Lab Session

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Outline

- GitHub setup (demo)
- Packet vs. Circuit switch network
- 5 Layer implementation
- Measuring Performance
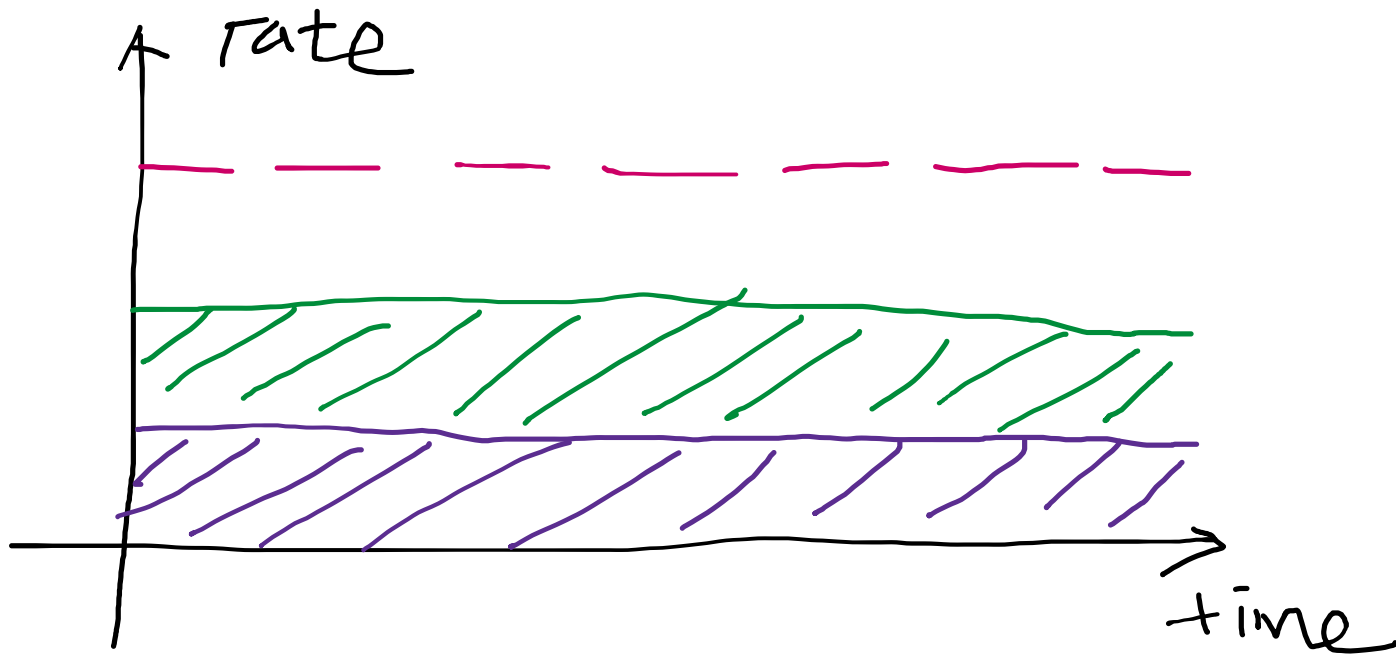- IP address & host names & DNS
- A http example
- Q&A

Packet vs. Circuit-switching network

- Packet-switching network
  - strategical multiplexing
    - applications send data periodically
  - shared connection

