

Necessary Modifications for IPv4 (1/3)

1

IPv4 – still currently the most used IP version - is exceptionally successful thanks to the foresight of its basic design:

- Use is also possible with new hardware technologies (IPv4 was developed before the spread of LAN technologies!)
- It also works in networks whose order of magnitude is faster than those for which it was originally designed
- Has coped with huge increases in the global heterogenous Internet

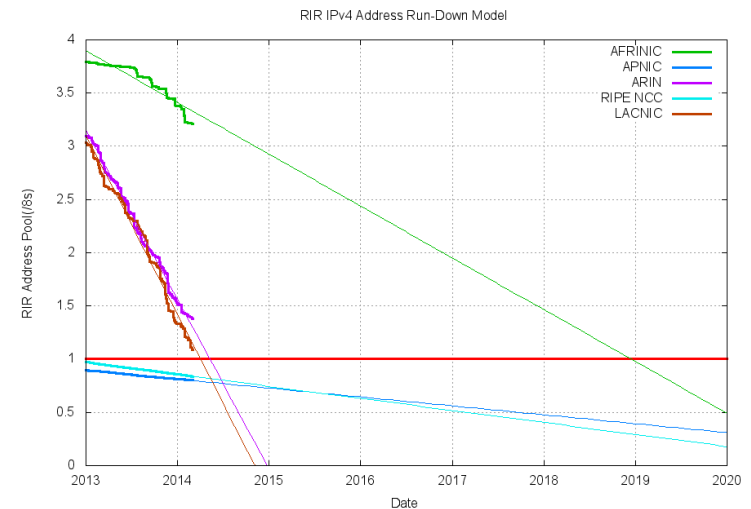
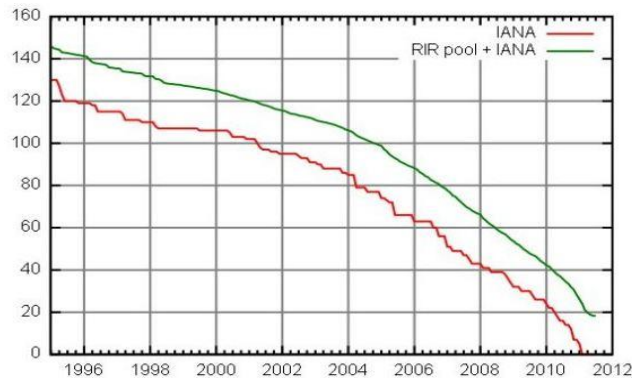
Nevertheless, there is an urgent **need for change** because of several fundamental problems

Necessary Modifications for IPv4 (2/3)

2

Basic problems of IPv4:

- Address space **too small** (limited to approx. one million networks) for supply of mobile end devices (cell phones), household appliances, consumer electronics, etc.



RIR address pools forecast from ipv4.potaroo.net

- The last free IPv4 address block was already allocated by the IANA to the 5 Regional Internet Registries (RIRs) on Jan. 31, 2011
- RIRs now only distribute their remaining blocks

Necessary Modifications for IPv4 (3/3)

3

Basic problems in IPv4:

- Routing with increasing number of hosts is problematic
 - Perimeter routing tables / complex protocol
- Service type for multimedia data is not specifiable
 - Quality of Service, e.g. for smooth and synchronous live transmission of video and audio data
- Lack of support in distributed group work
 - CSCW (Computer-Supported Cooperative Work)

Design Requirements for IPv6 (1/3)

4

IETF – Internet Engineering Task Force –in 1994 already started developing a new IP version – IPv6 – as successor of IPv4

- IPv6 assumes the successful basic concepts of IPv4, such as:
 - Connectionless
 - Each datagram contains a destination address
 - Each datagram is transmitted independently
 - Limited number of hops to destination

Design Requirements for IPv6 (2/3)

5

IPv6 offers the following improvements (1/2):

- New address size:
 - 128 bits – 16 bit groups in hexadecimal notation with a colon as a separator, zero compression
- New header format/multiple headers:
 - Required: a basic header
 - Optional: one or more additional headers
 - Optional: authentication and encryption
 - Different address types for unicast, multicast and cluster
- Video and audio support:
 - Real-time transmission by means of a mechanism for establishing predetermined transmission path

Design Requirements for IPv6 (3/3)

6

IPv6 offers the following improvements (2/2):

- ...
- Extensible protocol
- New functionalities from other protocols
 - Neighbor Discovery Protocol
 - Based on ICMPv6
 - Replaces e.g. ARP
 - Host autoconfiguration (“stateless DHCP”)
 - Support for multihoming and renumeration
 - Mobile IPv6