Multimedia via Internet

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EK1 / EK15 :
MMDP - Multimedia -Dienst-Plattform
History

- Multimedia was the big hit of 1992, and every corporation, magazine, and local pet store had a CD-ROM or "enhanced CD"
- Dedicated links: FDDI, ATM, GigaBitEthernet ...
- Internet became a hit in 1996
- Multimedia over internet?
Why Multimedia over Internet

- Internet is a shared datagram network
- integrated data and multimedia services over single network
- Millions of recipients?
Problems

• Need for steady bandwidth
  Just increasing the bandwidth will not solve the burstiness problem. For most multimedia applications, the receiver has a limited buffer. If no measure is taken to smooth the data stream, it may overflow or underflow the application buffer. When data arrives too fast, the buffer will overflow and the some data packets will be lost, resulting in poor quality. When data arrives too slow, the buffer will underflow and the application will starve.

• Synchronization of streams
  real-time data becomes obsolete and will be dropped if it doesn't arrive in time. If no proper reaction is not taken, the retransmission of lost packets would aggravate the situation and jam the network

• Bandwidth requirements
• Stream control
• Broadcasting - the one-to-many problem
Solution

- shrink your files!
- Protocols for Streaming!
Media streaming

- What is streaming content?
- Streaming protocols
- Streaming products
Main Players

- Progressive Networks
  - Real Video
- Microsoft - Active Streaming Format
- ISO’s MPEG-4 group
- IETF’s Multicast Initiative
- Quicktime
- Macromedia
The rise of RealNetworks

- RealNetworks is the pioneer and established market leader in streaming media technology on the Internet. RealNetworks is helping transform the Internet into the next mass medium by making real-time, or streaming, Internet broadcasting possible and profitable. In only four years, RealNetworks software systems have become by far the most pervasive method of streaming media on the Internet and intranets.

- The first RealPlayer was released in 1995, and to date over 80 million unique users have been registered. The RealPlayer download rate now exceeds 175,000 per day, an increase of more than 270% since the beginning of 1997. RealSystem software is used to deliver content on more than 85% of all streaming media enabled Web pages. Every week, over 145,000 hours of live sports, music, news and entertainment are broadcast over the Internet using our RealSystem technology. There are also hundreds of thousands of hours of content available on-demand. The RealNetworks family of Web sites is among the top audio/video destinations on the Web and ranks consistently in the top 25 most popular sites anywhere on the Internet. RealNetworks was ranked by PC Magazine as 24th on its list of 100 most influential companies.
The truth is that the capture and compression process is slow and cumbersome, and raw, captured video is huge. How huge? Ten seconds of raw, uncompressed NTSC video (which is the standard for television) will fill as much as 300 MB of storage space. That would be more than 200 of my professor's disks, just for 10 seconds.
Codes

- Codec is an abbreviation for compression/decompression. A codec can be either a software application or a piece of hardware that processes video through complex algorithms, which compress the file and then decompress it for playback. Unlike other kinds of file-compression packages that require you to decompress a file before viewing, video codecs decompress the video on the fly, allowing the client to view the file from its compressed original.

- **temporal**
- **spatial**
- **Hardware codes**
Temporal compression

- This method of compression looks for information that is not necessary for continuity to the human eye or ear (remember that videotape plays back sound as well as pictures). It looks at the video information on a frame-by-frame basis for changes between frames. For example, if you're working with video of a talking head (a clip of a person sitting or standing with little motion), there's a lot of redundant information in the recording. The background rarely changes, and most of the motion involved is simple head movements and the movement of the area around the mouth. The compression algorithm compares the first frame (known as a key frame) with the next (called a delta frame) to find anything that changes. After the key frame, it only keeps the information that does change, thus deleting a large portion of your file. It does this for each frame until it reaches the end of the file. If there is a scene change, it tags the first frame of the new scene as the next key frame and continues comparing the following frames with this new key frame. As the number of key frames increases, so does the file size.
Spatial compression

- Spatial compression uses a different method to delete information that is common to the entire file or an entire sequence within the file. It also looks for redundant information, but instead of specifying each pixel in an area, it defines that area using coordinates.
Hardware codecs

