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With faster modem links and improved compression technology now available, Nigel Whitfield shows you how to make the most of streaming media.

Live sound

The days of streaming media sounding like the wrong end of a call to an underwater phone box, and looking like a series of slides from an impressionist cartoon are, thankfully, long gone. Streaming media – audio and video that starts to play back as soon as you click to download it – has greatly improved from the early attempts of pioneers such as RealNetworks.

Nowadays, of course, modems are generally faster, and more people have digital links thanks to ISDN, cable modems and even ADSL. Compression technology has improved greatly too, as has processor speed, which means modern CPUs can handle more complex decompression routines. Best of all is the fact that you can now add streaming media files to your own website very easily, especially as many of the streaming tools suppliers offer cut-down free software aimed at consumers.

What's out there?

At the moment, there are three main companies offering competing streaming media formats: Apple, Microsoft and RealNetworks. Microsoft is a latecomer to the market, and it's tempting to write off its contribution if you're committed to providing a website that works on more than just Windows. But that would be unfair because,

and vision

despite its lack of cross-platform compatibility, there are other advantages to its system.

RealNetworks is the longest established player in the field and the first name that comes to mind when people consider streaming media. Some Internet Service Providers, such as Demon Internet, provide free Real Audio services for pages hosted on their servers. This makes it easy to get started with streaming media because you won't have the worry of configuring servers or hosting your own content.

Apple's QuickTime is one of the most flexible systems, with a player that will decode just about any format, streaming or not. For viewers on Windows and Macintosh systems, there's a wealth of content available via fast Internet links.

All these formats are steadily becoming fairly standards-based, but that doesn't mean you can use any player to play back any type of streaming file. What it does mean, however, is that they all use Real Time Streaming Protocol (RTSP) to access information over the Internet.

Like http, it defines a method for a client to request the transfer of a file, and will work over a number of networks. You'll also hear about Real Time Protocol (RTP), which is a lower-level protocol designed to make it easier to deliver continuous streams of information over the net.

When streaming MP3 requires a download to stream

With the Internet virtually awash with files in the MP3 format, it would seem a pretty logical choice for streaming. There are plenty of free downloadable tools you can use to create and serve streaming MP3, such as ShoutCast and Xing's StreamCast servers. There are also a couple of servers for Linux systems that will do the job.

The name of the streaming MPEG 3 format is m3u, and you can play streaming files in this format by configuring your web browser to recognise that extension – it will work with most of the popular media players.

With the ShoutCast network, you can become what the company terms a DJ, broadcasting your own radio station on the Internet, with a listing on the Shoutcast pages.

While all this is handy, there are some problems. First, different systems use different ways of serving and requesting the content. If you want to use a selection of different services, you might find yourself with a collection of different programs to listen to them as well. Widespread adoption of RTSP should fix that, however, allowing you to use just about any program to listen to m3u files. Until then, some services, like ShoutCast, will need you to use their own specific software.

The other big problem with MP3, in terms of streaming, is that it wasn't originally designed as a streaming format. If you record a file with a reasonable bit rate, it will still be quite large, and when you stream it, you'll end up using lots of your bandwidth.

For example, one of the sample files that we used in writing this article was an MP3 file with a bit rate of 6.8Kbytes/sec. The whole file was around 900Kb, and playing it over the Internet would use practically all the bandwidth available over the 64K line that linked the test server to the Internet.

Converting the file to a QuickTime streaming format reduced the size to about a third, and resulted in a much lower bit rate of about 12-13Kbits/sec at most.

Of course, one of the benefits of MPEG 3 is that you can choose a different bit rate to make a file smaller. If you're encoding one for people to listen to live, rather than by downloading, it's important to make it as small as possible.

For the time being, however, we would recommend that you stick to other formats, and certainly steer clear of anything that requires visitors to your pages to download yet another piece of software before they can listen to your audio.

In theory, using RTSP means you can play common formats using any media player you like. In practice, things are more difficult. If you're streaming MPEG, for instance, then most systems can play that. But try using QuickTime video format, or one of RealNetworks' file types, and you'll find that you're restricted to clients that understand those formats. This will cause some problems with web browsers.

For the technically minded, RTP sits on top of the UDP layer of the Internet Protocol, much like DNS. In other words, delivery of data isn't guaranteed. For really high-quality streaming media, you'll have to wait for IPv6 – the next generation of the Internet Protocol – which provides real options for specifying quality of service.

