CPSC 317 COMPUTER NETWORKING

Module 7: Link Layer – Day 3 – DHCP

LEARNING GOALS

DHCP

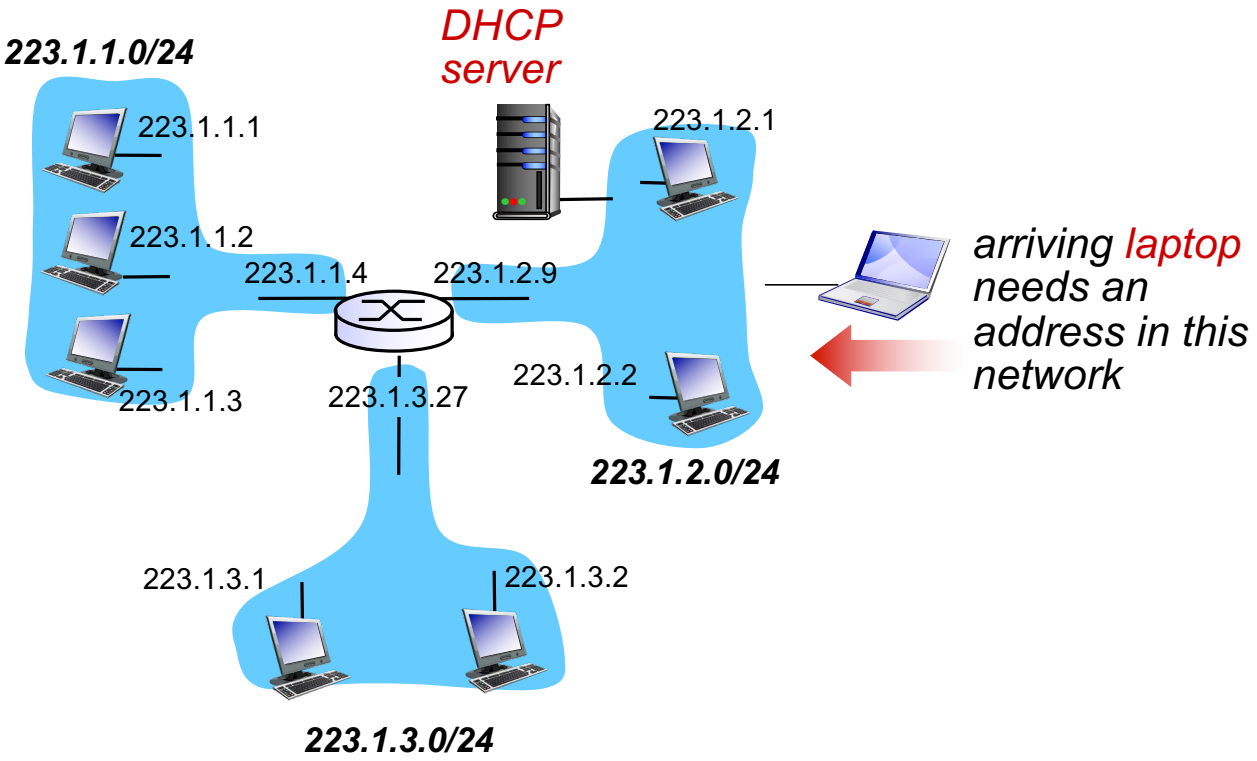
- Describe the purpose of DHCP
- Trace the four steps to get an IP address for a particular interface on a LAN
- Describe the configuration of DHCP on a LAN and the configuration information issued to support IP
- Describe the difference between a static and dynamic address
- Describe the notion of leasing an IP address
- Explain why broadcast is needed in DHCP

READING

- Reading: 4.3.3 (From Obtaining a Host Address: The Dynamic Host Configuration Protocol)

DYNAMIC HOST CONFIGURATION PROTOCOL

DHCP SCENARIO



DHCP

Goal: allow host to *dynamically* obtain its IP address (and other configuration information) when it joins a network

- support for mobile users who want to join network

DHCP overview

- DHCP is built on a client-server model
- On top of UDP ports 67 (server) and 68 (client)

DHCP basic messages

- host broadcasts DHCP discover
- DHCP server responds with DHCP offer
- host requests IP address with DHCP request
- DHCP server sends DHCP ack

CLICKER QUESTION

Which of the following does a newly arriving device need when it joins a network?

