DHCP – Dynamic Host Configuration Protocol

Computer Networking: A Top-Down Approach

9th edition

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DHCP: Dynamic Host Configuration Protocol

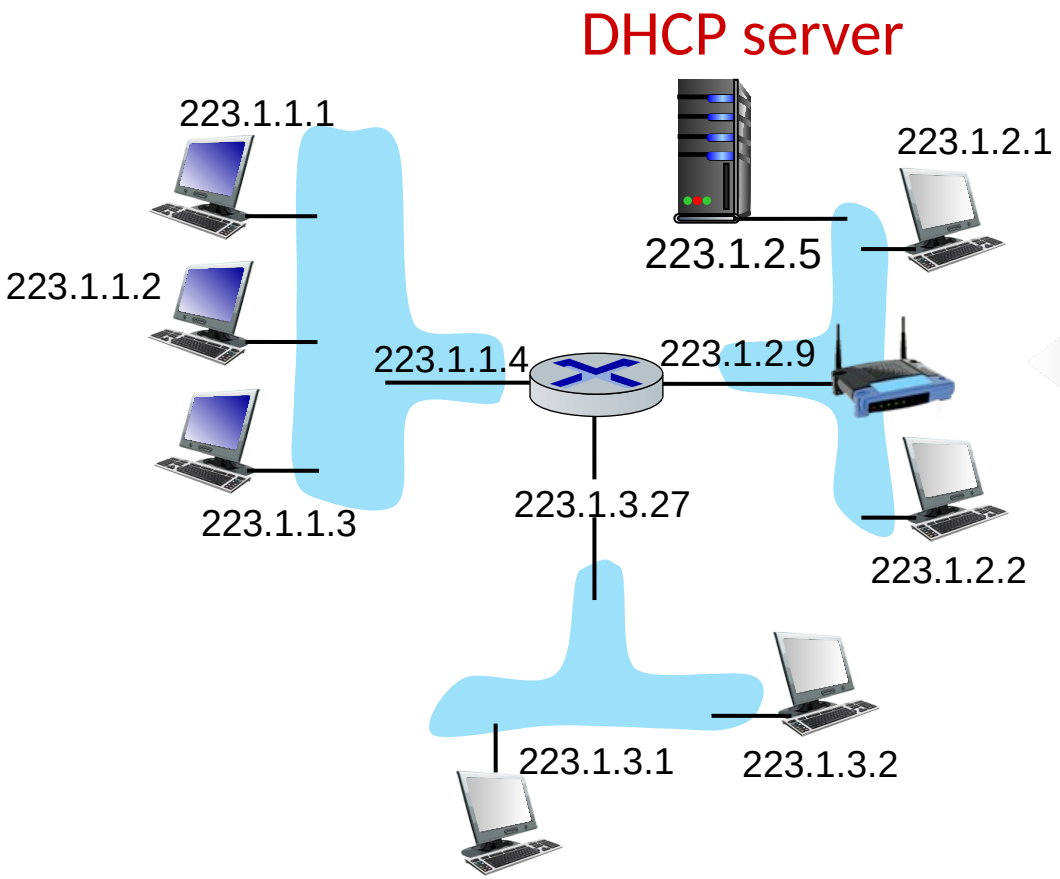
goal: host *dynamically* obtains IP address from network server when it "joins" network

- can renew its lease on address in use
- allows reuse of addresses (only hold address while connected/on)
- support for mobile users who join/leave network

DHCP overview:

- host broadcasts DHCP discover msg [optional]
- DHCP server responds with DHCP offer msg [optional]
- host requests IP address: DHCP request msg
- DHCP server sends address: DHCP ack msg

