Video Streaming

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Program:

- Module 1:
  - What is streaming?
  - Video and Internet
  - Transmissions protocols
- Module 2:
  - Shooting, Capturing, Editing, Serving, Playing;
  - Technologies;
  - Resources and case studies;

What is streaming?

Streaming concept

Streaming was first introduced by **RealNetworks** some years ago.

It consists of a technique for **making video, audio and other multimedia available quickly via the Internet**.

The advantage of streaming is that it can enable easier access to multimedia resources.

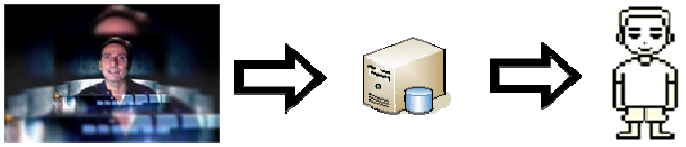
Another possibility is the integration of video and audio with other web-based applications, such as chat and other real-time collaboration tools.

What is streaming?

Streaming vs. downloading

What Is The Difference Between Downloading and Streaming?

When you **download** a video, you have to copy the entire file to your hard disk before you can play it.



What is streaming?

Streaming vs. downloading 2

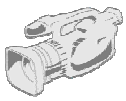
What Is The Difference Between Downloading and Streaming?

When the video is **streamed**, there is a small wait as the stream 'buffers' but there is no need to save the file.

Streaming is the act of sending media files (audio and/or video) over the Internet from one computer to another computer so that **the media plays as it is being delivered**.

What is streaming?

Streaming categories



Live
When an event is delivered via the Internet **at the same time** it is happening.
Example: live concerts, live radio, videoconferences.

On Demand
When the event is recorded on a digital support and saved in a server and **after** made accessible by Internet users.
Example: video clips, movies trailers.

Recap of Streaming Media

- Why using this technology?
  - To overcome limitations of WWW.
- What is streaming media?
- Streaming is not
  - Download all before playback is able
  - Media created with software like Macromedia Flash.
- Major streaming formats
  - Microsoft Windows Media
  - Real Networks
  - Apple Quicktime

Streaming Video

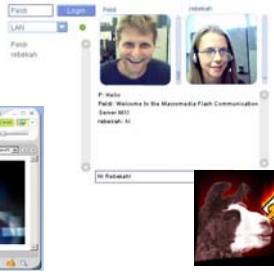
- Progressive streaming
  - Download a compressed video file to your hard drive via HTTP over the Internet
  - Use standard web server
  - Quality is better than real-time streaming
- Real-time streaming
  - Don’t need to download the entire video before playing
  - Require a special streaming server

Why Streaming Media?

- No waiting for complete downloads.
- Streamed files are not written to disk.
- Presentation of live events is possible.
- Enhance static web pages.

Video and Internet

Possible applications



Internet radio
Internet tv
E-commerce website
Training video
Video conference
Remote presence
Classroom setting
Realtime collaboration

Audio + **video** + **animation** = **multimedia**

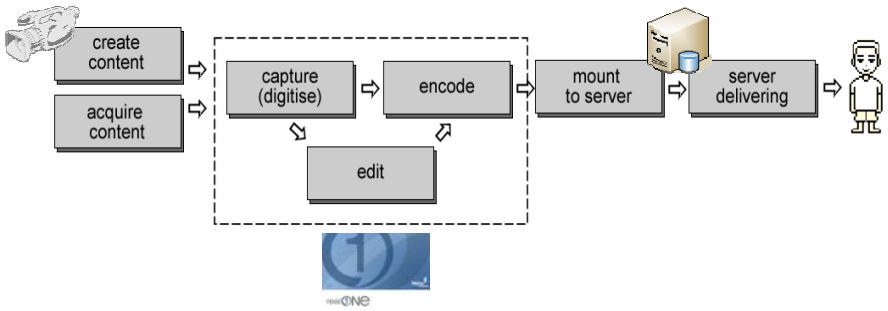
mouse + **keyboard** + **user** = **interaction**

RIA
Rich
Internet
Applications

Video and Internet

How does streaming work?

The streaming media development process



Video and Internet

How does streaming work?

How Is Streaming Different From Broadcasting?

Delivery of broadcast TV:

- Broadcast “blankets” the area with its signal (persistent);
- TVs are standardized by region. Every TV knows how to receive TV Broadcast;
- Any TV can “reach up and grab” broadcast signal and pulls it down to set;
- broadcast doesn’t reach every “air” is (line of sight);
- TVs outside the broadcast line of sight can’t grab signal

Video and Internet

How does streaming work?

How Is Streaming Different From Broadcasting?

