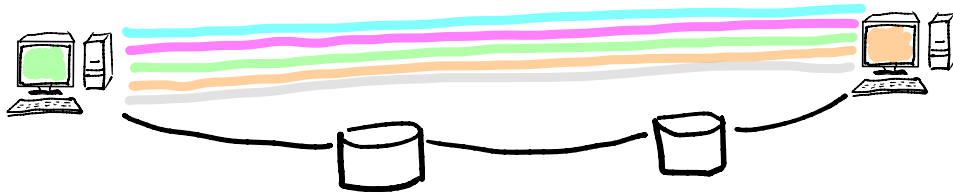


Lecture 2

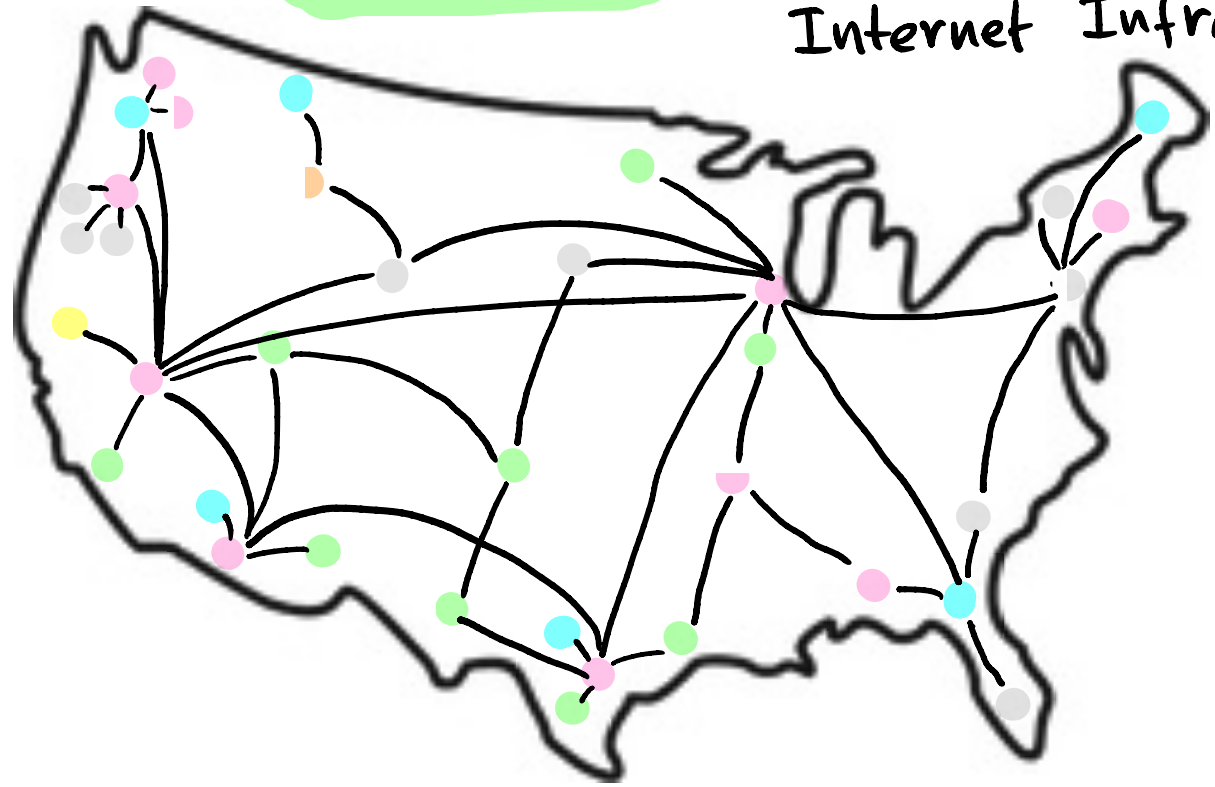
Internet as a service



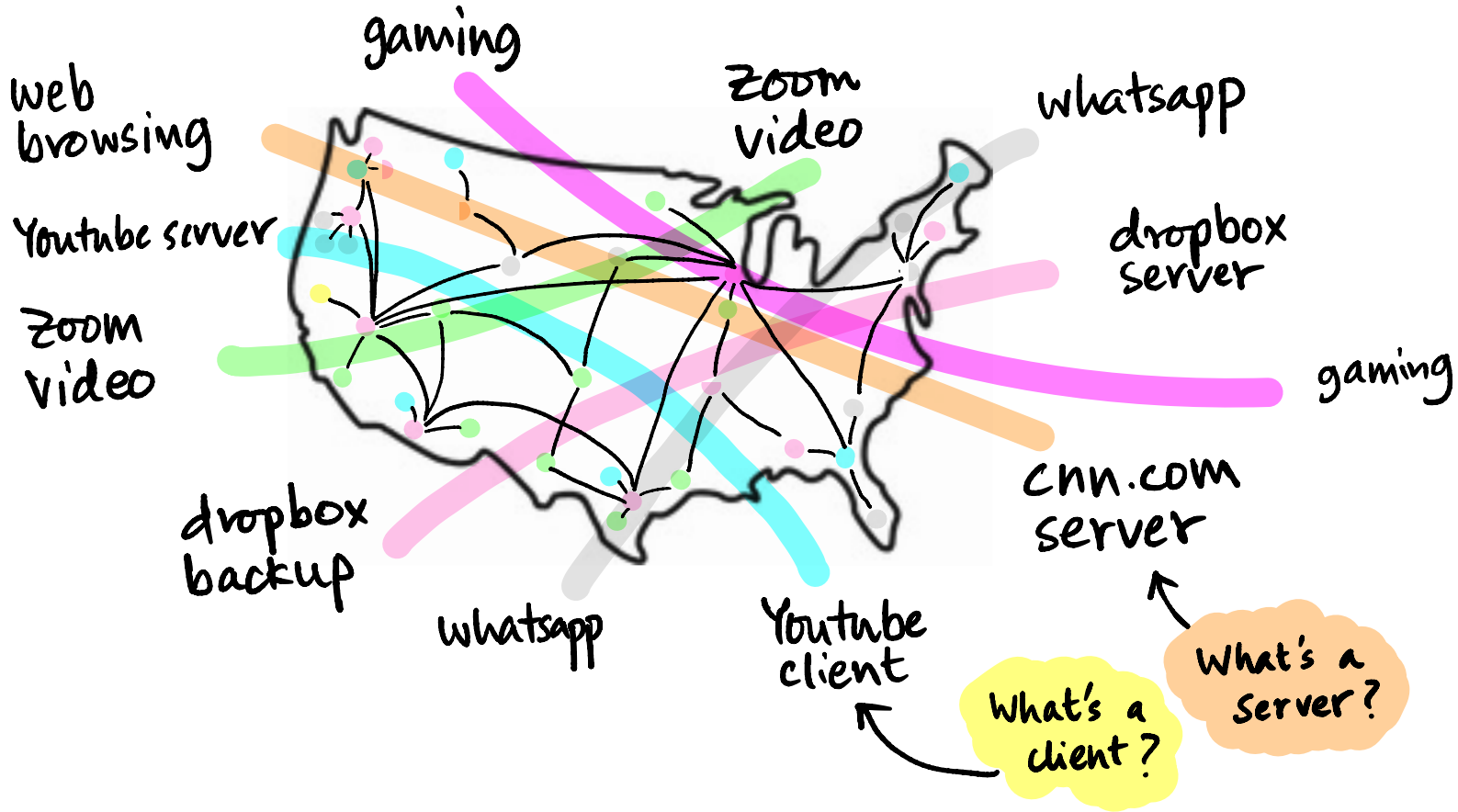
The airports are ready, and flights can link them

Now what?