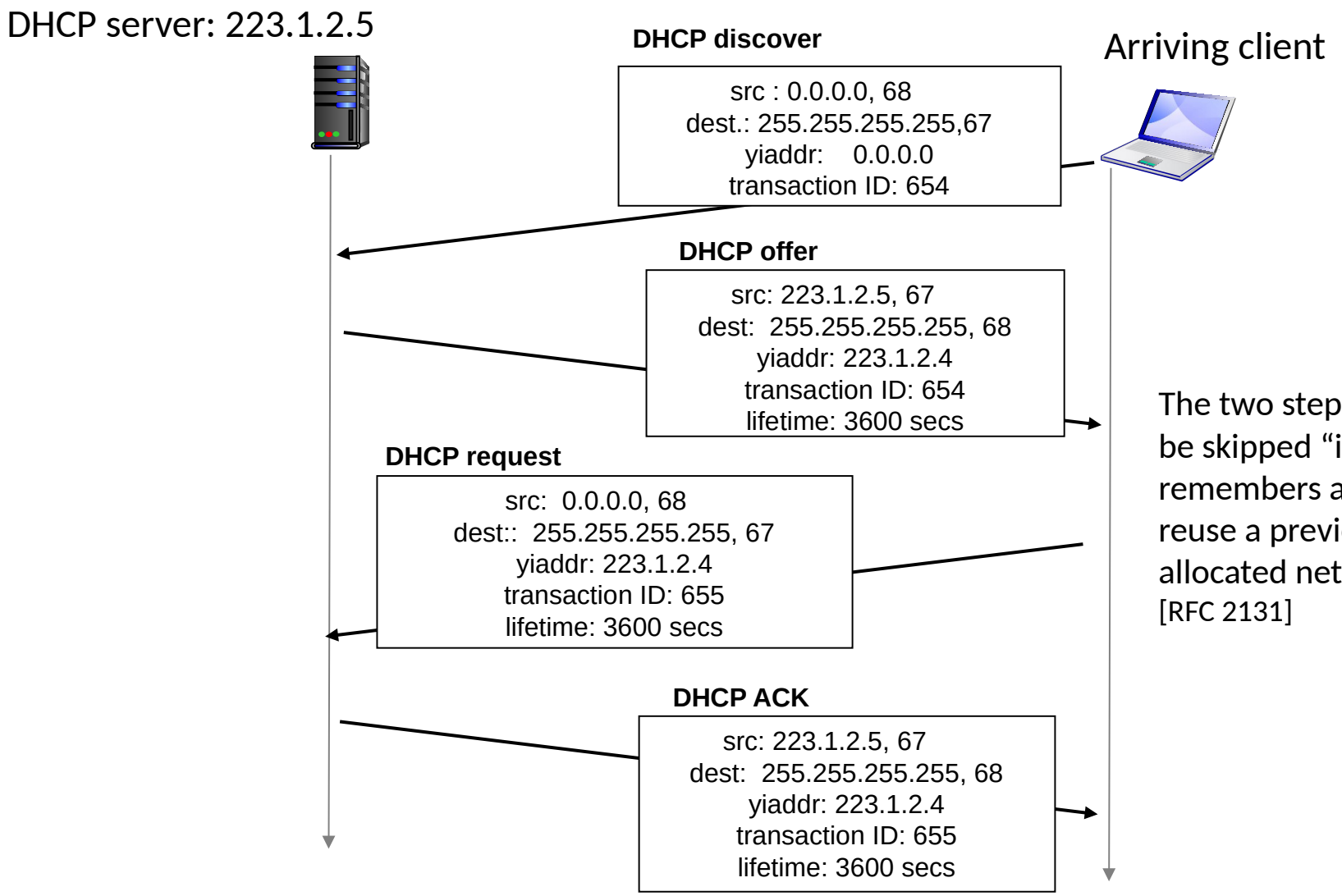
DHCP client-server scenario



Typically, DHCP server will be co-located in router, serving all subnets to which router is attached

arriving DHCP client needs address in this network

DHCP client-server scenario



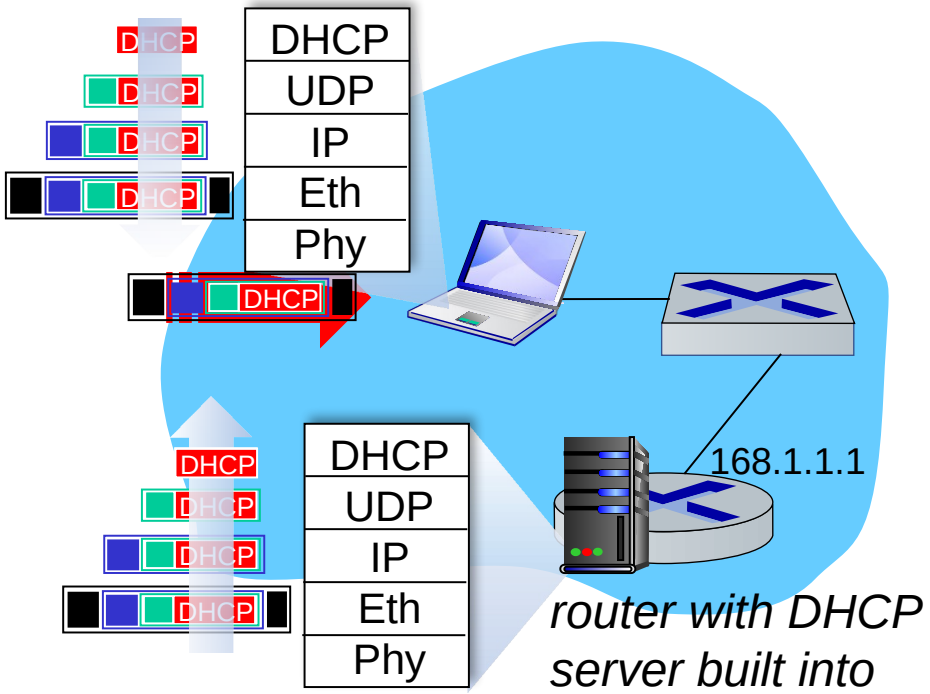
The two steps above can be skipped "if a client remembers and wishes to reuse a previously allocated network address" [RFC 2131]

