IPv6 Lecture 18

COMPSCI 726 Network Defence and Countermeasures

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Slides from Muhammad Rizwan Asghar

August 26, 2021

Source of some slides: Cisco Networking Area Academy







- The recent version of Internet Protocol (IP)
- Designed in 90s
- It offers larger address space
 - 128-bit (16-byte) address
- Major deployments and usage happening now
- IPv6 is intended to replace IPv4
 - Likely to co-exist with IPv4 for many years

IPV6 ADDRESS



Source: Data Communications and Networking by Behrouz A. Forouzan

ABBREVIATED IPV6 ADDRESSES



Source: Data Communications and Networking by Behrouz A. Forouzan

IPV6 PREFIX



Source: Data Communications and Networking by Behrouz A. Forouzan

MAC ADDRESS TO IPV6 CONVERSION



64-Bit IPv6 Modified EUI-64 Interface Identifier

IPV4 VS IPV6

_egend

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	

Field's Name Kept from IPv4 to IPv6

Name and Position Changed in IPv6

Fields Not Kept in IPv6

New Field in IPv6

IPv6 Header



IPV6 HEADER: SIMPLIFICATION



- Fixed length for the basic header
 - IPv4 header of variable length: 20-byte (min)
 - IPv6 has the main header: 40-byte (fixed)
 - Leads to fast header processing
 - No need of header length (hlen)
- Fragmentation only by traffic source
 - Source does path MTU discovery
 - No burden on routers to do fragmentation
 - No need of identification, flag and fragment offset

IPV6 HEADER: SIMPLIFICATION CONT



- Header checksums are eliminated
 - IP header checksum is recalculated by every node due to change in TTL
 - The idea is to improve performance by saving some resources
 - Error detection check can be enforced by upper layers

IPV6 HEADER



- Version (4-bit)
 - Used to indicate the version of IP and is set to 6
- Traffic class (8-bit)
 - Same as type of service in IPv4
- Flow label (20-bit)
 - Identifies the flow and it is intended to enable the router to identify packets that should be treated in a similar way without looking into those packets
 - Unique and powerful tool

IPV6 HEADER CONT

Team Trainc Class Flow Label Payload Length Most. Source Address Destination Address

- Payload length (16-bit)
 - Indicates length of the entire packet
- Next header (8-bit)
 - Indicates the first extension header or the upper layer protocol (e.g., TCP or UDP)
- Hop limit (8-bit)
 - TTL was renamed to hop limit
- Source/destination IPv6 address (128-bit)

VALUES OF THE NEXT HEADER FIELD

Value (in decimal)	Header
0	Hop-by-Hop Options Header
6	ТСР
17	UDP
41	Encapsulated IPv6 Header
43	Routing Header
44	Fragment Header
46	Resource ReSerVation Protocol
50	Encapsulating Security Payload
51	Authentication Header
58	ICMPv6
59	No next header
60	Destination Options Header

IPV6 EXTENSION HEADERS



ORDER IS IMPORTANT (RFC 2460)



IPV4 VS IPV6



Feature	IPv4	IPv6
Addressing	32-bit (limited)	128-bit (larger)
Address representation	Dotted decimal	Colon hexadecimal
Loopback address	127.0.0.1	::1
Chain of headers	Not supported	Supported
Header length	Variable	Fixed
Header checksum	Included	Not included
Fragmentation by	Router or sending host	Sending host
Security	Optional	IPSec built-in, optional
Adoption	Already deployed	Being deployed



Questions?

Thanks for your attention!