Lecture 10a - IPv6 Introduction

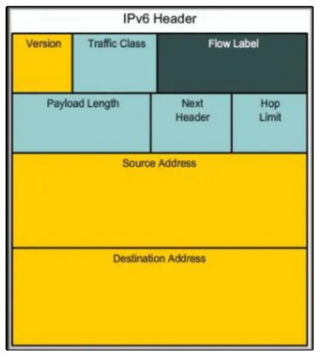
Type	Lecture
Materials	Empty
Reviewed	☑

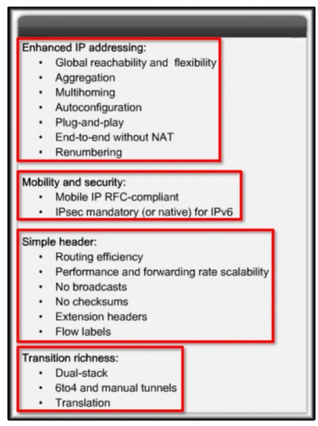
1. IPv4 Issues

- **Future Problems**
  - **Population Growth:** The Internet population is growing, and users stay connected longer
  - **Mobile Users:** Mobile phones, Mobile devices (tablets, iPads, laptops)
  - **Transportation:** There will be more than one billion automobiles
  - **Consumer Electronics:** Remote monitoring of home appliances
- **Address Usage:** Running out of addresses

2. IPv6

- Much larger address space
- IPv6 address = 16 bytes = 128 bits





3. IPv6 Address Representation

- **128 bits** in length and written as a string of **hexadecimal** values
- In **IPv6**, **4 bits** represents a single hexadecimal digit (nibble), **32 hexadecimal value** = IPv6 address
  - 2001 : 0DB8 : 0000 : 1111 : 0000 : 0000 : 0000 : 0200
  - FE80 : 0000 : 0000 : 0000 : 0123 : 4567 : 89AB : CDEF
- **Hextet** used to refer to a **segment** of **16 bits** or **four hexadecimals**
- Can be written in either **lowercase** or **uppercase**

4. IPv6 Addressing

- **Rule 1- Omitting Leading 0s**
  - The first rule to help reduce the notation of IPv6 addresses is any leading 0s (zeros) in any 16-bit section or hextet can be omitted.

Preferred	2001:0DB8:000A:1000:0000:0000:0000:0100
No leading 0s	2001: DB8: A:1000: 0: 0: 0: 100
Compressed	2001:DB8:A:1000:0:0:0:100

- **Rule 2 - Omitting All 0 Segments**
  - **Replace** any single, **contiguous string** of one or more **16-bit segments** (hextets) consisting of **all 0's** with a **double colon (::)**
  - **Double colon (::)** can only be used **once** within an address
  - Known as the **compressed format**

Example #1

Preferred	2001:0DB8:0000:0000:ABCD:0000:0000:0100
Omit leading 0s	2001: DB8: 0: 0:ABCD: 0: 0: 100
Compressed	2001:DB8::ABCD:0:0:100
OR	
Compressed	2001:DB8:0:0:ABCD::100

- **IPv6 Subnet Mask – Prefix Length**
  - IPv6 only uses **slash notation** for **prefix length**
    - **Prefix length** can range from 0 to 128
    - Typical **prefix** length is **/64**