In the meantime, the way that systems such as Apple's QuickTime TV network operate is by having a network of servers mirroring content on a high-bandwidth network, such as the one operated by Akamai. By bringing the content as close as possible to the end user, the company hopes to reduce the number of hops in the route and minimise the effect of Internet congestion. But for the time being, unless you have a lot of money to spend, you'll have to live with that congestion if you want to serve your own media.

Simply multimedia

There's one more acronym you're likely to come across when you dip a toe into the waters of streaming media – SMIL. This is a mark-up language, or more correctly an XML scheme, for controlling streaming media. You can specify, for example, an area within a browser window in which first one and then another media clip will play.

There are plenty of other neat tricks that SMIL can do, helping to provide a degree of interactivity within the world of streaming media. You can use SMIL to control the behaviour of clips with QuickTime and Real players, but for the time being, there's no need to worry about it. You can do streaming media without SMIL, it just gives web authors more control so they can do fancier things with streaming content. There's not enough space in this feature to fully cover SMIL, but we'll elaborate on it in a later issue.

For now, we'll assume you want to do something fairly simple, like adding streaming media to an existing website. You could use it to

Creating Real Audio content

Real Audio is a popular format, and some ISPs let you stream content from their free web space. RealProducer can convert a number of files into the format necessary for uploading to a web server. You'll find RealProducer Basic on the cover disc.

Installation is simple. Click on the Setup program and supply your email address. The first time you run the program, you'll have to choose whether you want people to be able to record your files as they watch them.

1 You'll now find yourself in the Recording Wizard, which is the simplest way of converting your file. You can start the Wizard from the File menu if it doesn't appear automatically. All you need to do is choose the type of information you want to process. In this example, we're electing to convert a file. Click OK to arrive at the next screen, where you can browse to find the file on your hard drive, then click Next to carry on.

2 The information screen allows you to specify copyright and other information, which can be displayed to people as they listen to your file. Supply the information that you want to make available, then click Next. You can specify whether you want to create a multi-rate file on the next screen, or a single-rate file. Choose the second option, of course, unless you know that your file will be on a Real System G2 server.

3 From this list of rates, you can choose the most appropriate; for the widest possible audience, choose one of the modem options, but remember that you'll lose some quality. On the next screen, you can specify the type of sound file – whether it's speech, music, and so on, which optimises the encoding. There's a similar screen for video too. The following screen lets you specify a file name for the results.

4 Here are all the statistics for the file. Check that all the settings are OK, then click Finish. You'll be returned to the main screen of RealProducer, where you have to click on the Start button to perform the conversion – the Wizard merely sets up the options for you.

5 When the conversion is finished, you will be asked if you want to submit information about your clip so that it can be indexed on RealNetworks' website. For the moment, just dismiss that dialog box. This screen shows the main RealProducer window, as you will see it when you're processing a video file. The window on the right shows the results of the processing, so you can see how much the quality is being affected, and change the settings if you like.

play a welcome message to people on your website or to allow visitors to see your latest TV advert. You might have sound files that you want people to be able to listen to, or a holiday video you want friends to be able to watch without having to first download the entire file.

Making choices

When you want to stream media, the first thing you need to do is choose which format you're going to use. There are some formats around that don't use RSTP – but they're strictly minority systems – and many of them will migrate to the standards-based system in time. If you want to be sure of reaching a reasonable audience, the choice is really between Apple, Microsoft and RealNetworks.

With three different formats, you need to pick the most appropriate for both your audience and the server that will be hosting your media clips, which needn't be the same one that hosts your web pages.

QUICK TIP

On a PC, you can choose which media player program is used for RTSP links by opening any folder, then selecting View, Folder Options in the resulting window. Click on File types and add or update an entry for RTSP links.

Adding Real Media files to your web space

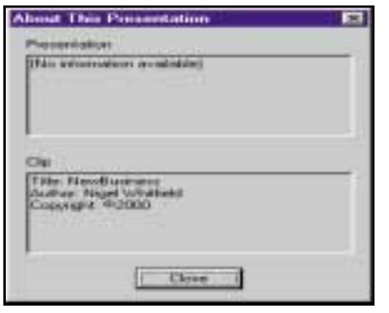
Adding Real Media files to your web space is simple; for this example, we're using the Demon homepages service, which provides two streams – so two people can be listening to your file simultaneously. Here we're just covering the basics of uploading a file. You can also embed Real Audio files in web pages, using the EMBED tag, which allows them to be played as background files. There's more information on some of the streaming media websites listed in the quick tips.

