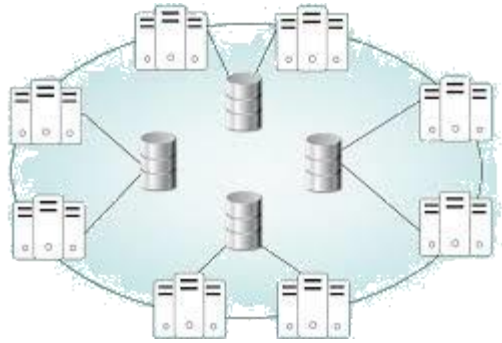
Distributed and Parallel Computer Systems

CSC 423

Fall 2021-2022



Lecture 9

Sample protocols

INSTRUCTOR

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Contents

- MobileIP
- TCP/UDP
- Wireless LAN

❑ Types of Networks

- Types of networks: how to choose
  - range, bandwidth, latency

- Networking principles: how it works conceptually
  - transfer mode, switching schemes
  - protocol suites, routing, congestion control

- Sample protocols: how it works in detail
  - MobileIP, TCP/UDP, Wireless LAN

❑ Internetworking

- To build an integrated network (an internetwork) we must integrate many subnets, each of which is based on one of these network technologies.
- To make this possible, the following are needed:

1) A unified internetwork addressing scheme that enables packets to be addressed to any host connected to any subnet.

2) A protocol defining the format of internetwork packets and giving rules according to which, they are handled,

3) Interconnecting components that route packets to their destinations in terms of internetwork addresses, transmitting the packets using subnets with a variety of network technologies.

❑ Internetworking

- For example, on the Internet,

  (1) is provided by IP addresses,

  (2) is the IP protocol,

  (3) is performed by the components called Internet Routers.

❑ 1.Interconnecting components

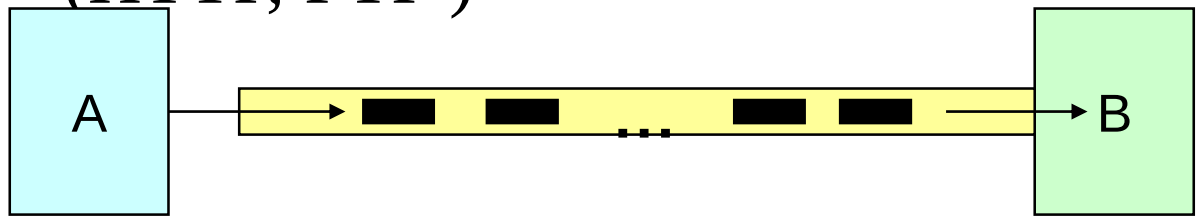
- The routers are responsible for forwarding the internetwork packets
- Switches perform a similar function to routers, but for local networks only.
- Hubs -They can also be used to overcome the distance limitations on single segments and provide a means of adding additional hosts (Broadcasting).
- The advantage of switches over hubs is that
  - they separate the incoming traffic
  - reducing congestion on the other networks to which they are connected.

❑ 2. Internet protocols

- An important part of that research was the development of the TCP/IP protocol suite. TCP stands for Transmission Control Protocol, IP for Internet Protocol.

- There are two transport protocols:–
  1. TCP (Transmission Control Protocol)
     - is a connection-oriented communication protocol that provides a reliable flow of data between two computers.
     - Example applications: (HTTP, FTP)

1.Connection is established.
2.Information is sent.
3.Connection is released.



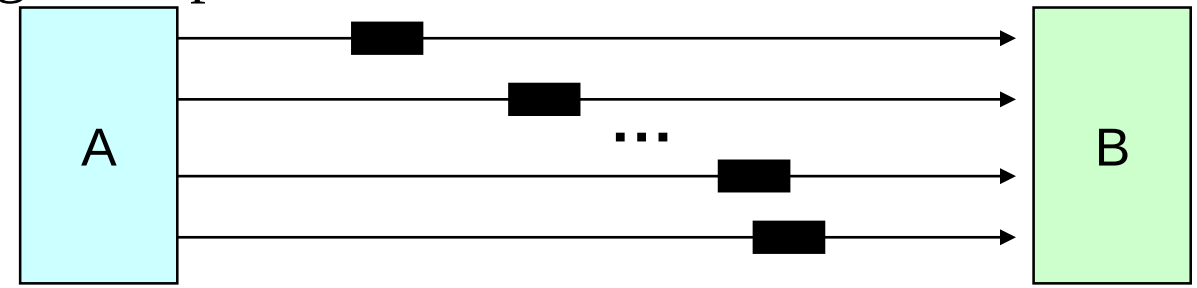
Connection-Oriented Communication

❑ 2. Internet protocols

➢ There are two transport protocols:

2. UDP (User Datagram Protocol)

- is a connectionless communication protocol that sends independent packets of data, called datagrams, from one computer to another with no guarantees about arrival or order of arrival.
- Each message is routed independently from source to destination
- Similar to sending multiple emails/letters to a friends, each containing part of a message.