- Hardware codecs are the most efficient way to compress and decompress video files. They are faster and require fewer CPU resources than their software counterparts. In order to capture clean raw video, most machines require a hardware codec that allows the video file to be fragmented and distributed rapidly on your hard drive. These hardware codecs are expensive, but deliver high-quality results. Using a hardware-compression device will deliver high-quality source video footage, but requires viewers to have the same decompression device in order to watch it. Hardware codecs are used often in video conferencing, where the equipment of the audience and the broadcaster are configured in the same way.
Protocols or Multimedia over Internet

- **RSVP (RFC 2205-2209)** - Resource ReSerVation Protocol
- **RTP (RFC 1889)** - Real-time Transport Protocol
  UDP with Timestamping ...
- **RTCP** - Real-Time Control Protocol
- **RTSP** - Real-Time Streaming Protocol
  basiert auf RSVP, RTP
RSVP

- RSVP is the network control protocol that allows data receiver to request a special end-to-end quality of service for its data flows. Real-time applications use RSVP to reserve necessary resources at routers along the transmission paths so that the requested bandwidth can be available when the transmission actually takes place. RSVP is a main component of the future Integrated Services Internet which can provide both best-effort and real-time service.
RTP

- Realtime transport protocol (RTP) is an IP-based protocol providing support for the transport of real-time data such as video and audio streams. The services provided by RTP include time reconstruction, loss detection, security and content identification. RTP is primarily designed for multicast of real-time data, but it can be also used in unicast. It can be used for one-way transport such as video-on-demand as well as interactive services such as Internet telephony
RTCP

- QoS monitoring and congestion control
- source identification
- inter-media synchronization
- control information scaling
RTSP

- Instead of storing large multimedia files and playing back, multimedia data is usually sent across the network in streams. Streaming breaks data into packets with size suitable for transmission between the servers and clients. The real-time data flows through the transmission, decompressing and playing back pipeline just like a water stream. A client can play the first packet, decompress the second, while receiving the third. Thus the user can start enjoying the multimedia without waiting to the end of transmission.

- RTSP, the Real Time Streaming Protocol, is a client-server multimedia presentation protocol to enable controlled delivery of streamed multimedia data over IP network. It provides "VCR-style" remote control functionality for audio and video streams, like pause, fast forward, reverse, and absolute positioning. Sources of data include both live data feeds and stored clips.
Today and in the further...

- Online-Music
- Online-Video
- TV-Streaming
- Videoconferencing
- Internet-Telephony
- Online-Gameing

- Online-Software
- Online-Learning
- Distributed simulation
- Remote virtual Reality

...
SMIL - HTML + Time?

The making of a SMIL presentation is basically, these three things:

- Create the areas for your media.
- Fill in those areas with media objects.
- Determine the order, in which to play them in sequence, parallel or combination of both.
<smil>
  <head> <!-- Presentation attributes. -->
    <meta name="title" content="House of Dreams"/>
    <meta name="author" content="RealNetworks, Inc."/>
    <meta name="copyright" content="(c) 1998"/>
  </head>
  <layout>
    <!-- Width, height, and background color of entire presentation. -->
    <root-layout width="580" height="213" background-color="black"/>
    <!-- Text region. -->
    <region id="text_region" left="0" top="0" width="260" height="213"/>
    <!-- Images region. -->
    <region id="images_region" left="260" top="0" width="320" height="213"/>
  </layout>
  <body>
    <par> <!-- Play these streams concurrently (in parallel). -->
      <text src="house.rt" region="text_region" begin="1s"/>
      <img src="house.rp" region="images_region" begin="1s"/>
      <audio src="house.rm" clip-end="145s"/>
    </par>
  </body>
</smil>
VoD

- Video On Demand
Live Broadcasting

- Capture and encoding
- Broadcast server
- Potential use of multicasting
- Bandwidth limitations
Multicast
Unicast
Too much is too much!

- Never include a permanently moving animation on a web page since it will make it very hard for your users to concentrate on reading the text.

References

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ftp://ftp.isi.edu/in-notes/rfc2205.txt

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