A Streaming Media Primer

A Guide for the Absolute Beginner

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Table of Contents

What is Streaming Media?

According to “Google[1]” the definition for 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". [2]

O.K., but what does all that mean? Basically the video we see at the movie theater or on our television sets is different from the video we view through the Internet. The main difference is that the video has to be heavily compressed. This compression is why the video often appears blurred or pixelated. The reason why the video has to be compressed so much is that video files are very large and the Internet does not have the capacity to move these files.

To compress video files we need an Encoder[3]. The encoder can be either a piece of hardware or a software program. It is also possible to have an encoder that is a combination of both. Encoding video can be done in real time for live broadcasting or pre-processed as part of an on demand application. The more a video has to be compressed the lower the quality will be.

The data stream passes from the server, through the Internet to the client who interprets that data stream as video. The data stream is interpreted by a piece of software known as the “Player”. The

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1 Google is a popular website for searching information on the Internet.
2 Taken from www.sasktel.com
3 A facility that encodes data for the purpose of achieving data compression. -Taken from www.sun.com

player contains an algorithm[4] that recreates the video from the data stream. The quality of this video stream is determined by a number of factors including the amount of compression that was used by the encoder and the compression technology it used. The process for compressing and decompressing video is called a “codec”. The type of codec used plays a major role in determining the characteristics of your video stream.

There are two types of video players; the native player and the “playerless” system. The native player is a piece of software that is distributed by the streaming software provider that has to be installed on the client's computer for the video to work. Examples of a native player include Quicktime, Real Player and Windows Media Player. The java player is also known as the “playerless” system. The “playerless” uses java so it does not require the client to install any software on their system to view the video. Both systems have their advantages, which will be discussed further in the “Player Debate” section.

4 A procedure or formula for solving a problem.

Streaming vs. Downloading: What's the difference?

To a content provider who is offering a very small amount of video as part of their on line service the difference may hardly be noticeable. But to anyone who is offering video content as part of their day to day operation should pay close attention to this next section. The major difference between the two is that streaming video gives an almost constant amount of data to a client at a time, while downloading provides data to the end user as fast as they can accept it. So downloading is better, right? Actually the answer is a resounding, No! The server delivering multiple constant streams can serve a much high number of clients than the same server that is downloading video to clients. As a matter of fact a server that is downloading video can easily become overloaded because of the processor intensive nature of downloading files.

Streaming has many advantages from the client's perspective as well. With a streaming technology the video starts playing immediately. On the other hand with a downloading method the end user has to wait until a significant portion of the video has finished downloading. With some formats the client has to wait until the whole clip has been downloaded! This can take between minutes and hours, depending on the size of the clip. So why would anyone use downloading? Well it's the cheapest solution, but let the buyer beware! This may be the appropriate solution if you have a very limited amount of video content, but if you are offering video content as part of your day to day operation this is not an acceptable practice.

Another important difference between streaming and downloading is that in the end downloading the same clip will use

more bandwidth[5] than the same clip that is streamed. How is this possible if the videos are the same size? Well the answer is that not everyone will watch your whole video. When downloading the client will download the whole video but may only watch part of it. With streaming video you only supply them with as much bandwidth as they need to view the video, or segment of that video. In the end this can result in an incredible amount of bandwidth savings.

A final consideration between downloading and streaming video is digital rights management Once someone has downloaded your video content onto their system they than have a local copy of your property. Even if your content is right protected it is still possible for a hacker to break your protection and than redistribute your content, without your permission. However when streaming it is much more difficult to record the video.

5 The rate at which information travels through a network connection, usually measured in bits per second, kilobits (thousand bits) per second, or megabits (million bits) per second.

Bandwidth Considerations, so how much do I need?

The bad news is this can be a complicated topic. The good news is that there are a multitude of bandwidth providers out there so you will be able find one that is right for your situation. The basic rule of thumb is that a minute of streaming high quality content requires about 2 mega bytes of bandwidth[6].

So where do you buy bandwidth? Well the short answer is that if your peak audience is less than a hundred than you will need a single server. In this case your best option may be to either rent or host a server. There are many hosting providers out there – do your home work and try to find one that is on one of the Internet highway's backbones. In this kind of solution you can get a dedicated server from anywhere between a hundred and five hundred dollars a month. With this type of service you should expect to get a minimum of a 100GB of bandwidth per month. Getting back to our original figure of 2MB per minute means that a 100GB will equal out to about 830 hours of video streaming.