1 Once you've created your files, you'll need to upload them to your web space. Here we're using CuteFTP, which you'll find on the cover disc, Skip the wizard that appears when you start the program, and choose Quick Connect from the menu. For the Demon server, enter homepages.demon.co.uk as the host, and your node name as the login name. For other ISPs, follow the instructions you've been given, then click the Connect button.

2 When the connection to the server has been made, you may see a message like this one, displaying status and other information. You can usually just click OK to dismiss it, and carry on. It's a good idea to create a folder for all your streaming media, to keep it in one place, so do that and then change to it.

6 If you visit your web site without an index.html file, this is what you'll see. It's a listing showing the sizes of all the files in the folder you created earlier. Double-clicking on a .rm file should download it to your hard drive and play it from there, while choosing the .ram file instead will download that, then launch RealPlayer to access the streaming server.

7 Here's RealPlayer, running one of the clips directly from the website. If you find that you can't hear it clearly yourself, it's probably a good idea to go back to RealProducer and re-encode the file, choosing a slower type of connection as the target for playback. If all is well, then your clip has been successfully uploaded, and you can go on to link it into your web pages.



8 This is the clip info, which contains the details you supplied when you created the clip using RealProducer. To show it, choose Clip Info from the View menu, which will display a line at a time scrolling just below the tool bar. To see all the info like this, click on the button to the right of the scrolling info window.

QUICK TIP

Netscape doesn't support URLs beginning with RTSP, so make sure your browser is configured to recognise the appropriate extension and MIME type. It should also be configured to launch the player at the appropriate time.

So just how do you choose the right format? There are a number of things to consider: quality of the media when it's viewed; amount of space taken up on your server; the ease of creating or converting files; the type of server you have access to; and whom you're expecting to view your files, and on which platform.

Choosing between the formats on the basis of quality is hard to do as they're all capable of producing good results. With a choice of multiple Codecs (Coder-Decoders) in QuickTime, for example, you can tweak file size, bit rate and quality to suit your needs. The same can be done with other formats.

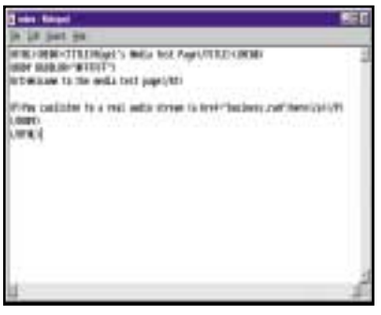
Making an objective assessment of the quality of the three systems isn't easy and, for many people, other considerations may take precedence, especially if you're financially restricted or the choice of platforms is constrained.

Creating media files is simple – our first workshop shows how to use RealProducer, which you'll find on the cover disc, to create files that

3 This is the display you'll see in CuteFTP, with our empty directory on the web server on the right and all the media files we've created on the left. Before you upload a file to the server, make sure you select binary mode, if your FTP program doesn't do it automatically for you. To copy a file over, just drag and drop it. Make sure you save your files with the extension .rm, otherwise you won't be able to play them as streaming media.

4 When you've uploaded the files to the Demon homepages server, and the directory listing refreshes, you'll see something like this. For each Real Media file that you've uploaded, with the extension .rm, a corresponding file with the extension .ram has been created automatically. It's these files that provide the streaming capability, rather than just allowing files to be downloaded and then played.

5 If you're using a server that doesn't create the RAM files automatically, create them by hand. As this one shows, it specifies the protocol pnm: followed by the complete path to the server holding your files. It's a neat trick, avoiding the problems where some web browsers can't be taught to understand methods like rtsp:// or pass them to other programs. The short RAM file is all that needs to be downloaded for RealPlayer to interpret the .rm file as streaming media.



9 Here's a simple bit of HTML. You refer to your streaming media file just like any other file on your website, with a standard <A HREF="filename.ram"> type of link. If you use the .rm file instead, then the web browsers will download the entire file to the hard drive and play it rather than accessing the streaming information via the RealNetworks server.

10 Here's the end result – a web page with a simple link to start the file playing. If you have unique content you'd like to promote, you can make use of the Submit option that appears in RealProducer when you've finished processing your file. Remember, although you can use the program to create streaming files from CDs and other material, you should always make sure you have the permission of the copyright holders before streaming files over the web.

