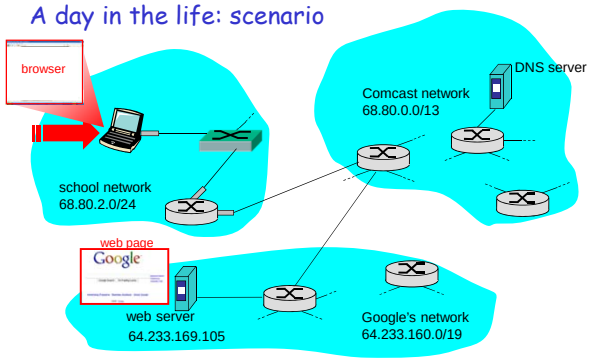
A day in the life of a Web request

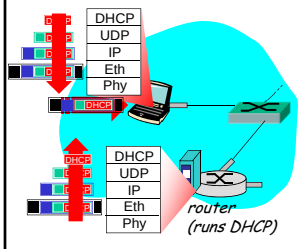
Synthesis: a day in the life of a web request

- 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

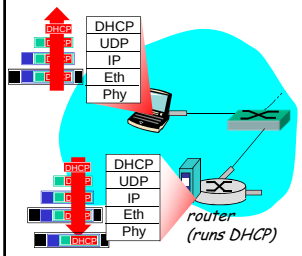


A day in the life… connecting to the Internet



- connecting laptop needs to get its own IP address, addr of first-hop router, addr of DNS server: use ***DHCP***
- DHCP request ***encapsulated*** in ***UDP***, encapsulated in ***IP***, encapsulated in ***802.1*** Ethernet
- Ethernet frame ***broadcast*** (dest: FFFFFFFFFFFF) on LAN, received at router running ***DHCP*** server
- Ethernet ***demux'ed*** to IP demux'ed, UDP demux'ed to DHCP

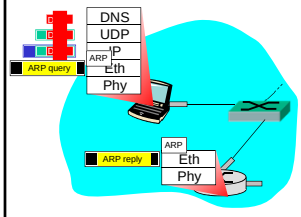
A day in the life… connecting to the Internet



- 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 forwarded (***switch learning***) through LAN, demultiplexing at client
- DHCP client receives DHCP ACK reply

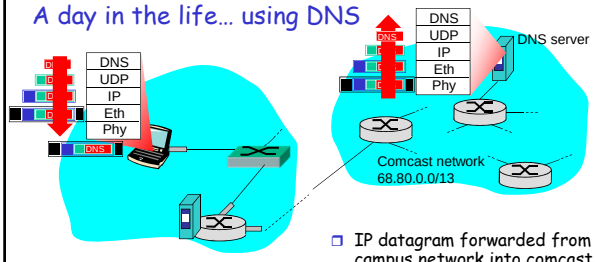
Client now has IP address, knows name & addr of DNS server, IP address of its first-hop router

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



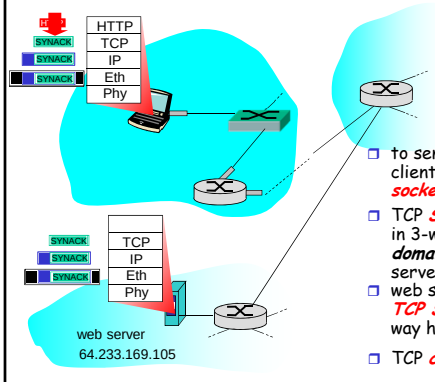
- before sending ***HTTP*** request, need IP address of www.google.com: ***DNS***
- DNS query created, encapsulated in UDP, encapsulated in IP, encasulated in Eth. In order to send frame to router, need MAC address of router interface: ***ARP***
- ***ARP query*** broadcast, received by router, which 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



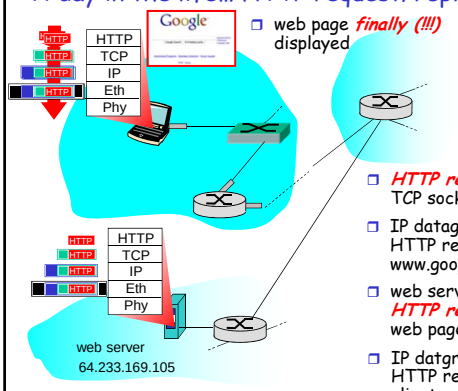
- IP datagram containing DNS query forwarded via LAN switch from client to 1st hop router
- IP datagram forwarded from campus network into comcast network, routed (tables created by ***RIP, OSPF, IS-IS*** and/or ***BGP*** routing protocols) to DNS server
- demux'ed to DNS server
- DNS server replies to client with IP address of www.google.com

A day in the life… TCP connection carrying HTTP



- to send HTTP request, client first opens ***TCP socket*** to web server
- TCP ***SYN segment*** (step 1 in 3-way handshake) ***inter-domain routed*** to web server
- web server responds with ***TCP SYNACK*** (step 2 in 3-way handshake)
- TCP ***connection established!***

A day in the life… HTTP request/reply



- web page *finally (!!!)* displayed

- *HTTP request* sent into TCP socket
- IP datagram containing HTTP request routed to www.google.com
- web server responds with *HTTP reply* (containing web page)
- IP datgram containing HTTP reply routed back to client