

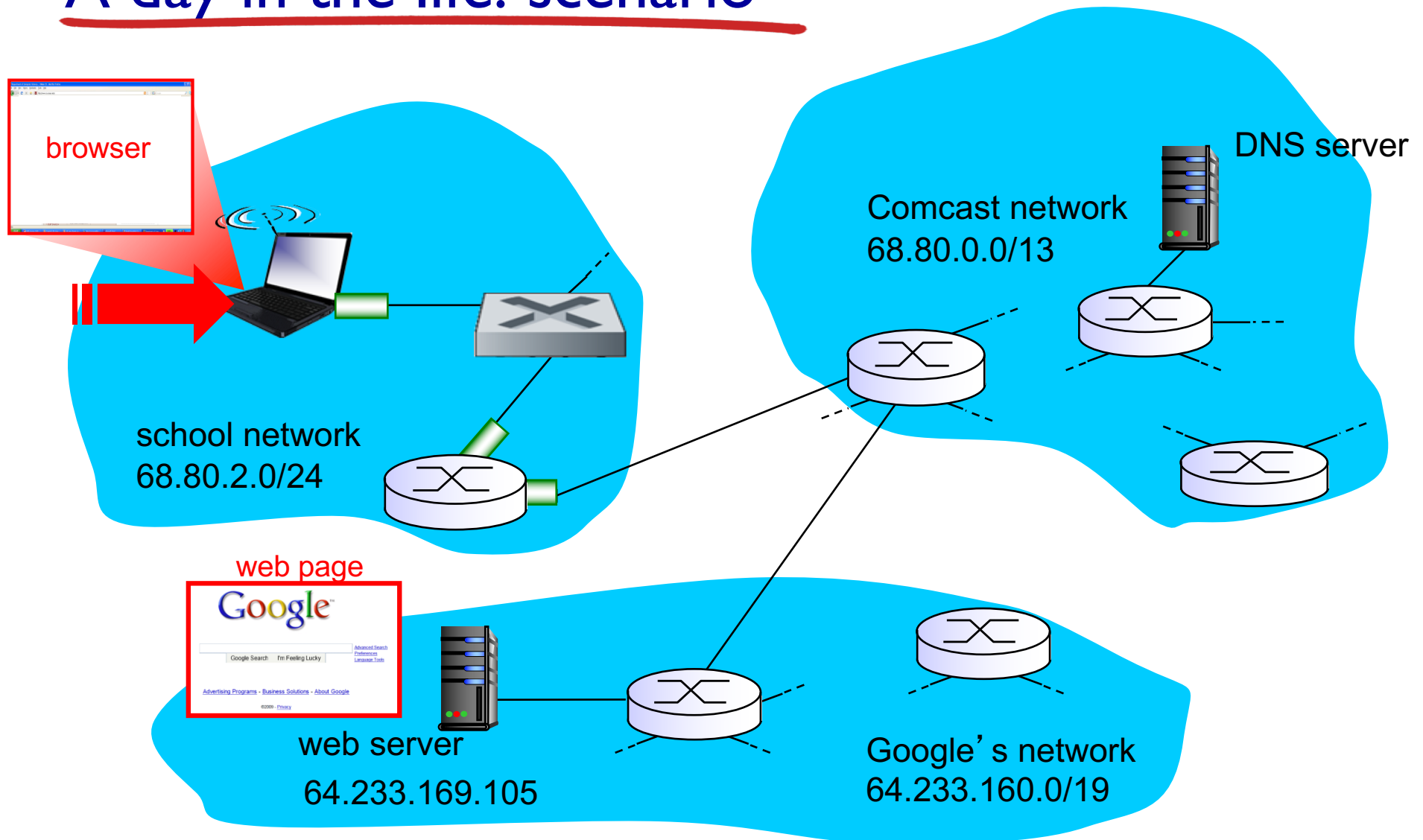
Link layer, LANs

6.7 a day in the life of a web request
- a wrapup of what we learnt in this course

