Introduction to IPv6

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Why a new version for IP?
Agenda

- Historical facts
- IPv4 address space status
- From Emergency measures …
- … to IPv6
Historical facts

- 1983: Research network for ~100 computers
- 1992: Commercial activity
- Exponential growth
- 1993: Exhaustion of the class B address space
- Forecast of network collapse for 1994!
- NRO statistics (Sep. 2005)
IPv4 /8 Address Space Status  
(sep. 2005)

Allocated

- AFRINIC
- APNIC
- ARIN
- LACNIC
- RIPE NCC
- Central Registry

Available

- IANA Reserved: 65

Not Available

- Experimental: 16
- Multicast: 16
- Private Use: 1
- Public Use: 1
IPv4 Allocations from RIRs to LIRs/ISPs Yearly Comparison

Emergency measures
CIDR …

- Allocate exceptionally class B addresses
- Re-use class C address space
- CIDR (*Classless Internet Domain Routing*)
  - RFC 1519 (PS)
  - network address = prefix/prefix length
  - less address waste
  - allows aggregation (reduces routing table size)
Private Addresses
(RFC 1918 BCP)

- Allow private addressing plans
- Addresses are used internally
- Similar to security architecture with firewall
- Use of proxies or NAT to go outside
  - RFC 1631, 2663 and 2993
- NAT-PT is the most commonly used of NAT variations
NAT (RFC 2663)

Public address space

Private address space

Internet

Company
Guatemala – 30 January – 1 February '07

Public address space

Private address space

128.1.2.3

Proxy: 192.1.2.3

10.1.1.1

Internet

Company
Network Address Translation

Public address space | private address space

Internet | Company

Routable address pool
NAT (continued)
NAT (continued)
NAT (continued)

- Advantages:
  - Reduce the need of official addresses
  - Ease the internal addressing plan
  - Transparent to some applications
  - “Security”
  - Netadmins/sysadmin

- Disadvantages:
  - Translation sometime complex (e.g. FTP)
  - Apps using dynamic ports
  - Does not scale
  - Introduce states inside the network:
    - Multihomed networks
  - Breaks the end-to-end paradigm
  - Security with IPsec

=> Should be reserved for small sites in Client/Server mode
Emergency Measures

- These emergency measures gave time to develop a new version of IP, named IPv6
- IPv6 keeps principles that have made the success of IP
- Corrects what was wrong with the current version (v4)
- BUT are emergency measures enough?