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The structure and management of addresses in the Internet today

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Overview

- Addresses, management and policy – what and why
- The role of the RIR – what is APNIC
- Policy development process
- Policy proposals – your say
- Address management (IPv4, IPv6, AS numbers)
- Requesting and obtaining IP address resources
- IP address statistics


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IP Addresses – an Internet resource

- Internet resources can be considered to be
 - Anything that is required to facilitate the operation and functionality of the Internet.
- Network hardware, media and connectivity – *operational*
- Internet services – *useful*

Internet address space – *globally functional*:
the “link” that binds individual networks into the Internet by providing the unique identifiers used to address and reach devices on the Internet.

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“On the Internet...”
you are nothing but an IP Address!

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IP address space

- For the “link” to work there must be a standard addressing mechanism that is consistently implemented, managed and maintained.
- Managing address space then requires:
 - A consistent, universally understood system that is:
 - equitable
 - acknowledges that addresses are not infinite
 - has rules governing how it is used - there is an impact on operation and functionality (eg. routing)

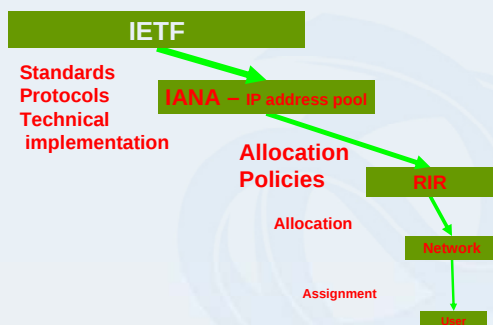
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Internet address management structure

- Agreed on policy and procedures determine a common management system
 - Defined and implemented through agreement and consensus by the community of Internet network operators and users.
 - Implementation facilitated by an infrastructure comprising essentially the RIRs, NRO, ASO, IANA (ICANN)
 - RIRs only regional component of the Internet infrastructure that has a neutral, permanent operational presence (secretariat)

What is APNIC

So where do IP addresses come from?



The RIR structure

- Five RIRs today
 - Open
 - Transparent
 - Neutral and impartial



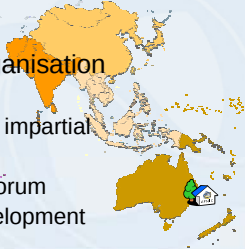
- Addresses distributed fairly
 - Based on need
 - No discrimination
- Not for profit membership organisations
 - Membership open to all interested parties
 - Bottom up, industry self-regulatory structure
- Policies developed by industry at large
 - Through open policy processes



What is APNIC?

- **Regional Internet Registry (RIR) for the Asia Pacific Region**
 - Regional authority for Internet Resource distribution
 - IP addresses (IPv4 and IPv6), AS numbers, in-addr.arpa delegation
- **Membership-based organisation**
 - Established 1993
 - Non-profit, neutral and impartial

Not operations forum
Not standards development

[illegible]

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- **Background**
 - Established 1993, Tokyo
 - Moved to Brisbane 1999
 - 1472 members in 49 of 62 AP economies
 - 52 staff, 19 nationality/language groups
- **Membership and community services**
- **Other activities**
 - Outreach
 - Liaison: IETF, APT, PITA, APEC, ISP-A's
 - ITU Sector Member
 - UN ECOSOC consultative status
 - Deployment of rootservers...
- **www.apnic.net**

What is the APNIC community?

- **Open** forum in the Asia Pacific
 - Open to any interested parties
- Voluntary participation
- Decisions made based on consensus
- Public meetings
- Mailing lists




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What does APNIC do?

<u>Resource service</u> • IPv4, IPv6, ASNs • Reverse DNS delegation • Resource registration • Authoritative registration server • whois	<u>Policy development</u> • Facilitating the policy development process • Implementing policy changes
<u>Information dissemination</u> • APNIC meetings • Web and ftp site • Publications, mailing lists • Outreach seminars http://www.apnic.net/community/lists/	<u>Training & Outreach</u> • Training • Internet Resource management • Technical workshops and tutorials - Subsidised for members Schedule: http://www.apnic.net/training


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Policy development process


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Why a policy?

