**A day in the life of a web request**

***Scenario:* student attaches laptop to campus network, requests/receives www.google.com**

1. connecting laptop needs to get its own IP address, addr of first-hop router, addr of DNS server: use *DHCP*
2. DHCP request *encapsulated* in *UDP*, encapsulated in *IP*, encapsulated in *802.3* Ethernet
3. Ethernet frame *broadcast* (dest: FFFFFFFFFFFF) on LAN, received at router running *DHCP* server
4. Ethernet *demuxed* to IP demuxed, UDP demuxed to DHCP
5. DHCP server formulates *DHCP ACK* containing client’s IP address, IP address of first-hop router for client, name & IP address of DNS server
6. encapsulation at DHCP server, frame forwarded (*switch learning*) through LAN, demultiplexing at client
7. DHCP client receives DHCP ACK reply
8. “*Client now has IP address, knows name & addr of DNS server, IP address of its first-hop router”*
9. before sending *HTTP*request, need IP address of www.google.com: *DNS*
10. DNS query created, encapsulated in UDP, encapsulated in IP, encapsulated in Eth. To send frame to router, need MAC address of router interface: *ARP*
11. *ARP query* broadcast, received by router, which replies with *ARP reply* giving MAC address of router interface
12. “client now knows MAC address of first hop router, so can now send frame containing DNS query”
13. IP datagram containing DNS query forwarded via LAN switch from client to 1st hop router
14. 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
15. demux’ed to DNS server
16. DNS server replies to client with IP address of www.google.com
17. to send HTTP request, client first opens *TCP socket* to web server
18. TCP *SYN segment* (step 1 in 3-way handshake) *inter-domain routed* to web server
19. web server responds with *TCP SYNACK* (step 2 in 3-way handshake)
20. “TCP *connection established!”*
21. *HTTP request* sent into TCP socket
22. IP datagram containing HTTP request routed to [www.google.com](http://www.google.com)
23. web server responds with *HTTP reply* (containing web page)
24. IP datagram containing HTTP reply routed back to client