Internet Infrastructure



Applications running on the "edge"



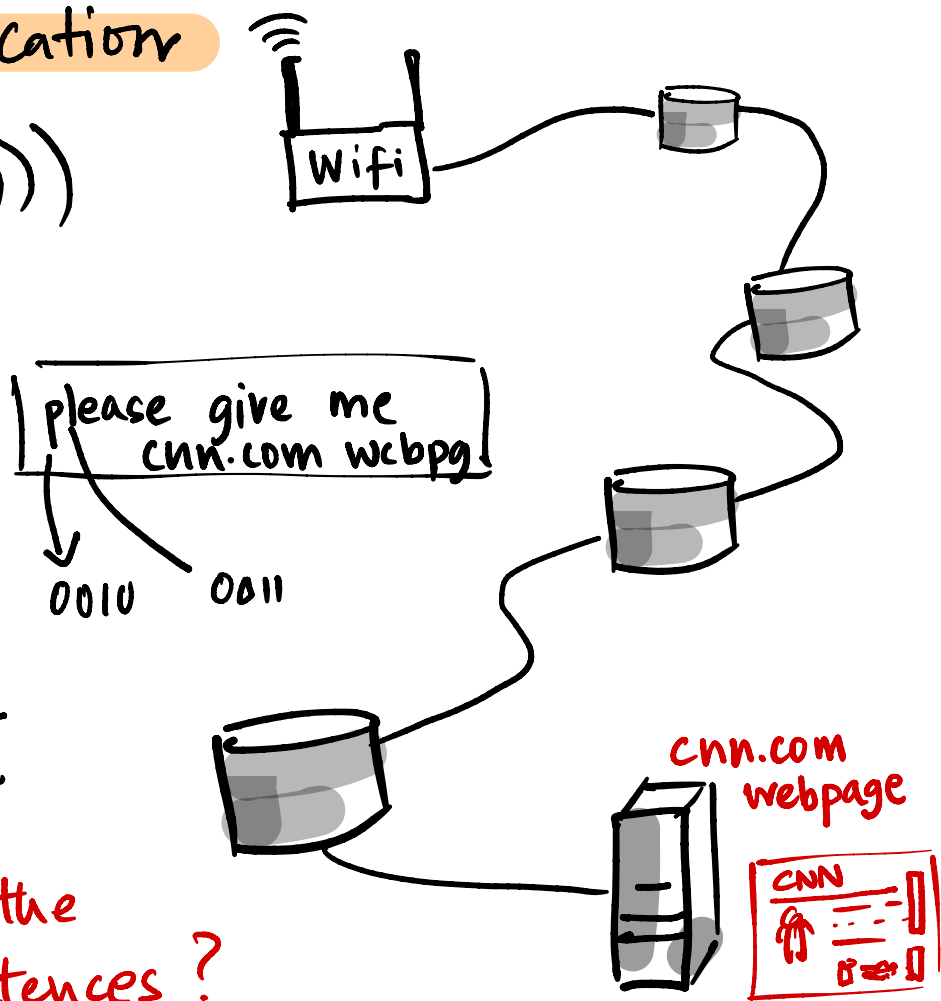
Web Browsing application



Software inside laptop

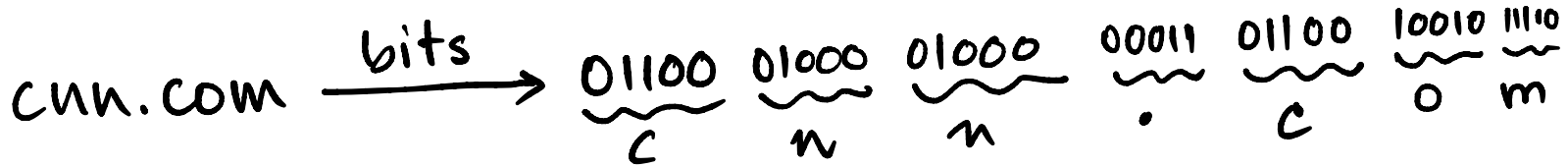
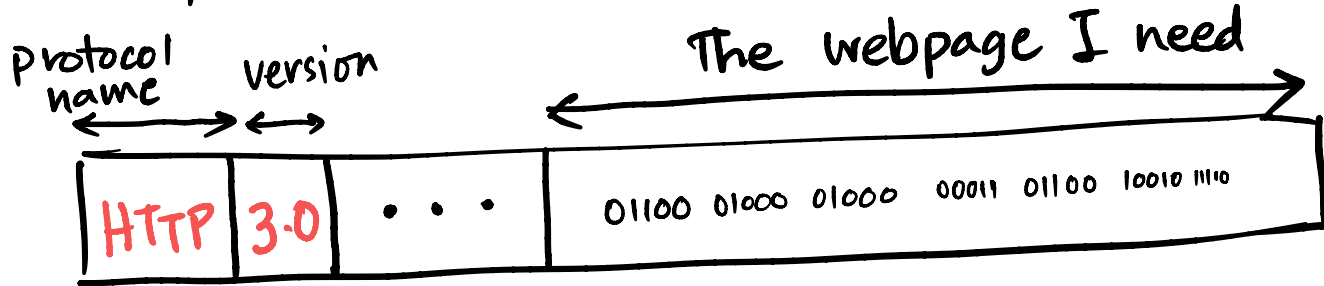
step 1: Create a data packet

wait!! what's inside the packet? English sentences?



