Introduction to Streaming Video

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This is an interactive session: please connect your laptop to the **`bucknell_guests`** *wireless network.*

What is Streaming Video?

Goal: to replicate typical TV broadcasts.

- Transmission of digital audio and video across a data network.
- Playback begins immediately (almost… after buffering).
- A copy of the content is not (should not) readily obtained by the client.

Challenges

TV is easy:

Everyone has the same Channel 3.

In streaming video, you have to address diverse:

>> Operating Systems
>> Browsers
>> Media Codecs
>> Bandwidth
>> Media Players
>> Users

The Institutional Repository (IR) Audience

Patron location is not fixed – local versus remote.
No control over clients' hardware or software.

>> Present both high and low bandwidth options.
>> Include tools to help the user decide which option to use.
>> Use an operating system-agnostic stream.

Approaches to Streaming Video

HTTP: File Download

Streaming Media Servers

Hybrids

Multicast

HTTP “Streaming”: File Download

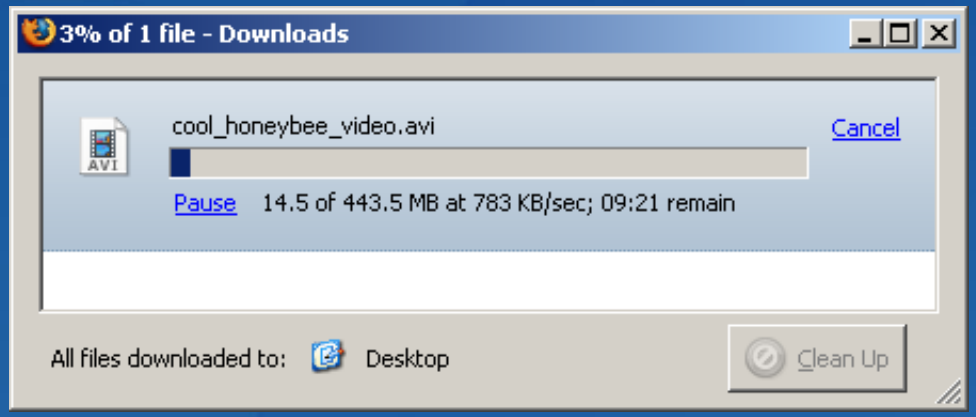
.AVI (.MOV, etc.) file on a webserver

File is saved to the client’s hard drive

Client plays the downloaded file

HTTP "Streaming": File Download

- Easy – Just put the AVI on your webserver.
- Client machine must download entire file before playback begins



- Client obtains a full copy of the media file.

HTTP “Streaming”: Demo

http://www.bucknell.tv/demos

- Copy AVI to webserver
- Test with audience

Approaches to Streaming Video

HTTP: File Download

Streaming Media Servers

Hybrids

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Streaming Media Servers

Windows Media (and QuickTime / Real / etc.)

- Each client's connection is negotiated with the server on an individual basis
- Able to stream live events
- You already own the software: Included as part of Window Server 2003/2008

Streaming Media Servers

Windows Media Services

- Files to be streamed must be in a compatible WMV format
- Clients must use a compatible version of WMP
- Mac / Linux users are problematic*

Streaming Media Servers: Demo

Windows Media Services

- Convert source video to WMV

```
ffmpeg –b 2000k -i /uploads/StarTrekTOS-TheLightsOfZetar-Clip.avi
 -acodec wmav2 TrekClip.wmv
```

