Project 3
Video Streaming

15-441: Computer Networks

Matt Mukerjee
David Naylor
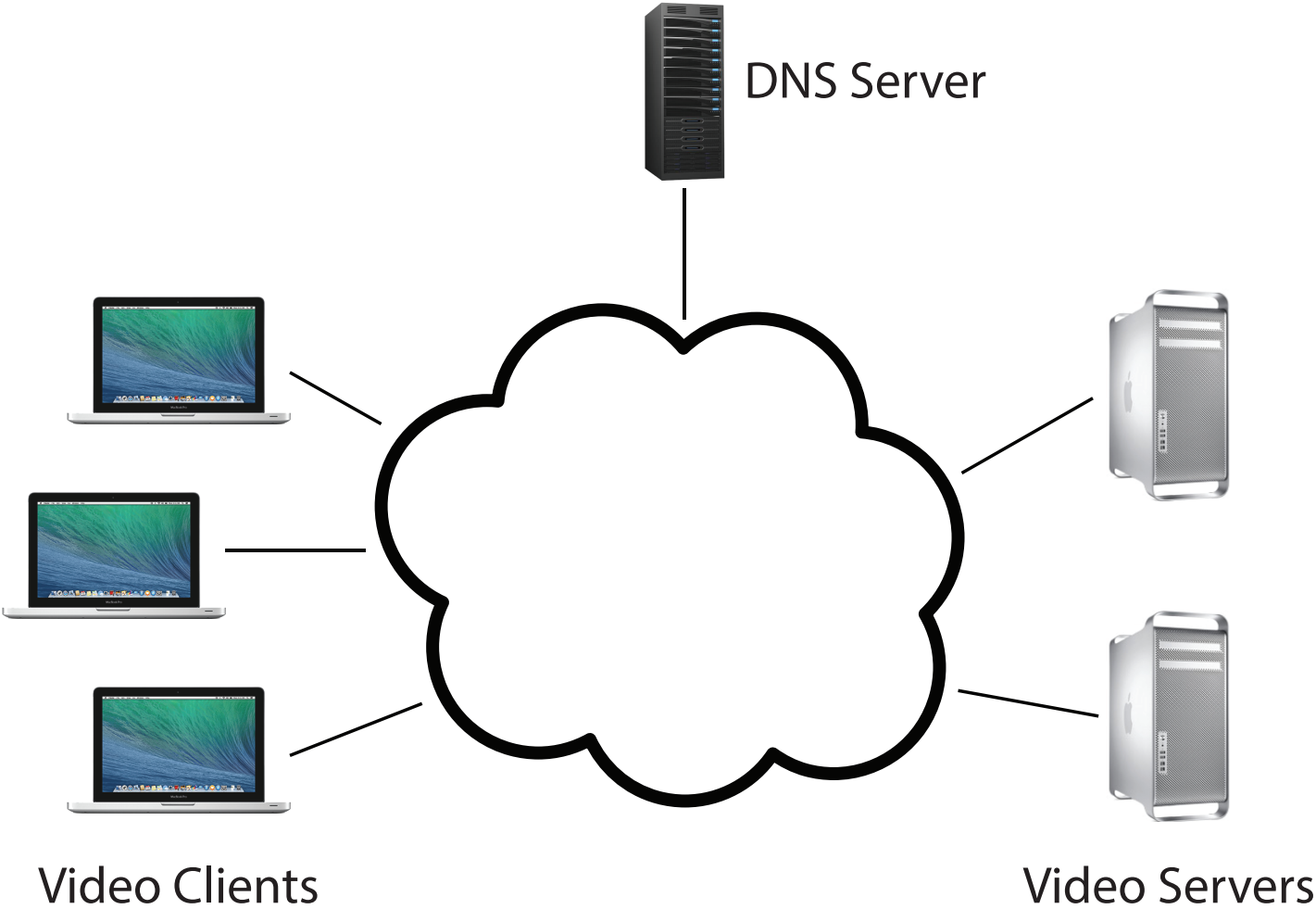Ben Wasserman

This is a brand new project.

