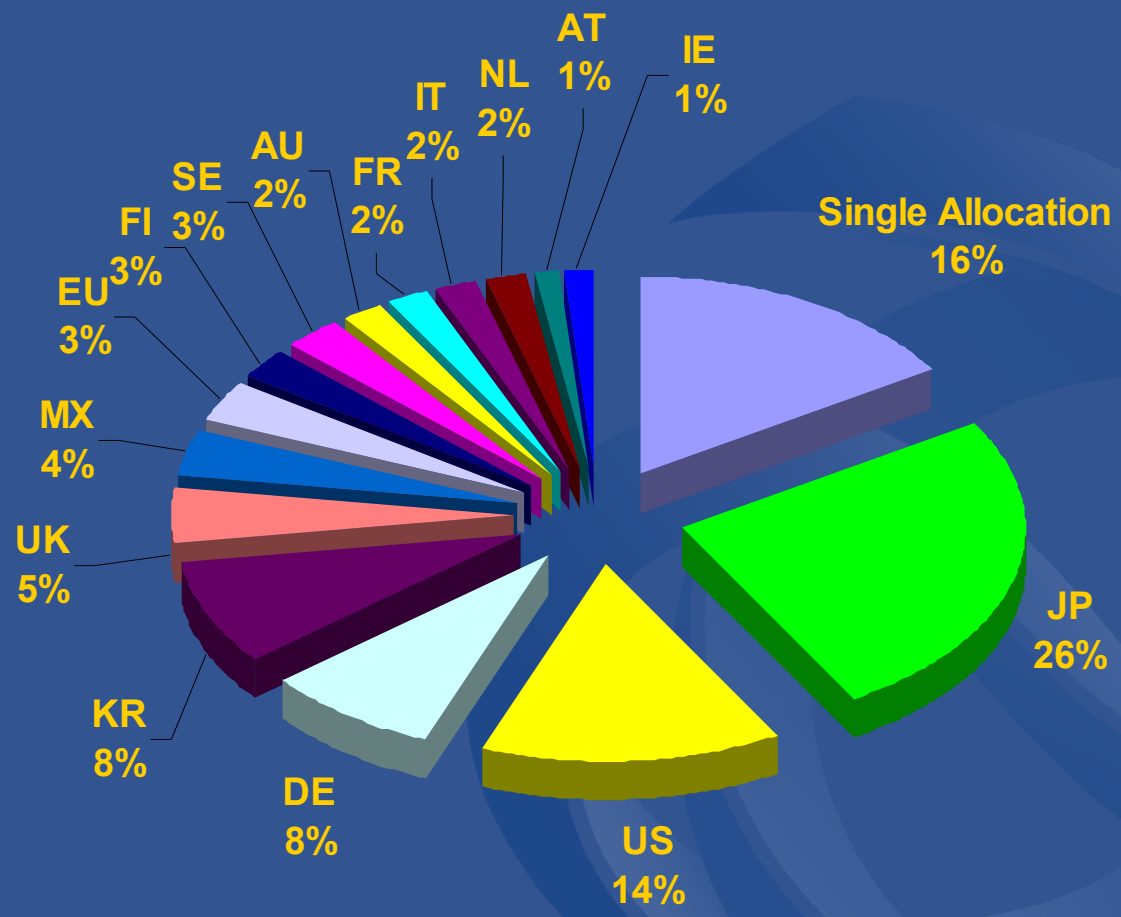
