17/6/2019

Lecture 05 tutorial: Network Layer. Part 1.

Question 1.
What is the fundamental difference between a router and a (link-layer) switch?

A
A router forwards a packet based on the packet's IP (layer 3) address. A link-layer switch forwards a packet based on the packet's MAC (layer 2) address.

Question 2.
What is the difference between routing and forwarding?

A
Forwarding is about moving a packet from a router or switch input port to the appropriate output port. Routing is about determining the end-to-end routes between sources and destinations.

Question 3.
Do routers have IP addresses? If yes, how many?

A
Yes. They have one address for each interface, therefore, minimum two IP addresses

Question 4.
Suppose Host A sends Host B a TCP segment encapsulated in an IP packet. When Host B receives the packet, how does the network layer in Host B know it should pass the payload of the IP packet to TCP rather than to UDP or to something else?

A
8-bit protocol field in the IP header contains information about which transport layer protocol the destination host should pass the segment to.

Question 5.
Explain the meaning of the following fields in the IPv4 header:

a. Total Length (TL)
b. Time to Live (TTL)

A
Write the answer

Question 6.
What does the Internet Corporation for Assigned Names and Numbers (ICANN) do?

A
Write the answer (Slide 17)

Question 7.
What is CIDR? What does **120.12.20.0/22** mean?

A
Write the answer (Slides 19, 20)

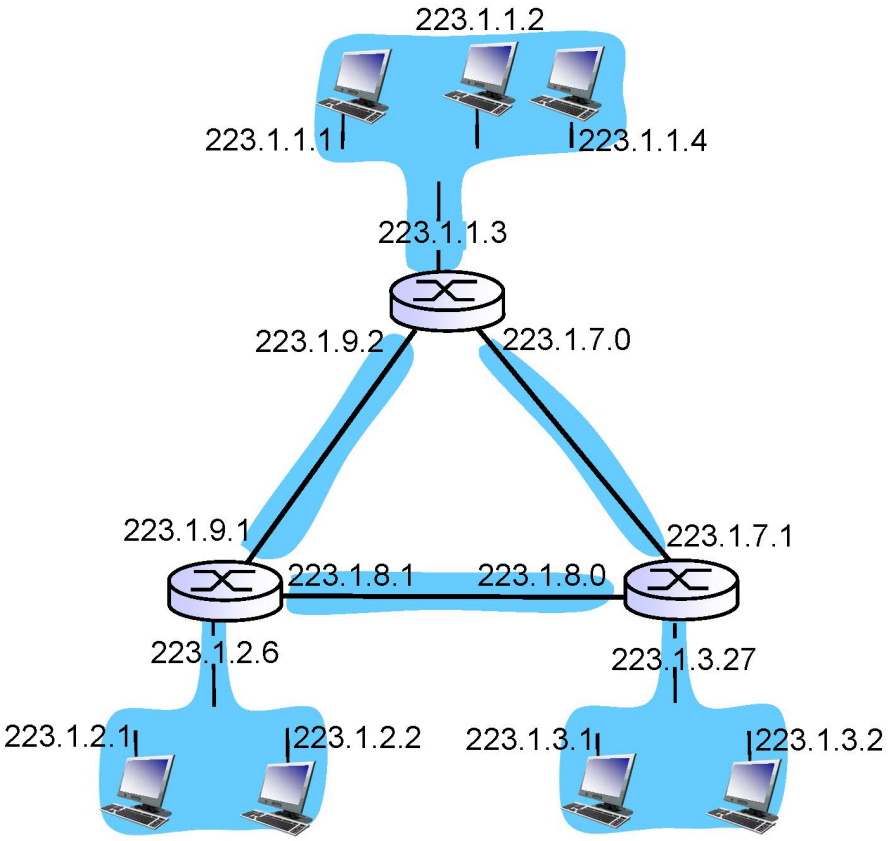
Question 8.
Consider a router that interconnects three subnets: Subnet 1, Subnet 2, and Subnet 3. Suppose all of the interfaces in each of these three subnets are required to have the prefix `223.1.17.0/24`. Also suppose that Subnet 1 is required to support at least 60 interfaces, Subnet 2 is to support at least 90 interfaces, and Subnet 3 is to support at least 12 interfaces. Provide three network addresses (of the form `a.b.c.d/x`) that satisfy these constraints.