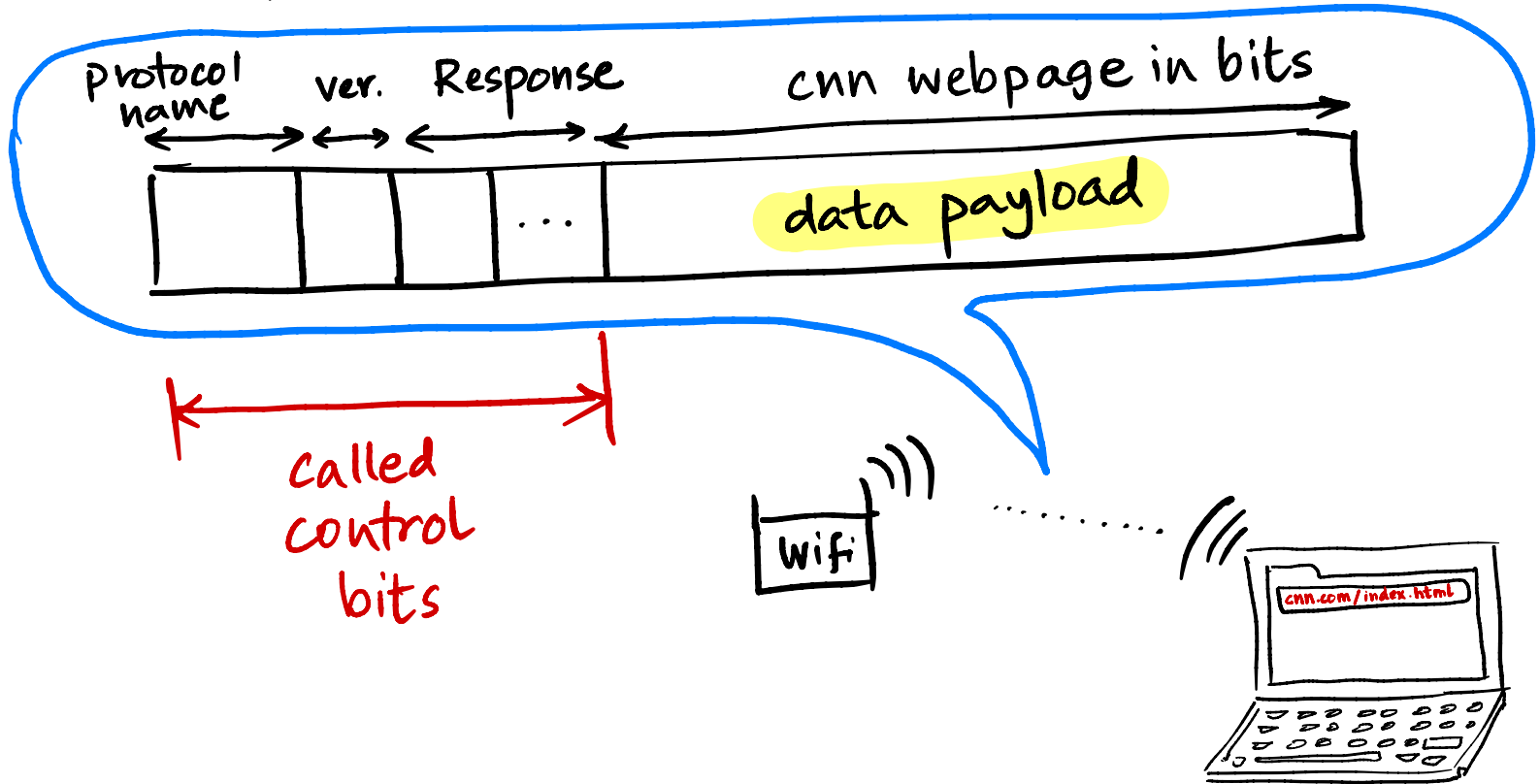
Protocols : HTTP

Data packet : sequence of bits

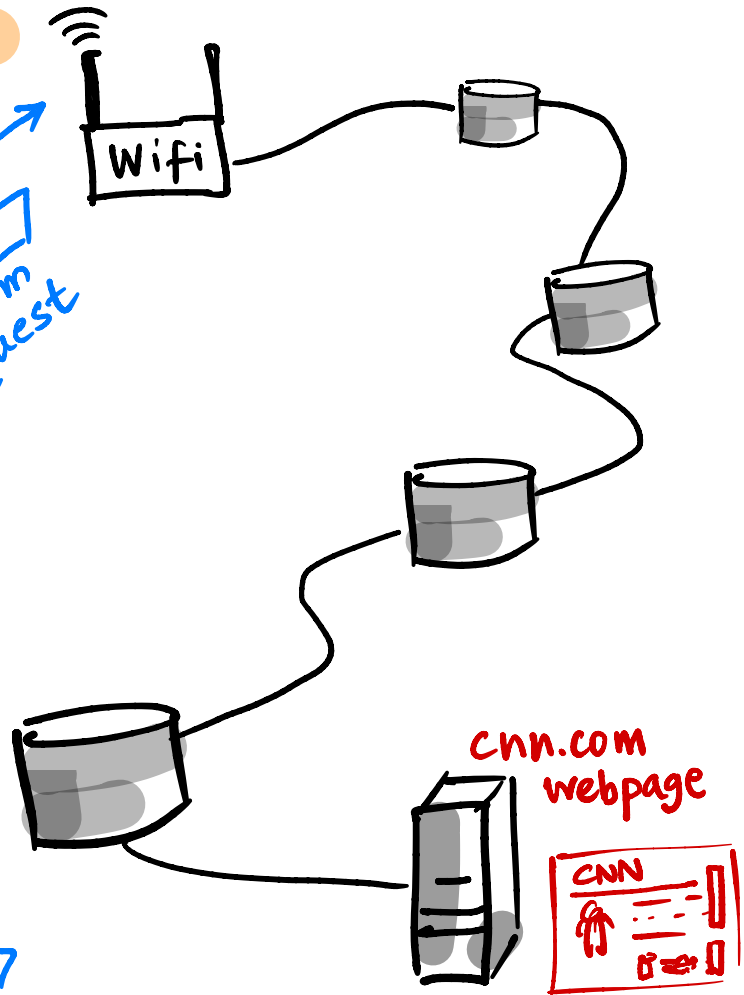
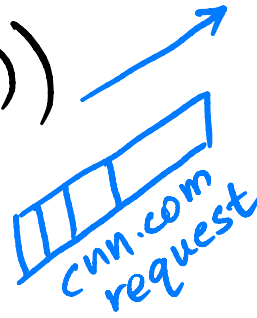
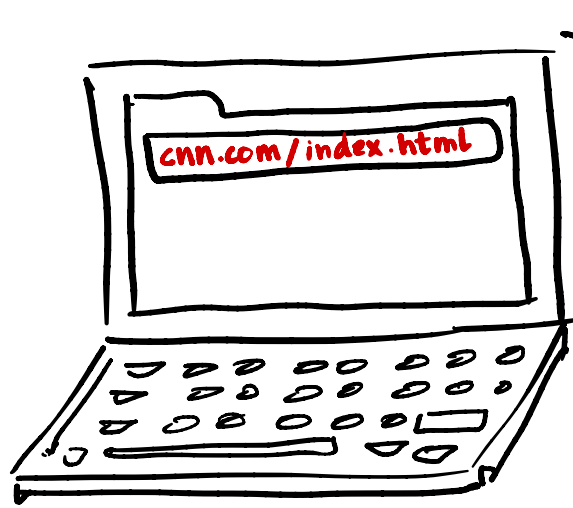


