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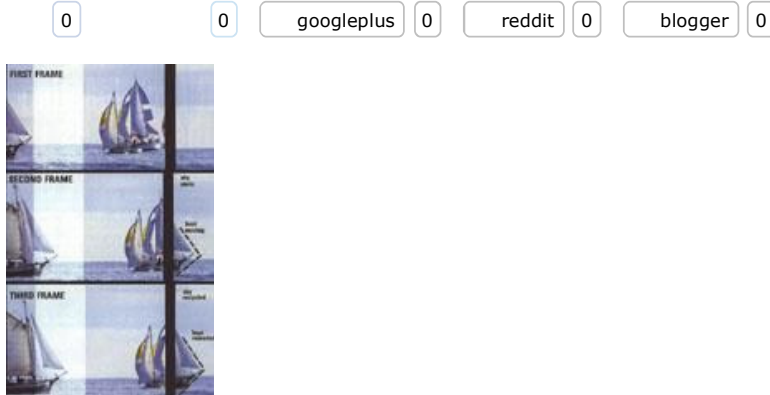
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Streaming Video: Internet Broadcasting for the Masses

Use the technology of streaming video to transmit your videos over the Internet to a global audience. We'll explain step-by-step how to get started on this road to the future of video.

During the dark ages of the early 1990's, people waited many minutes to download video clips from the Internet. Finally, someone thought, "Why don't we watch one part of the video while the rest of it downloads?" Thus streaming video, a system of special compression and buffering techniques was born. It allows you to transmit real-time video over the Internet to an exponentially expanding worldwide audience.

You may ask yourself "What does this have to do with me? I'm not a computer person." But if you're a videographer, you might be interested in a way to present your work to a potential audience of millions. After reading this article, you'll understand:

- what streaming video is,
- how to shoot video for streaming,
- how to digitize and compress the video onto your hard drive, and
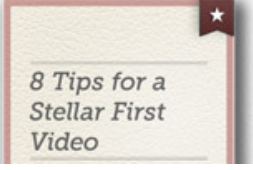- why you need a streaming server.

So keep reading and step into the future of video.

The Basics

To view a streamed video file from the Internet, you need to install a plug-in (special helper software that works in conjunction with your Web browser to handle the downloading and decompression of the video). To perform the miracle of transmitting and receiving video and sound through a phone or high-speed data line, streamed video uses a nearly magical formula of compression and buffering.

To compress video, a complex mathematical formula breaks the video into individual frames. Each frame is broken into moving and static components. Compression software takes each moving object and guesses where it will be in the next frame. By refreshing only the moving components of a frame, and recycling the static, compression reduces the size and transmission time of the video file. Similarly, in *The Flintstones*, the animators saved countless hours by drawing only the moving parts of each frame. Fred's mouth was often times the only thing moving in a scene, thus that was the only part actually redrawn for a frame, the rest was recycled from the previous frame. There is a downside to compression. If the camera is panning, zooming, or moving in any way, the whole image is in motion, leaving nothing to recycle. This leads to poor compression, and slower transmission.

Compared with the voodoo magic of compression, buffering seems fairly bland. By giving the file a few seconds to load before starting to play, a reserve of video is available in the memory of the viewing computer in case the transmission slows for a moment. When the transmission slows, the viewing computer uses part of the reserve of video. If the transmission becomes too slow, the buffer completely exhausts itself, and the video plays at a lower frame rate and becomes choppy. Better streaming packages will adapt the buffer size to the speed of the connection, even as it fluctuates with the normal ebb and flow of Internet traffic.

Shooting for Streaming

Streamed video is heavily compressed, so your goal is to maximize the quality of the video, while minimizing the amount of digital artifacts and choppiness that will inevitably occur in a streamed video.

Remember that if the camera is moving, everything in the shot is moving too. To keep your streamed video from slowing down, shoot images with very little motion and use a tripod. Avoid high-motion shooting techniques, such as panning and zooming. This is not to say that you must eliminate all motion in your shots, but try to make sure that the only thing moving is the main subject.

The colors you choose can also affect how well your video will compress. Bright solid colors are best. Dark colors can confuse the compression software by blending together with subtle shadows. The contrast of colors is crucial too. Choose subjects that contrast distinctly from their backgrounds. Patterns, either in the foreground or background, must be constantly refreshed when there is the slightest movement.

Digitizing and Compressing

If you use an analog camcorder, you'll need a capture card to digitize the video. A video capture card is an expansion card that works in conjunction with, or replaces, the existing graphics adapter inside your computer. If you used a DV (Digital Video) camcorder with a FireWire jack, you'll be able to transfer the video directly onto your hard drive with a FireWire capture card.

