MIKROTIK
TRAIN THE TRAINER SESSION
HOME ASSIGMENT
IPv6 BASICS
BY DAVID GONZALEZ H.

A BIT ABOUT ME

- Telecommunications Engineer (Colombia)
- Linux System Administrator & consultant
- Asterisk and VoIP consultant
- Independent Network Analyst and Consultant
- Self learner / IT Opportunity Seeker
- Mikrotik Certified
  - Network Associate
  - Routing Engineer
  - Traffic Control Engineer
  - Trainer Candidate ;)
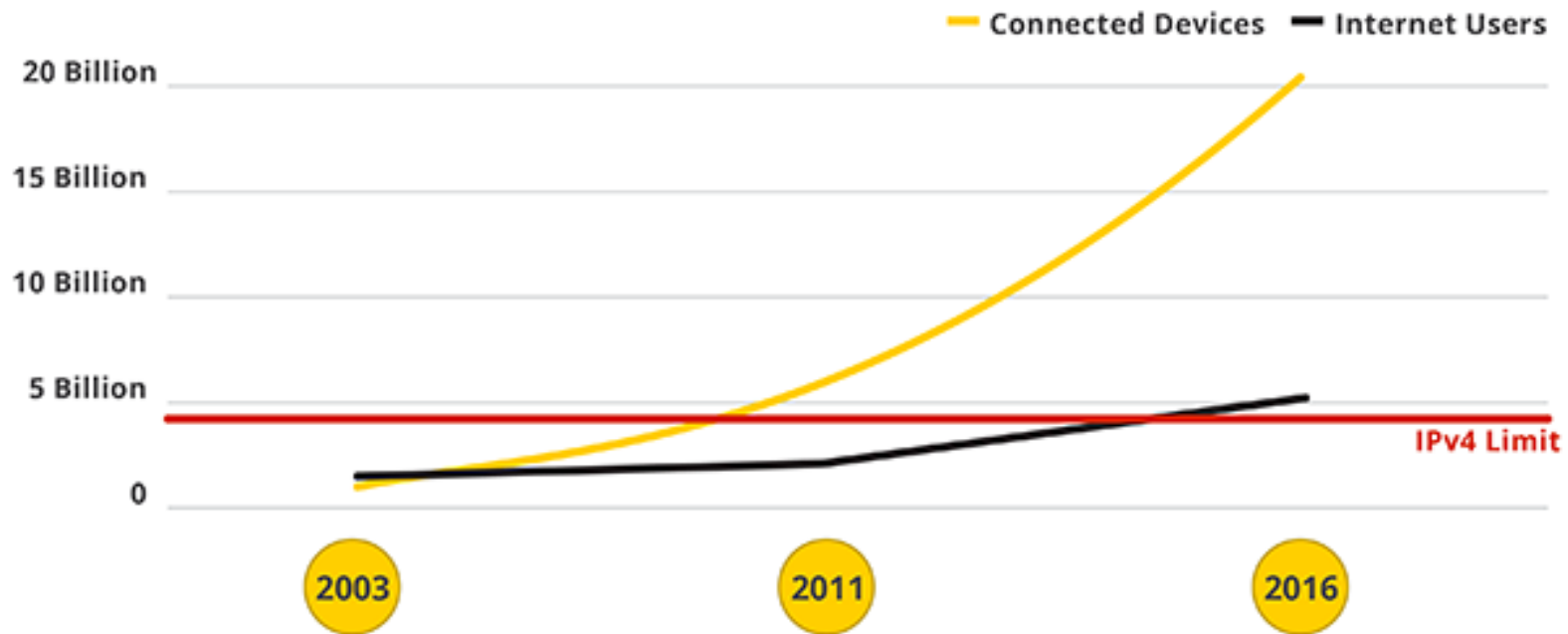
ROAD MAP

- Brief introduction to IPv6
  - Why IPv6 (No fear, IPv6 is here)
    - IPv6 Addressing
  - IPv6 on Mikrotik RouterOS
  - Routing on IPv6
  - Introduction to OSPFv3
- LAB
- Q & A