- Long term interests of the Internet requires prudent management of address space
- While address management is not a pure “technical” issue, mismanaged management can severely impact Internet operation.
 - routing tables
 - filtering and accessibility
 - imbalance of distribution

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Policy development

- Industry self-regulatory process
 - Policy is developed by the AP Internet community to suit needs of region
 - Facilitated by RIR staff
 - Globally coordinated through the NRO
- Policy implementation
 - APNIC shares with its members and their customers a collective responsibility
 - RIR process
 - ISPs and other affected parties

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Participation in policy development

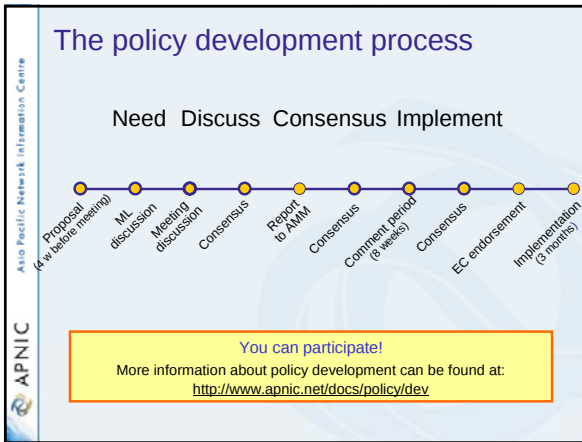
- Why should I bother?
 - Responsibility as an APNIC member
 - To be aware of the current policies for managing address space allocated to you
 - Business reasons
 - Policies affect your business operating environment and are constantly changing
 - Ensure your 'needs' are met
 - Educational
 - Learn and share experiences
 - Stay abreast with 'best practices' in the Internet

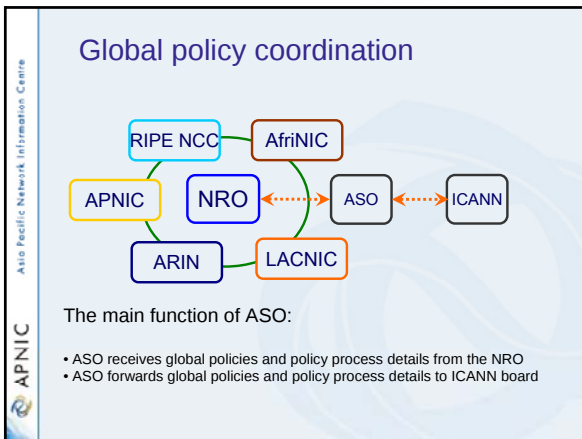
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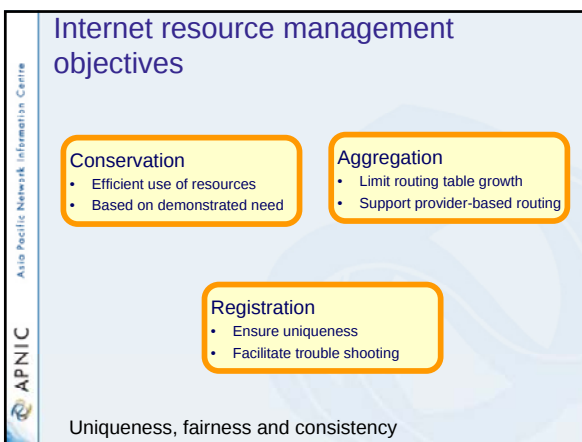
Policy Development Process

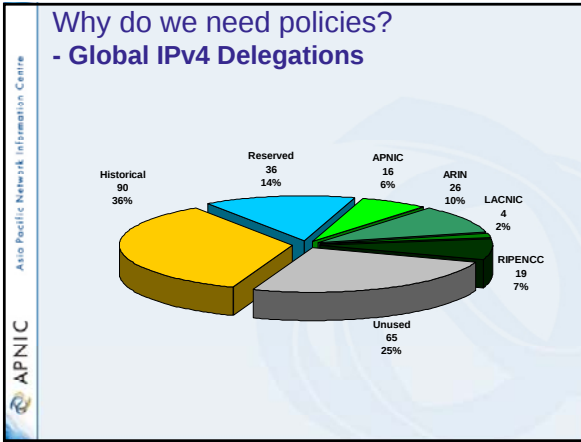
Internet community proposes and approves policy

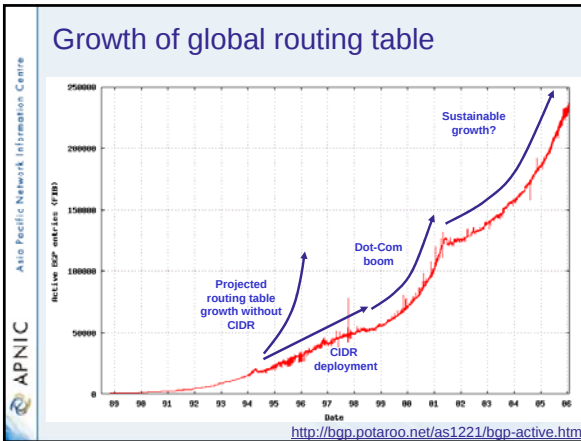
All decisions & policies documented & freely available to anyone