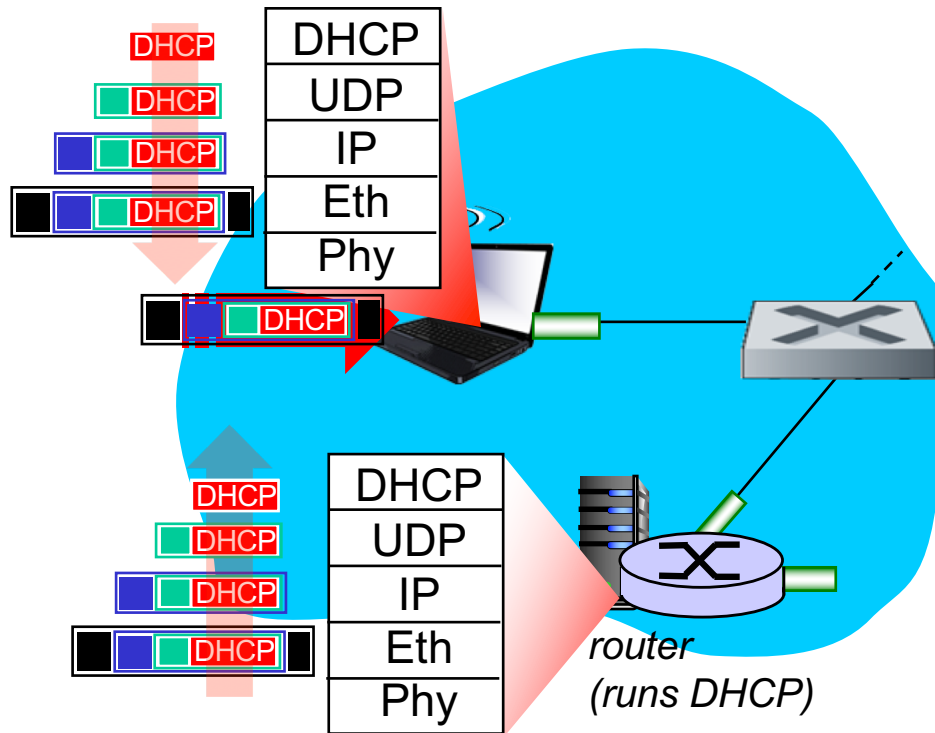
Synthesis: a day in the life of a web request

- ❖ journey down protocol stack complete!
 - application, transport, network, link
- ❖ putting-it-all-together: synthesis!
 - *goal*: identify, review, understand protocols (at all layers) involved in seemingly simple scenario: requesting www page
 - *scenario*: student attaches laptop to campus network, requests/receives `www.google.com`