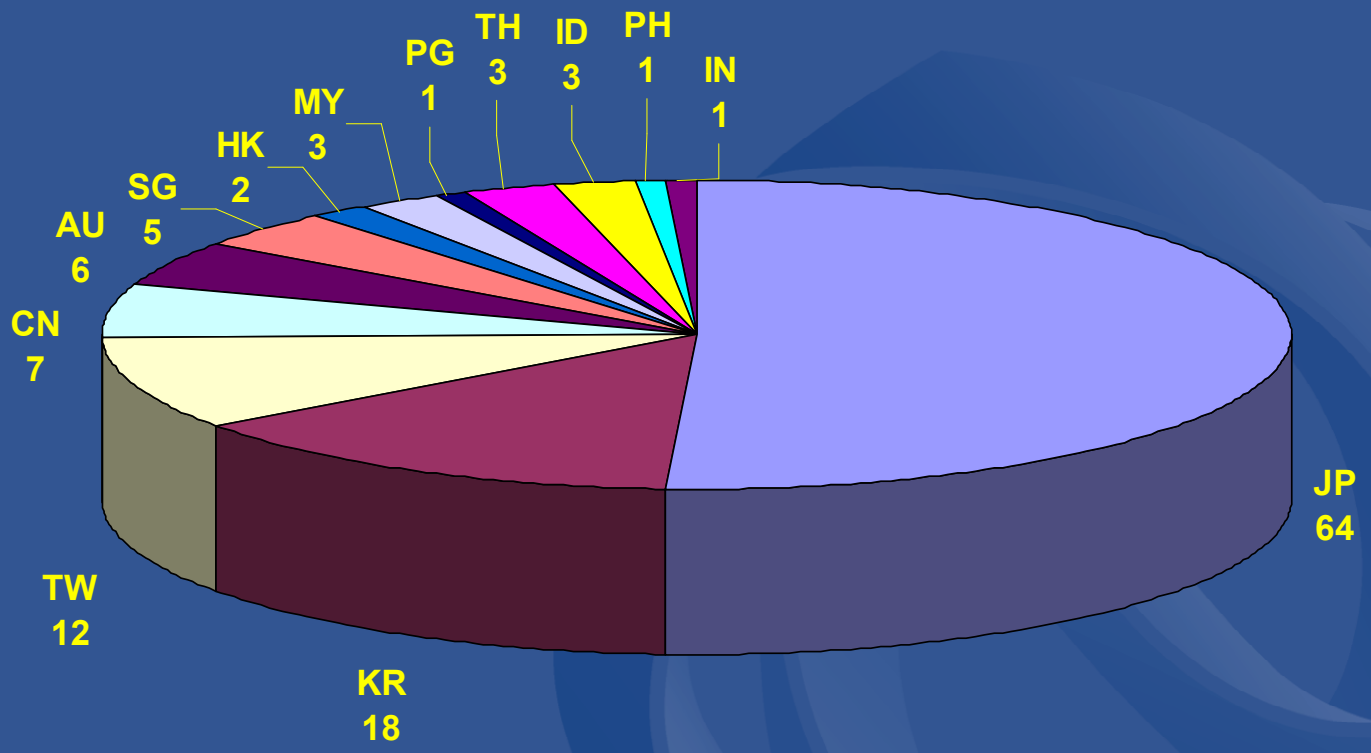
IPv6 Allocations - Global