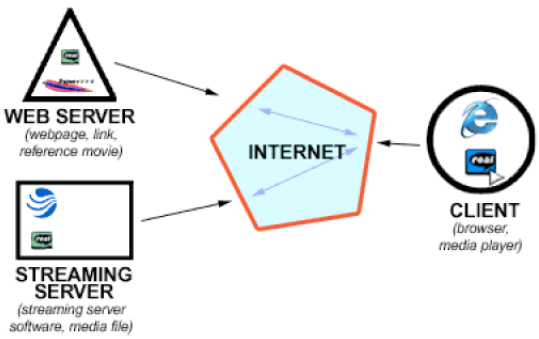
Delivery of streaming video:

- server only sends signal out to computers which want it (signal is not persistent);
- computer media players are not compatible with one other;
- computer must request video stream. Media player must be compatible;
- No physical barriers: stream can reach anywhere on the Internet;
- Computers must meet minimum bandwidth requirements

Video and Internet

How does streaming work?

Streaming media playback in theory



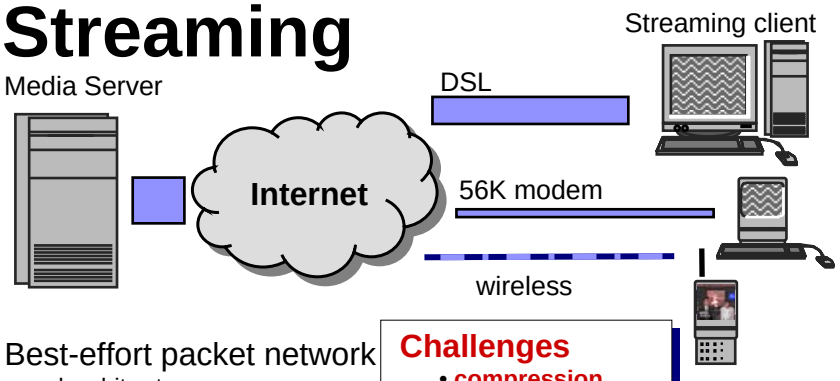
- Web bandwidth

Connection	Rated	Typical throughput	Safe bets
28.8 modem	28.8 Kbps	2.4 KB/second	2 KB/second
56K modem	53 Kbps	4.8 KB/second	4 KB/second
Dual ISDN	128 Kbps	12 KB/second	10 KB/second
DSL	384 Kbps	35 KB/second	30 KB/second
T1	1.54 Mbps	150 KB/second	50 KB/second
Cable modem	6 Mbps	300 KB/second	50 KB/second
Intranet/LAN	10 Mbps	350 KB/second	35 KB/second
100base-T LAN	100 Mbps	500 KB/second	50 KB/second

Kbps = kilobits per second • Mbps = megabits per second • KB/second = kilobytes per second

Source:
http://www.adobe.com/products/aftereffects/pdfs/AdobeStr.pdf

Internet Media Streaming



Best-effort packet network
- low bit-rate
- variable throughput
- variable loss
- variable delay

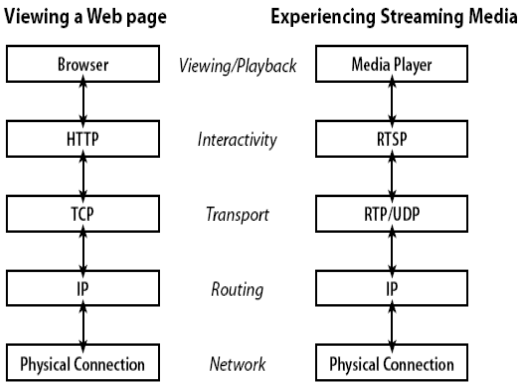
Challenges
- **compression**
- **rate scalability**
- **error resiliency**
- **low latency**

Transmissions protocols

In general there are two methods to deliver a media file on the Web: by a normal **web server** with the **HTTP** protocol, or by a dedicated server (**streaming server**) with the **RTSP** protocol (Real Time Streaming Protocol) or another similar streaming protocol.

HTTP protocol
based on TCP/IP, it was created to deliver text and images files, not streaming media files. The normal process of an HTTP request consists of the communication opening between the client (the browser) and the web server, the file request, the file delivering and the closing of the connection. There's no space to "play" a file.
RTP protocol
Layered on top of UDP, so there's no error handling or reliability. One-to-one or one-to-many (original goal) transmission. Includes payload type identification, sequence numbering and time stamping (SMPTE timecode).
RTSP protocol
based on TCP for communication and usually layered on top of RTP, it is dedicated to streaming. By this protocol you can control the file time "duration", which can be played with different speed, can be controlled by the server, can be stopped and played again, and its playing can be changed at runtime depending on different parameters.