Connectionless Communication

❑ 2. Internet protocols

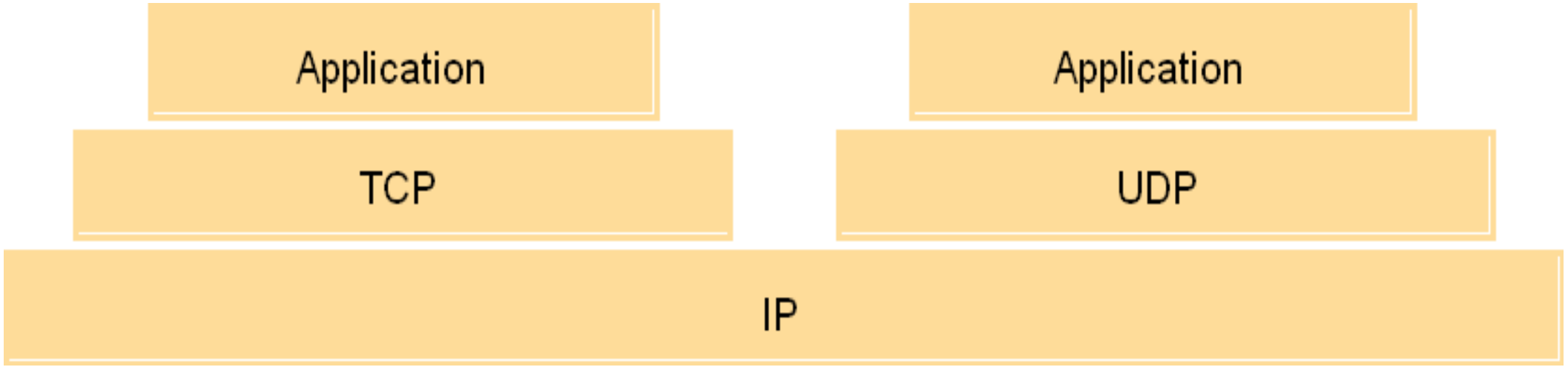
➢ Difference: Connection-oriented and Connectionless service

1. In connection-oriented service authentication is needed, while connectionless service does not need any authentication.

2. Connection-oriented protocol makes a connection and checks whether message is received or not and sends again if an error occurs, while connectionless service protocol does not guarantee a message delivery.

❑ The programmer's conceptual view of a TCP/IP Internet

- The success of TCP/IP is based on:
  - their independence of the underlying transmission technology,
  - enabling internetworks to be built up from many heterogeneous networks and data links.



❑ 3. IP addressing

- The most challenging aspect of the design of the Internet protocols was:
  - the construction of schemes for naming and addressing hosts

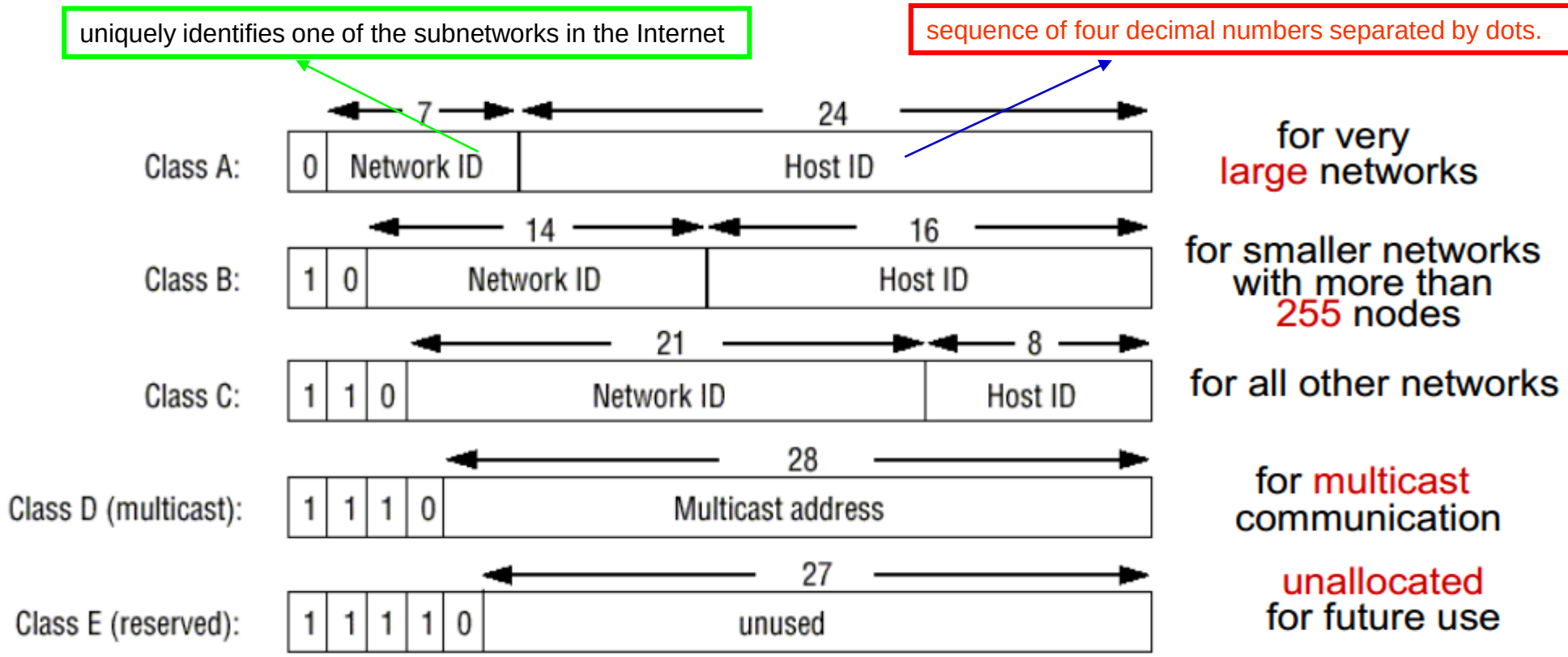
- The scheme used for assigning host addresses to networks and the computers connected to them had to satisfy the following requirements:
  - It must be universal - any host must be able to send packets to any other host on the Internet.
  - It must be efficient in its use of the address space