IPv6 allocations in AP



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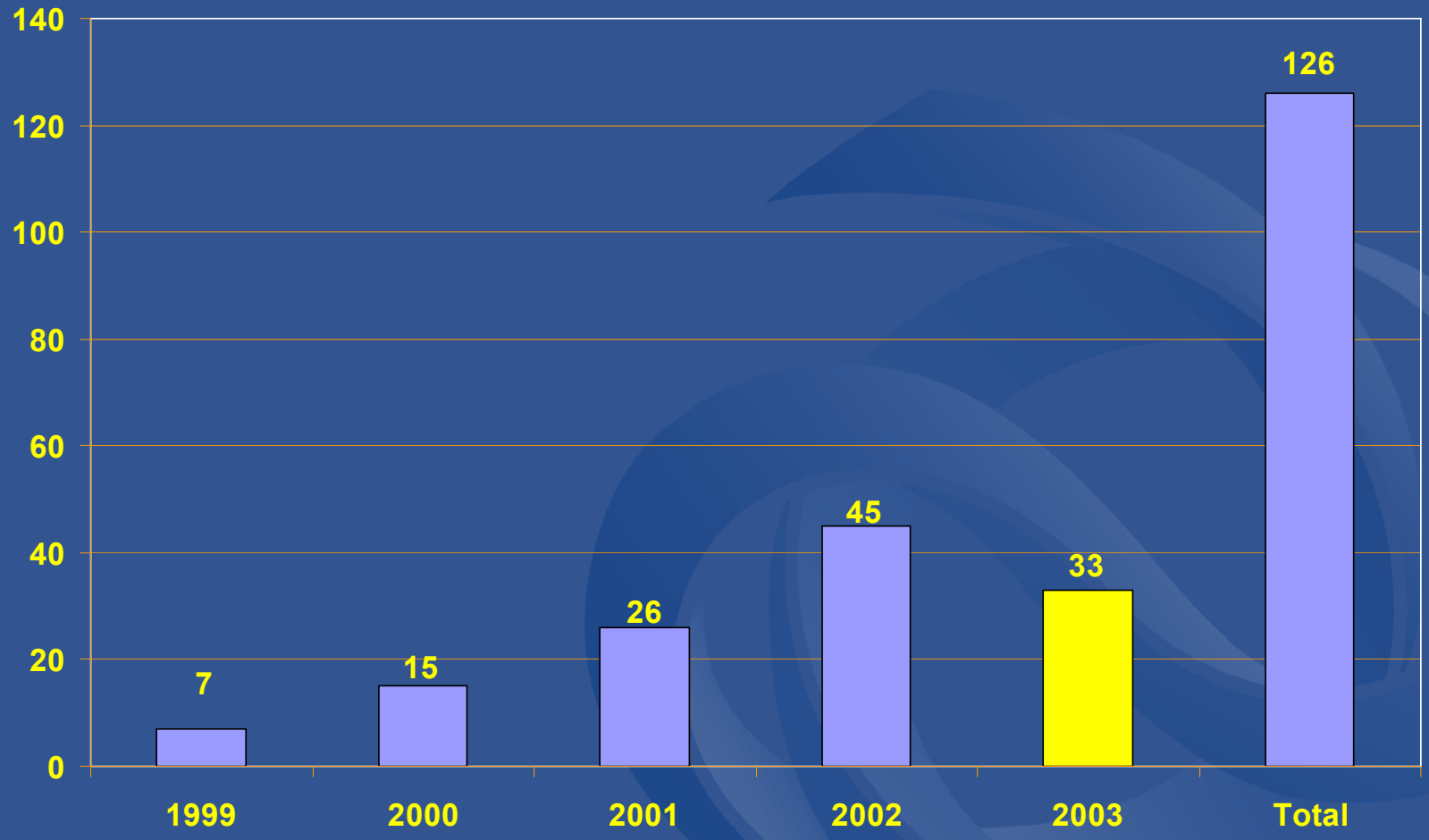
IPv6 Allocations in AP - by year