There will be bumps.
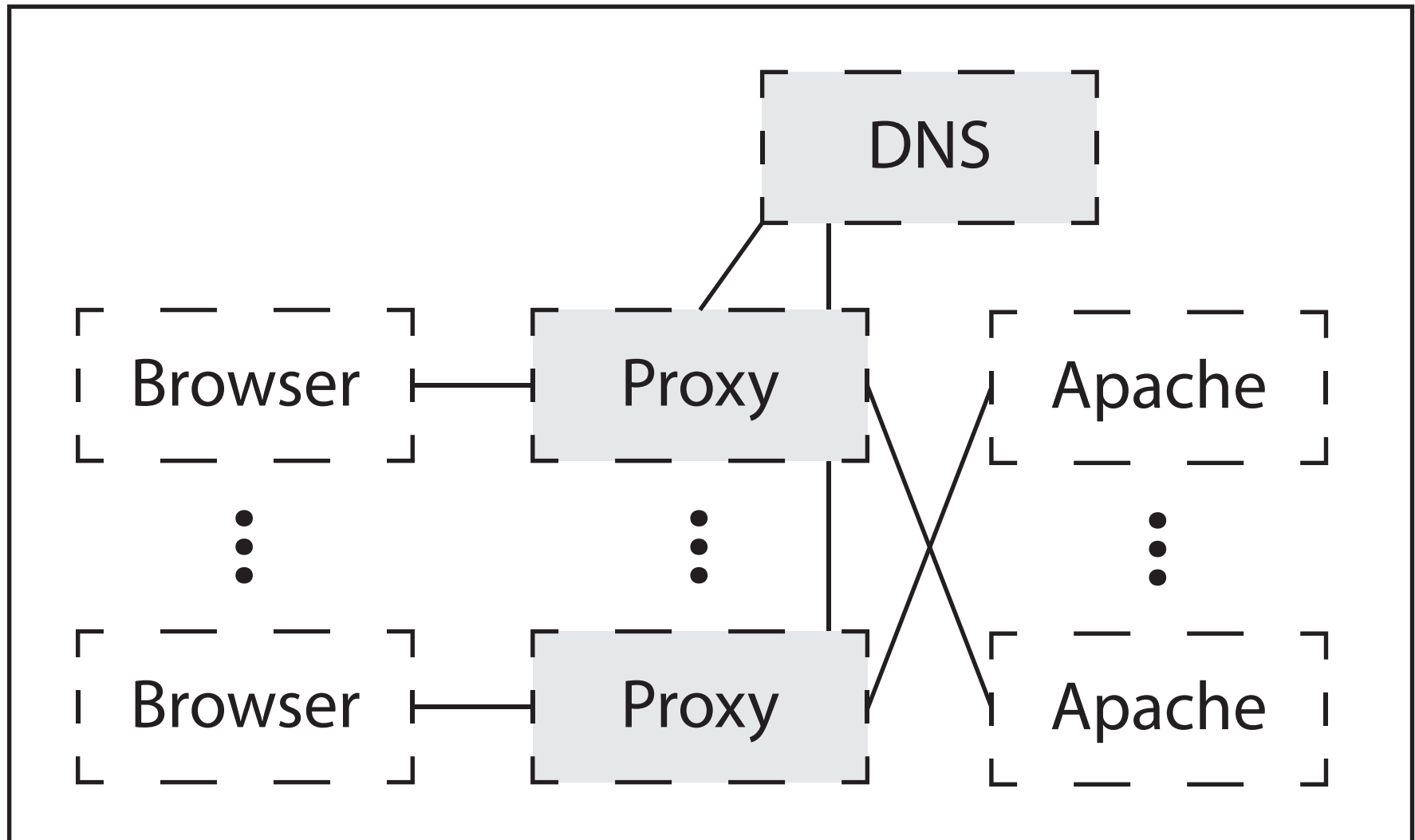
Thanks for your patience :)

If all goes well, we'll be packaging up
this project for other Universities!

You're helping future
generations of CS students!

Video CDN: The Real World

DNS Server

Video Clients

Video Servers

Video CDN: Your System
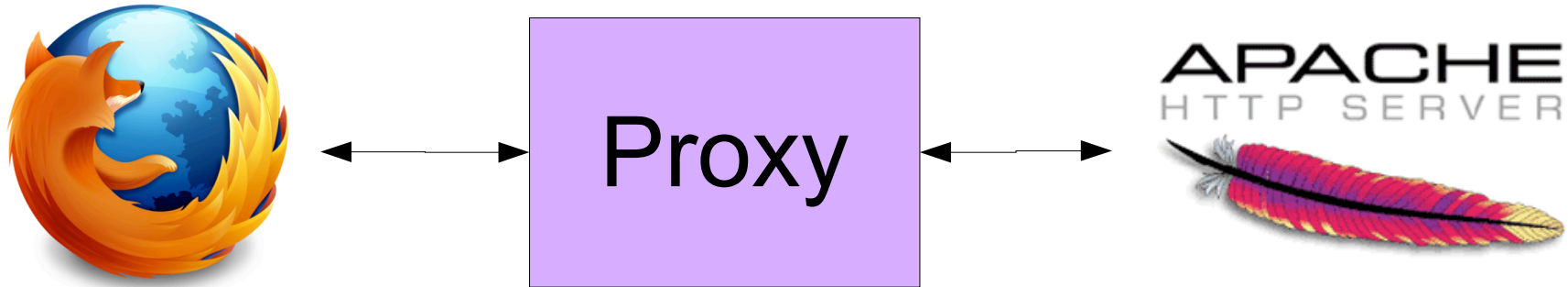
Your Job: 2 Parts