LAB ACTIVITY

NO FEAR, IPv6 IS HERE

- According to Google Internet connections to date is ~20 Billion with a "B"
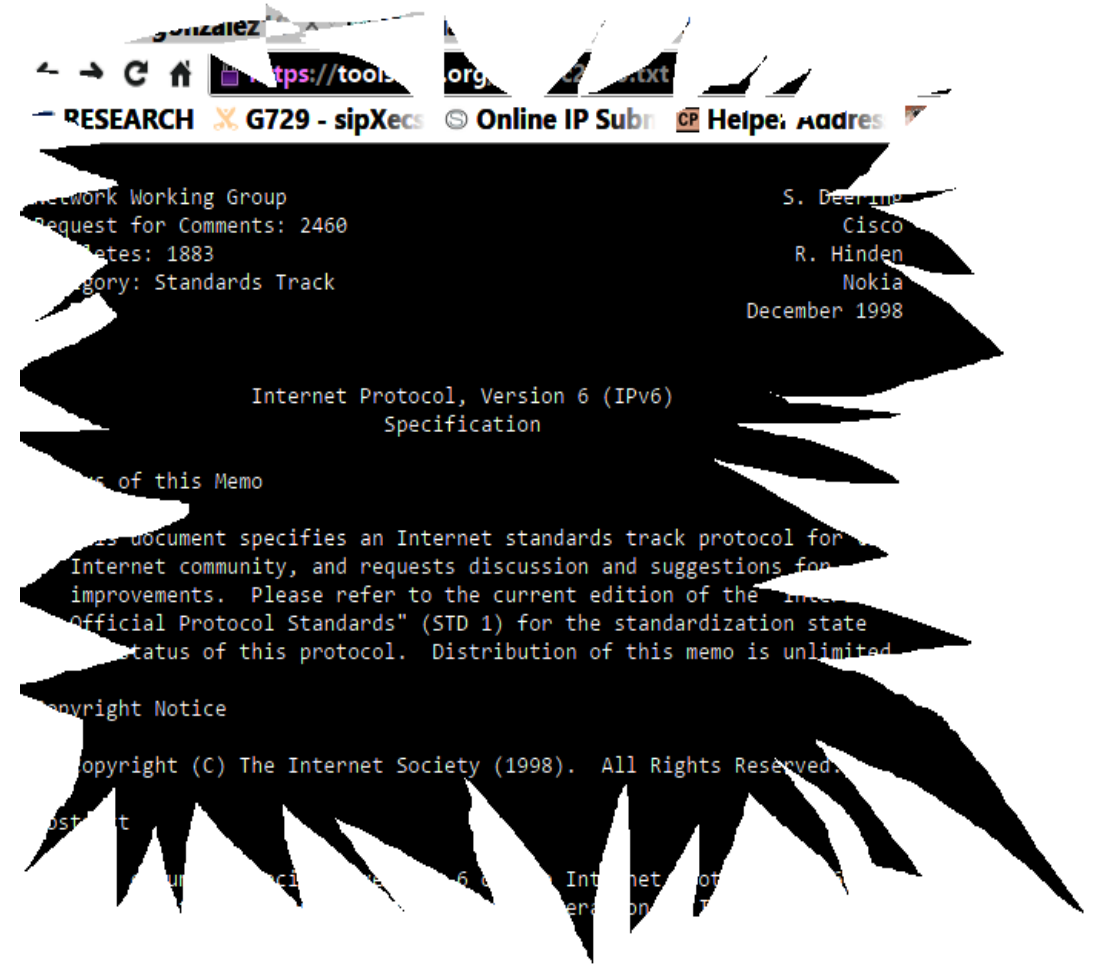
NO FEAR, IPv6 IS HERE

- FEATURES
  - much larger address space;
  - support of stateless and statefull address autoconfiguration;
  - built-in security;
  - new header format (faster forwarding).
  - Multicast is standard feature of IPv6

NO FEAR, IPv6 IS HERE

- Internet Protocol version 6
  - RFC 2460 covers the Internet Protocol, Version 6 (IPv6) Specification in detail
  - RFC 4291 IP Version 6 Addressing Architecture

NO FEAR, IPv6 IS HERE

IPv4 32-bits

IPv6 128-bits

2^{32} = 4,294,967,296

2^{128} = 340,282,366,920,938,463,463,374,607,431,768,211,456

2^{128} = $2^{32} * 2^{96}$

2^{96} = 79,228,162,514,264,337,593,543,950,336 times the number of possible IPv4 Addresses (79 trillion trillion)

- 128 bit addresses instead of 32 (IPv4)
- By default public, so No NAT No more
- Easy to deploy, yeah, the dude said easy!.