A
`223.1.17.0/26`
`223.1.17.128/25`
`223.1.17.64/28`

Question 9.
Consider a subnet with prefix 128.119.40.128/26. Give an example of one IP address (of form xxx.xxx.xxx.xxx) that can be assigned to this network. Suppose an ISP owns the block of addresses of the form 128.119 .40.64/26. Suppose it wants to create four subnets from this block, with each block having the same number of IP addresses. What are the prefixes (of form a.b.c.d/x) for the four subnets?

A
Any IP address in range 128.119.40.128 to 128.119.40.191
Four equal size subnets:
128.119.40.64/28, 128.119.40.80/28, 128.119.40.96/28, 128.119.40.112/28

Question 10.
Consider the network **topology** shown in Slide 28:



Denote the three subnets **with hosts** (starting clockwise at 12:00) as Networks A, B, and C. Denote the subnets **without hosts** as Networks D, E, and F.

a) Assign network addresses to each of these six subnets, with the following constraints: All addresses must be allocated from 214.97.254/23; Subnet A should have enough addresses to support 250 interfaces; Subnet B should have enough addresses to support 120 interfaces; and Subnet C should have enough addresses to support 120 interfaces. Of course, subnets D, E and F should each be able to support two interfaces. For each subnet, the assignment should take the form a.b.c.d/x or a.b.c.d/x - e.f.g.h/y.

b) Using your answer to part (a), provide the forwarding tables (using longest prefix matching) for each of the three routers

A

From 214.97.254/23, possible assignments are

a) Subnet A: 214.97.255/24 (256 addresses)
Subnet B: 214.97.254.0/25 - 214.97.254.0/29 (128-8 = 120 addresses)
Subnet C: 214.97.254.128/25 (128 addresses)

Subnet D: 214.97.254.0/31 (2 addresses)
Subnet E: 214.97.254.2/31 (2 addresses)
Subnet F: 214.97.254.4/30 (4 addresses)

b) To simplify the solution, assume that no datagrams have router interfaces as ultimate destinations. Also, label D, E, F for the upper-right, bottom, and upper-left interior subnets, respectively.

Router 1

Longest Prefix Match	**Outgoing Interface**
11010110 01100001 11111111	Subnet A
11010110 01100001 11111110 0000000	Subnet D
11010110 01100001 11111110 000001	Subnet F

Router 2

Longest Prefix Match	**Outgoing Interface**
11010110 01100001 11111111 0000000	Subnet D
11010110 01100001 11111110 0	Subnet B
11010110 01100001 11111110 0000001	Subnet E

Question 11.
What are the

a. Private networks addresses,
b. Link-local addresses

Where are they used?

A
Write the answer (Slides 29, 30, 31 and the Internet)

Question 12.
Describe the DHCP protocol. Use an example to demonstrate the main steps of the protocol

A
Write the answer (Slide 34 - 36)

Question 13.
Where are the DNS root servers? (Slide 39)

A
Go to: **http://root-servers.org** and **http://www.iana.org/domains/root/servers** **a**nd compile a short answer

Question 14.
Open the command window and practice using **nslookup** command
A
e.g.

```
app> nslookup  zz.cn
Server:  ns1.its.monash.edu.au
Address:  130.194.1.99

Non-authoritative answer:
Name:    zz.cn
Address:  211.100.61.67
```

Question 15.
Assume that you try to access **vic.gov.au** and your local DNS server does not know the IP address. Draw diagrams similar to that in slides 42, 43 and 44 to demonstrate how the name resolution works using both the **iterated** and **recursive** query.

A
Consult slides 42, 43, 44