A day in the life: scenario

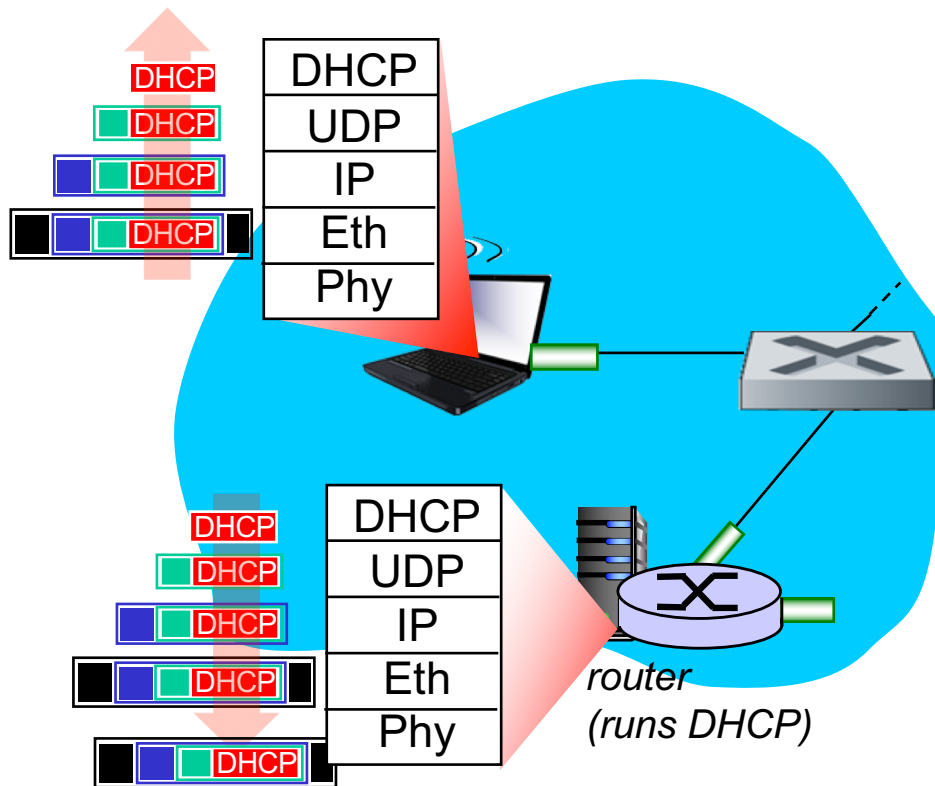


A day in the life... connecting to the Internet



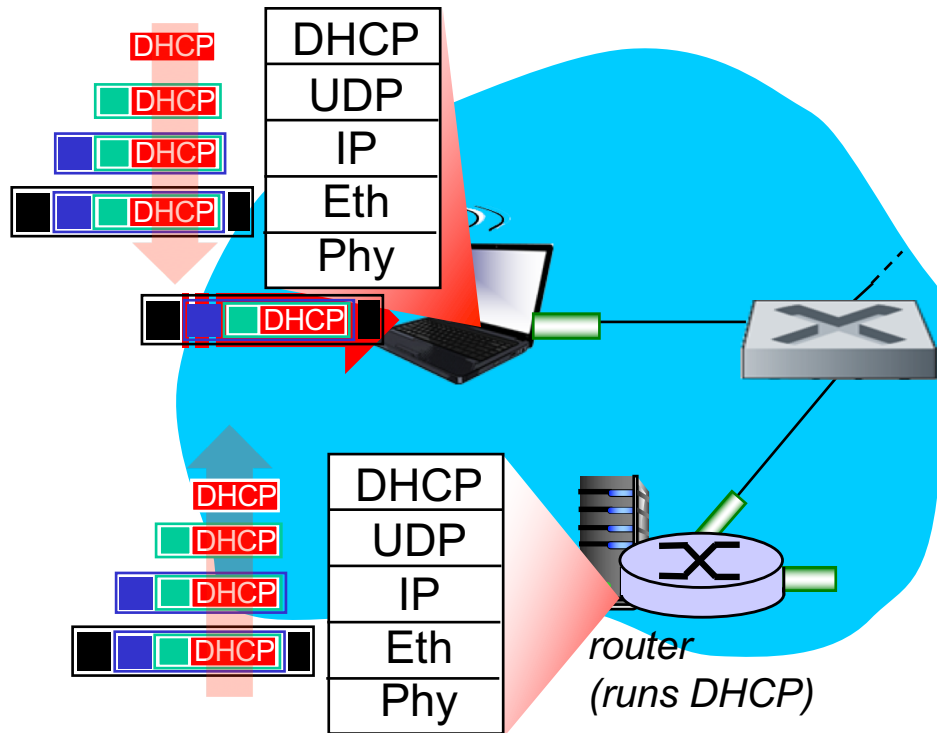
- ❖ connecting laptop needs to get its own IP address, addr of first-hop router, addr of DNS server: use **DHCP**
- ❖ DHCP **Discover** Message *encapsulated* in **UDP**, encapsulated in **IP**, encapsulated in **802.3** Ethernet
- ❖ Ethernet frame *broadcast* (dest: FFFFFFFFFFFFFFFF) on LAN, received at router running **DHCP** server
- ❖ Ethernet *demuxed* to IP demuxed, UDP demuxed to DHCP