IPv6 and Mikrotik by David Gonzalez

NO FEAR, IPv6 IS HERE

- IPs are divided into groups called hextets (equivalent to octecs but double the size)
- 16 bit hex numbers eg: 2001:4860:4860::8844
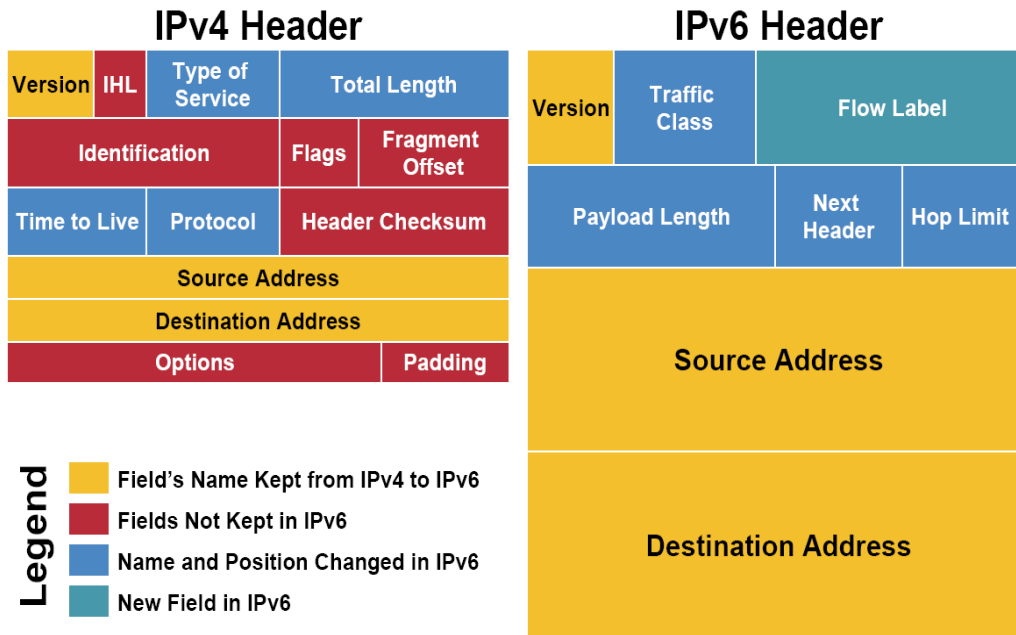- Numbers are separated by (:)

2001:0DB8:A1B0:ABCD:0000:0000:0000:1000

same as

2001:DB8:A1B0:ABCD::1000

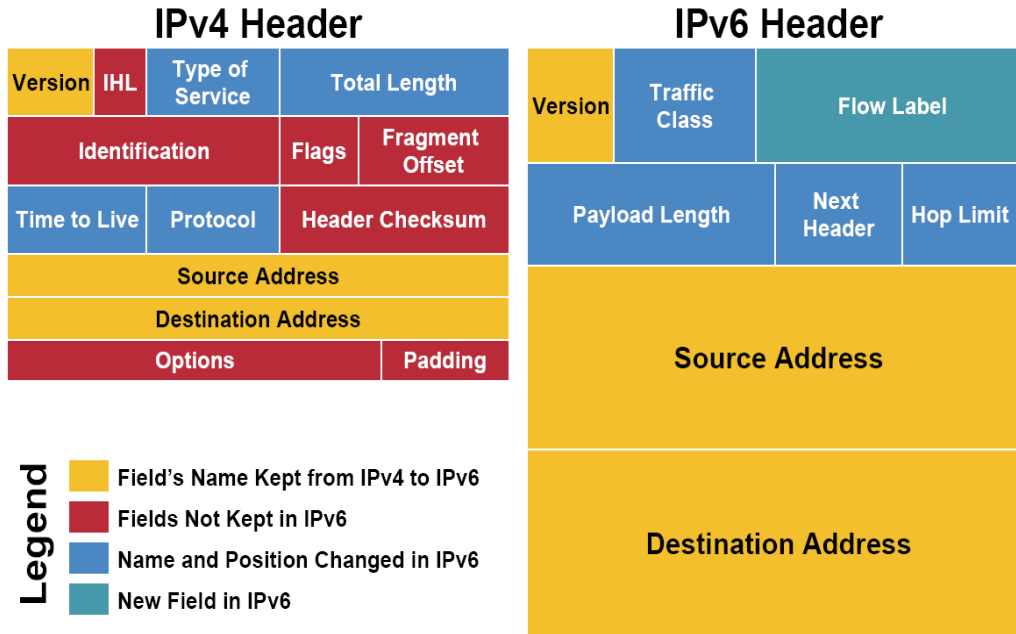- Abbreviations are possible, leading 0's can be omitted, trailing 0's can't

LAB ACTIVITY

IPv6

IPv4 Header

Version	IHL	Type of Service	Total Length	
Identification			Flags	Fragment Offset
Time to Live		Protocol	Header Checksum	
Source Address				
Destination Address				
Options			Padding	

Legend
- Field's Name Kept from IPv4 to IPv6
- Fields Not Kept in IPv6
- Name and Position Changed in IPv6
- New Field in IPv6

IPv6 Header

Version	Traffic Class	Flow Label	
Payload Length		Next Header	Hop Limit
Source Address			
Destination Address			

- IPv6 header is much simpler than IPv4 header.