- RTP is one way stream, RTSP enables control of streaming media (two way, like HTTP)



Transmissions protocols

- RTSP (Real Time Streaming Protocol)

  -high priority on continuous streaming rather than on absolute document security

- MMS (Microsoft Media Server).

  -This server cluster is able to handle up to 30,000 20k streams concurrently

Transmissions protocols

- TCP
- UDP

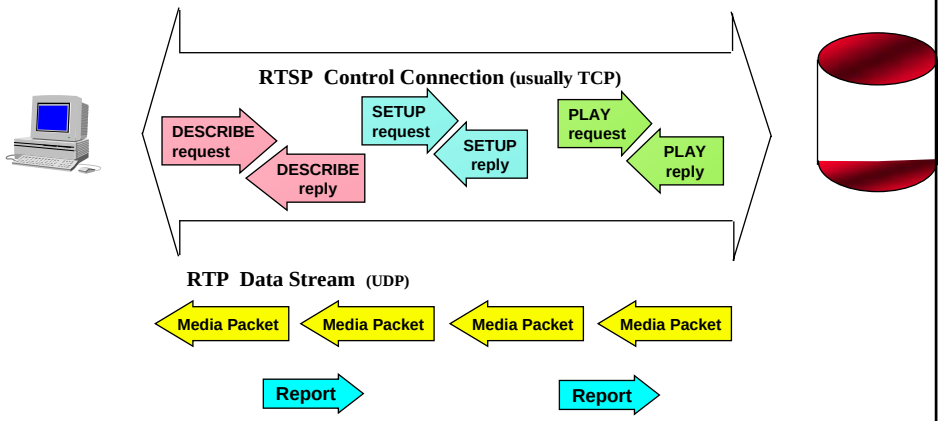
- RTSP (RealTime Streaming Protocol)
Real Networks

- MMS (Microsoft Media Server)
Microsoft
MMSU/MMST
MSBD (Media Stream Broadcast Distribution)

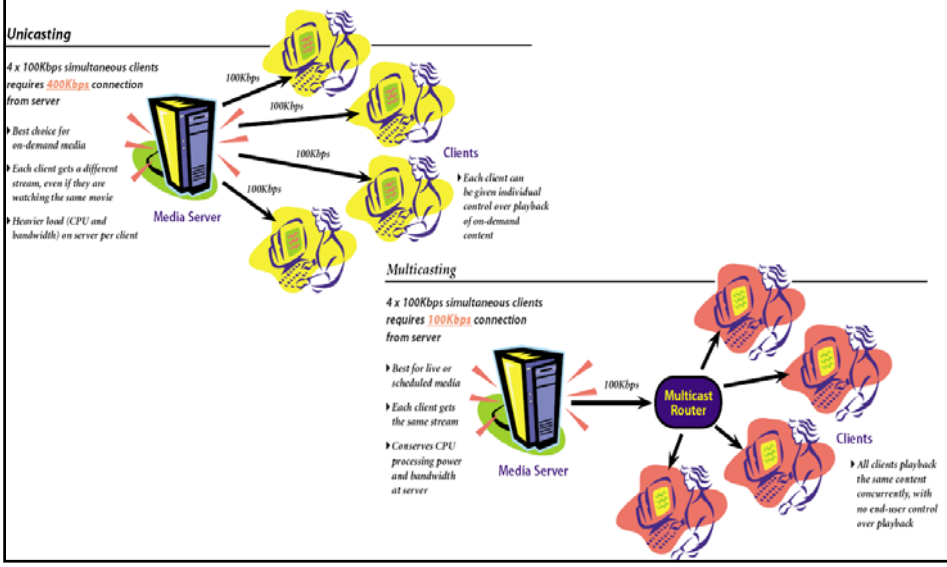
-**RTMP (Real Time Messaging protocol)**
Macromedia Flash

- HTTP
slower
transparent to firewall
lack of streaming functionalities

RTSP / RTP

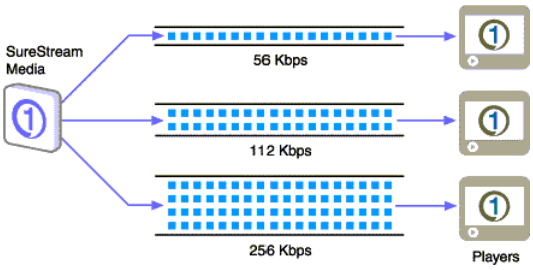


Unicast vs. Multicast



Multiple Bit Rate Encoding

- Combine several different streams into a single file
- The appropriate bit rate stream is automatically selected



The development process

Content planning 1

- Narrative
like conventional film and television, video streaming is all about telling stories.