- Circuit-switching network
  - admission control multiplexing
  - dedicate connection
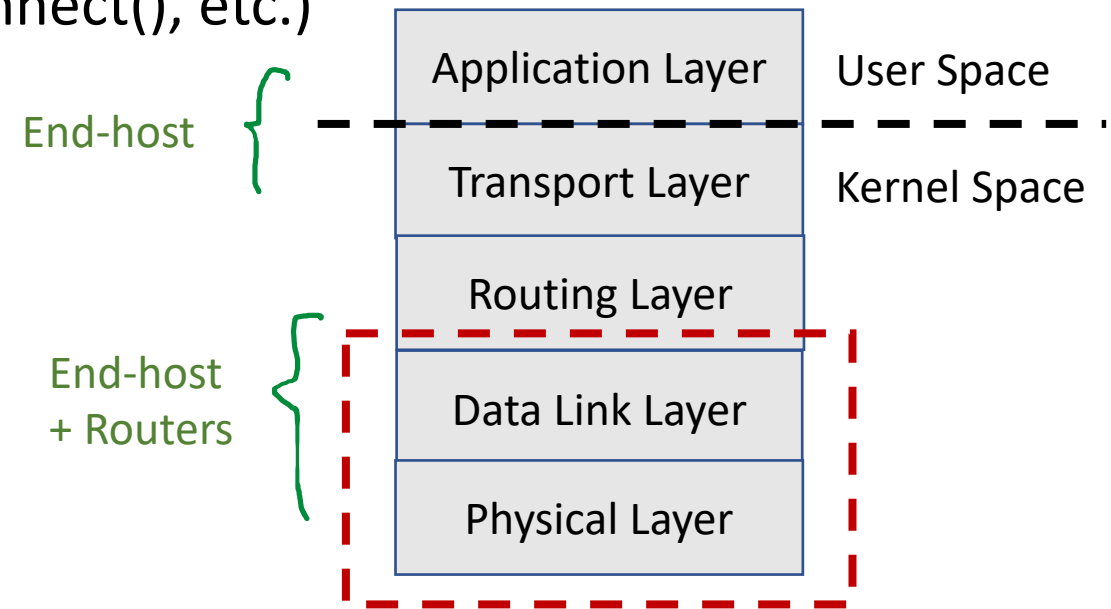
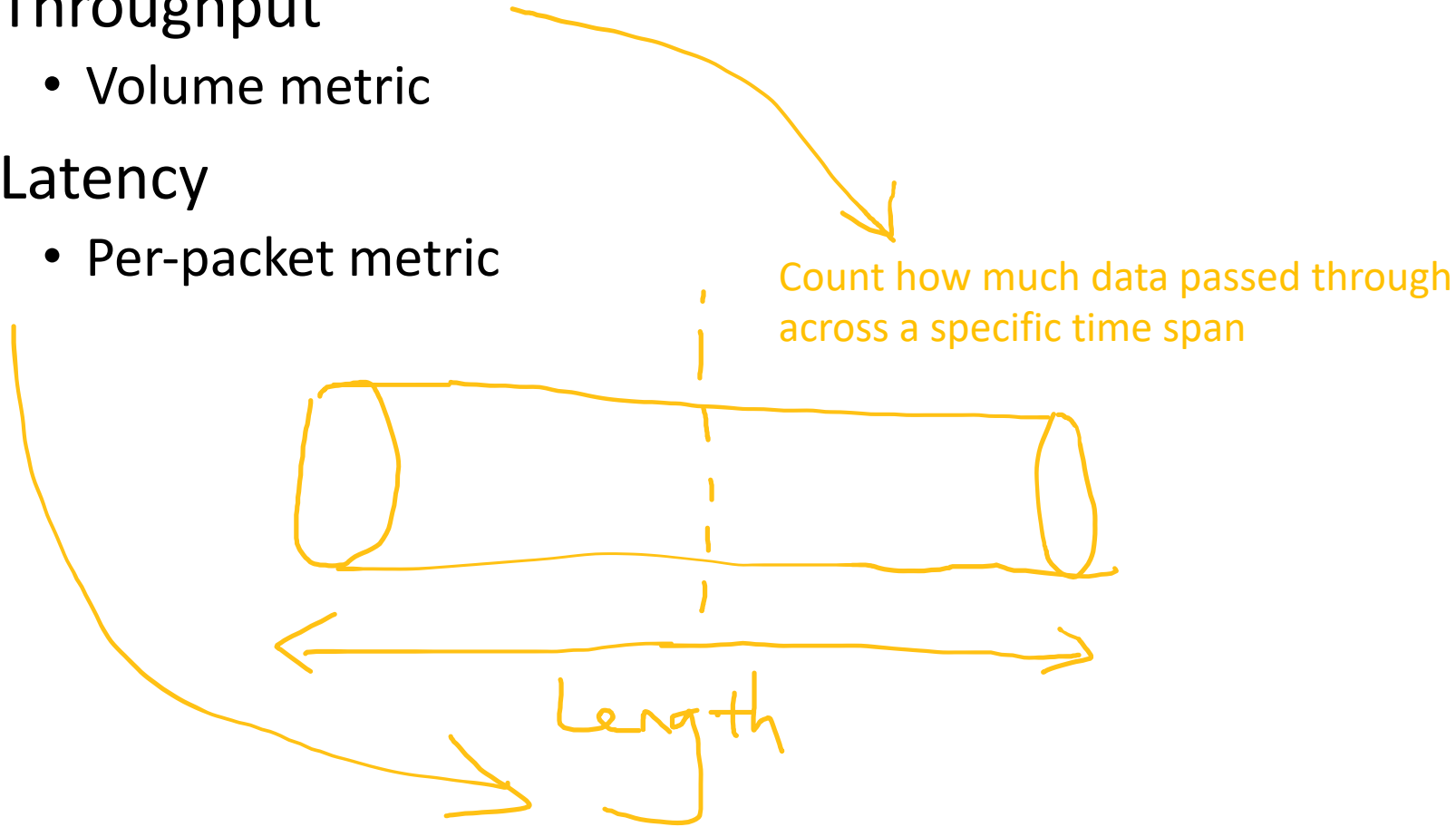