

Computer Networks

Helping IP with ARP, DHCP (§5.6.4)



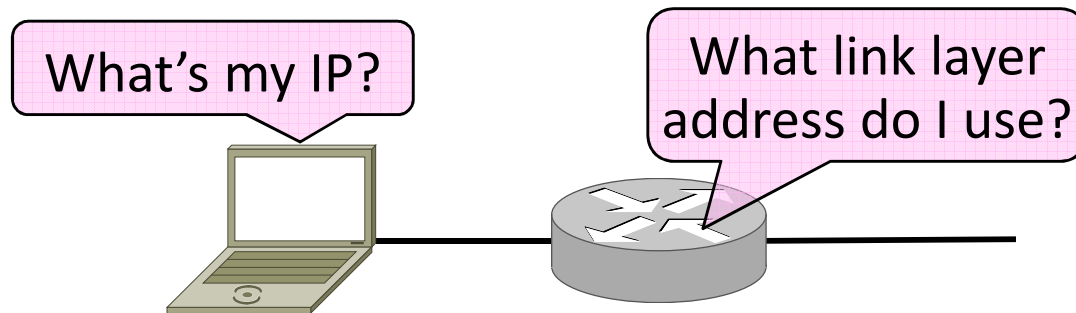
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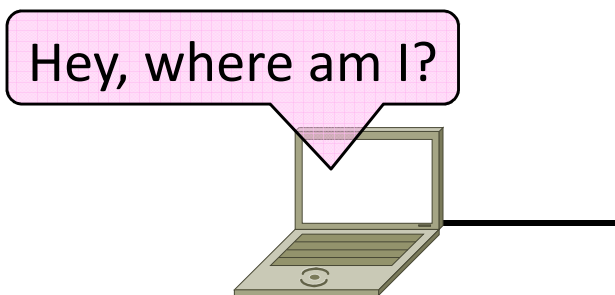
Topic

- Filling in the gaps we need to make for IP forwarding work in practice
 - Getting IP addresses (DHCP) »
 - Mapping IP to link addresses (ARP) »



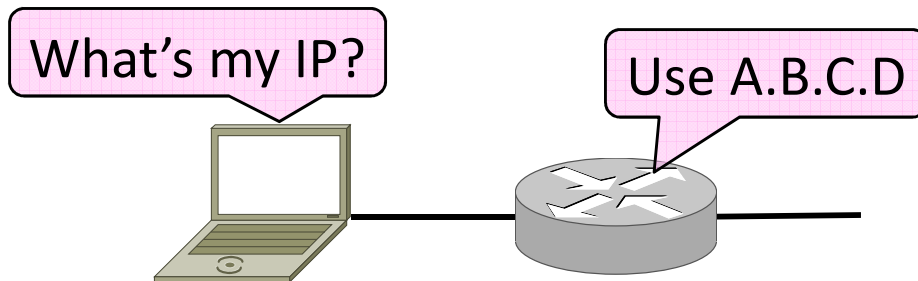
Getting IP Addresses

- Problem:
 - A node wakes up for the first time ...
 - What is its IP address? What's the IP address of its router? Etc.
 - At least Ethernet address is on NIC



Getting IP Addresses (2)

1. Manual configuration (old days)
 - Can't be factory set, depends on use
2. ~~A~~ A protocol for automatically configuring addresses (DHCP) »
 - Shifts burden from users to IT folk



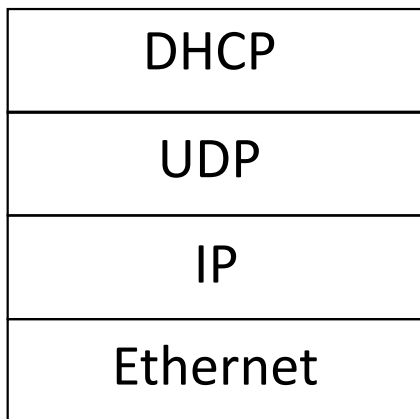
DHCP

- DHCP (Dynamic Host Configuration Protocol), from 1993, widely used

- It leases IP address to nodes
- Provides other parameters too
 - Network prefix
 - Address of local router
 - DNS server, time server, etc.