Protocols : HTTP

When packet comes back from cnn.com server



Web Browsing application



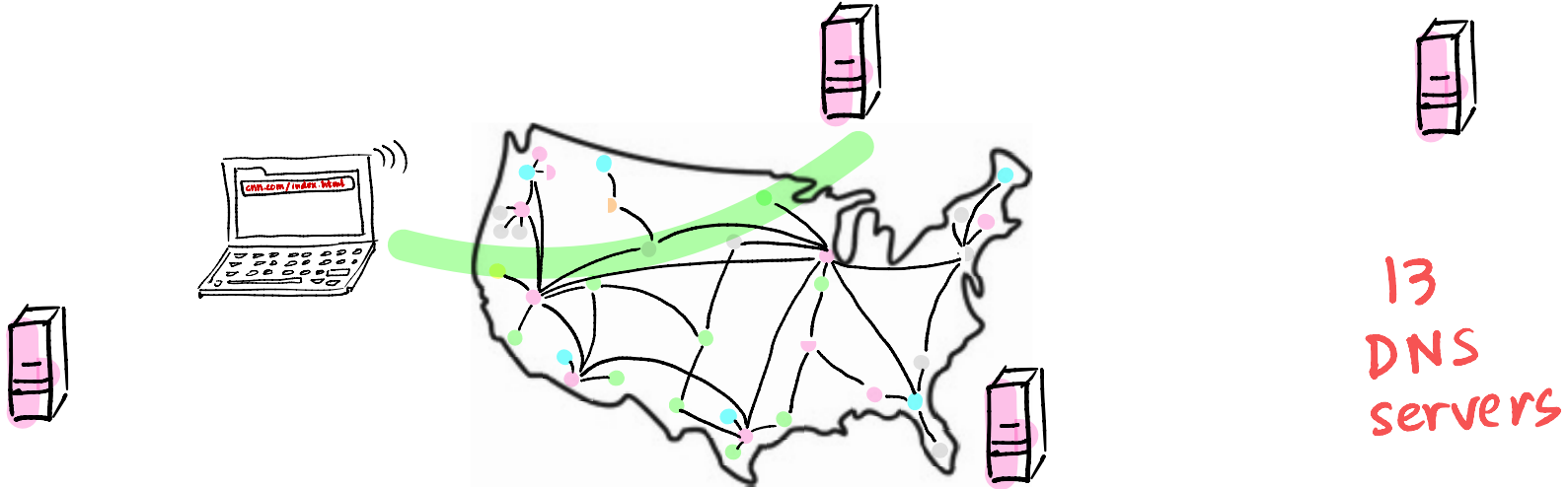
Software inside laptop

Step 1: Create a data packet

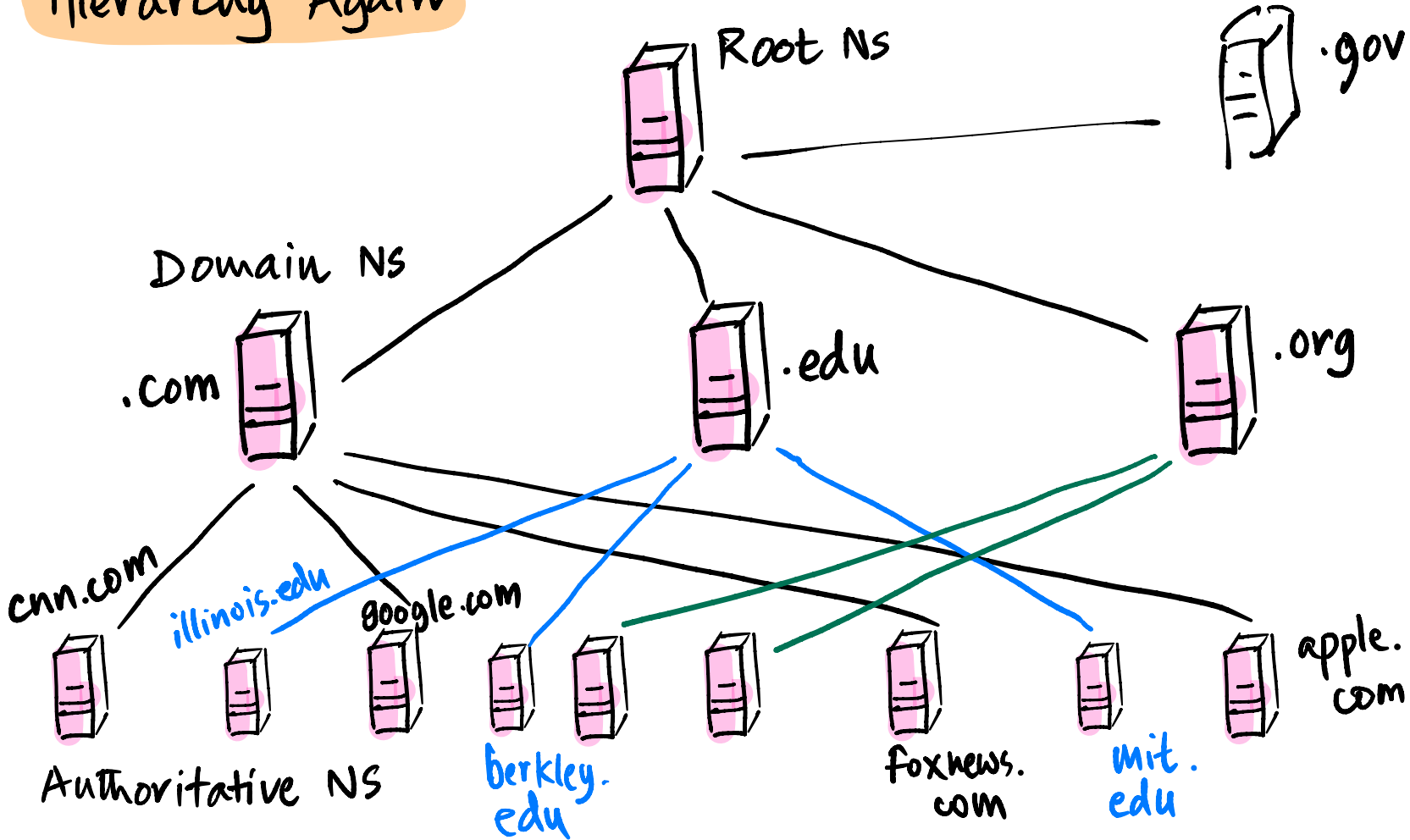
Step 2: But what is the destination address?

Domain Name Service (DNS)

