

# DHCP - Dynamic Host Configuration Protocol

*Computer Networking: A  
Top-Down Approach*

9<sup>th</sup> edition

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# DHCP: Dynamic Host Configuration Protocol

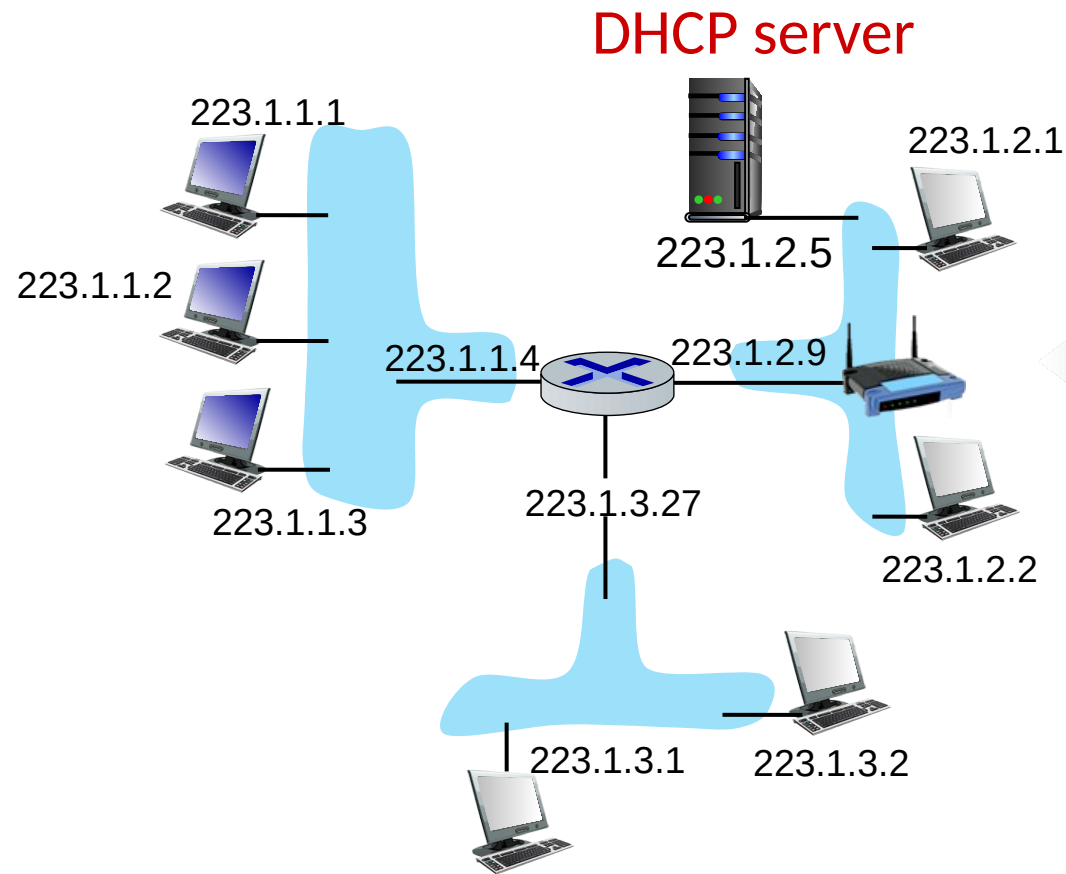
**goal:** host *dynamically* obtains IP address from network server when it “joins” network

- 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



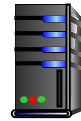
Typically, DHCP server will be co-located in router, serving all subnets to which router is attached



arriving **DHCP client** needs address in this network

# DHCP client-server scenario

DHCP server: 223.1.2.5



## DHCP discover

src : 0.0.0.0, 68  
dest.: 255.255.255.255, 67  
yiaddr: 0.0.0.0  
transaction ID: 654

Arriving client



## DHCP offer

src: 223.1.2.5, 67  
dest: 255.255.255.255, 68  
yiaddr: 223.1.2.4  
transaction ID: 654  
lifetime: 3600 secs

## DHCP request

src: 0.0.0.0, 68  
dest.: 255.255.255.255, 67  
yiaddr: 223.1.2.4  
transaction ID: 655  
lifetime: 3600 secs

## DHCP ACK

src: 223.1.2.5, 67  
dest: 255.255.255.255, 68  
yiaddr: 223.1.2.4  
transaction ID: 655  
lifetime: 3600 secs