A. An IP address
B. The subnet mask (or length of the network part of the address)
C. The IP address of a router that can forward datagrams outside this network
D. The IP address of a DHCP server
E. The IP address of a DNS server

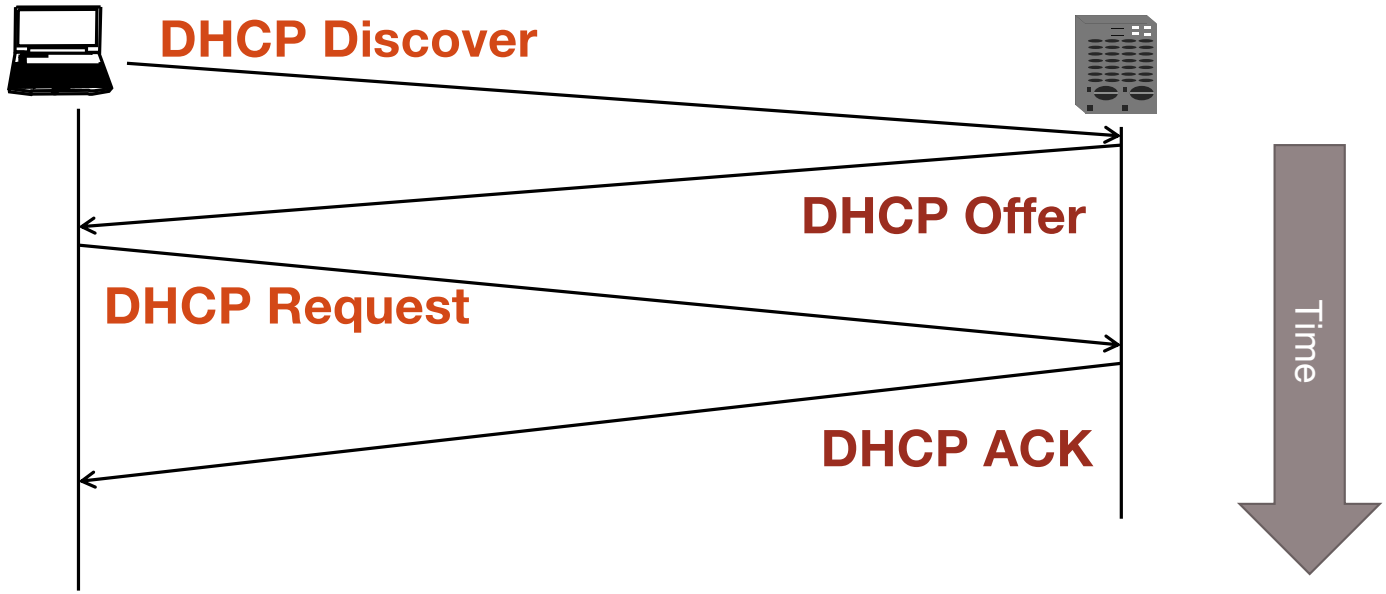
REVERSE ARP

- The predecessor protocol to DHCP was called RARP
- It only provided the newly arriving device an IP address
- Why was that enough for many years?