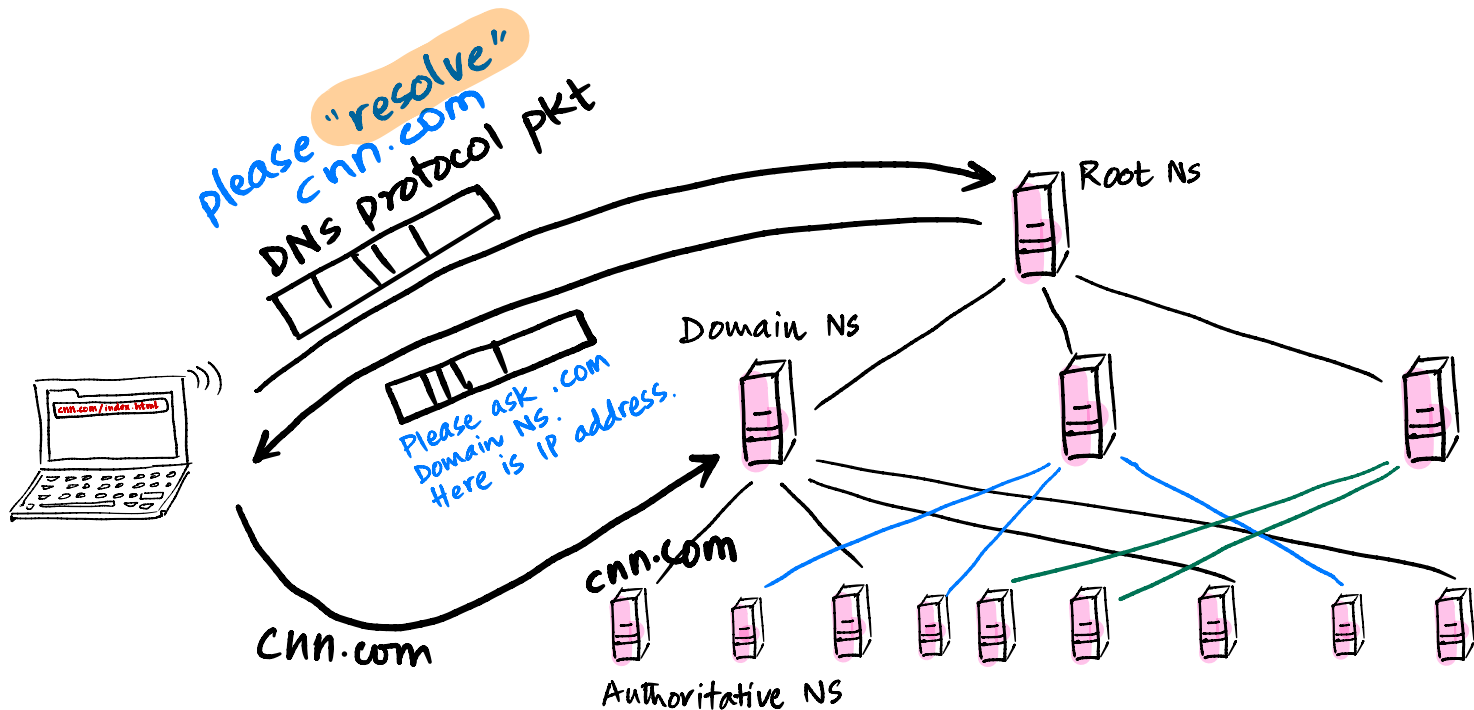
Step 2: Let's ask DNS server for IP address of cnn.com



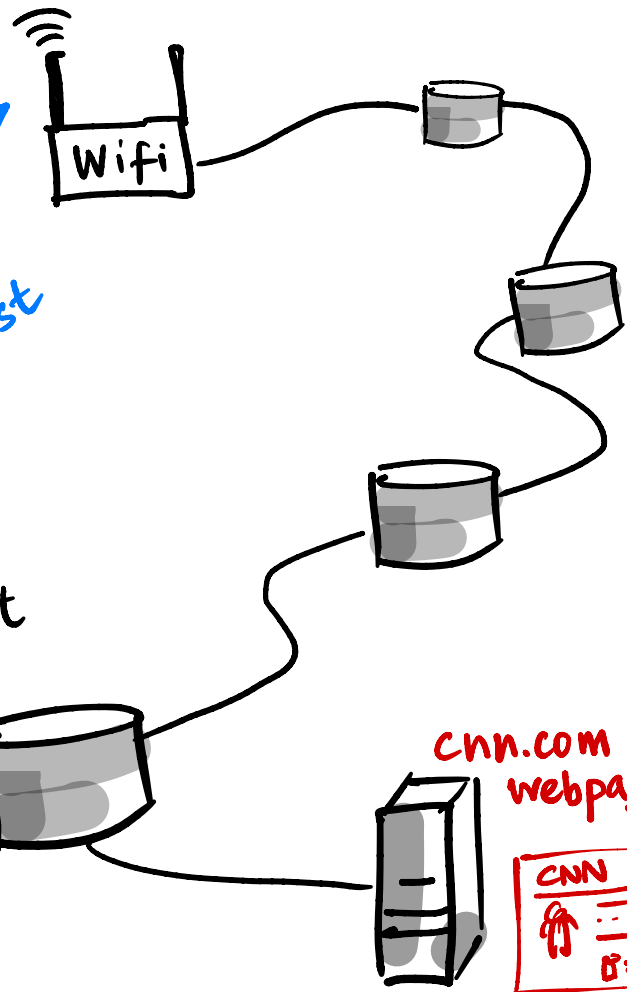
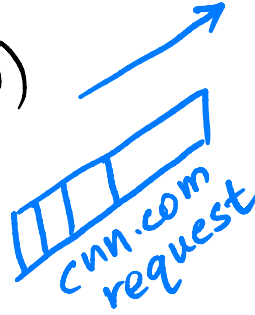
Hierarchy Again



Iterative DNS



Web Browsing application



Software inside laptop

Step 1: Create a **HTTP** request pkt

Step 2: Get IP address using **DNS**

Step 3: Add IP address to the "destination IP" field in packet header

Step 4: Send data packet



9am



HTTP request

HTTP response (webPg)