DHCP: more than IP addresses

DHCP can return more than just allocated IP address on subnet:

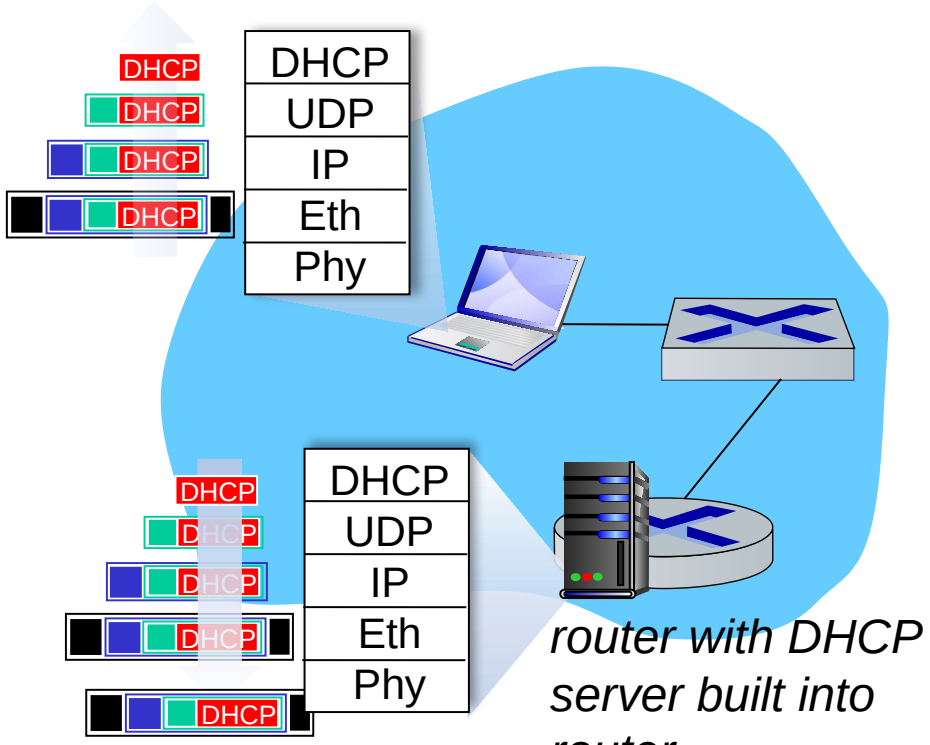
- address of first-hop router for client
- name and IP address of DNS sever
- network mask (indicating network versus host portion of address)

DHCP: example



- Connecting laptop will use DHCP to get IP address, address of first-hop router, address of DNS server.
- DHCP REQUEST message encapsulated in UDP, encapsulated in IP, encapsulated in Ethernet
- Ethernet frame broadcast (dest: FFFFFFFFFFFF) on LAN, received at router running DHCP server
- Ethernet de-mux'ed to IP de-mux'ed, UDP de-mux'ed to DHCP

