

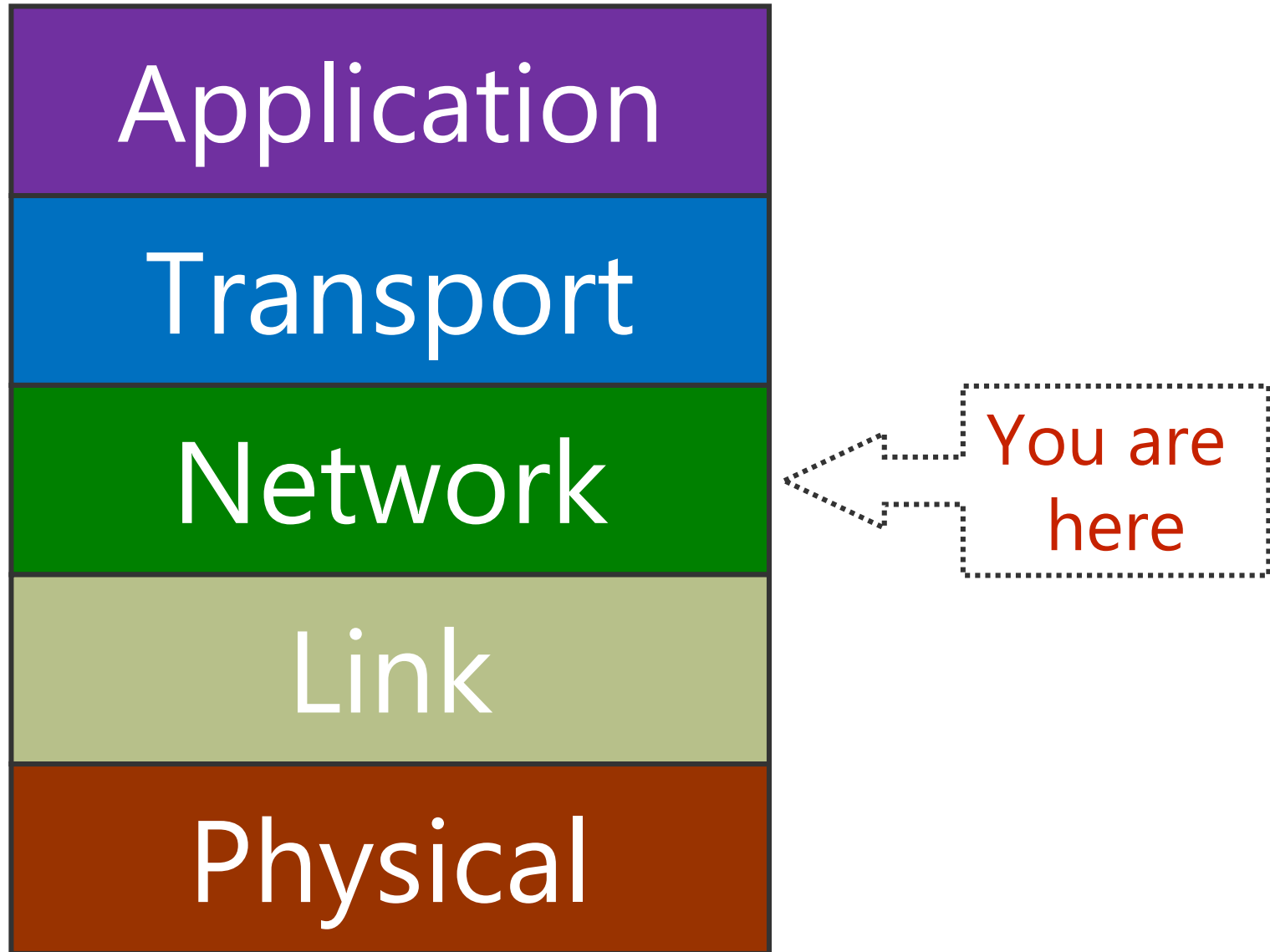
CS2105

An $\text{\AA}\omega\epsilon\sigma\omicron\mu\epsilon$ Introduction to Computer Networks