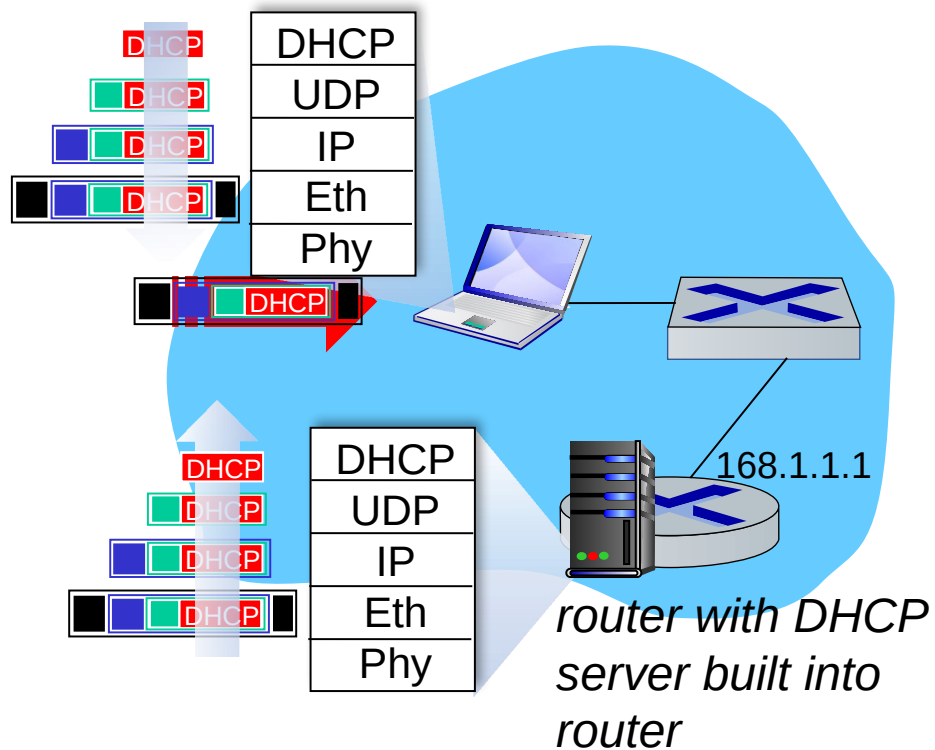
The two steps above can be skipped “if a client remembers and wishes to reuse a previously allocated network address” [RFC 2131]

# DHCP: more than IP addresses

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

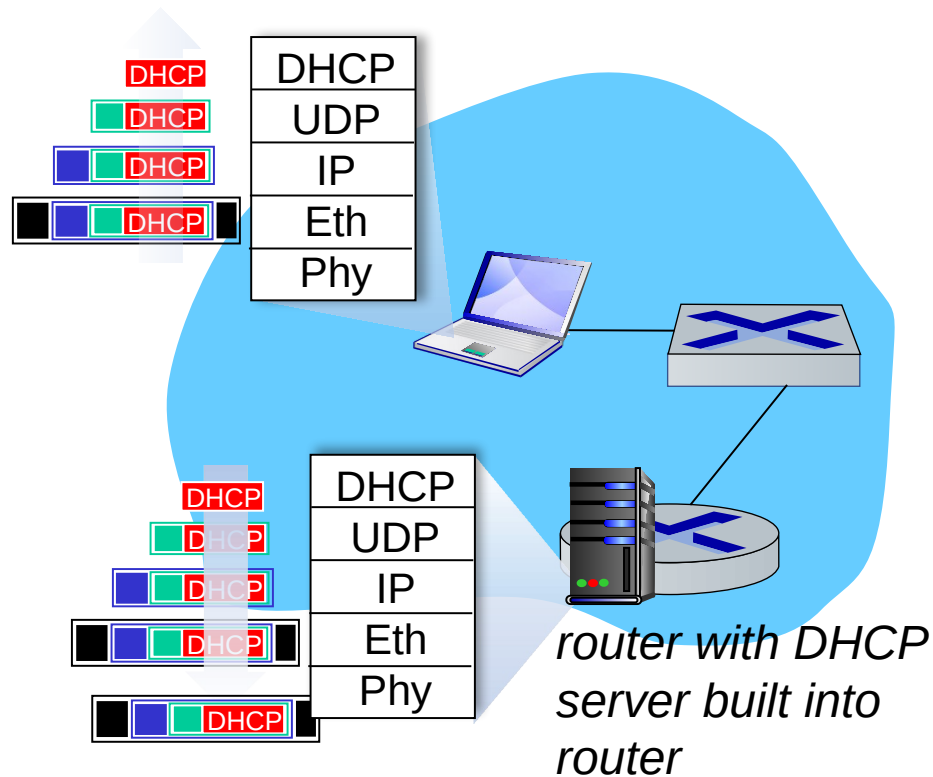
- address of first-hop router for client default gateway
- name and IP address of DNS sever
- network mask (indicating network versus host portion of address)