Proposals not reaching consensus at APNIC 23 – returned to SIG for further discussion

[prop-046] IPv4 countdown policy proposal

[prop-043] Proposal to remove reference to IPv6 policy document as an "interim" policy document

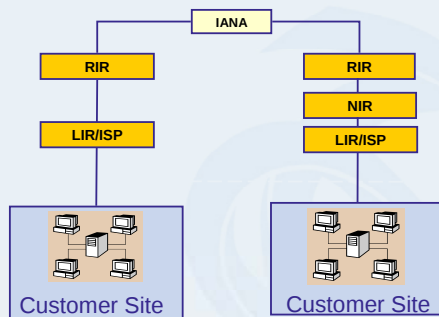
[prop-042] Proposal to change IPv6 initial allocation criteria of email updates for APNIC Registry and whois data

Policy proposals for the the APNIC 24 OPM Delhi 3 – 7 September 2007

- prop-047-v001: eGLOP multicast address assignments
 - this is a proposal for RIRs to begin assigning multicast addresses.
- prop-048: IPv6 ULA-central
 - This is a proposal to allow the assignment of IPv6 blocks within the so-called "Centrally Assigned Unique Local IPv6 Unicast Addresses" to organizations or individuals requiring it.

APNIC address management

Address management hierarchy




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APNIC policy environment

“IP addresses not freehold property”

- Assignments & allocations on license basis
 - Addresses *cannot* be bought or sold
 - Internet resources are public resources
 - ‘Ownership’ is contrary to management goals

“Confidentiality & security”

- APNIC to observe and protect trust relationship
 - Non-disclosure agreement signed by staff


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APNIC allocation policies

- Aggregation of allocation
 - Provider responsible for aggregation
 - Customer assignments /sub-allocations must be non-portable
- Allocations based on demonstrated need
 - Detailed documentation required
 - All address space held to be declared
 - Address space to be obtained from one source
 - routing considerations may apply
 - Stockpiling not permitted


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Allocation and assignment

Allocation

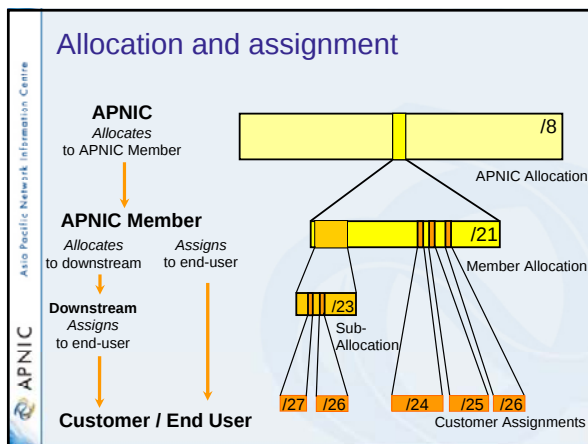
“A block of address space held by an IR (or downstream ISP) for subsequent allocation or assignment”

- Not yet used to address any networks

Assignment

“A block of address space used to address an operational network”

- May be provided to LIR customers, or used for an LIR’s infrastructure (‘self-assignment’)



Portable & non-portable

Portable Assignments

- Customer addresses independent from ISP
 - Keeps addresses when changing ISP
- Bad for size of routing tables
- Bad for QoS: routes may be filtered, flap-dampened

Non-portable Assignments

- Customer uses ISP's address space
 - Must renumber if changing ISP
- Only way to effectively scale the Internet

Portable allocations

- Allocations made by APNIC/NIRs"

Address assignment policies

- Assignments based on requirements
 - Demonstrated through detailed documentation
 - Assignment should maximise utilisation
 - minimise wastage
- Classless assignments
 - showing use of VLSM
- Size of allocation
 - Sufficient for up to 12 months requirement

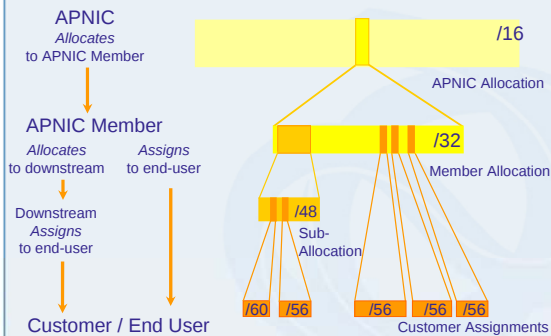
Supporting historical resource transfer

- Bring historical resource registrations into the current policy framework
 - Allow transfers of historical resources to APNIC members
 - the recipient of the transfer must be an APNIC members
 - no technical review or approval
 - historical resource holder must be verified
 - resources will then be considered "current"
- Address space subject to current policy framework