Lecture 6 discussion note



Department of Computer Science
School of Computing



Lectures 6&7: Roadmap

4.1 Overview of Network Layer

4.2 What's Inside a Router

4.3 The Internet Protocol (IP)

- 4.3.3 IPv4 Addressing

5.2 Routing Algorithms

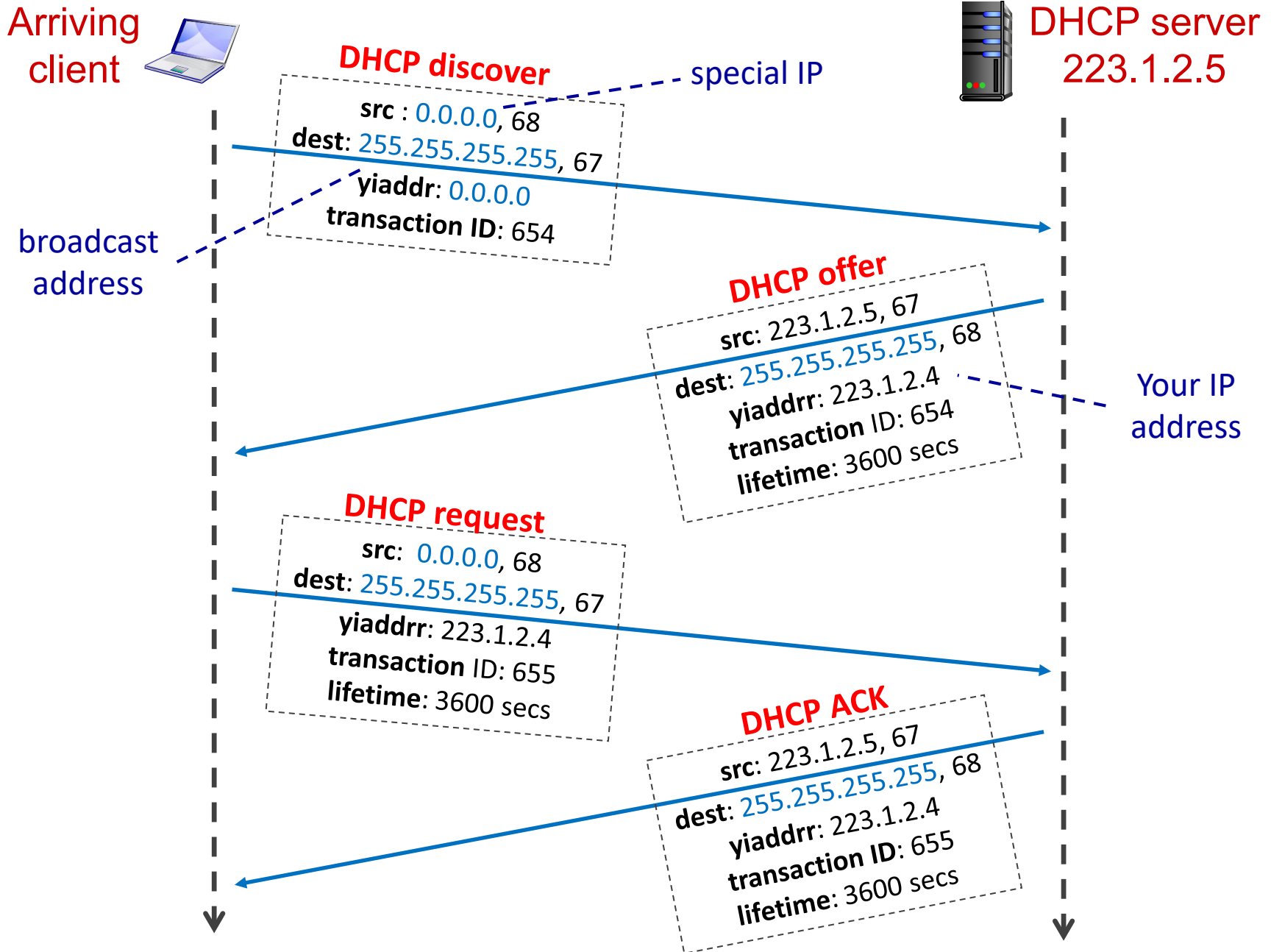
5.6 ICMP

IP Address Allocation

- ❖ **Q1:** How does an ISP get a block of addresses?
- ❖ **A1:** ICANN: Internet Corporation for Assigned Names and Numbers
 - Allocates addresses
 - Manages DNS
 - Assigns domain names, resolves disputes
- ❖ **Q2:** How does an organization obtain a block of IP addresses?
