	Spring 20)26	Discussion 9
	1 Multipl	e Choice	
1.1	NAT allows mu	ltiple hosts to share the same IP address in a way that conforms to the	ne E2E principle.
1.2	Port numbers a	re used to multiplex among hosts behind the same NAT.	
1.3	Which protocol	does a host use to learn its own IP address?	
	(a) DHCP	(d) ICMP	
	(b) DNS	(e) None of these	
	(c) ARP		
1.4	Which protocol	does a host use to learn its own MAC address?	
	(a) DHCP	(d) ICMP	
	(b) DNS	(e) None of these	
	(c) ARP		
1.5	-	does a host use to learn the MAC address of another host on the same	ne network?
	(a) DHCP	(d) ICMP	
	(b) DNS	(e) None of these	
	(c) ARP		

1.6 DHCP is a protocol in which of the following layers?

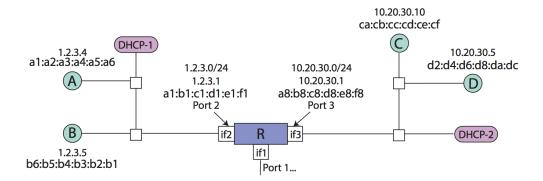
2 ARP, DHCP, NAT

- (a) Physical (d) Transport
- (b) Datalink (e) Application
- (c) Network
- 1.7 ARP is a protocol in which of the following layers?
 - (a) Physical
- (d) Transport
- (b) Datalink
- (e) Application
- (c) Network
- 1.8 Which of the following can a host learn with DHCP? Select all that apply.
 - (a) Its own MAC address.

- (b) Its own IP address.
- (c) The MAC address of another host.
- (d) The IP address of another host.
- (e) The IP address of its first-hop router.
- (f) The MAC address of its first-hop router.

(g) Its own subnet mask.

2 Host-to-Host



Consider the above topology. Here, two networks are connected through router R. R has three interfaces, each associated with a port, MAC address, IP address, and subnet.

We are going to consider what happens when A sends a packet to C. Assume that A just attached to the network, but already knows the IP address of C (10.20.30.10). No hosts or routers have sent any previous ARP requests.

2.1 First *A* needs to learn its own IP address, subnet mask, and the IP of its first-hop router by using DHCP. For each of the following DHCP messages, indicate the message's timing in the packet exchange (1 is first, 4 is last), who sends the message, and whether the message is broadcast or unicast.

Message	Order	Sender	Message Type
DHCP request			
DHCP ACK			
DHCP discovery			
DHCP offer			

2.2 Using this information, how does A determine if C is on the same subnet?

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Given that C is not on the same subnet as A, A must send the packet to its first hop router R. Which requests and responses are exchanged before this can happen?

Request	Response
ARP request for 1.2.3.4	ARP response: 1.2.3.4
ARP request for 1.2.3.1	ARP response: 1.2.3.1
ARP request for $10.20.30.10$	ARP response: 10.20.30.10
ARP request for a1:a2:a3:a4:a5:a6	ARP response: a1:a2:a3:a4:a5:a6
ARP request for a1:b1:c1:d1:e1:f1	ARP response: a1:b1:c1:d1:e1:f1
ARP request for ca:cb:cc:cd:ce:cf	ARP response: ca:cb:cc:cd:ce:cf

- 2.4 Is the ARP request broadcast or unicast? What about the ARP response?
- In the packet A now sends to R, what are the source and destination IP and MAC addresses?
- 2.6 How does R know which interface to forward A's packet on?
- $\fbox{2.7}$ Now R has the packet. List all remaining packets that are exchanged until C receives the packet from A.
- 2.8 What are the source and destination IP and MAC addresses for the packet that R sends to C?

 Source IP:

Source MAC:		
Destination IP:		
Destination MAC:		

3 Network Address Translation

Consider a host A behind a NAT, trying to communicate with a remote host B. When a packet headed for B leaves host A, its source port is 56789, destination port is 443, source IP is 192.168.1.10, destination IP is 8.8.8.8. When a packet headed for A leaves host B, its source port is 443, destination port is 60000, source IP is 8.8.8.8, destination IP is 203.0.113.5. Based on the information above, answer the following questions:

3.1	The packet from host A to host B arrives at the NAT. What are the fields in the packet after the NAT has altered it?
	Source IP:
	Course Dout
	Source Port:
	Destination IP:
	Destination Port:
3.2	The packet from host B to host A arrives at the NAT. What are the fields in the packet after the NAT has altered it?
	Source IP:
	Source Port:
	Destination IP:
	Destination Port: