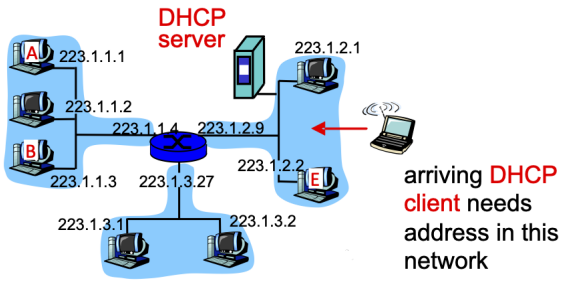
IK2218 Protocols and Principles of the Internet
EP2120 Internetworking

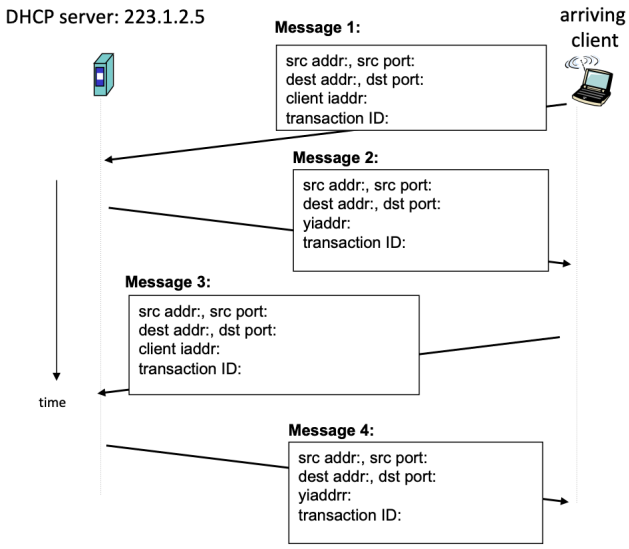
Homework 4

Solutions due: 19:00, October 16, 2023
Review due: 19:00, October 18, 2023

1. **DHCP (15 p)**
Consider the following scenario, where a DHCP client arrives and requests an IP address from the DCHP server.



In the simplest case, four DHCP messages will be exchanged according to the figure below. Name these four DHCP messages (message type) and fill in the missing fields in each message. You can assume that the subnet to which the DHCP client arrives is a /24 network and that all addresses below 223.1.2.10 are occupied. Based on that, you can let the DHCP server hand out a suitable IP address. You also have to select reasonable transaction IDs.

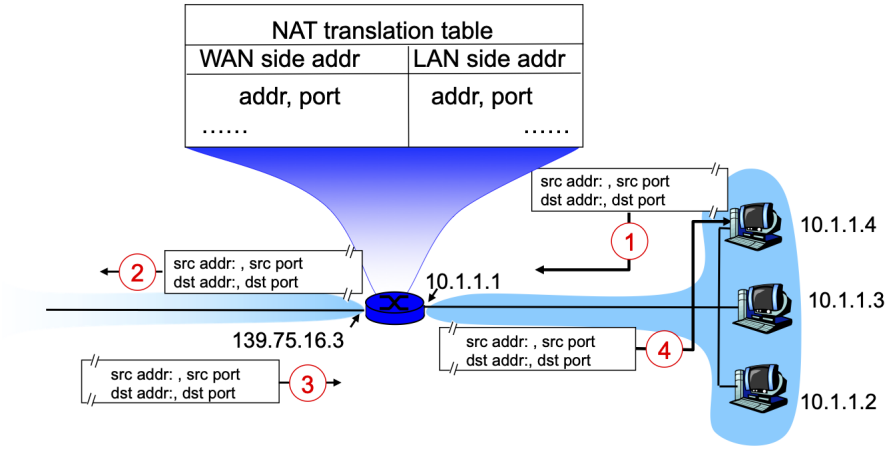


2. **IPv6 Autoconfiguration (10 p)**
In IPv6 stateless autoconfiguration, the client can create an IP address based on the client's MAC address, instead of requesting the IP address from a DHCP server. Discuss advantages and problems with using an IPv6 address generated from the MAC address, and explain how IPv6 privacy extensions address the problems.

3. **Firewalls (25 p)**
Firewalls can be placed in a number of different places, providing different protection. Give at least three examples of places where deploying firewalls is motivated, and explain the motivation for placing them there.

4. **NAT (25 p)**
Consider the figure below. Assume that host 10.1.1.4 on a private network (10.1.1.0/24) sends an HTTP request through its NAT box to a web server on address 130.237.20.12 and that this web server answers with an HTTP response back to the host. Fill in

source address, source port, destination address, and destination port in the IP packets 1-4 in the figure. Also, fill in the NAT table as it will look when the four packets have been exchanged.



5. Software-Defined Networking (25 p)

(a) Describe the traditional model of a router, partitioned into a control plane and data plane. Your answer should cover properties of control plane and data plane and examples of functions in the control plane and data plane respectively. (10 p)

(b) Explain the idea of generalized forwarding and software-defined networking (SDN). What does it mean that the SDN control plane is logically centralized? In what way is SDN forwarding more general than traditional IP forwarding? What is the OpenFlow protocol? (15 p)