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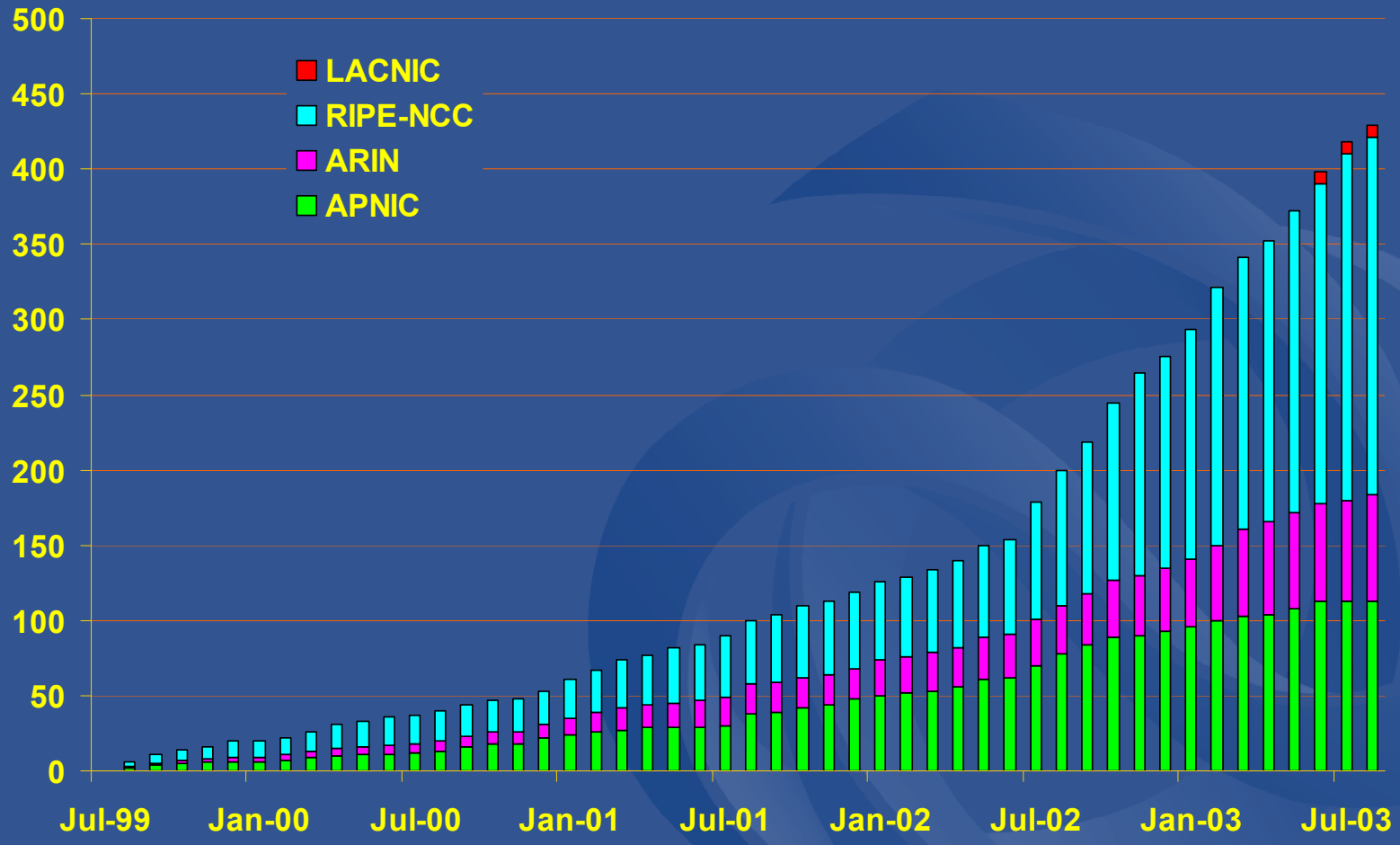
IPv6 Allocations Globally - by time