DHCP Protocol Stack

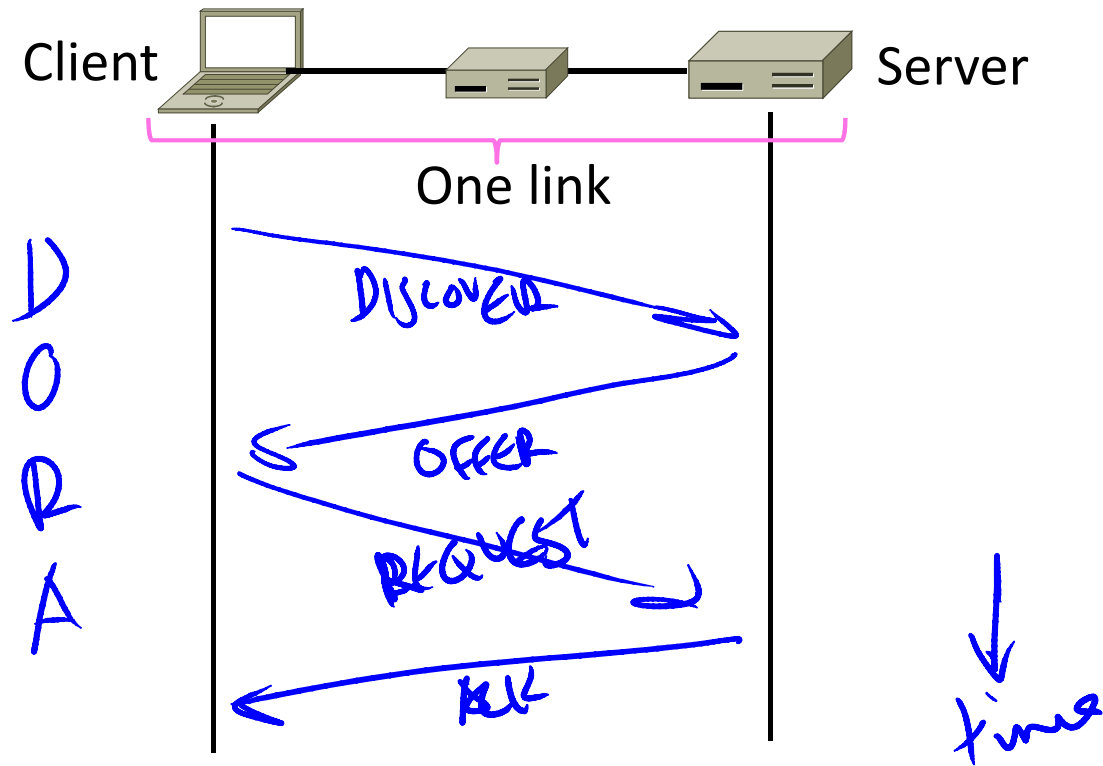
- DHCP is a client-server application
 - Uses UDP ports 67, 68



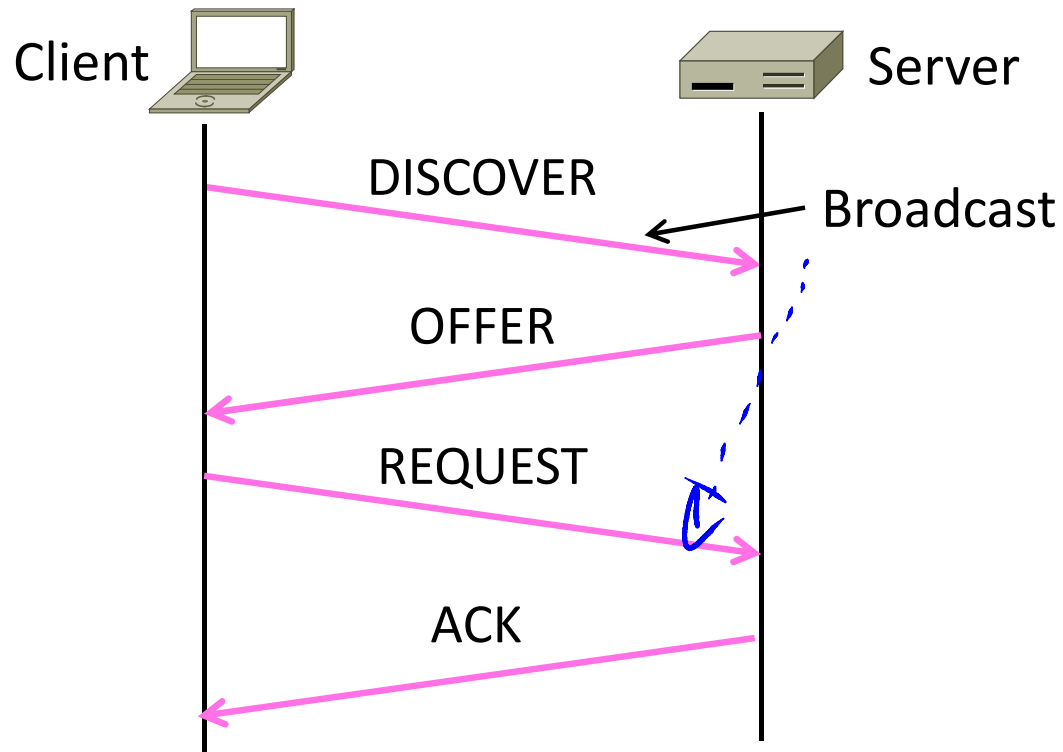
DHCP Addressing

- Bootstrap issue:
 - How does node send a message to DHCP server before it is configured?
- Answer:
 - Node sends broadcast messages that delivered to all nodes on the network
 - Broadcast address is all 1s
 - IP (32 bit): 255.255.255.255 ←
 - Ethernet (48 bit): ff:ff:ff:ff:ff:ff ↗

