

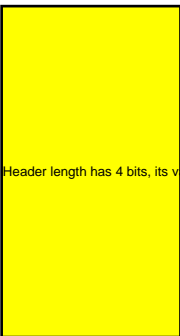
# CS3200: Computer Networks

## Lecture 16

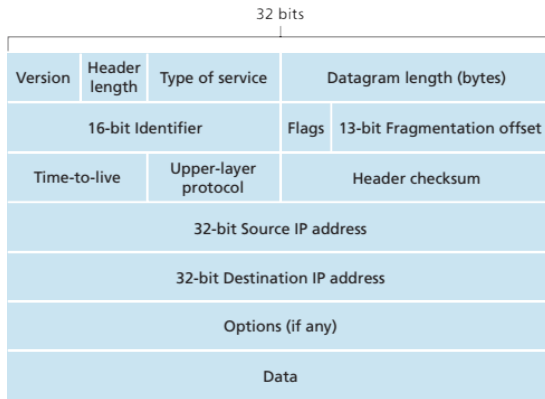
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03 Sep, 2019

# IPv4 Datagram Format

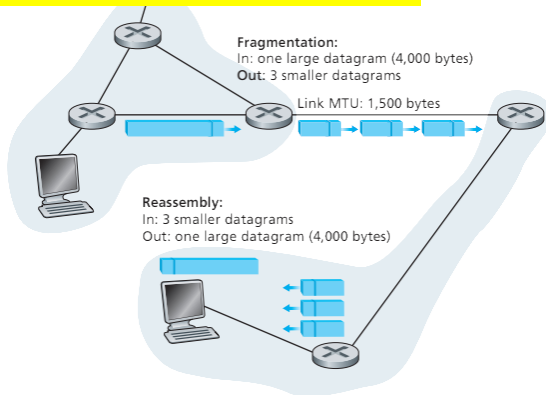


Header length has 4 bits, its v



# IPv4 Fragmentation

**MTU = Maximum Transmission Unit**



# IPv4 Fragmentation

For example, a packet of 4,520 bytes, including the 20 bytes of the IP header (without options) is fragmented to two packets on a link with an MTU of 2,500 bytes:

$$2480 / 8 = 310$$

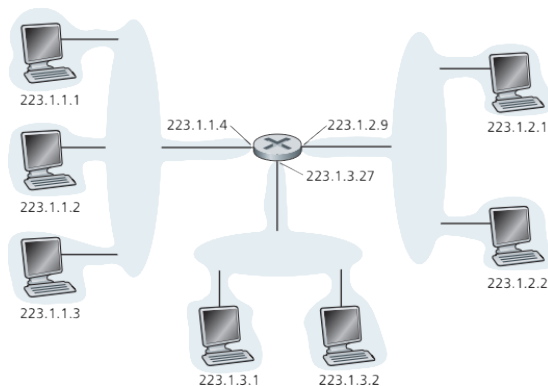
Fragment	Size (bytes)	Header size (bytes)	Data size (bytes)	Flag <i>More fragments</i>	Fragment offset (8-byte blocks)
1	2500	20	2480	1	0
2	2040	20	2020	0	310

On a link with an MTU of 1,500 bytes, each fragment results in two fragments:

Fragment	Size (bytes)	Header size (bytes)	Data size (bytes)	Flag <i>More fragments</i>	Fragment offset (8-byte blocks)
1	1500	20	1480	1	0
2	1020	20	1000	1	185
3	1500	20	1480	1	310
4	560	20	540	0	495

- Each IP address is 32 bits long (equivalently, 4 bytes), and there are thus a total of  $2^{32}$  (or approximately 4 billion) possible IP addresses.
- These addresses are typically written in so-called **dotted-decimal notation**.
- Each interface on every host and router in the global Internet must have an IP address that is globally unique.

# IPv4 Addressing



# IPv4 Addressing

- The Internet's address assignment strategy is known as **Classless Interdomain Routing**.
- CIDR generalizes the notion of subnet addressing.
- As with subnet addressing, the 32-bit IP address is divided into two parts and again has the dotted-decimal form  $a.b.c.d/x$ , where  $x$  indicates the number of bits in the first part of the address.
- The  $x$  most significant bits of an address of the form  $a.b.c.d/x$  constitute the network portion of the IP address, and are often referred to as the prefix (or network prefix) of the address.
- The remaining  $32 - x$  bits of an address can be thought of as distinguishing among the devices within the organization, all of which have the same network prefix.

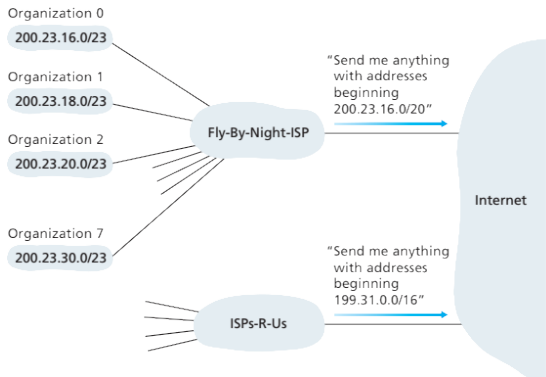
- Before CIDR was adopted, the network portions of an IP address were constrained to be 8, 16, or 24 bits in length, an addressing scheme known as **classful addressing**.
- What was the issue with this addressing scheme?

Issue is either it is too less or too high.



# Hierarchical Addressing

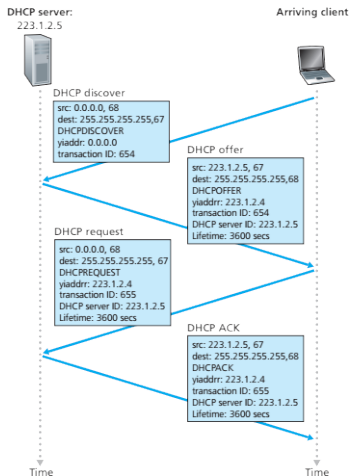
IP addresses are managed under the authority of the Internet Corporation for Assigned Names and Numbers (ICANN)



# Dynamic Host Configuration Protocol (DHCP)

A means to assign IP address to hosts within an organization.

yiaddr is the offered IP. 255.255.255.25



# Network Address Translation (NAT)