[illegible]

IPv6 address management

Allocation and Assignment





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IPv6 initial allocation

- Initial allocation criteria
 - Plan to connect 200 end sites within 2 years
 - Default allocation ("slow start")
- Initial allocation size is /32
 - Larger initial allocations can be made if justified according to:
 - IPv6 network infrastructure plan
 - Existing IPv4 infrastructure and customer base
- License model of allocation
 - Allocations are not considered permanent, but always subject to review and reclamation



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End site assignment policy for IPv6

- Any size longer than /48
 - Decision is up to LIRs or ISPs
 - Implication: any size between /64 - /48
 - Global coordination is required
 - Utilisation measured using HD (Host density) ratio = 0.94
 - HD ratio measurement unit: /56
 - This achieves more efficient address utilisation
 - useful lifetime of IPv6 to encompass a period in excess of 100 years
- Utilisation determined from end site assignments
- ISP/LIR responsible for registration of all /48 assignments
 - Intermediate allocation hierarchy not considered
- Further allocations depend on utilisation meeting the HD ratio criteria





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Internet Registry Procedures

Addressing Plan

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Addressing plan

- To complete documentation
 - First need a technical PLAN
 - Documenting the architecture of the present and eventual goal
 - IP addressing is fundamental part of network design
 - IP addressing ‘planning’ example to follow..

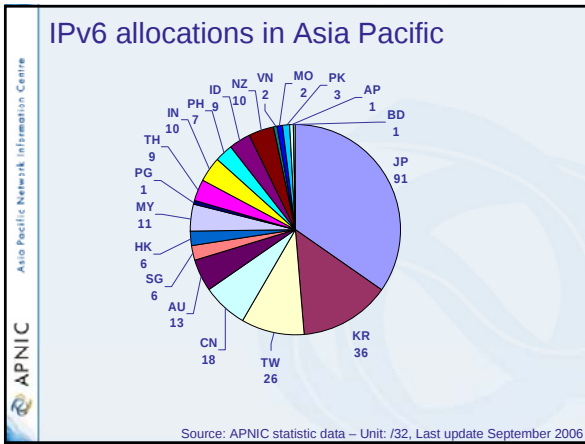
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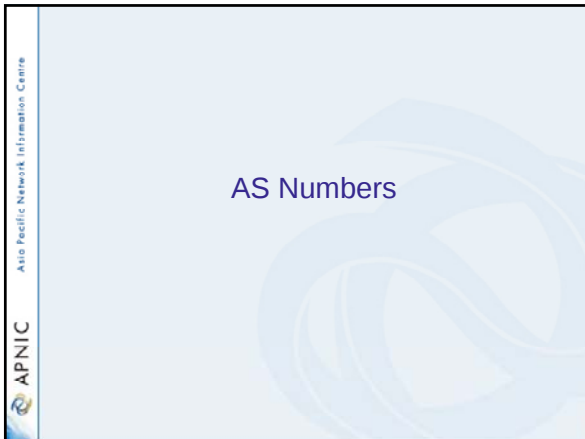
Addressing plan

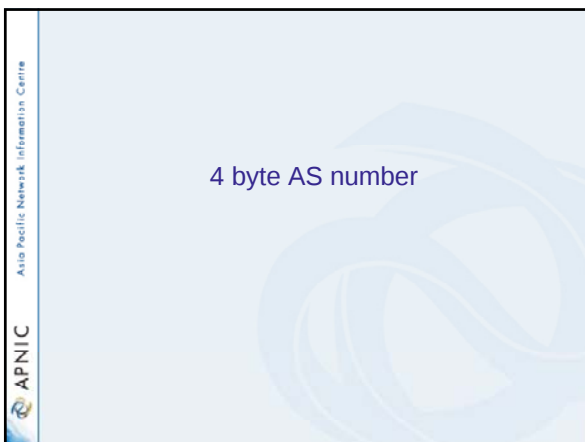
- Identify components of network
 - Customer services
 - ISP internal infrastructure
- Identify phases of deployment
 - Starting off, 6 months, 12 months
- Identify equipment and topology changes
 - Need for redundancy
 - Need for increased scale

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IPv6 statistics







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Background

- Current 2 byte ASN (16 bits)
 - Possibly run into the exhaustion by 2010
 - 4 byte ASN is developed by IETF
- 4 byte ASN distribution policy (32 bits)
 - Reached consensus in APNIC in 2006
- Timeline
 - APNIC started allocating 4 byte ASN upon specific request Jan 2007, default 2 byte ASN
 - Jan 2009: Default 4 byte ASN, 2 byte ASN on request
 - Jan 2010: 4 byte ASN only

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Questions ?

Thank you



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