A day in the life... connecting to the Internet



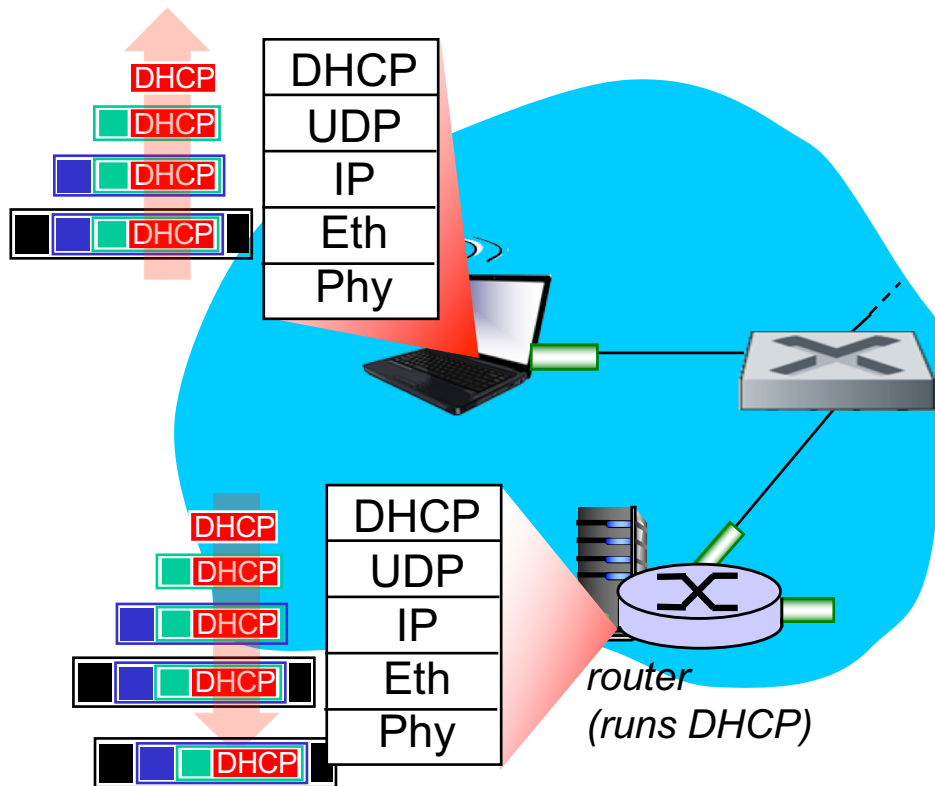
- ❖ DHCP server formulates *DHCP Offer* message containing client's IP address
- ❖ encapsulation at DHCP server, frame again broadcasted on LAN
- ❖ DHCP client receives DHCP Offer message

A day in the life... connecting to the Internet



- ❖ The client initiates DHCP **Request** message
- ❖ DHCP Request *encapsulated* in **UDP**, encapsulated in **IP**, encapsulated in **802.3** Ethernet
- ❖ Ethernet frame *broadcast* (dest: FFFFFFFFFFFFFFFF) on LAN, received at router running **DHCP** server
- ❖ Ethernet *demuxed* to IP demuxed, UDP demuxed to DHCP

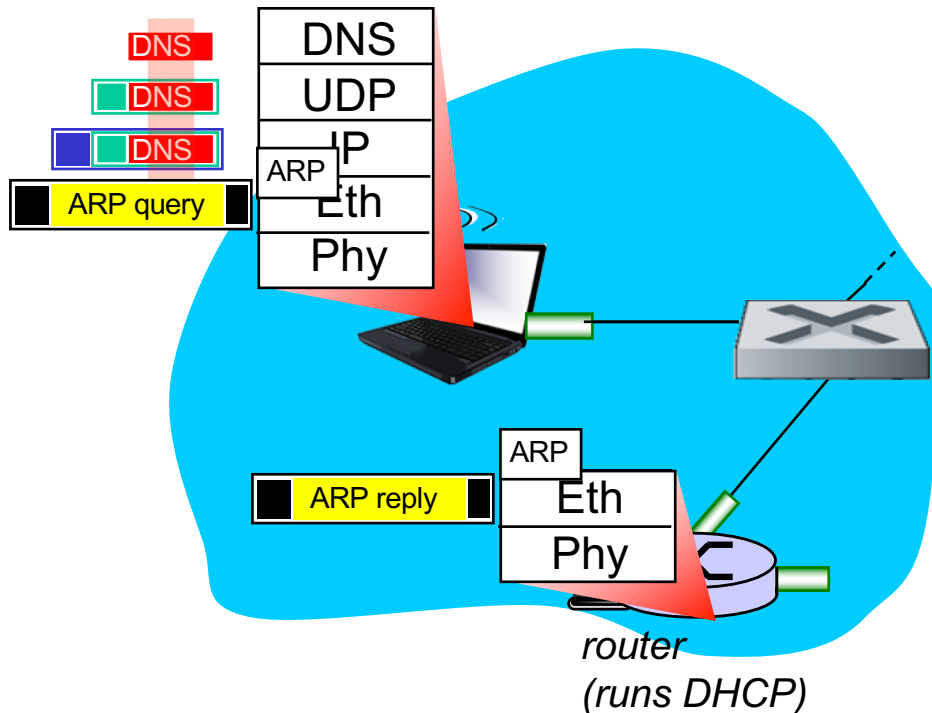
A day in the life... connecting to the Internet



