

## Sample Questions on IP Layer

**Q1)** The only entries in a certain route table are (128.59.28.0/22, port 0), (128.59.28.0/23, port 1) and (128.59.28.0/24, port 2). These entries indicate CIDR network number, the prefix and the corresponding port to which a packet should be forwarded. If a packet arrives with a destination IP address equal to 128.59.29.18, which port will this router forward the packet to?

**Q2.** A Router R1 has received a datagram with destination IP = 199.20.30.30. The current routing table at R1 has got four entries as follows:

199.20.30.0/28	Interface 1
199.20.30.16/29	Interface 2
199.20.30.24/30	Interface 3
Default	Interface 4

Which interface would be selected by R1 to forward this packet? Show your working.

**Q3.** Suppose an ISP owns the block of addresses of the form 101.101.128/17. 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?

**Q4.** Suppose a peer with user name Arnold discovers through querying that a peer with user name Bernard has a file it wants to download. Also suppose that Bernard is behind a NAT whereas Arnold isn't. Let 138.76.29.7 be the WAN-side address of the NAT and let 10.0.0.1 be the internal IP address for Bernard. Assume that the NAT is not specifically configured for the P2P application.

- (a) Discuss why Arnold's peer cannot initiate a TCP connection to Bernard's peer, even if Arnold knows the WAN-side address of the NAT, 138.76.29.7.
- (b) Now, suppose that Bernard has established an ongoing TCP connection to another peer, Cindy who is not behind a NAT. Also suppose that Arnold learned from Cindy that Bernard has the desired file and that Arnold can establish (or already has established) a TCP connection with Cindy. Describe how Arnold can use these two TCP connections (one from Bernard to Cindy and the other from Arnold to Cindy) to instruct Bernard to initiate a direct TCP connection (that is, not passing through Cindy) back to Arnold. This technique is sometimes called connection reversal. Note that even though Bernard is behind a NAT, Arnold can use this direct TCP connection to request the file, and Bernard can use the connection to deliver the file.

**Q5.** Suppose you purchase a wireless router/ADSL modem and connect it to your telephone socket. Also suppose that your ISP dynamically assigns one IP address to your connecting device (i.e. your router/modem). Also suppose that you have five PCs at home that use 802.11 to wirelessly connect to your wireless router. How are IP addresses assigned to five PCs? Does the wireless router use NAT? Why or why not?

**Q6.** List all the changes a NAT box makes in TCP and IP headers when it receives a packet from inside node (private IP address) destined to a global IP address say 8.8.8.8.