# 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: FFFFFFFF) 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



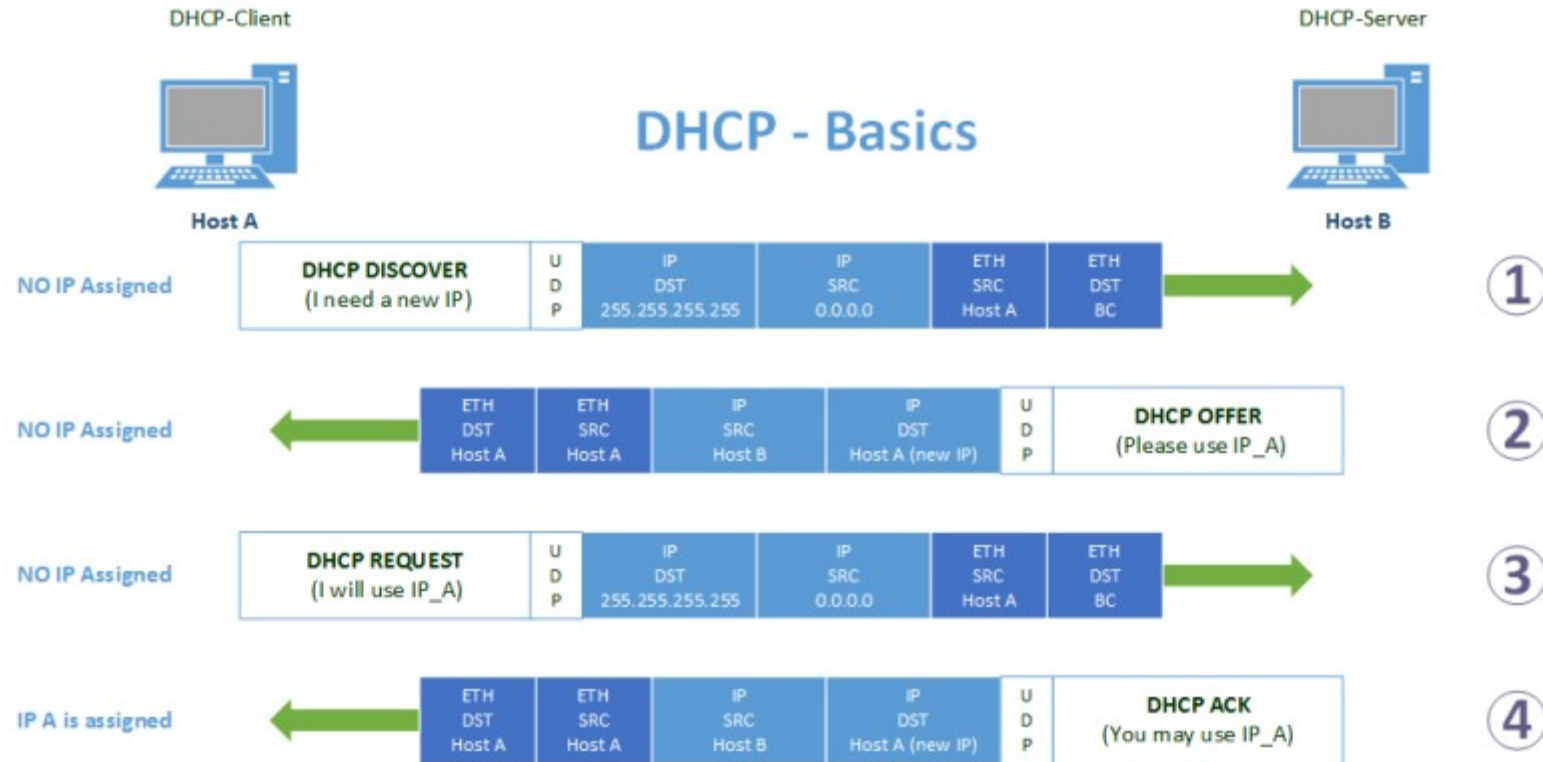
- DCP server formulates DHCP ACK containing client's IP address, IP address of first-hop router for client, name & IP address of DNS server
- encapsulated DHCP server reply forwarded to client, de-muxing up to DHCP at client
- client now knows its IP address, name and IP address of DNS server, IP address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



<https://crnetpackets.com>

# 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