- ❖ **A2:** Buy from registry or rent from ISP's address space.

IP Address Allocation

- ❖ How does a host get an IP address?
 - manually configured by system administrator, or
 - automatically assigned by a **DHCP** (**Dynamic Host Configuration Protocol**) server.

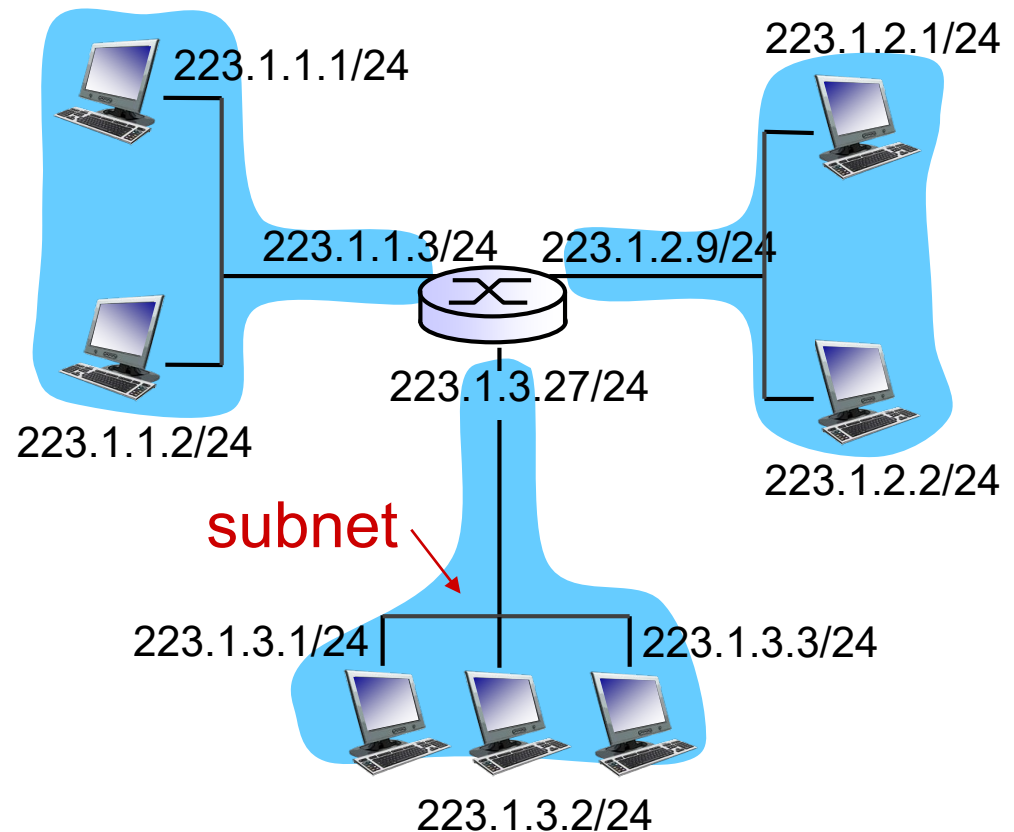


More on DHCP

- ❖ In addition to host IP address assignment, DHCP may also provide a host additional network information:
 - IP address of first-hop router
 - IP address of local DNS server
 - Network mask (indicating network prefix versus host ID of an IP address)