- The size of IPv6 header is much bigger than that of IPv4 header, because of IPv6 address size. IPv4 addresses are 32bit binary numbers and IPv6 addresses are 128 bit binary numbers.

- In IPv4 header, the source and destination IPv4 addresses are 32 bit binary numbers. In IPv6 header, source and destination IPv6 addresses are 128 bit binary numbers.

IPv6

IPv4 Header

Version	IHL	Type of Service	Total Length	
Identification			Flags	Fragment Offset
Time to Live		Protocol	Header Checksum	
Source Address				
Destination Address				
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Legend
- Field's Name Kept from IPv4 to IPv6
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IPv6 Header

| Version	Traffic Class	Flow Label	
Payload Length		Next Header	Hop Limit
Source Address			
Destination Address			

- IPv4 header includes space for IPv4 options. In IPv6 header, we have a similar feature known as extension header. In IPv6 header we do not have options, but have extension headers.

- The fields in the IPv4 header such as IHL (Internet Header Length), identification, flags are not present in IPv6 header.

- Time-to-Live (TTL), a field in IPv4 header, typically used for preventing routing loops, is renamed to it's exact meaning, "Hop Limit".

NO FEAR, IPv6 IS HERE

There are multiple IPv6 address types, that can be recognized by their prefix. RouterOS distinguishes the following:

- multicast (with prefix ff00::/8)
- link-local (with prefix fe80::/10)
- loopback (the address ::1/128)
- unspecified (the address ::/128)
- other (all other addresses, including obsoleted site-local addresses, and unique local addresses; they all are treated as global unicast).
- One difference between IPv6 and IPv4 addressing is that IPv6 automatically generates a link-local IPv6 address for each active interface that has IPv6 support.
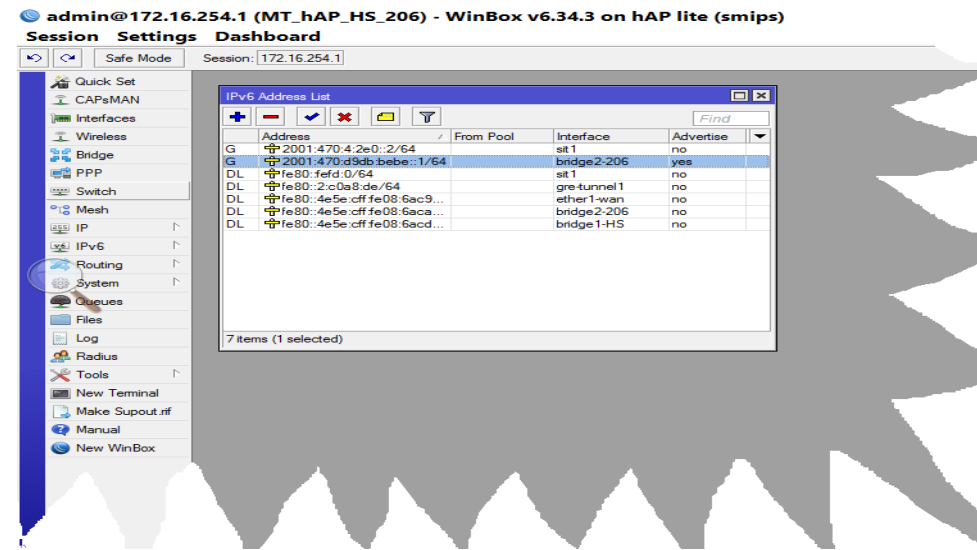
IPv6 on Mikrotik

- Support from 3beta10+
- MikroTik IPv6 support at the moment:
  - DHCPv6 prefix delegation for DHCP server, DHCPv6-PD client.
  - static addressing and routing, router advertisement daemon (for address autoconfiguration);
  - dynamic routing: BGP+, OSPFv3, and RIPng protocols;
  - firewall (filter, mangle, address lists, connection table);
  - DNS name servers;
  - 6in4 (SIT) tunnels;
  - SSH, telnet, FTP, WWW access, Winbox, API, ping, traceroute;
  - Web proxy;
  - Among others (http://wiki.mikrotik.com/wiki/Manual:IPv6_Overview)

IPv6 on Mikrotik

Features not yet supported:
- automatic tunnel creation;
- policy routing;
- multicast routing;
- MPLS;

- Among others (http://wiki.mikrotik.com/wiki/Manual:IPv6_Overview)

LAB ACTIVITY

THAT'S IT!
ANY QUESTIONS?