School of Computing and Information Systems COMP30023: Computer Systems Tutorial Week 7

Network Layer - IP Addresses and Packet Switching 1. Do routers have IP addresses? If so, how many? 2. Datagram networks route each packet as a separate unit, independent of all others. Virtual-circuit networks do not have to do this, since each data packet follows a predetermined route. Does this observation mean that virtual-circuit networks do not need the capability to route isolated packets from an arbitrary source to an arbitrary destination? Explain your answer. 3. A network on the Internet has a subnet mask of 255.255.240.0. What is the maximum number of hosts it can handle? 4. A router has just received the following new IP addresses: 57.6.96.0/21, 57.6.104.0/21, 57.6.112.0/21, and 57.6.120.0/21. If all of them use the same outgoing line, can they be aggregated? If so, to what? If not, why not? 5. A large number of consecutive IP addresses are available starting at 198.16.0.0. Suppose that four organizations, A, B, C, and D, request 4000, 2000, 4000, and 8000 addresses, respectively, and in that order. Each request is given the lowest-numbered subnet available for it. For each of these, give the first IP address assigned, the last IP address assigned, and the mask in the w.x.y.z/s notation. 6. A router has the following (CIDR) entries in its routing table:

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Address/mask 135.46.56.0/22 135.46.60.0/22 192.53.40.0/23 default

Next hop Interface 0 Interface 1 Router 1 Router 2

For each of the following IP addresses, where does the router send the packet if a packet with that address arrives? (a) 135.46.63.10 (b) 135.46.57.14 (c) 135.46.52.2 (d) 192.53.40.7 (e) 192.53.56.7

7. List one motivation for a host to send an IP packet with the wrong source IP address. List two ways that this can adversely affect the legitimate owner of that IP address.
8. The IP packet header includes a time-to-live field that is decremented by each router along the path. Why is the time-to-live field necessary?
9. Bonus for fun: IPv6 uses 16-byte addresses. If a block of 1 million addresses is allocated every picosecond, how long will the addresses last?

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