DHCP Messages



DHCP Messages (2)

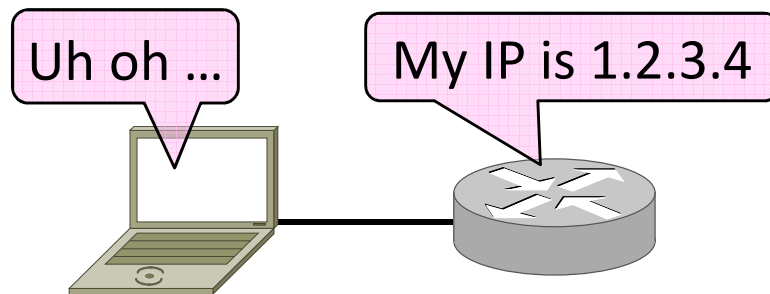


DHCP Messages (3)

- To renew an existing lease, an abbreviated sequence is used:
 - REQUEST, followed by ACK
- Protocol also supports replicated servers for reliability

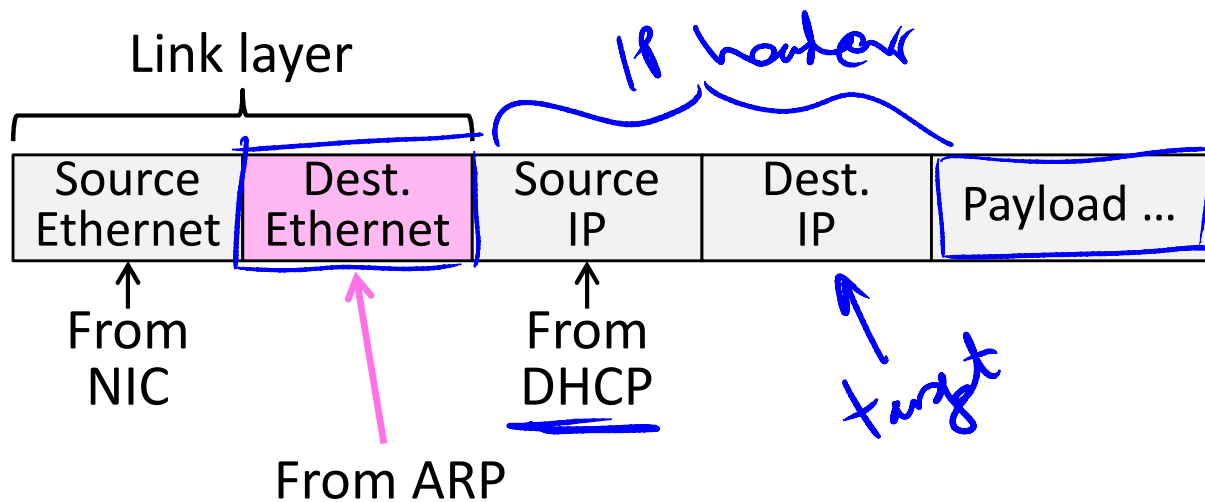
Sending an IP Packet

- Problem:
 - A node needs Link layer addresses to send a frame over the local link
 - How does it get the destination link address from a destination IP address?




ARP (Address Resolution Protocol)

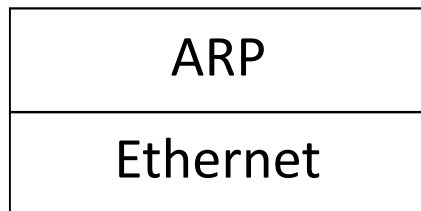
- Node uses to map a local IP address to its Link layer addresses