❑ Addressing on the Internet Protocol

- addresses used in source and destination fields of the Internet Protocol requirements
  - define a unique address for any node on the Internet
  - define a sufficiently large address space
    - IPv4 (1982): 32-bit addresses for 2^{32} (appr. 4 billion) addresses insufficient due to
      - ✓ unforeseen growth of internet
      - ✓ inefficient use of address space
    - IPv6 (1994): 128-bit addresses for 2^{128} (appr. $3x10^{38}$) addressable nodes
      - ✓ max. 7x1023 IP addresses per m2 of entire earth surface
      - ✓ if as inefficiently allocated as phone numbers: 10^3 per m^2
  - support a flexible routing scheme, but addresses themselves should not contain routing information

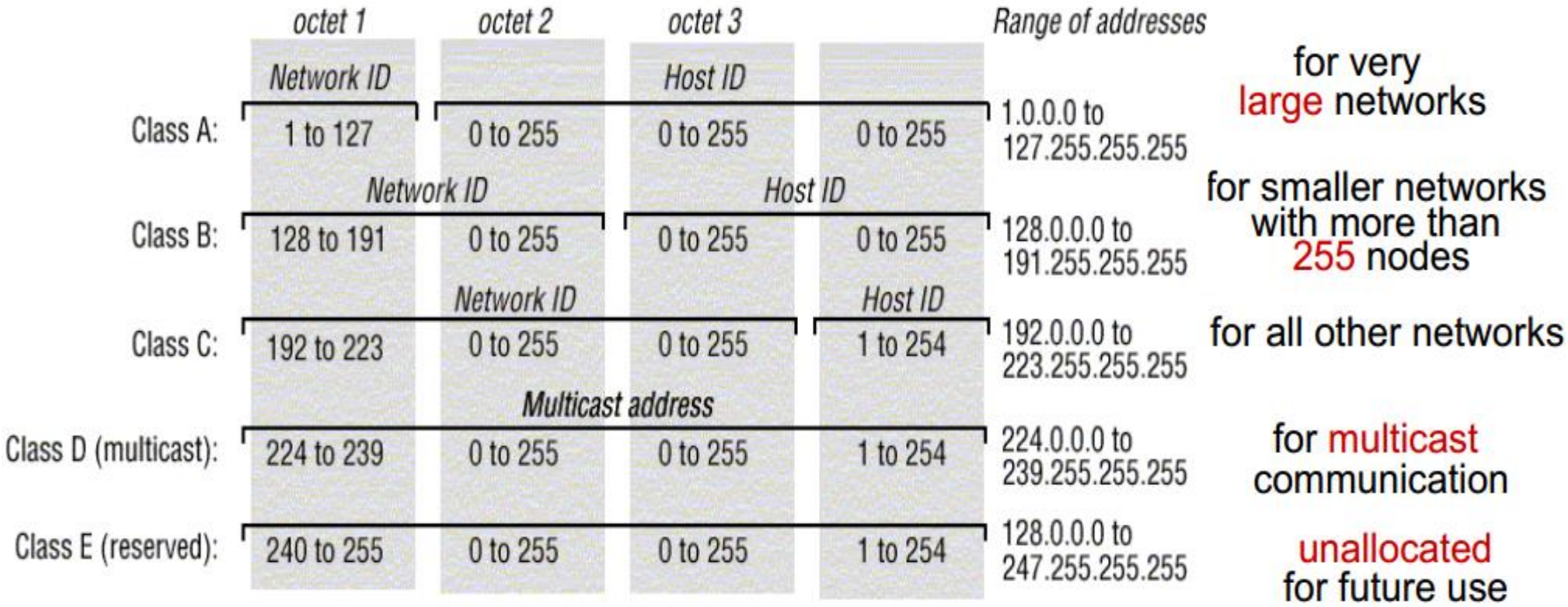
❑ Addressing in the Internet Protocol

- Addressing in the Internet Protocol
  - address class structure



❑ Addressing

- Addressing in the Internet Protocol
  - decimal address representation



❑ Internet Protocol

- IP version 6 (IPv6), 1994
  - enlarged address space
  - improved routing speed

Thank you