HTTP Proxy
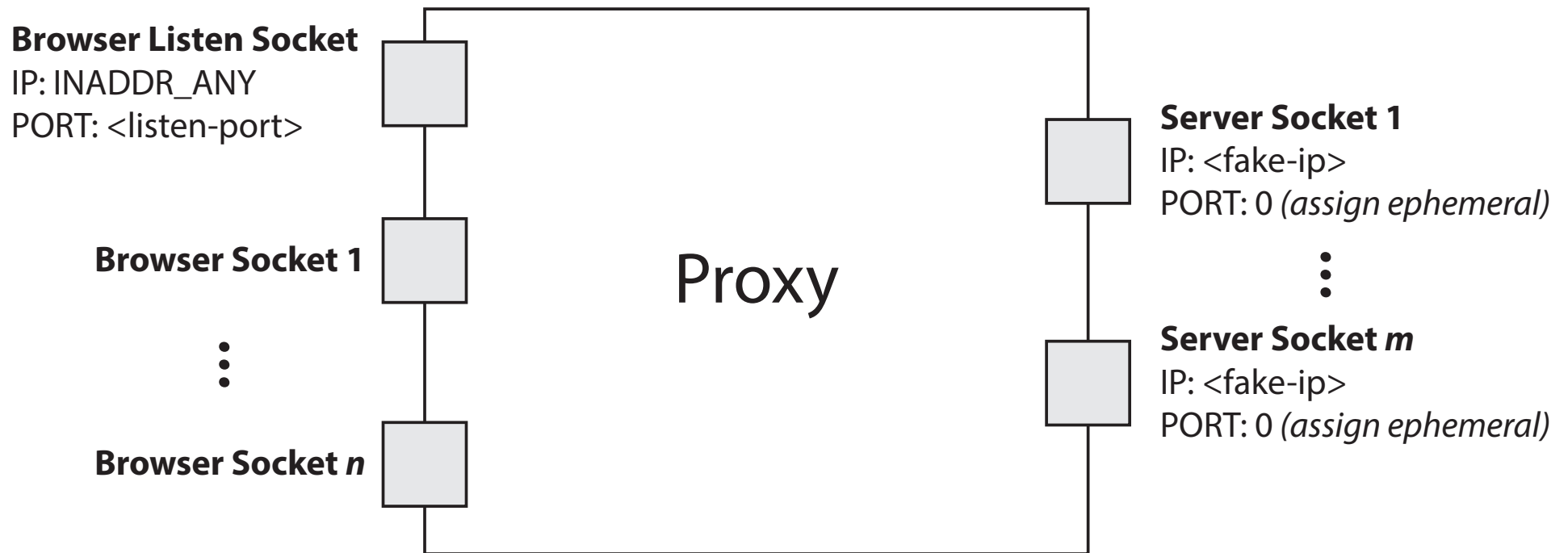
Adaptive bitrate selection

DNS Server

Load balancing

HTTP Proxy

- Browser requests video chunks
- Proxy forwards request to server, returns data to browser
- Proxy estimates throughput, selects appropriate bitrate for each chunk
- Re-using project 1 code is fine

HTTP Proxy

Browser Listen Socket
IP: INADDR_ANY
PORT: <listen-port>

Browser Socket 1

⋮

Browser Socket *n*

Proxy

Server Socket 1
IP: <fake-ip>
PORT: 0 *(assign ephemeral)*

⋮

Server Socket *m*
IP: <fake-ip>
PORT: 0 *(assign ephemeral)*

HTTP Proxy

Throughput Estimation

- Per chunk

$$T = \frac{B}{t_f - t_s}$$

size of chunk

time chunk transfer from server completed

time request received

- Average:

$$T_{current} = \alpha T_{new} + (1 - \alpha)T_{current}$$

Exponentially-Weighted Moving Average (EWMA)

HTTP Proxy

Bitrate Selection

- Modify Request-URI

500 Kbps

`/path/to/video/big_buck_bunny_500Seq2-Frag3`

1 Mbps

`/path/to/video/big_buck_bunny_1000Seq2-Frag3`

DNS Server

Load Balancing

- Round robin

- Geographic proximity
  - Real world: IP prefix → location mapping
  - This project: Link State Advertisements

!!! This is not realistic, but it's easy and teaches you about LSA !!!

Network Simulator

- We provide a network simulator!
- More details in PDF

Logistics

- Starter Code
  - Virtual machine
  - Download VirtualBox
- Submission
  - Goal: Autolab
  - Submit a tarball either way

Project 3
Video Streaming

15-441: Computer Networks

Matt Mukerjee
David Naylor
Ben Wasserman