


IPv6 Overview and Procedures

INET 2000
Network Training Workshop


ASIA PACIFIC NETWORK INFORMATION CENTRE



Overview

- ♦ Rationale
- ♦ Addressing
- ♦ Features of IPv6
- ♦ Current Status
- ♦ Allocation policy


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Rationale

- ♦ Address depletion concerns
 - ♦ Squeeze on available addresses space
 - ♦ Emphasis on efficient addressing
 - ♦ Probably will never run out, but will be harder to obtain
 - ♦ Address conservation techniques
 - ♦ Dial up customers do not have permanent IP addresses
 - ♦ Widespread use of NAT and 'private' addressing with large end sites


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Rationale

- ♦ Scalability
 - ♦ Hierarchical routing (CIDR)
 - ♦ Grew out of need to keep Internet routing working
 - ♦ Providers 'aggregate' their routes
 - ♦ In IPv6 still a concern
- ♦ IPv6 designers
 - ♦ Concerned about lack of global addressability
 - ♦ Robustness and scalability of the Internet


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Rationale

- ♦ Design goals
 - ♦ Availability of address space, autoconfiguration, security, real-time flow support, scalability
- ♦ Opportunity
 - ♦ To optimise on years of IPv4 deployment experience
- ♦ Protocol
 - ♦ In principle should remain similar to IPv4

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Addressing

- ♦ Address types
 - ♦ Unicast (one-to-one)
 - ♦ Global
 - ♦ Link-local
 - ♦ Site-local
 - ♦ Compatible
 - ♦ Multicast (one-to-many)
 - ♦ Anycast (one-to-nearest)
 - ♦ Reserved

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Addressing
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- ♦ **Terminology**
 - ♦ **Node**: A protocol that implements IPv6
 - ♦ **Router**: A node that forwards IPv6 packets not explicitly addressed to itself
 - ♦ **Host**: Any node that is not a router
 - ♦ **Link**: A communication facility or medium over which nodes can communicate at the link layer ie. the layer immediately below IPv6
 - ♦ **Neighbours**: Nodes attached to the same link
 - ♦ **Interface**: A node's attachment to a link
 - ♦ **Address**: An IPv6 layer identifier for an interface or set of interfaces

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Addressing
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- ♦ **Address hierarchy matches ISP hierarchy**
 - ♦ **TLA** = Top Level Aggregator
 - ♦ Transit ISP
 - ♦ **NLA** = Next Level Aggregator
 - ♦ ISP
 - ♦ **SLA** = Site Level Aggregator
 - ♦ Customer

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Addressing
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- ♦ **Aggregatable Global Unicast Format**
 - ♦ RFC2374 (FP001)
 - ♦ 128 bit addresses

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Addressing
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- ♦ **Bootstrap process (rfc2450)**
 - ♦ TLA - special TLA 0x0001

- ♦ Sub-TLA field /29

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Addressing
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- ♦ **Assignments**
 - ♦ Minimum assignment to end-site or customer is a /48 prefix (SLA)
 - ♦ 16 bits for subnetworks
 - ♦ 65535 subnetworks per site
 - ♦ 64 bits for hosts
 - ♦ 18446744073710 million hosts per subnetwork!!


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Addressing
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- ♦ **LAN addressing**

- ♦ Subnet prefix + MAC address = /128


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Features of IPv6

- ♦ Server-less auto-configuration (plug-&-play)
- ♦ Streamlined header format and flow identification
- ♦ Expanded addressing capability
- ♦ More efficient mobility options
- ♦ IP layer privacy and authentication
- ♦ Improved support for options/extensions


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Current Status

- ♦ Specifications
 - ♦ Core IPv6 specifications are IETF draft standards and are well tested
 - ♦ IPv6 base spec, ICMPv6, Neighbor Discovery, Multicast, Listener Discovery, PMTU Discovery, IPv6 over Ethernet....
 - ♦ Others further behind but progressing
 - ♦ Mobile IPv6, header compression, A6 DNS support, IPv6-over-NBMA, multihoming support
- ♦ For status
 - ♦ <http://playground.sun.com/ipv6>


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Current Status

- ♦ Deployment
 - ♦ 6BONE experimental infrastructure
 - ♦ For testing and debugging IPv6 protocols and operations
 - ♦ Should be 'production quality'
 - ♦ Many participants worldwide
 - ♦ 200 sites in 39 countries
 - ♦ More information
 - ♦ <http://www.6bone.net>
 - ♦ Anyone can join!


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Current Status

- ♦ Deployment
 - ♦ 6REN
 - ♦ Production infrastructure in support of education and research
 - ♦ CAIRN, Canarie, CERNET, Chunghwa Telecom, DANTE, Esnet, Internet2, IPFNET, NTT, Renater, Singren, Sprint, SURFnet, vBNS, WIDE
 - ♦ Mixture of native and tunneled paths
 - ♦ More information
 - ♦ <http://www.6ren.net>
 - ♦ <http://www.6tap.net>


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Current Status

- ♦ Deployment assistance
 - ♦ <http://www.ipv6.org>
 - ♦ Contributed FAQ's and other info
- ♦ Deployment advocacy
 - ♦ <http://www.ipv6forum.com>
- ♦ Address allocations
 - ♦ Test address space - 6BONE
 - ♦ Production address space - APNIC, ARIN, RIPE NCC


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Allocation Policy


- ♦ Global Policy Document
 - ♦ <http://www.apnic.net/policies.html>
- ♦ Request Forms
 - ♦ APNIC
 - ♦ <http://www.apnic.net/apnic-bin/ipv6-subtle-request.pl>
 - ♦ ARIN
 - ♦ <http://www.arin.net/regserv/ipv6/ipv6-regserv.html>
 - ♦ RIPE NCC
 - ♦ <http://www.ripe.net/ripe/docs/ripe-195.html>
- ♦ FAQ
 - ♦ <http://www.apnic.net/drafts/ipv6/IPv6-FAQ.html>

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 Allocation Policy
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Peering with ≥ 3 subTLAs
AND either
 Plan to provide IPv6 services within 12 months
OR
 ≥ 40 SLA customers

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 Allocation Policy
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♦ Bootstrap
 Peering with ≥ 3 ASes
AND
 Plan to provide IPv6 services in 12 months
AND either
 ≥ 40 IPv4 customers
OR
 6bone experience


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 Allocation Policy
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♦ 'Slow start'

- ♦ First allocation to a TLA Registry will be a /35 block
 - ♦ Representing 13 bits of NLA space
 - ♦ Entire /29 reserved (aggregatable)
- ♦ IANA allocations
 - ♦ APNIC: 2001:0200::/23
 - ♦ ARIN: 2001:0400::/23
 - ♦ RIPE NCC: 2001:0600::/23

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 Questions?
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