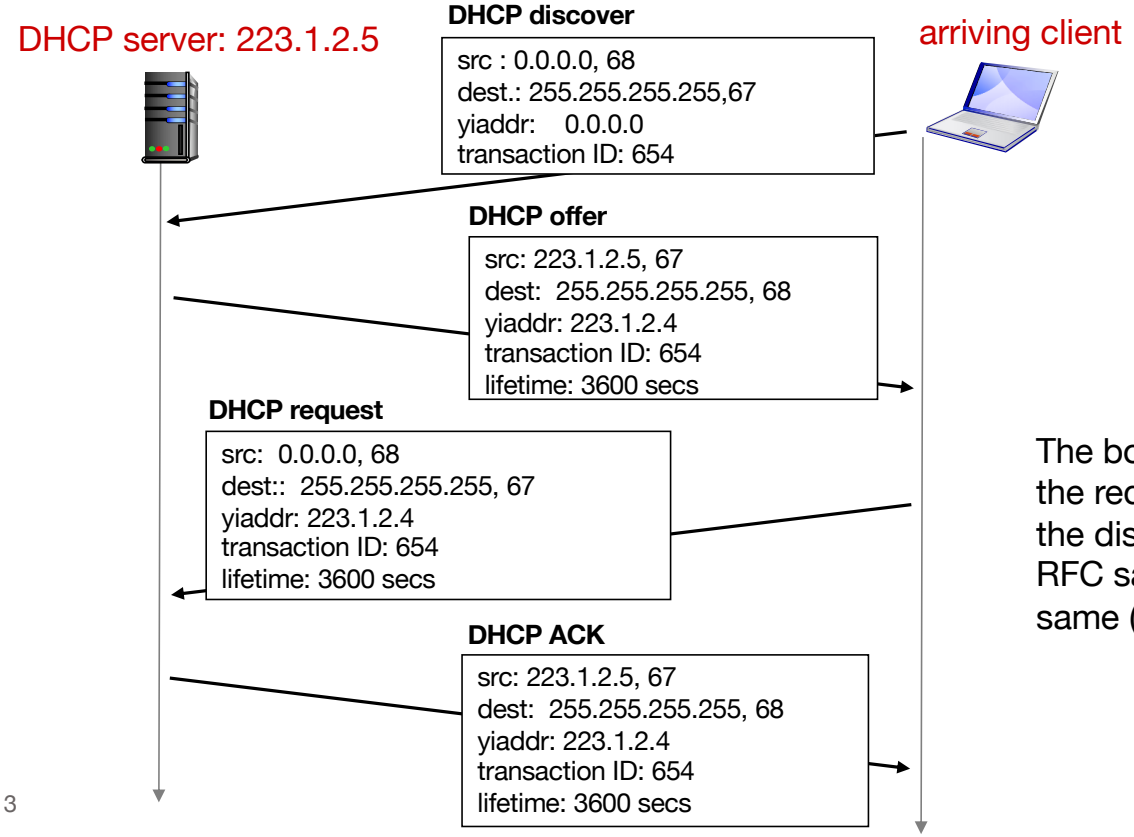
DHCP STEPS

- **DHCP Discover**: client asks server for an IP address
- **DHCP Offer**: server provides a possible IP address to client
- **DHCP Request**: client accepts the offer and requests to be assigned the IP address
- **DHCP ACK**: server acknowledges request and assigns new IP address to client

DHCP: EVENT RESPONSE DIAGRAM



DHCP CLIENT-SERVER SCENARIO



The book shows the xid of the request as different from the discover/offer but the RFC says they should be the same (and wireshark agrees)

FROM RFC 2131

If the 'giaddr' field in a DHCP message from a client is non-zero, the server sends any return messages to the 'DHCP server' port on the BOOTP relay agent whose address appears in 'giaddr'. If the 'giaddr' field is zero and the 'ciaddr' field is nonzero, then the server unicasts DHCPOFFER and DHCPACK messages to the address in 'ciaddr'. If 'giaddr' is zero and 'ciaddr' is zero, and the broadcast bit is set, then the server broadcasts DHCPOFFER and DHCPACK messages to 0xffffffff. If the broadcast bit is not set and 'giaddr' is zero and 'ciaddr' is zero, then the server unicasts DHCPOFFER and DHCPACK messages to the client's hardware address and 'yiaddr' address. In all cases, when 'giaddr' is zero, the server broadcasts any DHCPNAK messages to 0xffffffff.