# Packet-switching network
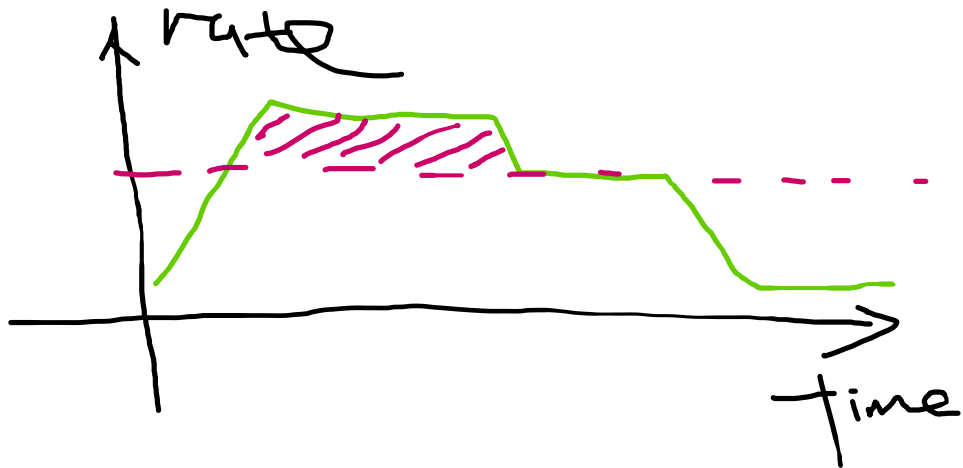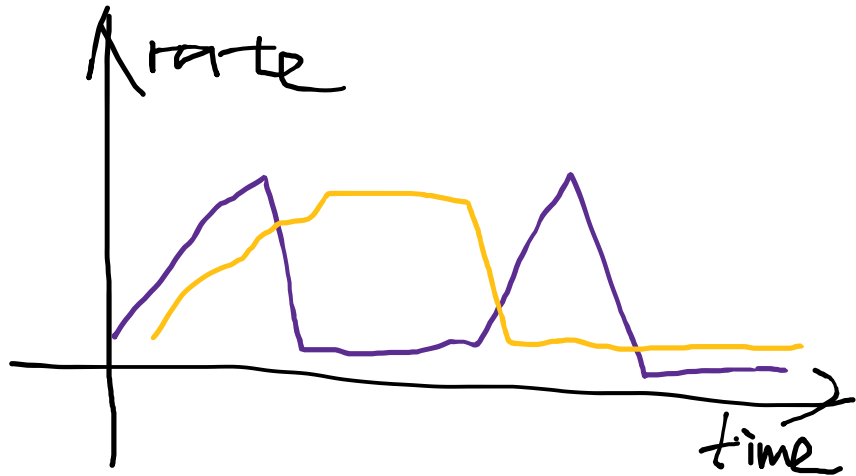
Circuit-switching network