9am + 100 msec

9:01 am

Time



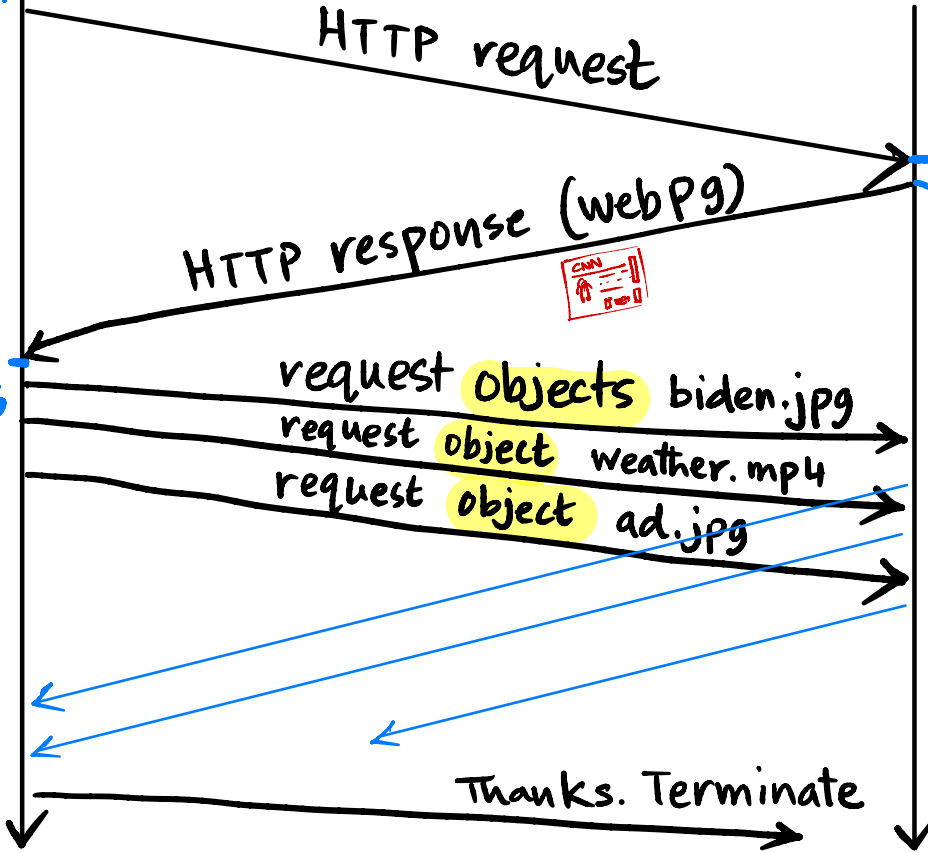
9:01am + 103ms

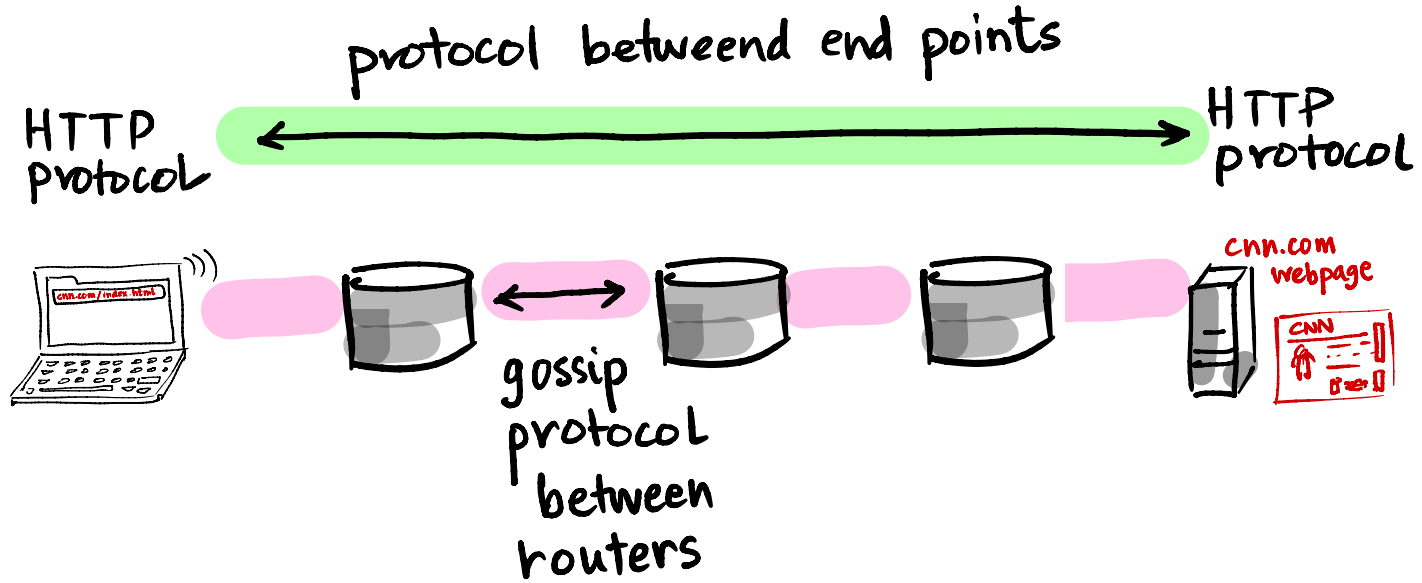
request objects biden.jpg

request object weather.mp4

request object ad.jpg

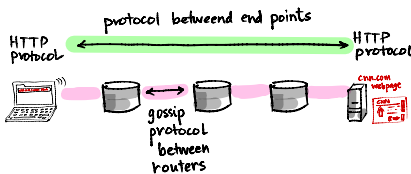
Thanks. Terminate





But say your bank balance is sent using HTTP

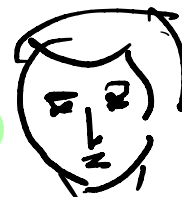
What if packet gets lost?
We Need acknowledgments