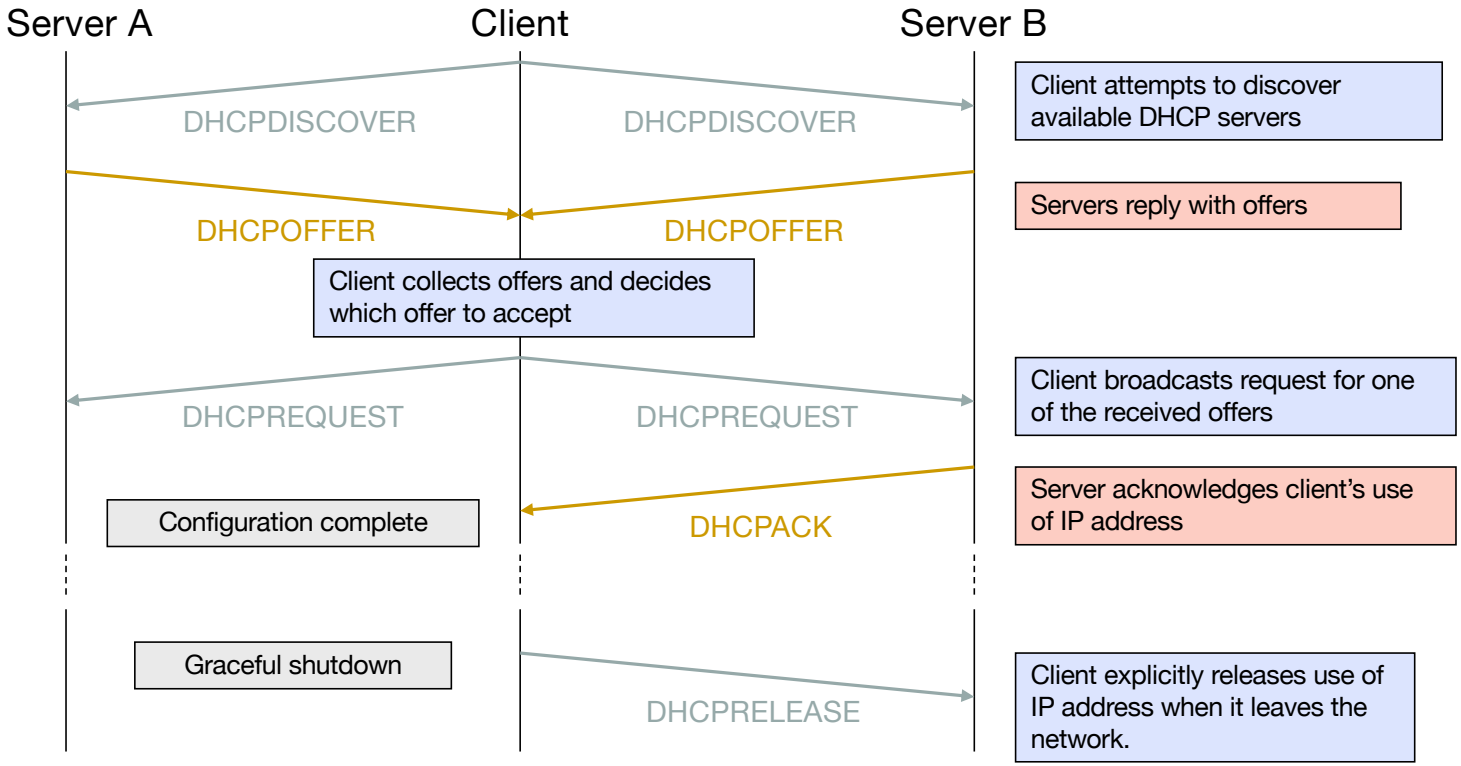
DHCP OFFER/ACK INCLUDES:

- Unique IP address for client
- Netmask for local network
- Lease time
  - How long can you use the IP address before renewing (in seconds)
- Routing information
  - Usually IP address for only one catch-all router (default gateway) is provided
- Host name, domain name (optional)
- Name (DNS) server (optional)

QUESTIONS ABOUT DHCP?

- Why use leases?
- What if two machines request an IP at the same time?
- What if there are more than one server?

DHCP CONVERSATION (TWO SERVERS)



CLICKER QUESTION

After the DHCP process finishes, and an application has data to send (e.g., a browser URL to send to a web server), which of the following ***still needs to be retrieved***?

A. The source IP address
B. The destination host name
C. The IP address of the router
D. The link-layer address of the router

WHEN THE LEASE RUNS OUT

- What does the client do as the lease nears its expiration time?
- Send a new DHCP request when half the lease is left
- If no response, repeat again when one eighth of the lease is left

WHEN THE CLIENT GOES AWAY

- There is a DHCP Release message that the client can send when it is done with the lease

IN CLASS ACTIVITY

- ICA73