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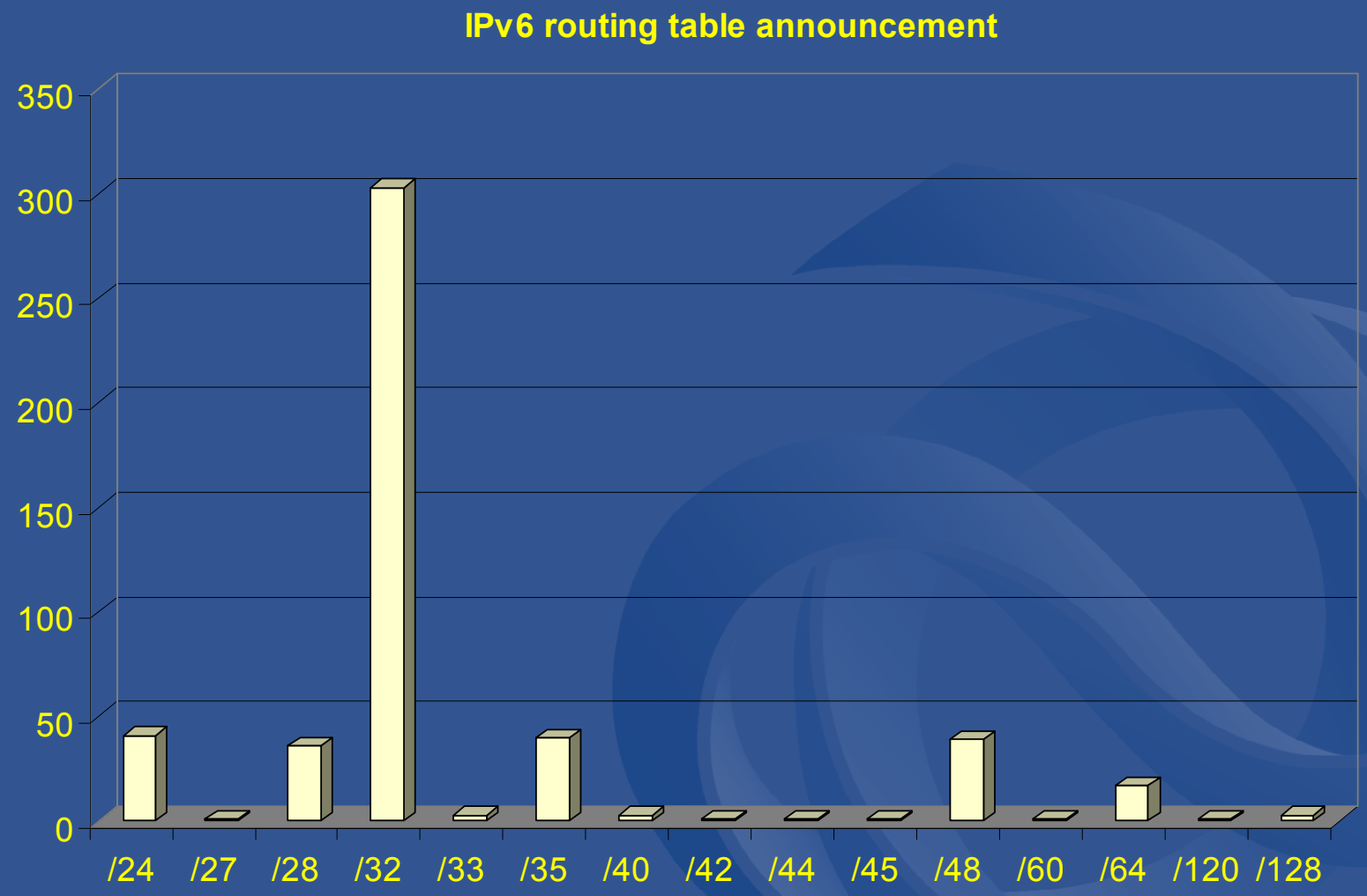
IPv6 routing table



Source: http://bgp.potaroo.net/v6/as1221/index.html

Last updated Jan 2004

APNIC16 policy update

- IPv4/IPv6 policy proposal
  - Prop-011-v001: Revised IXP assignment policy
    - Definition amended, restriction on routing lifted
    - Further discussion required for remainder of proposal
- IPv6 informational proposal
  - Create a guidelines document to explain existing IPv6 policy

References

- IPv6 Resource Guide
  - http://www.apnic.net/services/ipv6_guide.html
- IPv6 Policy Document
  - http://www.apnic.net/policies.html
- IPv6 Address request form
  - http://ftp.apnic.net/apnic/docs/ipv6-alloc-request

FAQ

- http://www.apnic.net/info/faq/IPv6-FAQ.html

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Thank you!