- ❖ DHCP server formulates **DHCP ACK** containing client's IP address, IP address of first-hop router for client, name & IP address of DNS server
- ❖ encapsulation at DHCP server, frame broadcasted through LAN,
- ❖ DHCP client receives DHCP ACK reply

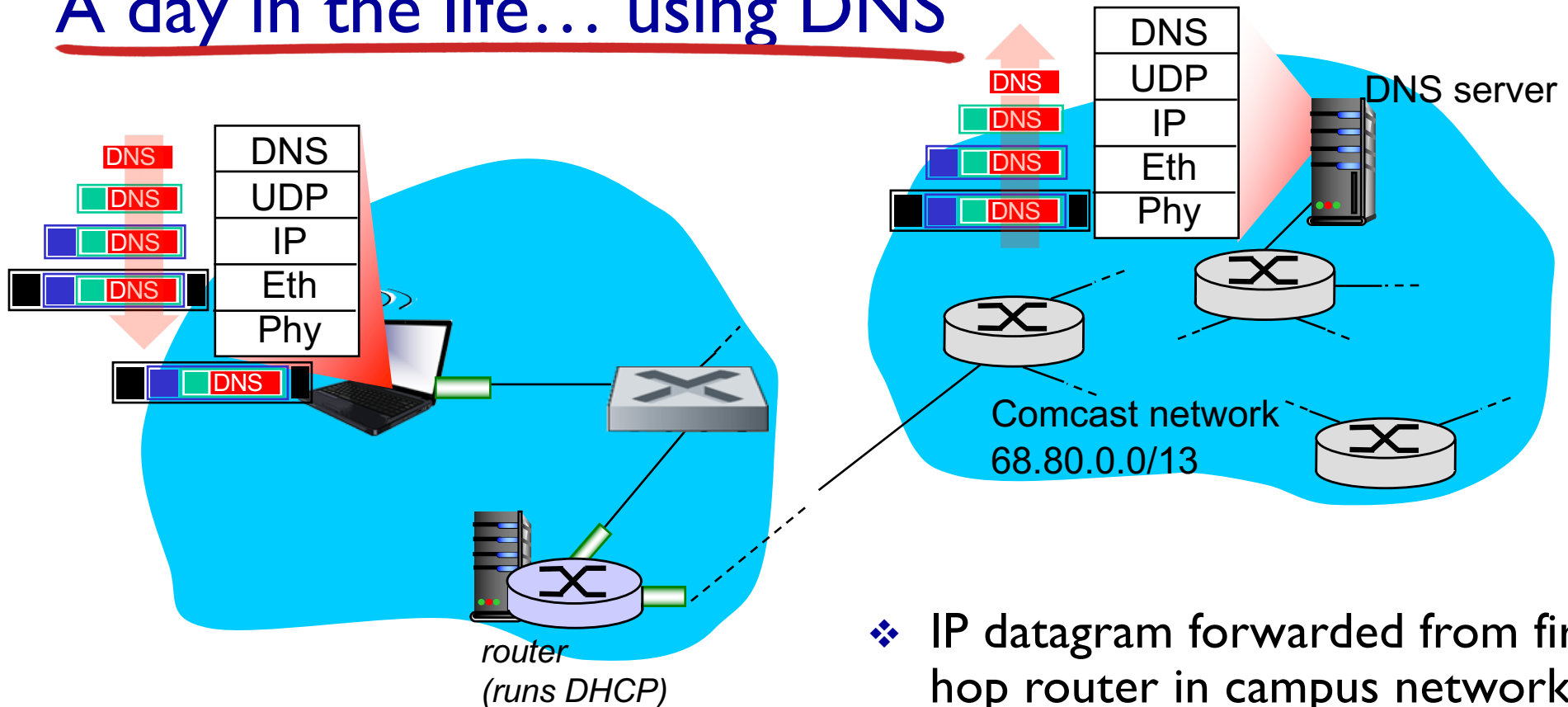
Client now has IP address, knows name & addr of DNS server, IP address of its first-hop router