- What is special about streaming?
unlike conventional film, some media are often displayed and used with other web resources such as web pages, animation, and messaging, which enrich the user experience. In addition, in digital media there is less emphasis on sequential narrative

- Scripts and storyboards
What you have to say (script) and what do you want to show (storyboard)

The development process

Content planning 2

-Shooting video for streaming

How you actually shoot your subject depends on the subject and how you intend to use the video.

Some tips to consider for a single lecturer for example:

- Composition
- Timing
- Movement
- User-orientation

The development process

Content planning 3

-Preparing for filming

Live broadcasts
Location
Shooting the subject
close up
Shooting for streaming
keep it simple !
Simple background
Tips for shooting
even lighting
not too much action or camera movement
The presenter

The development process

The equipment

Video camera
Tripod
Microphone
Lights
Capture card
Computer
Encoding software
Streaming server

Shaky camera: troubles for the encoder

The development process

Capturing the video

What computer hardware will you need?

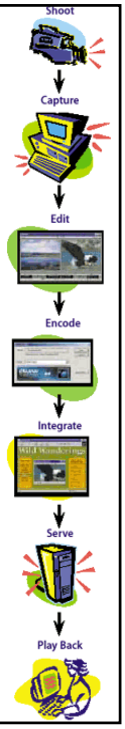
Capturing from digital

Capturing from analogue

What software will I need?

Capturing Video

- Get all data to the computer digitally.
- Use highest possible quality settings.
- 25 fps for video and 16-bit for audio is suitable.



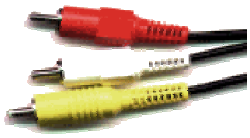
Capturing Video tips

- Resize the frame at 4:3 ratio when digitizing it
  - Keep width and height multiple of 16, for the codec
  - Eventually crop some pixels before resizing, to keep aspect ratio
- Deinterlace

The development process

Alternatives to filming

- Existing video material resources
- Audio only
- Screen capture software
- Macromedia Flash



macromedia FLASH

RenderSoft CamStudio

The development process

Editing

-Editing tips for streaming

Save an original copy
File formats
    deinterlace: it's frame not field !
Crop the film
    multiple of 16x16
Reduce the picture size.
Do not use too many special effects
    titles outside of video frame
Keep the clips short
Avoid background sounds such as music or talking
Enhance the audio signal

The development process

- **Encoders and players**
- Encoding, two main questions:

1. What media player will be used (e.g. Windows Media Player, RealOne media player)?
2. What Internet connection speed will be available? There is usually the option of delivering different quality of streams to users with different connection speeds.

- Use the multiple bit rate encoding features of the streaming encoder

Edit

- Adobe Premiere – tool for digital video editing
  - Put clips together
  - Make transitions
  - Add effects
  - Adding sound
- Compose a video production for streaming

Some Advices :

- Don’t add too much effects (transitions, dissolves, 3D-text etc.)
- Sometimes video sequences could be replaced with slow-motion or still images
- Make titles large and simple
- Audio

Integration With SMIL

- SMIL let you choreograph rich media presentations
- SMIL is to streaming servers what HTML is to web servers
- You bring together your presentations using SMIL
- RealNetworks supports SMIL in its player
  - Also IE >= 5.5 supports SMIL in HTML files

Technologies

Technologies

- **Real Networks**
  - RealPlayer
  - RealProducer
  - RealServer
    Helix OpenSource
- **Microsoft (WMT)**
  - WindowsMediaPlayer
  - WindowsMediaEncoder
  - WindowsMediaServer
- **Apple Quicktime**
  - Quicktime Player
  - QuickTimeStreaming Server
  - Darwin OpenSource
- **Macromedia Flash**
  - Flash Player
  - Communication Server Mx

- Macromedia/Adobe uses On2 VP6 or Sorenson codec for Flash video (FLV)
- Flash video does also real streaming

- Note: Google Video uses Flash video (and also all the other video sharing services: the player is embedded in the web page)

Streaming Server

- To use real time streaming you must use specific streaming servers.
- To upload data to a streaming server, you must save the data in a data type format that the server is able to stream.

- For example, SMIL -file.

Streaming Server…

- Microsoft, Real networks and Apple also provide streaming servers.
- Streaming servers for real time streaming do not use the same protocols as an ordinary HTTP server.

Pros of Streaming Servers

- Can broadcast and multicast (one stream to many users)
- Doesn’t leave a copy of the users hard drive
- Bandwidth usage can adjust to conditions

Cons of Streaming Servers

- The data that get lost in the transmission get lost forever
- Playback or data can be delayed or disrupted because the data rate gets bigger than the bandwidth
- Firewalls may not allow streaming files pass

Streaming Media Today

- Is used for movie trailers
- Live broadcasting

The Future

- If the user has a fast connection, streaming media is a practical way for broadcasting multimedia
- The future for streaming is bright
- Entire movies can probably be streamed
- The technology will be improved
- Distance courses by streaming media