- Create publishing point
- Test with audience

Approaches to Streaming Video

HTTP: File Download

True Streaming


Hybrids

Multicast

HTTP “Streaming” Hybrids

FLV file on a webserver

Excess data cached to local disk

Playback begins ~ immediately

HTTP "Streaming" Hybrids

YouTube
Broadcast Yourself

Played

Downloaded

HTTP Streaming Hybrids Demo

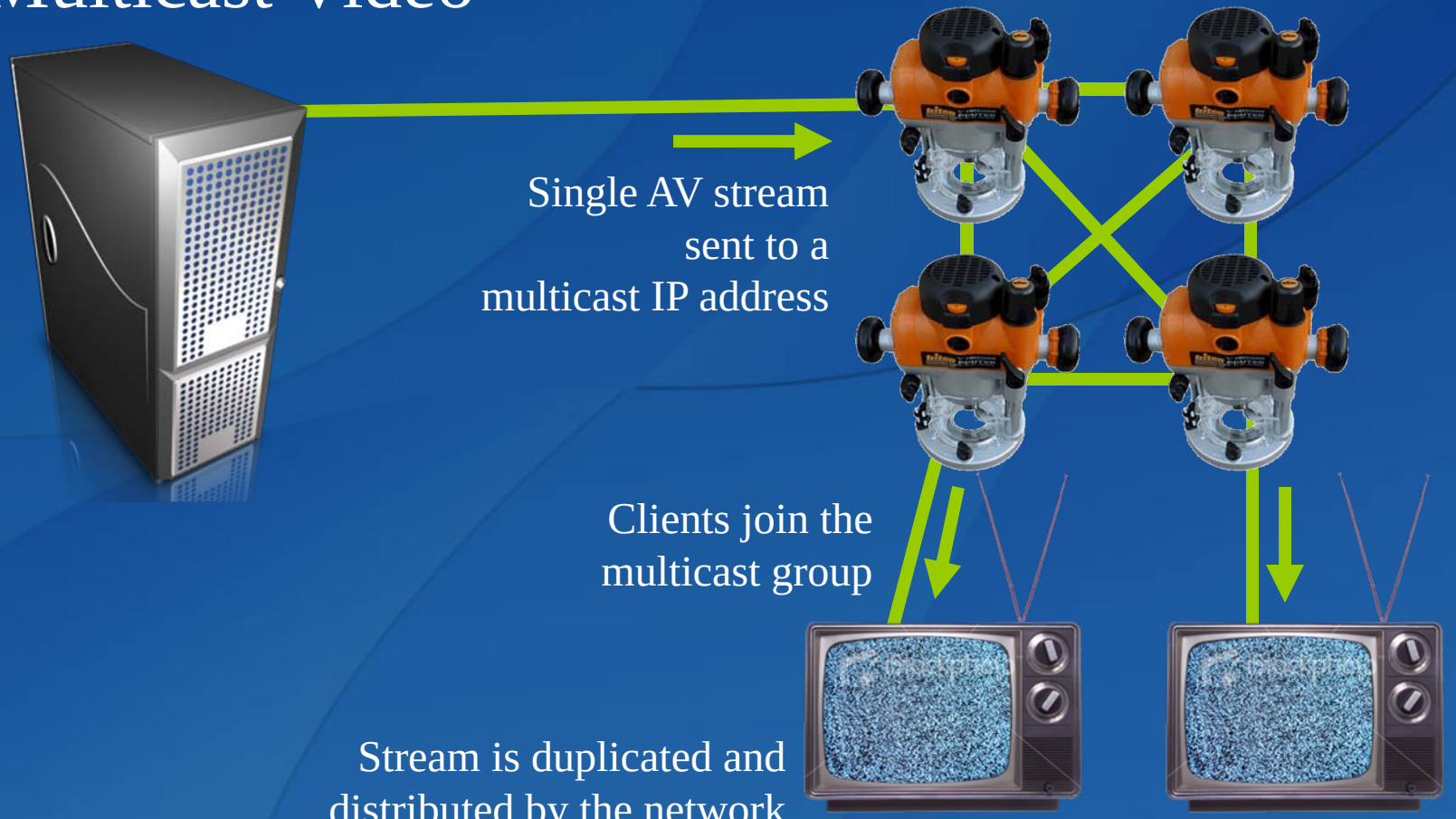
www.bucknell.tv

- Upload source video to server
- Convert to FLV
- Test with audience

Approaches to Streaming Video

- HTTP: File Download
- True Streaming
- Hybrids
- Multicast

Multicast Video



Multicast: Digital CATV Equipment

MPEG2 Encoder

Set-Top Box (STB)