5 Layer implementation

- Application Layer
  - basic socket interfaces (e.g., socket(), connect(), etc.)
- Transport Layer
  - OS Kernel
- Routing Layer
  - OS Kernel + Routers
- Link Layer
  - NIC/Device driver
- Physical Layer
  - Cables

Application Layer	User Space
Transport Layer	Kernel Space
Routing Layer	
Data Link Layer	
Physical Layer	

End-host

End-host + Routers

Measuring Performance

- Throughput
  - Volume metric

- Latency
  - Per-packet metric

Count how much data passed through across a specific time span

Length

Fundamental (Physical) Limits

- Related to hardware medium
- Capacity (maximal throughput)
  - throughput <= bottleneck capacity

- Latency
  - propagation delay (how long it takes to deliver signals)
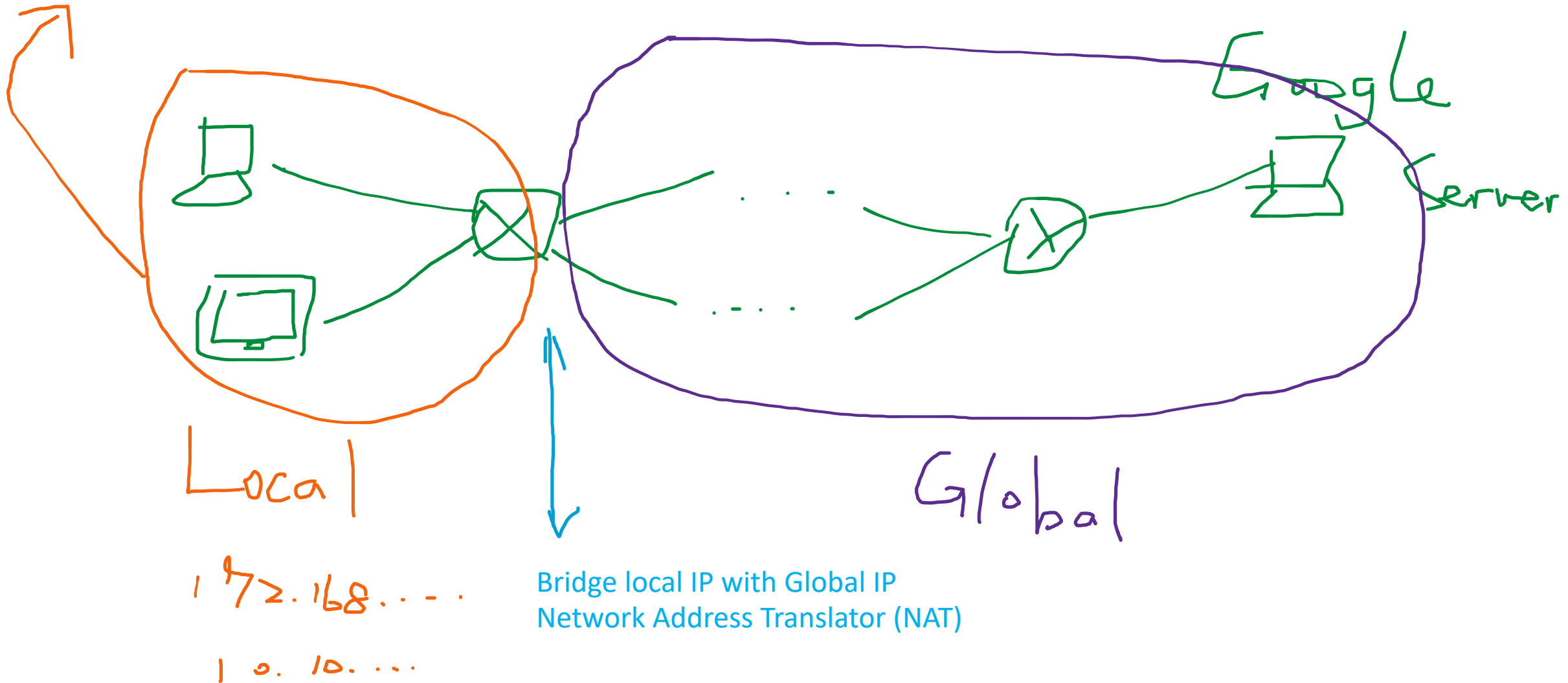 - latency >= propagation delay
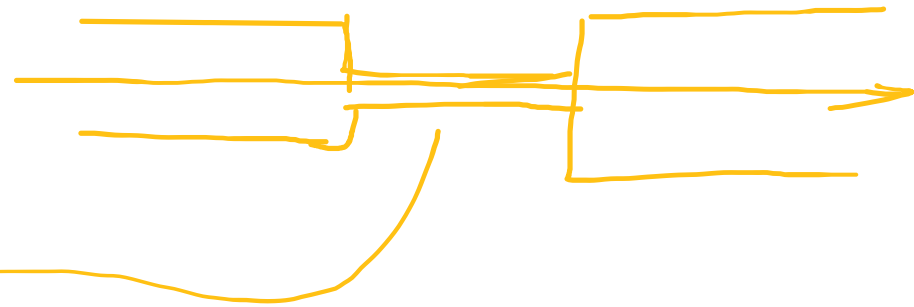
IP address & host names

- Naming identities in network

- IP address
  - 32-bit number (IPv4) or 128-bit number (IPv6)

