

ECSE-6600: Internet Protocols

Quiz 1

SOLUTIONS

Time: **60 min (strictly enforced)**

Points: **50**

YOUR NAME:

Be brief, but DO NOT omit necessary detail

I.[4 pts* 6 = 24] Below, you are give a true or false statement and asked a follow up short question. {Note: Copying text directly from the slides or notes will not earn (partial) credit. Brief, clear and consistent explanation will.}

1. **False statement:** When an 800-byte packet is fragmented at a link whose MTU = 580 bytes, the fragment offset in the second fragment is set to 68.

- Qn: What is the fragment offset in the second fragment ?

Ans. $580 - 20 = 560$ The nearest multiple of 8 to 560 is 560

The offset = $560 / 8 = 70$

[2 Point Each for getting 560 and 70]

2. **False statement:** “Connectivity” is the same as getting a physical link.

Qn: Explain how connectivity is a virtualization of a physical link.

Ans. “Connectivity” means direct or indirect access to every other nodes. Indirect connection does not mean getting physical link but getting connected end-to-end like TCP connection in a packet switched network.

[4 Points for Correct]

3. **False statement:** A layer-2 switch is a router.

Qn: Explain how layer-2 and layer-3 switches are different from simple bridges and routers.

Ans. A layer-2 switch provides multiple parallel paths through a switch fabric which simple bridges don't provide. A layer-3 switch is a router with fabric and per-port ASICs.

[2 Pts Each for L2 and L3 Switch]

4. **True statement:** Statistical multiplexing is useful when the peak rate is much larger than the average rate.

Qn: Explain how statistical multiplexing relates to peak/average rates, and metrics like: utilization, queuing delay and cost of the resource.

Ans. In statistical multiplexing, the service rate is determined somewhere between the peak and the average according to the cost of the resource. If the cost of the resource is high, the service rate gets close to the average. Accordingly the resource utilization increases and as a trade-off queuing delay also increases.

[1 pt each for peak/avg rate, utilization, Queuing Delay & Cost]

5. **False statement:** Subnet masking solves the internetworking problem of heterogeneity.

Qn: What protocol concepts are used to solve the problem of heterogeneity?

Ans. The minimal overlay model like IP with a new address space and packet format enables a variety of heterogeneous lower layer protocols to be mapped onto.

[2 Points for Overlay Model, 1 pt each for address space and packet format]

6. **True statement:** Address hierarchy supports inter-network scalability.

Qn: Exactly how does address hierarchy help support scalability?

Ans. Address hierarchy enables the two-level forwarding which distinguishes between direct and indirect connected nodes. In that way, filtering based on the hierarchical address allows the network to scale.

[4 Points for Correct]

II. [8 pts] Why is classful addressing inefficient ? Explain how subnet masks and VLSMs help to address this problem.

Ans.

Classful addressing is inefficient in two ways:

1. *Internal fragmentation: No single network has as many hosts to fill the class B address space which leads to host number wastage.*
[2 Points]
2. *External fragmentation: Only class B addresses are wanted and hence class C network numbers are unused.*
[2 Points]

Subnet mask allows sub-division of a class into sub-networks so that each subnet will have fewer host numbers to represent a single broadcast domain.
[2 Points]

VLSMs allow a single class to have multiple lengths of subnet masks. This allows each subnet to have exactly the number of hosts necessary to number all its hosts.
[2 Points]

III. [7 pts] Filtering leads to efficiency and hence scalability. Explain what filtering functionality is provided in: repeaters/hubs, bridges and routers.

Ans.

Repeaters: No filtering is provided.

[1 Point]

Hubs: No filtering is provided

[1 Point]

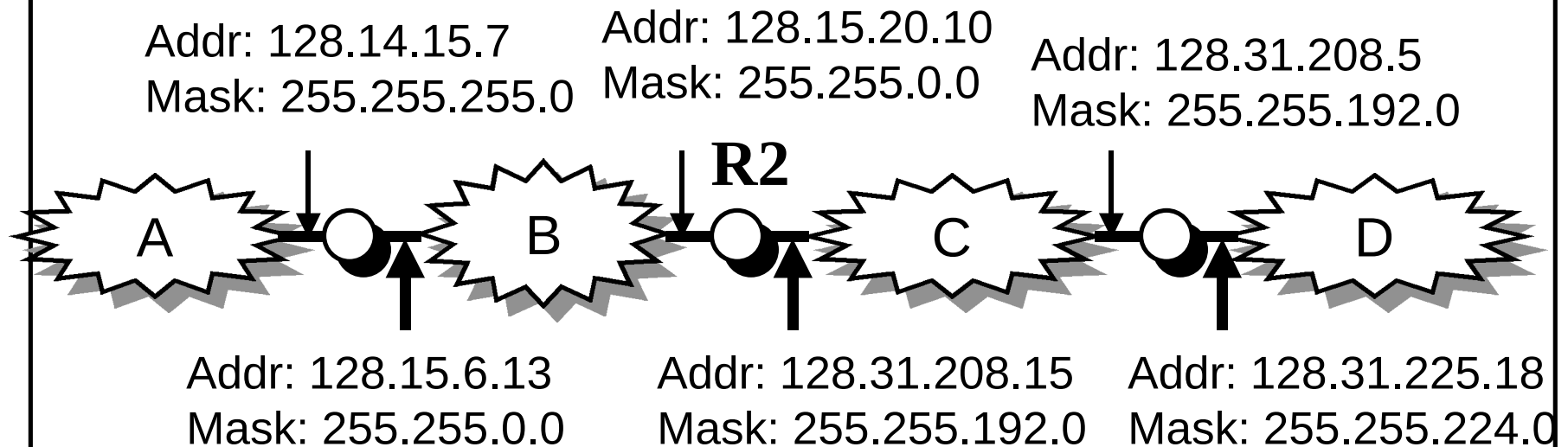
Bridges: Simple filtering based on simple learning algorithm is provided connecting two or more collision domains. Bridges default to flooding if the destination is not found in the forwarding table.

[2 Points]

Routers: Sophisticated filtering based on the routing table is provided and this leads to hop-by-hop forwarding. Routers never resort to flooding, in the worst case the packet will be forwarded to the default router.

[3 Points]

IV. [11 pts] Consider the enterprise inter-network which uses VLSMs.



A) (3 pts) Consider two hosts H1 and H2 configured with addresses 128.31.30.40 and 128.31.198.6. Which network if any, can they be placed on (among A,B,C,D), and what would their subnet mask be ?

Ans.

128.31.30.40 belongs to no subnet.

[1 Point]

128.31.198.6 belongs to subnet C and the mask is 255.255.192.0

[1 Point for Class C and 1 Point for Subnet Mask]

B) (6 pts) Fill up the routing table at router R2. One example entry is filled up for you.

<u>Destination</u>	<u>Mask</u>	<u>Next Hop</u>
128.14.15.0	255.255.255.0	128.15.6.13
128.31.192.0	255.255.192.0	Deliver direct
128.15.0.0	255.255.0.0	Deliver direct
128.31.224.0	255.255.224.0	128.31.208.5

[2 Points for Each Correct Row, -0.5 point for each incorrect element]

C) (2pts) Could two hosts have the same IP address but different subnet masks? Why or Why not?

Ans. No, there cannot exist two hosts with the same IP address. Subnet masks simply divide up one large address space into several pieces and cannot make one IP address be reused.

[1 Point for answering Yes/No and 1 Point for the reason.]