A day in the life... ARP (before DNS, before HTTP)



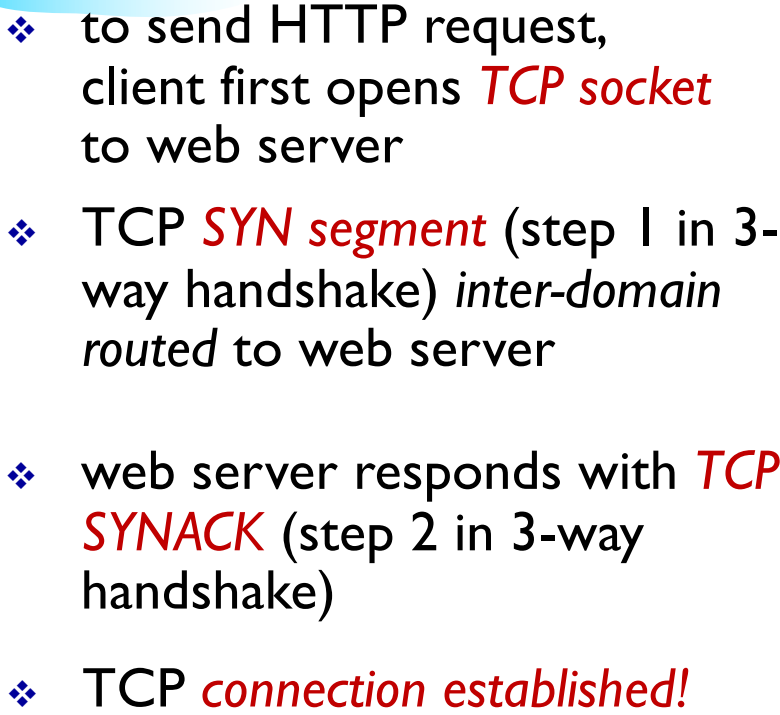
- ❖ before sending *HTTP* request, need IP address of `www.google.com`:
DNS
- ❖ DNS query created, encapsulated in UDP, encapsulated in IP, encapsulated in Eth. To send frame to DNS server, need MAC address of first hop router: *ARP*
- ❖ *ARP query* broadcast, received by router, which replies with *ARP reply* giving MAC address of router interface
- ❖ client now knows MAC address of first hop router, so can now send frame containing DNS query

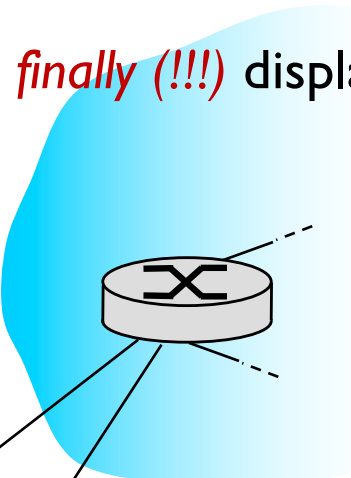
A day in the life... using DNS



- ❖ IP datagram containing DNS query forwarded via LAN switch from client to first hop router

- ❖ IP datagram forwarded from first hop router in campus network into comcast network, routed (tables created by *RIP*, *OSPF*, *IS-IS* and/or *BGP* routing protocols) to DNS server
- ❖ demux'ed to DNS server
- ❖ DNS server replies to client with IP address of www.google.com





- ❖ *HTTP request* sent into TCP socket