If your peak load will be in excess of a hundred or more users than it is time to consider using a “Content Delivery Network”. A Content Delivery Network (from now own called a CDN) is a network that will distribute your content over a large number of servers. Distributing your content in this manner has many advantages over using a standard single server setup. With this kind of set up you don't have to worry about downtime or your server becoming over loaded. In addition the way this technology works is that it will always choose the most direct server to communicate with your client. This will make your client connections faster, which in turn will make your video load faster. The drawback with using this kind

6 When using the Vx30 method -other methods may not be able to support this many concurrent sessions.

of system is that it is more expensive. CDNs usually charge by the gigabyte and you can expect to pay anywhere from $2-6 per GB depending on the company and the amount of bandwidth your pre-purchase.

The Player Debate

In the first section we outlined the basic difference between the native player and the java player. So why would you use one over the other? Well the advantage of the native player is that it has better performance over the java player. This means that older computers will be able to see the video without any performance related issues. The problem with native players is that as the content provider you need to offer video for at least 2 different formats, to guarantee that your video will be viewable by at least 60% of the people who visit your website. This makes deploying and updating your video content much more complicated. The other issue is that as new technology develops your customers each have to update their "player" individually so that they can take advantage of your improved service.

For the client this is undesirable as well. For they have to install, upgrade and manage different video applications on their computer just so they can see streaming video. There has also been a number of security exploits that have taken advantage of the different video players as well.

On the other hand, the java system uses a software program that is installed on over 90% of the world's computer systems. As the content provider this means that you can offer one format to reach a larger audience. Another nice advantage of this system is that, unlike the native player system, when you upgrade your clients get automatically upgraded. This is because all the streaming technology resides on your server, so when the client connects to your server they get upgraded automatically without having to do anything. Another aspect of the playerless system is that video playback is more immediate. This is because the client does not have to wait for a third party program to launch before they can view the video.

The Video Server

The video server is a software program that maintains the different connections between the server and the client. There are serveral video server technologies on the market today. The major disadvantage in video servers is that they either allow you to only stream their proprietary video format or that they have expensive licensing costs. Video servers are also relatively complicated to setup and maintain as they are designed with the professional user in mind. Another limitation to the video server is that they cannot support as high a number of client connections as their web server counterpart[7]. Video servers also make use of a host of protocols to stream the video. The problem with using these protocols is that they require you to open up ports on your firewall to use them. This makes your server vulnerable to attack and if your client is behind a restrictive corporate firewall than they will not be able to receive the video.

The "zero client"[8] approach that is used by Vx30 has many advantages over the traditional video server. Among these advantages are:

1. Easy to use.
2. Supports a higher number of clients per server.
3. Platform agnostic – you can use any Operating System or Web Server technology.
4. When you upgrade your content you automatically upgrade you server and clients.

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7 A Web Server is a software application that uses the HyperText Transfer Protocol. A Web Server is usually run on a computer that is connected to the Internet. There are many Web Server software applications, including public domain software from Apache, and commercial applications from Microsoft, Oracle, Netscape and others. A Web Server may host or provide access to Content and responds to requests received from Web browsers. Every Web Server has an IP address and usually a domain name, eg. www.murdoch.edu.au or a sub-domain, eg. www.it.murdoch.edu.au. Some Web Servers are Virtual Servers.

8 A system where no software is installed on the server.

5. Uses only the HTTP protocol – more secure and can stream to clients behind restrictive corporate firewalls.

Realtime vs On Demand

There is basically one critical difference between an On Demand and a Real Time system. The difference is that one is broadcasted in real time (or as it happens) and the other is prerecorded and made available as requested. The realtime system is more complex and requires both a hardware and a software solution. To broadcast a live event you need a capturing device that will give you a live feed to encode. A typical capturing device could be a camera that is connected to a computer via a USB or Firewire Port. Another type of capturing device could be a video card that is taking input from a mixer board or another type of analog[9] input.

To complete the live feed a piece of software will encode the video stream in real time into a streaming video format. Once the stream is encoded it will than be broadcasted to the Internet directly off the encoding machine or through a relay network. A relay network is a system of servers that will amplify the video signal for the purpose of reaching a larger audience.

In an on demand application the video is taken from a storage device such as a tape, a hard drive or a CD and than converted into a streaming video format. If you are going from tape you will need a hardware capturing device. Hardware capturing devices range greatly in price and capabilities, so you will have to shop around to find one that is right for your needs. Once the video is encoded you than place your content onto either your web or video server. The video content than is made available to your clients by linking to it from within your web pages.

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9 A mode of transmission in which information is represented by a continuously variable electrical signal.