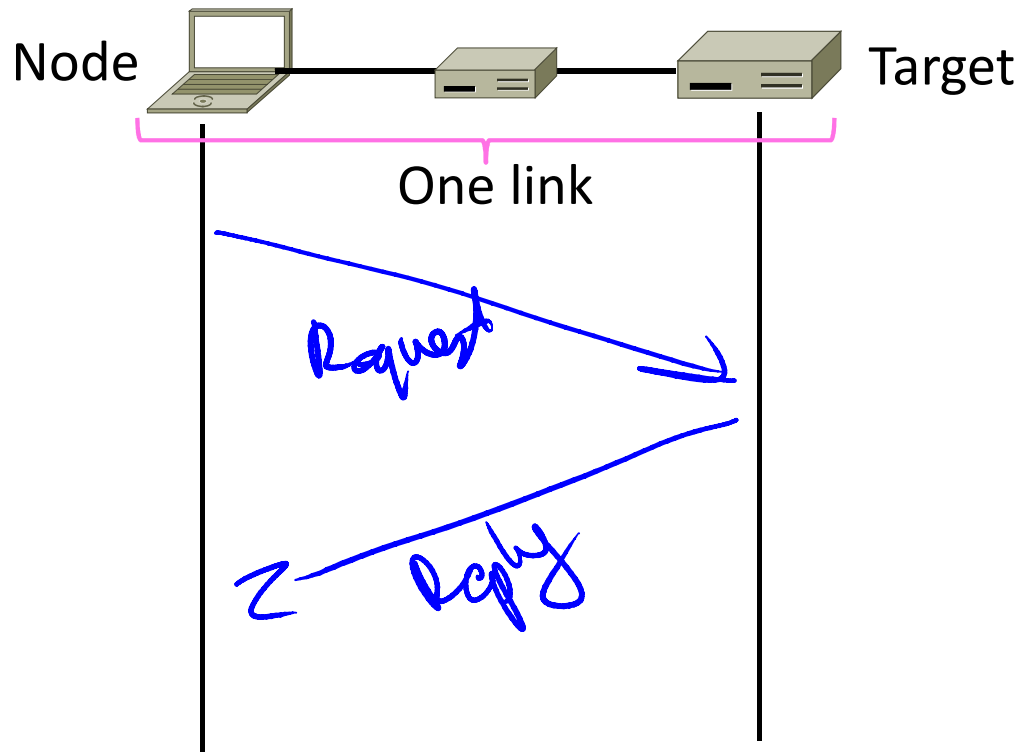
ARP Protocol Stack

Address Resolution Protocol

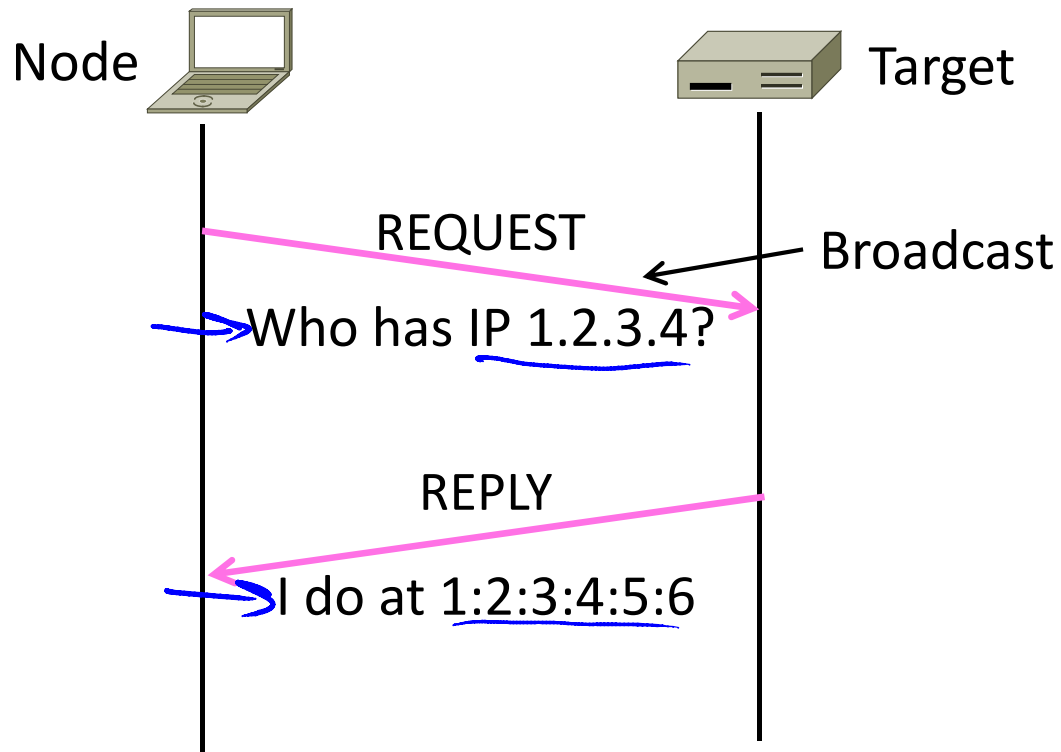
- ARP sits right on top of link layer
 - No servers, just asks node with target IP to identify itself 
 - Uses broadcast to reach all nodes




ARP Messages



ARP Messages (2)



Discovery Protocols

- Help nodes find each other
 - There are more of them!
 - E.g., zeroconf, Bonjour
-  Often involve broadcast
 - Since nodes aren't introduced
 - Very handy glue

END

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