With analog video, the first step is compressing the video into an AVI, MOV, or MPEG format to store on your hard drive. Compress the video at the lowest available ratio that allows the clip to fit on your hard drive. Don't worry about the file size at this point, because you will have to compress the video again into a streamable format.

Once your video is captured, edited and rendered into a file onto your hard drive, you need to select one of the streaming software packages to further compress the file into a streamable format. The software you choose needs to be supported by the streaming server you select. Find out which software packages your prospective server supports before purchasing software or hosting services (See sidebars of streaming software and streaming servers).

When you compress the MPEG, MOV, or AVI into the streamable format you have to choose exactly how you want it compressed. The first decision to make is how much of the video quality you want to sacrifice to make the video play better over the Internet to phone-modem-connected users. The three factors that make up the quality of a video are frame rate, color depth and resolution.

Frame rate is the number of still images that make up one second of a moving video image. At 30 frames per second (fps), images seem to move fluidly and naturally. Video digitized at a frame rate of less than 15fps becomes noticeably jumpy. Since current phone and modem technology limits the frame rate to 10fps, you might as well set 10fps as the target in your compression scheme. If a video clip contains a lot of action, then limit it to 7fps.

An alternative to using 7fps streamed video is the Web slideshow, which limits the frame rate to one frame every five seconds. This allows for one higher resolution image to be displayed with an audio track, instead of 35 low resolution frames. (See the May 1998 issue for more about Web slideshows.)

The second quality variable is color depth, the number of bits of data the computer assigns to each pixel of the frame. When there are more bits of data assigned to color each pixel, there are more colors that can be emulated on the screen. Most video is either 8-bit 256 color, 16-bit 64,000 color, or 24-bit 16.8 million color. 256-color video is very grainy and unsuitable for viewing. 24-bit color is optimal, but because it greatly increases the size of the streaming file, you'll want to settle for 16-bit color.

The third factor in determining the visual quality of the picture is resolution, measured in number of pixels. The more pixels there are in your picture, the higher the resolution of the video. For example, if your video is 640x480, you have 640 pixels across each of the 480 vertical lines of pixels. Streamed video ranges in resolution from postage-stamp size (49x49 pixels) to 160x120 pixels, the highest resolution you can stream to users connected through a telephone line, all the way up to 640x480 and beyond, which is considered full-screen video.

Serving Up Your Video

To provide streamed video on your Web site, you either have to serve it from your own Web server, or have it served from a remote video streaming service provider. Since few of us have own Web server we'll avoid the techno mumbo-jumbo and just cover what to look for in a streaming server.

The first consideration is how many "streams" a remote streaming provider will allot to you. A single stream, for example, would allow one viewer to watch one video clip at a time. If you had 20 minutes of streamed video, 10 streams would allow up to 720 people to watch that video in a 24-hour period. Some servers charge you by the number of streams you want *available* to potential viewers, while others charge you by the number of streams actually *served* to viewers.

Some servers do not sell their service by the number of available streams. Instead, they charge by the Megabyte for the total amount of your data that they have served, regardless of the number of concurrent streams that your viewers are using.

Another thing to keep in mind when choosing a streaming server, is that not every company will serve every format of streamed video. When you've chosen a streaming software package that you want to use, make sure the serving company you are considering can accommodate it (see sidebar).

The Possibilities

Streaming video is just in its infant stage, yet is has a potential limited only by the amount of data that can be transmitted at one time, or bandwidth. However, bandwidth is expanding exponentially. For the Web surfer, this could eventually mean 200 million channels of TVesque video. For makers of video, this could be an

unprecedented broadcasting opportunity. For more information about streaming video, visit Videomaker's video streaming FAQ at www.streamingvideos.com.

*Larry Lemm is **Videomaker**'s editorial assistant.*

[Sidebar: The Streaming Contenders]

Even though streaming video is fairly new, there are already a few major players in the streaming software market.

RealVideo: RealVideo software by RealNetworks (www.real.com) is the current leader of the video streaming industry. Its browser plug-in and encoding software are free, but you have to pay for the server software. Because of its large installed base, RealVideo is a solid choice for any potential video streamer.

Netshow: Netshow (www.microsoft.com/netshow/) is an up and coming video streaming package from industry giant Microsoft. The plug-in and encoder are free, while the serving software is compatible with RealVideo, Vivo and VDO to allow a video server to serve a variety of streaming formats.

VDONet: VDO by VDOCorp (www.vdo.net) was one of the earliest streaming packages, but is now losing ground in popularity to the other formats. The plug-in is free, but you'll have to pay for the encoding and serving software.
- LL

[Sidebar: Streaming Servers]

Here is a list of companies that will host your streamed video.

Video 2 Net
www.video2net.com/

911 Media Arts Center
www.911media.org

NET Limited
www.netlimited.net

WCD Enterprises
www.wcd.net

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