A Streaming Media Primer

A Guide for the Absolute Beginner

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What is Streaming Media?

According to the web definition ***streaming video*** is:

A sequence of "moving images" that are sent in compressed form over the Internet and displayed by the viewer as they arrive. Streaming media is streaming video with sound. With streaming video or streaming media, a web user does not have to wait to download a large file before seeing the video or hearing the sound. Instead, the media is sent in a continuous stream and is played as it arrives. The users needs a player which is a special program that decompresses and sends video data to the display and audio data to speakers. A player can be either an integral part of a browser or downloaded from the software maker's web site. Streaming video is usually sent from prerecorded video files, but can be distributed as part of a live broadcast "feed". [1]

Concept 1: Compression

O.K. now that we've read the definition what does all that mean? Well to start, the video we see at the movie theater or on our television sets is very different from the video we view through the Internet. Different because the former is generally in a "raw" or "uncompressed" format which means it is of a higher quality. On the other hand, the video we view through the Internet needs to be heavily compressed because the Internet does not have the capacity to send video in it's raw form. That is one reason why the video we typically see through the Internet is roughly one half the size (physical dimension) of television. Video files are compressed by using a specialized piece of hardware or software (or combination of the two) known as an "Encoder".

An encoder has specialized compression techniques that are used to reduce the file size. Every encoder has a complimentary "decoder" that knows how to reconstruct the original video signal from the encoded file. When considered as a whole an encoder and decoder are known as "Codecs" - which is short for "Compression/ Decompression". Some codecs are based on Internationally set standards, e.g. MPEG II which is used for DVDs. Other codecs are closed and proprietary such as Microsoft's Windows Media Video. In addition, codecs often have different "Profiles" which are slightly modified versions of the same codec that are optimized for a certain application, e.g. High Definition Television, Internet Video Streaming, Cell-Phone playback, Low-Latency etc...

The decoder, like the encoder, can also be a piece of hardware, software or combination of the two. In the computer world, decoders are usually software based and are bundled with other types of software which together are known as a "Media Player". Media Players are usually distributed by the maker of the proprietary codec.

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[1] quoted from www.sasktel.com

Using Microsoft as an example again, they distribute a software known as Windows Media Player which when installed on your PC will allow it to decode Windows Media Video *(.wmv files)*.

Concept 2: Downloading vs Streaming

There are two ways to send a video file from a server to an end user. The most basic way is to download a physical copy of the video file from the server to the user's hard drive. The advantage in this system is that it is relatively easy to set-up, simply place the video on the server and then place a hyperlink either in an e-mail or a web page that directs the user to the content. There are many limitations in this method but we will only cover a few:

- User retains a copy of your video content. If you want to "protect" your content you should not make it available for download. There are technologies known as "Digital Rights Management (DRM)" that can combat this issue.

- Downloading uses more bandwidth. Because the user downloads the video as fast his Internet connection will allow, often times the user will download more of the video then they actually watch. In addition if they wanted to watch only the end of the video they will need to download all of the content before they will be able to access that portion of the content.

- Fewer simultaneous connections per server. Downloading video can be very demanding on the server because it will only take a small number of users on a broadband network to use up all of your server's bandwidth. By streaming the video you are able to throttle the bandwidth and in turn support more simultaneous users.

The alternative to downloading a physical copy of the file to the user is to "stream" only that portion of the video that the user is currently watching (plus a small buffer to compensate for intermittent network issues). Streaming video typically requires a specialized piece of software to be installed on the server that will manage the connections to the user. Because the user does not download a copy of the file they are unable to save it locally. As stated above the Streaming method also uses less bandwidth and can support more users per server. However, that is not to say Streaming is without it's limitations including:

- More complicated to set-up then downloading.

- Streaming Server software can be expensive and may require proprietary platforms e.g. Windows Server Environment and do not necessarily fit economies of scale.

Concept 3: The Media Player

Today, there are a vast array of media players in the world. Some media players take a universal approach and will play most media formats, while others only play specialized proprietary formats. Do to the fact that not every media player is installed on every system it has become a de-facto standard for web sites to offer several versions of the same video in different formats so that they comply with at least one type of media player on every system. Usually these players are Windows Media Player, Quicktime and Real Player.

Another popular video format today is Flash video. Flash plays through a special plug-in that is installed in the web browser. Because Flash is a plug-in for the browser and not a Media Player on the system it will be necessary to install the plug-in for each web browser that you use on your system. Like the players above Flash has it's own proprietary format, that require special encoders to create the video content.

A third option is the format advocated by Maui X-Stream known as "Player-Less" streaming. Player-Less streaming is different in that the video player is not installed on the client but is sent as part of the video stream. The major advantage to this system is that it relies on a ubiquitous technology known as Java to operate. Because Java is installed on over 90% of the world's PC's and other devices (e.g. PDAs, cell-phones etc...) it is possible to have one video format reach almost all devices. If a client does not have Java they can download and install it from www.java.com. Java is available for almost all operating systems including Windows, Macintosh, Linux and Unix.

Concept 4: Live Video Streaming vs. Pre-recorded or On-Demand Streaming

There are two basic ways that a video can be streamed. One is in real-time, or as it is happening and the other is pre-recorded content. The major difference between the two is that the Live Streams cannot be downloaded, they need to be streamed. So, you will need a server side software to route the streams from the encoding tool to the end user. Conversely, a pre-recorded video can either be used in conjunction with a streaming server or as a download.

Like media players there are a number of streaming servers on the market today, and they usually come together as a family of software e.g. Windows Media Server/ Windows Media Video/Windows Media Player. Player-Less streaming is a little different in that the pre-recorded content is streamed without the use of a streaming server. This is possible because the tiny java player that is sent with the video stream is capable of negotiating the stream between the client and an ordinary web server. In this way you get the simplicity of a download system with all the benefits of the streaming server system. However, like the competition live video streaming with the Player-Less system still requires a server side routing tool, which is known as VX30 B-Cast.

Summary

This paper is a gross simplification of many subjects. It is only intended as a quick introduction for the newbie who is just learning the abcs of Internet video streaming. To reiterate the 4 key concepts covered in this paper are

1. **Encoding** - how video is compressed for transport on the Internet.
2. **Streaming vs. Downloading** - the two ways to send video over the Internet.
3. **The Media Player** - how video is decoded on the client.
4. **Live Video vs. Pre-recorded Content** - live video has more requirements than pre-recorded.