- ❖ DHCP runs over UDP
 - DHCP server port number: 67
 - DHCP client port number: 68

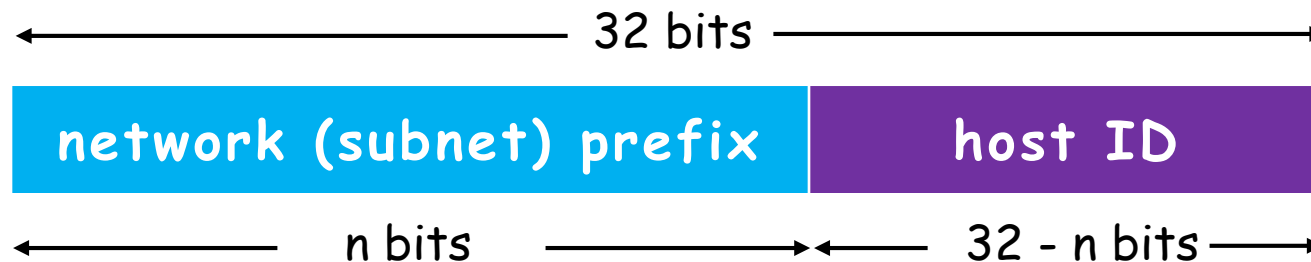
IP Address and Network Interface



A network consisting of 3 subnets
(first 24 bits of IP addr. are network prefix)

IP Address and Subnet

- ❖ An IP address logically comprises two parts:



- ❖ **Subnet** is a network formed by a group of “directly” interconnected hosts.
 - Hosts in the same subnet have the same network prefix of IP address.
 - Hosts in the same subnet can physically reach each other without intervening router.
 - They connect to the outside world through a router.

IP Address: CIDR

- ❖ The Internet's IP address assignment strategy is known as **Classless Inter-domain Routing (CIDR)**.
 - Subnet prefix of IP address is of arbitrary length.
 - Address format: **a.b.c.d/x**, where **x** is the number of bits in subnet prefix of IP address.

← subnet prefix → ← host ID →
 11001000 00010111 00010000 00101010

this subnet contains 2^9 IP addresses
 subnet prefix: 200.23.16.42/23

/23 indicates the no. of
 bits of subnet prefix

Subnet Mask

- ❖ **Subnet mask** is used to determine which subnet an IP address belongs to.
 - made by setting all subnet prefix bits to "1"s and host ID bits to "0"s.
- ❖ Example: for IP address 200.23.16.42/23:

	<div> <div>← subnet prefix →</div> <div>→ host ID →</div> </div>			
IP address in binary	11001000	00010111	00010000	00101010
Subnet mask	11111111	11111111	11111110	00000000
Subnet mask in decimal	255.255.254.0			

Q1

Which of the following is a public IP address?

- A. 10.10.10.10
- B. 172.10.10.10
- C. 192.168.10.10

Q2

Which of the following is a VALID subnet mask?

- A. 255.232.0.0
- B. 255.240.0.0
- C. 255.250.255.0

Q3

Which of the following IP addresses belong to the subnet 192.168.0.0/20?

- A. 196.168.10.10
- B. 196.168.16.10
- C. 196.168.128.10

Q4

An organization is granted the IP address block 211.80.180.0/24. The administrator wants to create 15 subnets of equal size. How many more bits will be used for the subnet prefix?

A. 3

B. 4

C. 5

Q5

An IP datagram with destination address 12.10.1.9 reaches a router. Suppose the router engages longest prefix matching and has the following 3 routing entries. Which entry will be used to forward this IP datagram?

- A. 12.8.0.0/14
- B. 12.10.0.0/15
- C. 12.10.0.0/20