BUTV: Bucknell University's Digital Cable TV

Subscription
CATV

Foreign Language &
Special Events

Bucknell

D&E
Communications

BUTV: Bucknell University's Digital Cable TV

D&E Communications
Datacenter
State College, PA

Multicast Video: Pros and Cons

- High bandwidth, broadcast-quality streams
- Very efficient use of network bandwidth

- Requires multicast-aware routers and switches
- Inefficient for single-viewer applications
- Disastrous to wireless networks
- Does not work across the Internet

Multicast Demo

- Obtain packet capture
- Re-transmit the packets
- Test with a BUTV set-top box

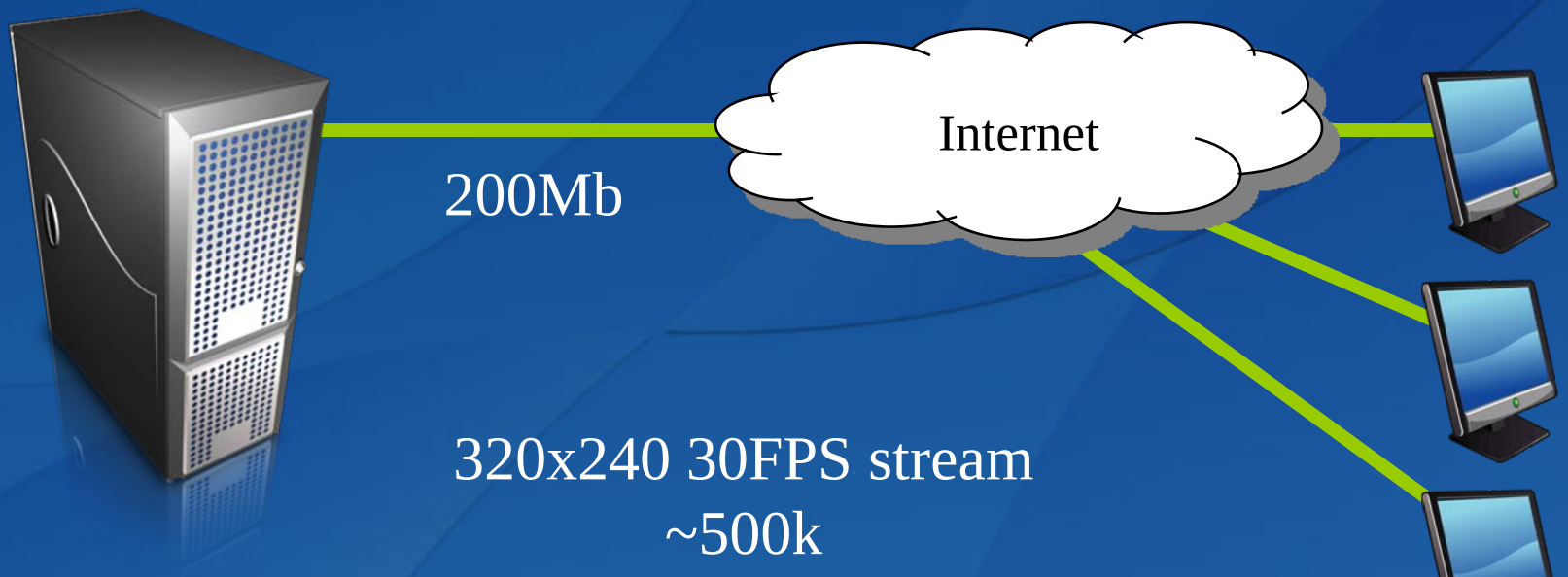
Automating the Process: www.bucknell.tv

Archival Video In IR

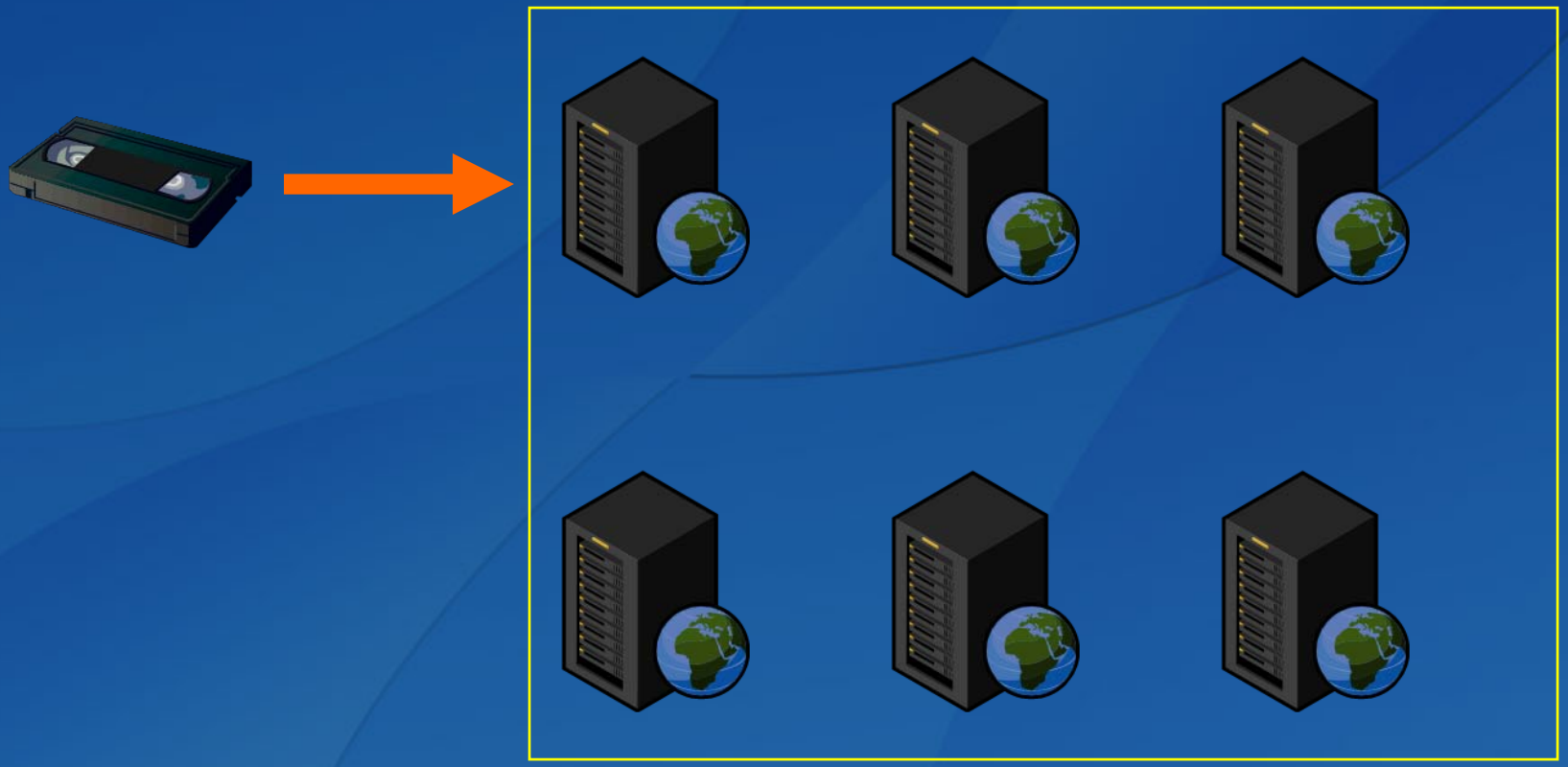
FLV Transcoder

Streaming Flash Video

Streaming Video: Bandwidth Issues



The tubes are full: Akamai to the rescue



34,000 Servers – 70 Countries – 900 Networks

Bucknell hosts 5 Akamai servers

The tubes are full: Akamai to the rescue

34,000 Servers – 70 Countries – 900 Networks

