

CS447 – Networks and Data Communications

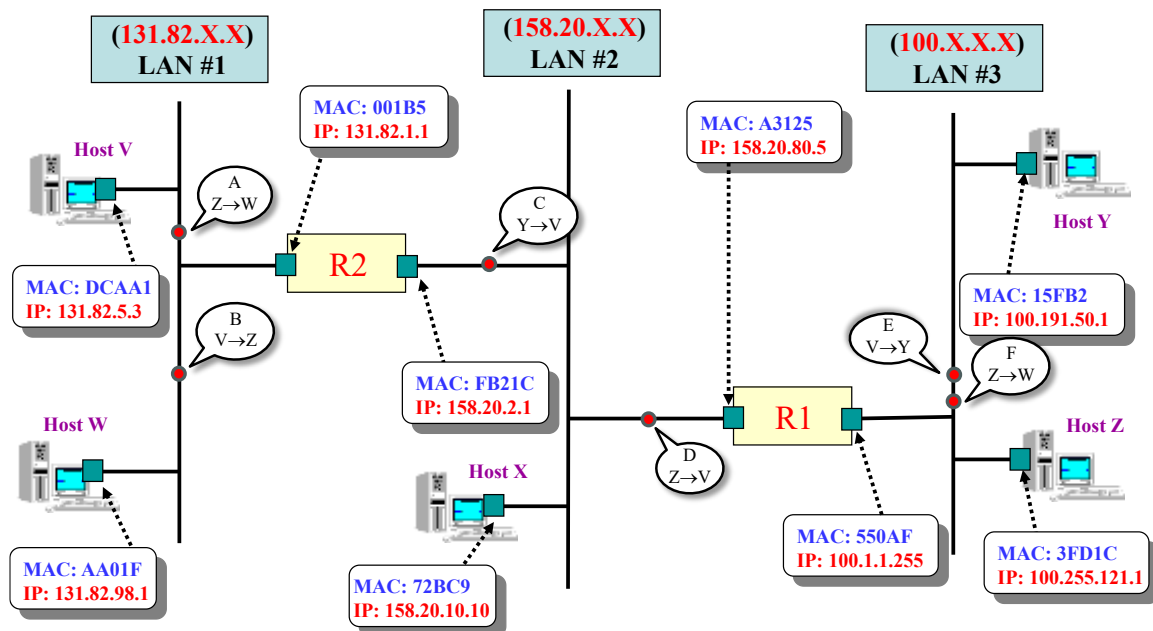
Summer 2026

Homework #2 Questions (**SOLUTIONS**)

Submission Due (each student is required to submit (by email) your solutions for this homework by 11:00AM on June 23

QUESTION #1

In the figure below, show:



- The source (sender) IP address
- The destination (receiver) IP address
- The source (sender) MAC address
- The destination (receiver) MAC address

when a payload message* (a network packet that carries some payload data from a source host to a receiver host) at point A, B, C, D, E, and F (the direction of network traffic is shown in the figure).

Note*: we are not dealing with “ARP search” or “ARP reply” (but a network packet that carries some payload data).

Solutions:

- A:** Source IP: 100.255.121.1
Destination IP: 131.82.98.1
Source MAC: 001B5
Destination MAC: AA01F
- B:** Source IP: 131.82.5.3
Destination IP: 100.255.121.1
Source MAC: DCAA1
Destination MAC: 001B5
- C:** Source IP: 100.191.50.1
Destination IP: 131.82.5.3
Source MAC: A3125
Destination MAC: FB21C
- D:** Source IP: 100.255.121.1
Destination IP: 131.82.5.3
Source MAC: A3125
Destination MAC: FB21C
- E:** Source IP: 131.82.5.3
Destination IP: 100.191.50.1
Source MAC: 550AF
Destination MAC: 15FB2
- F:** Source IP: 100.255.121.1
Destination IP: 131.82.98.1
Source MAC: 3FD1C
Destination MAC: 550AF

QUESTION #2

Complete the following table, which “translates” given CIDR-prefix to the classic three-class IP address structure where:

- # Equivalent Class-C: the number of Class-C domains a domain with / N CIDR-prefix can contain (where N represents 27 ~ 14 in the following table) – in terms of the maximum number of the host computers.
 - For example, if a network domain with ‘ k ’ (a network domain with / k) CIDR-prefix can consist of as many as ‘ n ’ host computers, while each Class-C domain can consist of ‘ m ’ host computers, it will be ‘ m/n ’ (translate it to an integer when m/n becomes an integer).
 - If a given network domain with a CIDR-prefix is smaller than a Class-C domain, represent the number using a fraction (e.g., “1/3” - translate it to an integer when m/n becomes an integer).
- # of Host Addresses: the maximum number of host computers a domain with / N CIDR-prefix can contain (where N is 27 ~ 14 in the following table).

CIDR Block PreFix	# Equivalent Class-C	# of Host Addresses
/27		
/26		
/25		
/24		
/17		
/16		
/15		
/14		

Solutions:

/27: $2^{(32-27)}/2^{(32-24)} = 2^5/2^8 = 1/2^3 = 1/8$ Class-C domains, $2^{(32-27)} = 2^5 = 32$ hosts
 /26: $2^{(32-26)}/2^{(32-24)} = 2^6/2^8 = 1/2^2 = 1/4$ Class-C domains, $2^{(32-26)} = 2^6 = 64$ hosts
 /25: $2^{(32-25)}/2^{(32-24)} = 2^7/2^8 = 1/2 = 1/2$ Class-C domains, $2^{(32-25)} = 2^7 = 128$ hosts
 /24: $2^{(32-24)}/2^{(32-24)} = 2^8/2^8 = 1 = 1$ Class-C domain, $2^{(32-24)} = 2^8 = 256$ hosts

/17: $2^{(32-17)}/2^{(32-24)} = 2^{15}/2^8 = 2^7 = \underline{128 \text{ Class-C domains}}, 2^{(32-17)} = 2^{15} = \underline{32,768 \text{ hosts}}$
/16: $2^{(32-16)}/2^{(32-24)} = 2^{16}/2^8 = 2^8 = \underline{256 \text{ Class-C domains}}, 2^{(32-16)} = 2^{16} = \underline{65,536 \text{ hosts}}$
/15: $2^{(32-15)}/2^{(32-24)} = 2^{17}/2^8 = 2^9 = \underline{512 \text{ Class-C domains}}, 2^{(32-15)} = 2^{17} = \underline{131,072 \text{ hosts}}$
/14: $2^{(32-14)}/2^{(32-24)} = 2^{18}/2^8 = 2^{10} = \underline{1,024 \text{ Class-C domains}}, 2^{(32-14)} = 2^{18} = \underline{262,144 \text{ hosts}}$