Project 3

Video Streaming

15-441: Computer Networks

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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

Video Clients → DNS Server → Video Servers
Video CDN: Your System

Diagram showing the relationship between Browser, Proxy, Apache, and DNS.
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

\[ T = \frac{B}{t_f - t_s} \]

- 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 \(\rightarrow\) 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