- Host names
  - human-readable names (e.g., www.google.com)
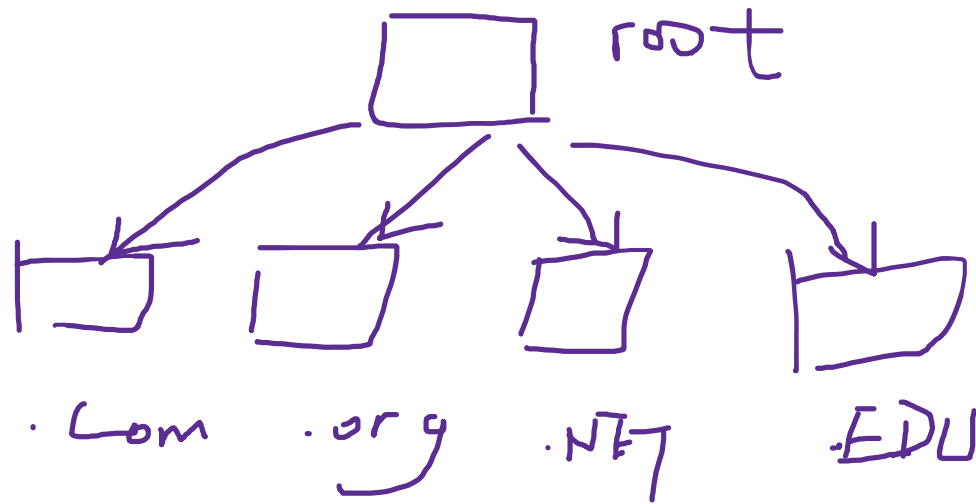
Mapping

Domain Name
System
(DNS)

Private & Public IP address

Local

172.168....

10.10....

Bridge local IP with Global IP
Network Address Translator (NAT)

Global

Google Server

DNS

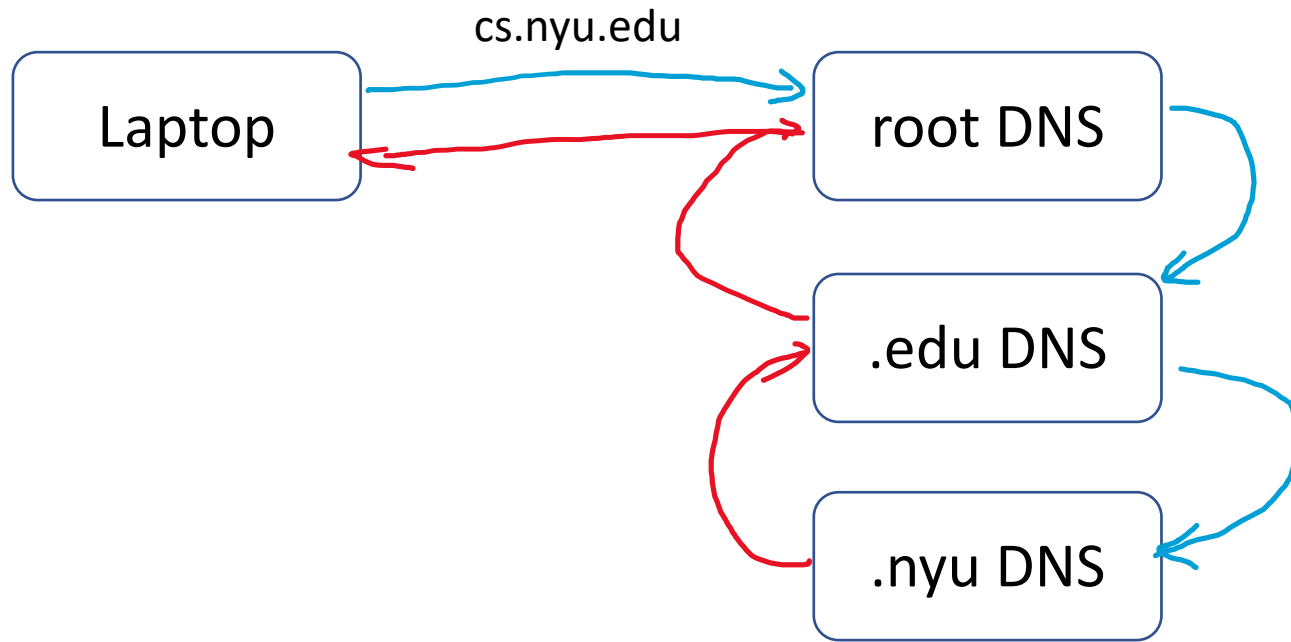- Hierarchical Mapping from Host names to IP addresses

A http request example

A http request example

- when you type cs.nyu.edu in your browser, what happens next...
- (1) browser checks its cached DNS for the IP address of cs.nyu.edu
- (2) if it misses, then it checks cached DNS in your end-host OS
- (3) if it misses, then it will read /etc/hosts on your disk
- (4) if it misses, it will send DNS request to remote DNS server

Recursive DNS lookup

cs.nyu.edu

Laptop

root DNS

.edu DNS

.nyu DNS

Iterative DNS lookup