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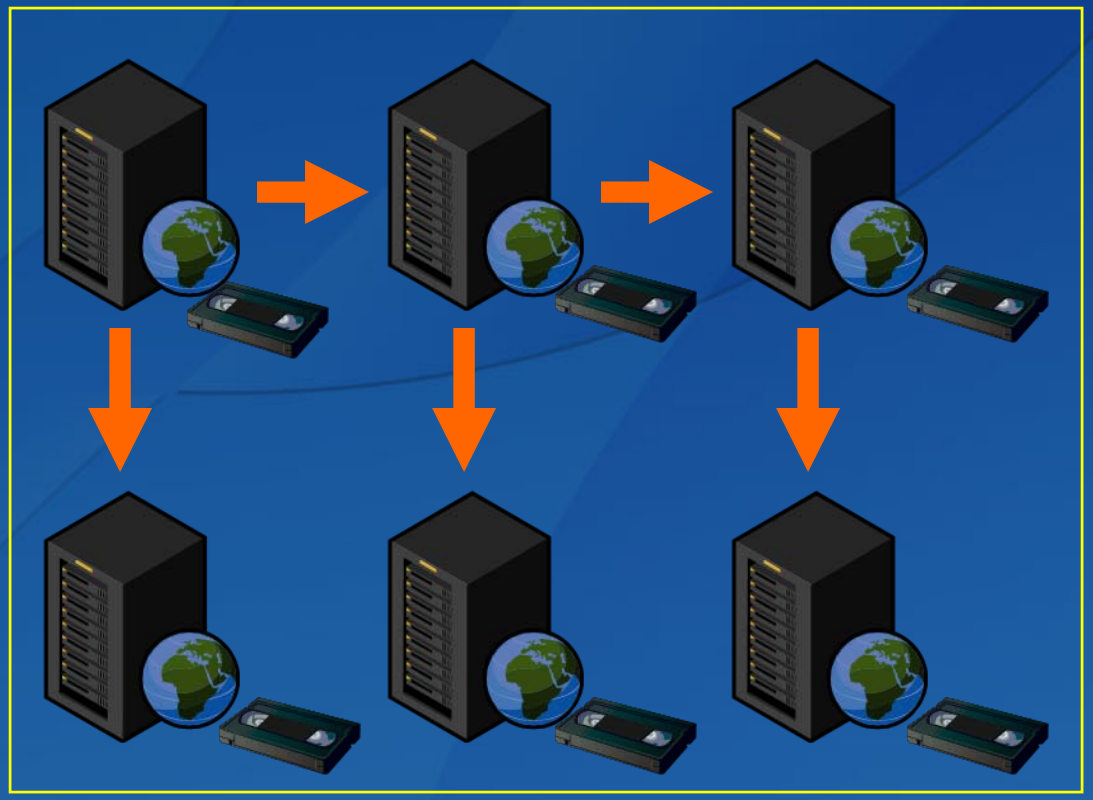
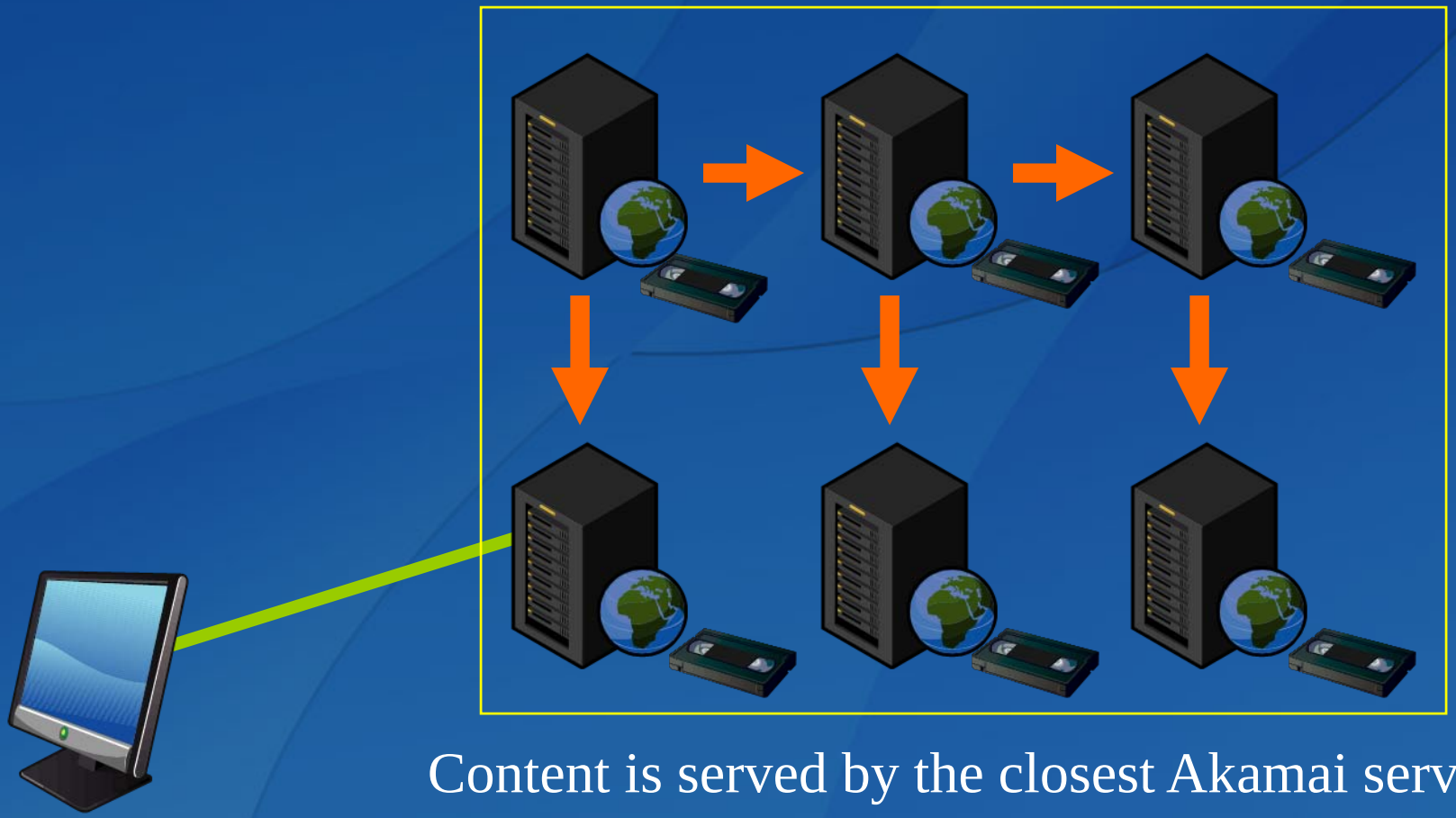
The tubes are full: Akamai to the rescue



34,000 Servers – 70 Countries – 900 Networks

Bucknell hosts 5 Akamai servers

Akamai and Streaming Video



Content is served by the closest Akamai server.
All major ISPs host Akamai cache servers.

Akamai Streaming Video: Case Study

Patron connecting from a Time-Warner Cable Modem

Streaming directly to Bucknell:
41ms Latency
24 Router Hops

Streaming through Akamai:
10 ms Latency
7 Router Hops

Akamai Demo

www.bucknell.tv/demos

- Upload source video to server
- Convert to FLV
- Upload to Akamai
- Prepare HTML Container
- Test with Audience

Thank you for your attention. Questions?

References and Resources:

VLC: www.videolan.org
VirtualDub: www.virtualdub.org
FFMPEG: sourceforge.net/projects/ffmpeg
Ububtu: www.ubuntu.com
Medibuntu: www.medibuntu.org
SWFObject: http://code.google.com/p/swfobject
Akamai: www.akamai.com
PSKL: www.pskl.us

Appendix A: Archival Formats & Key Frames