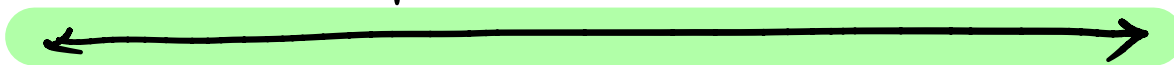
CEO Cook



CEO Musk



important matters



Reliable delivery



unreliable delivery



Applications

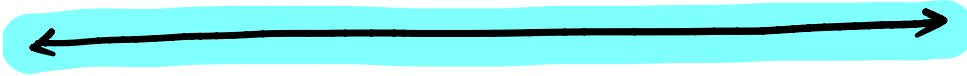
protocol between end points

HTTP
protocol



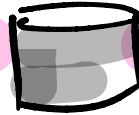
HTTP
protocol

~~Transport~~
Reliable
Transport
protocol



Transport
protocol

Network



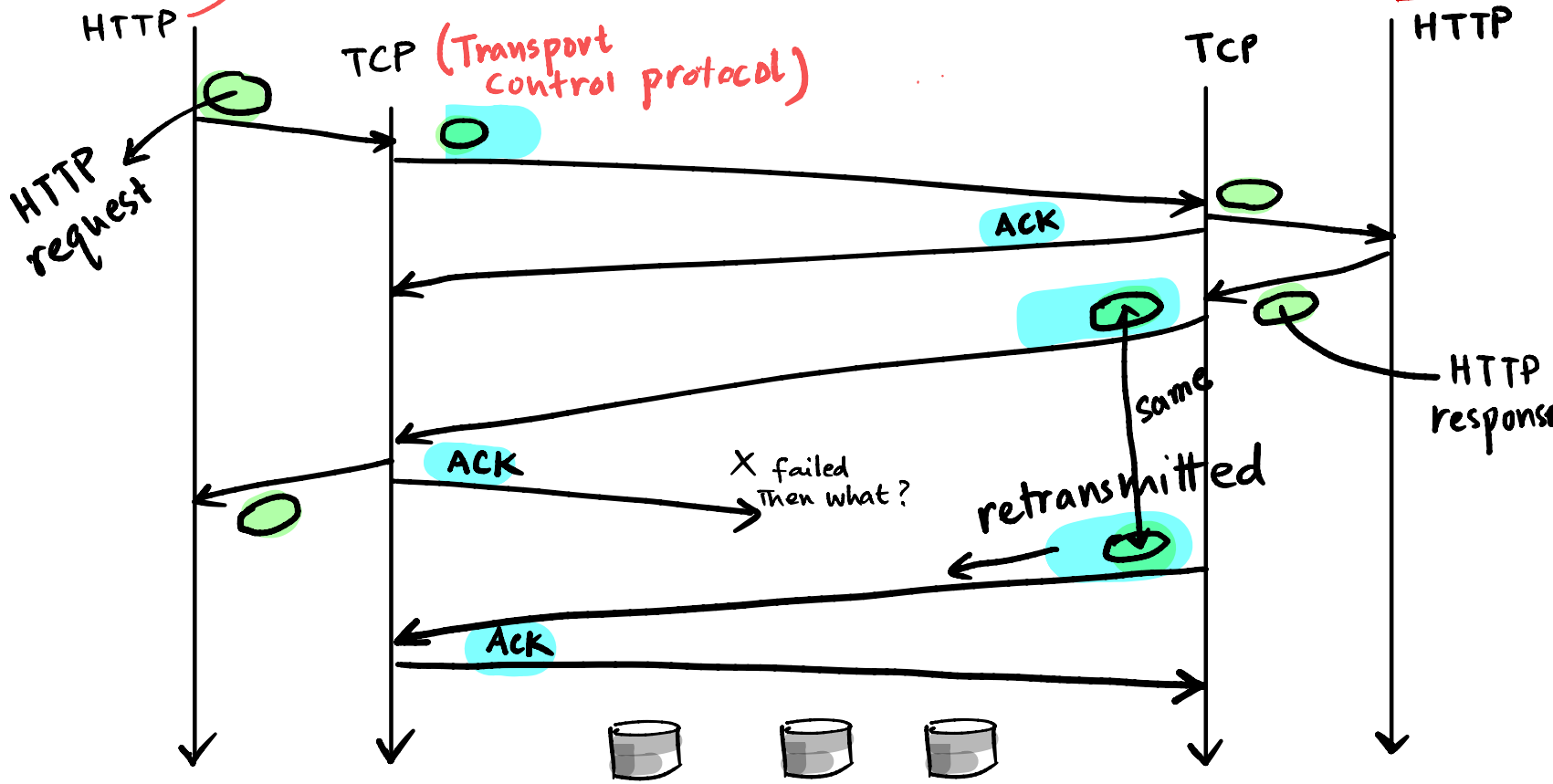
gossip
protocol
between
routers



cnn.com
webpage



Hypertext Transfer Protocol





HTTP

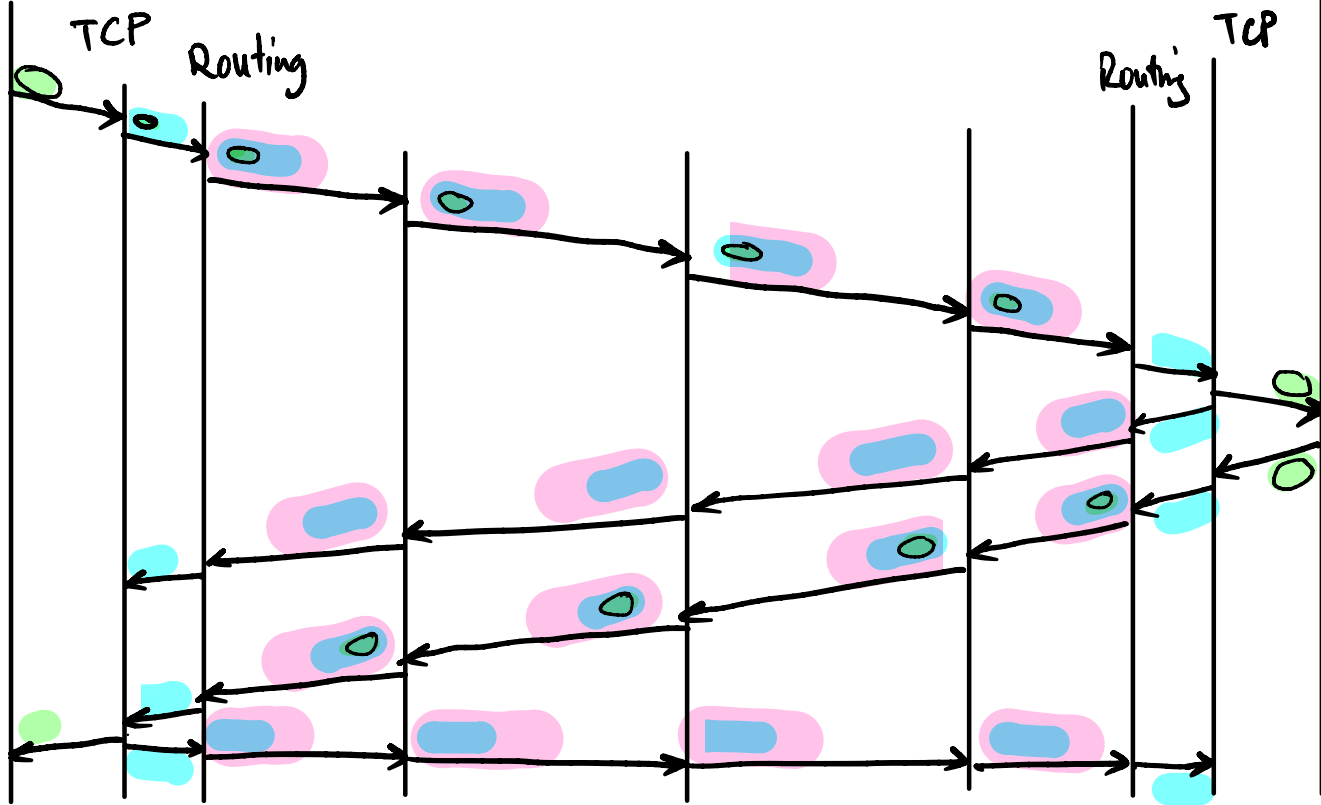
TCP

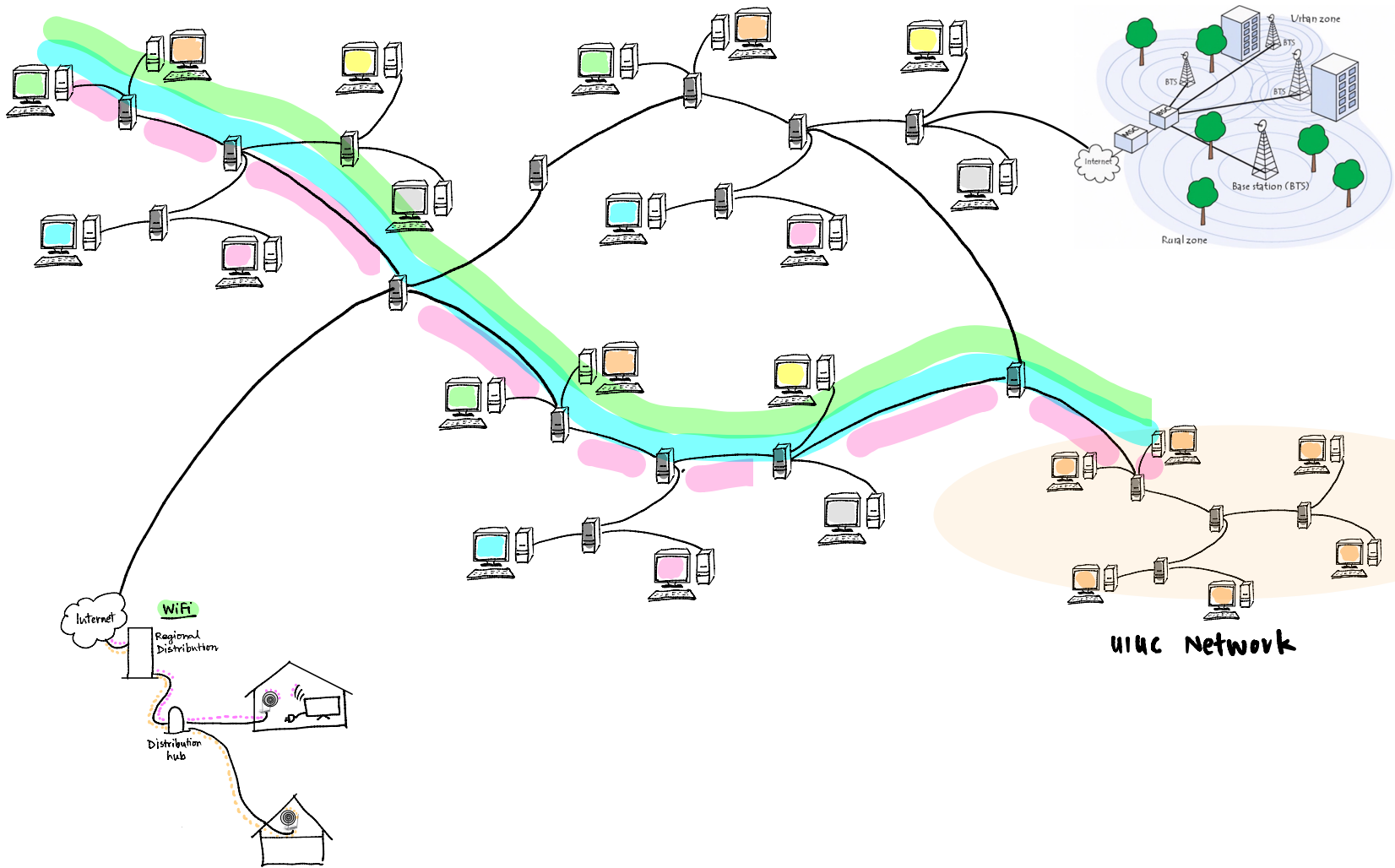
Routing

Routing

TCP

HTTP

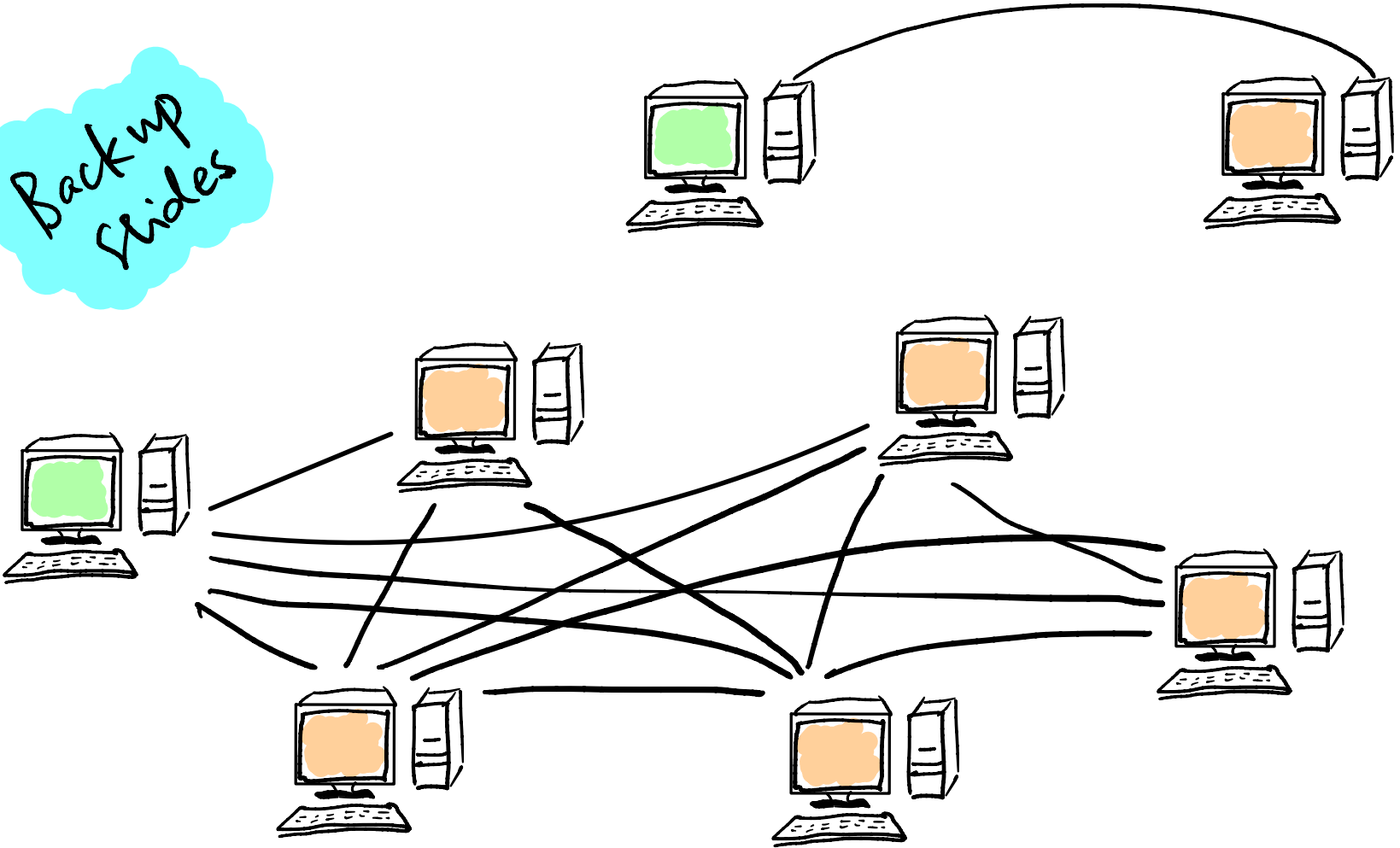




Questions?

The word "Questions?" is written in a light green, rounded, hand-drawn font. The letter 'Q' is significantly larger than the other letters. There are two decorative circles: a small one above the 't' and a larger one to the right of the question mark. Each circle consists of a pink outer ring, a light blue middle ring, and a green center.

Backup Slides



Lecture 3

Internet

concepts, foundations

Facts and Concepts

- Layering : Analogy with airline industry → protocols --> ISO / OSI architecture → Success of layering evident today
- Network Edge : Client/server vs. P2P architecture vs. Hybrid
- Network Edge : Connection-less (UDP) vs. Connection-oriented service (TCP)
- Network Edge : Residential access networks : Wired access (DSL vs. Cable)
- Network Edge : Residential access networks : Wireless vs. Cellular vs. Satellite
- Network Core : Circuit switching vs. Packet switching
- Network Core : Circuit switching : FDM vs. TDM
- Network Core : Packet switching : Statistical multiplexing
- Network Core : Packet switching : Datagrams vs. Virtual circuits
- Network Computing : Cloud vs. Edge
- Foundations:
 - Signals: time and frequency domain representation (FFT)
 - Bandwidth, Spectrum
 - Carrier frequency, Modulation, encoding, decoding,
 - Bit rate, bit error rate (BER), Packet error rate (PER)
 - Throughput, Congestion
 - Latency (Transmit time, Propagation delay, Queueing time, Processing time)
 - Wireless: SNR, SINR, Shannon's capacity,
- Real Internet measurements (Traceroute)
- Timeline and history ...