DHCP: example



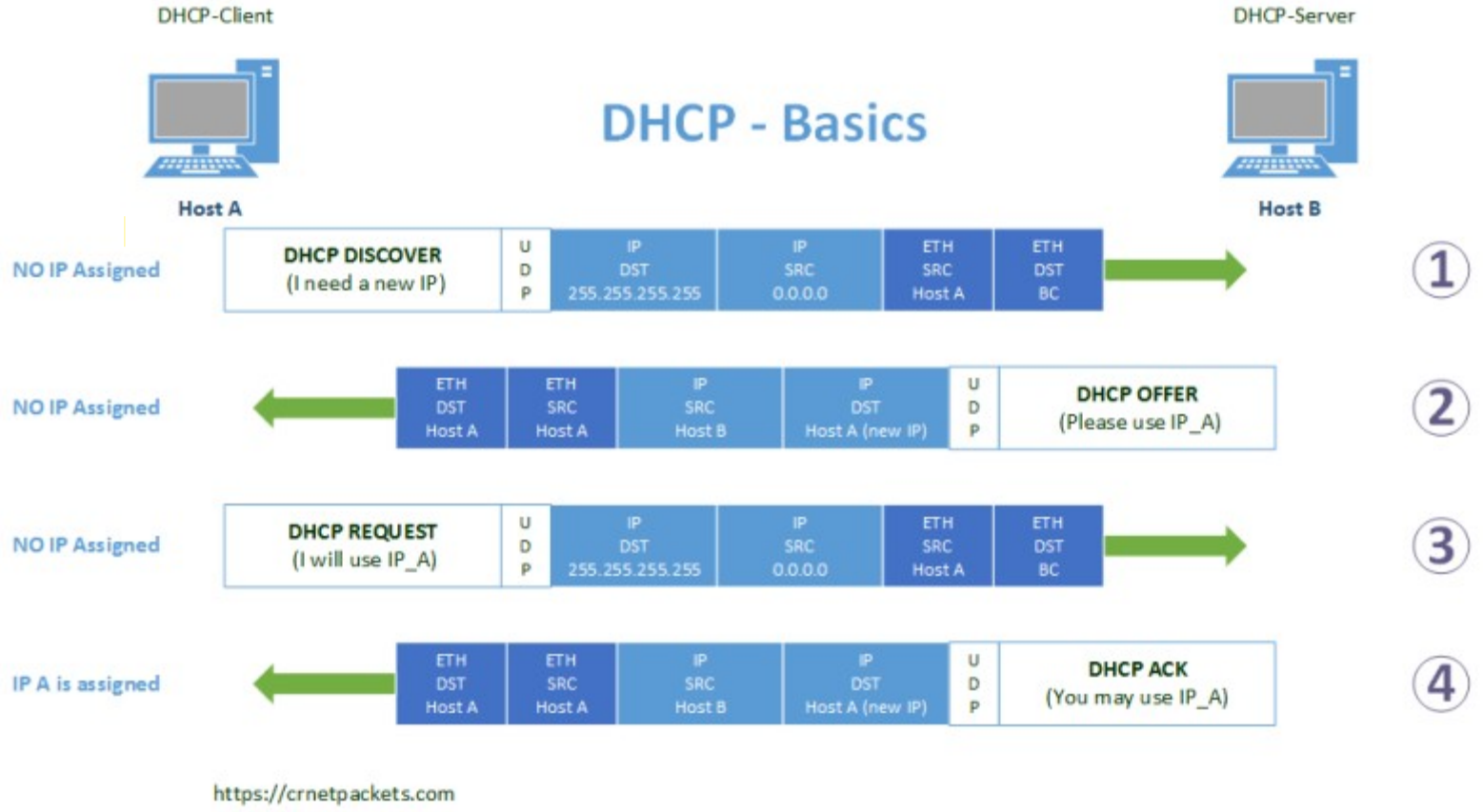
router with DHCP server built into router

- DCP server formulates DHCP ACK containing client's IP address, IP address of first-hop router for client, name & IP address of DNS server
- encapsulated DHCP server reply forwarded to client, de-muxing up to DHCP at client
- client now knows its IP address, name and IP address of DNS server, IP address of its first-hop router

DHCP: Which layer protocol?

- Not a Network layer protocol
- Why not?
- Is a Application layer protocol.
- Why it is a application layer protocol?
  - Defines message formats

DHCP: Layering



DHCP: Encapsulation

- A DHCP message is inside a UDP segment, which is inside an IP packet.
  - *Encapsulation layers:* The process follows the standard network model, with DHCP at the application layer.
    - DHCP messages are sent within a User Datagram Protocol (UDP) segment.
    - The UDP segment is then placed inside an Internet Protocol (IP) packet.
  - *Why this order:*
    - UDP: DHCP relies on UDP for speed rather than guaranteed delivery.
    - IP: The IP packet provides the source and destination IP addresses to route the message across networks.

DHCP: Encapsulation