11 Finally, if you have problems with streaming media not working properly, remember to check the options in your browser. This is the settings screen in the Mac version of Internet Explorer. You need to make sure that .ram files are set to View with Application and that the application is set to RealPlayer.

can be served using the free streams available on Demon websites. Mac or PC users who have QuickTime Pro (Mac users just need to fill in a registration form) can simply open a file and save it in a streaming format.

There are commercial tools available as well, including Media Cleaner from Terran, which can convert a wide range of formats and save the results ready for streaming on any of the three servers, but it isn't a cheap program. If you want to create lots of media files, it's a worthwhile investment and gives you control over the results. Alternatively, if you're a business you can contract out the work to specialists, but that won't come cheap.

Which platform?

Perhaps the most important consideration will be platform choices. While all three major systems are available for both Windows and Macintosh, there are other considerations. At the time of writing, Microsoft's media player for the Mac was

QUICK TIP

Registering QuickTime 4 gives you the ability to save streaming files for both Audio and Video. Simply choose Export from the File menu, and then select the speed and format that you want.

Setting up your own streaming server

If you want to set up your own streaming server, it's very simple to get started with Apple's QuickTime. You don't have to pay any fees to use the server, and you can download the open source version, known as Darwin Streaming Server for a variety of platforms. Information and binaries for Linux on Intel or Solaris 7 on Sparc can be found at www.apple.com/quicktime. We downloaded the LinuxPPC binary, running on a PowerMac system with MkLinux.

1 Start at www.streamingserver.org, where you'll find binaries based on Apple's server in the PRISS section. There are also links to Apple's site, for which you'll have to register before downloading. The binaries differ slightly, with some file names changing, but all provide essentially the same functionality – just choose the one that's suitable for your own platform. Apple's binary packages provide some additional utilities, including a streaming proxy.

2 Most packages are downloaded as a gzipped tar file, like ss102.ppc.tar.gz. Unzip with gunzip, and then extract files from the archive with tar xvf filename. The version we used provided just two files – QTSS.conf, which has to go in the /etc directory, and a binary called QuickTimeStreamingServer, which you should put in the appropriate directory on your system. In Apple packages, there's an Install shell script, which copies files to the appropriate locations for you.

6 It may be worth downloading one of the Apple packages simply for the short sample.mov file that comes with them. Otherwise, you'll need to create a file to stream. Here we're using QuickTime Player on the Mac, registered to give the facility to Export. Choose Export, select QuickTime movie, and choose a streaming speed from the menu beneath the file formats. The options button gives these choices, allowing you to add 'hints' for Internet streaming.

7 When you've copied a movie file into the directory you specified in the configuration file, you're ready to check that it's playing. Start QuickTime Player, and choose Open URL from the File menu. For a file called sample.mov on a server called media.mycompany.com, the URL would be rtsp://media.mycompany.com/sample.mov. If all is well, the file will start playing in a few seconds – Apple's sample.mov file is an iMac advert.

8 If all the people who'll be accessing your server are using Internet Explorer, that's about all you need to do. You can configure the browser to allow access to RTSP URLs directly, so a web page like this, with code such as Vision On will work fine. Unfortunately, that's not enough for Netscape. You'll need to do more work to make pages that work with any browser.

QUICK TIP

RTSP uses port 554 by default. If you're behind a firewall, you'll need to ensure that it allows both TCP and UDP traffic to pass through on that port, or use a streaming proxy server. Port 7070 is also used by some clients.

only a beta, so many Mac users will be reluctant to download it. QuickTime and RealPlayer are full releases for both platforms, and the RealPlayer is also available in beta form for Solaris on Sparc and Linux on Intel systems.

If reaching the widest possible audience is important to you, then RealPlayer looks like the sound choice at the moment, with QuickTime running a good second. On the server side, you may be constrained by what your ISP offers – if it has free streaming for a particular format, then you're better off using that if you want to get a feel for it.

On the other hand, if you need many streams, then the choice may simply be one of cost. RealNetworks' charges are based on the number of streams, which usually filter down to the pricing models of ISPs offering the service.

Microsoft's streaming server only runs on Microsoft operating systems so, if you want to use it, you'll need to hunt around for an ISP that has Microsoft servers, or run it on a system in-house.

3 This is the configuration file, called streaminserver.conf in the Apple packages, or QTSS.conf in some others. Make sure the server is listening on port 554, which is the default for RTSP, and set the maximum number of streams, via maximum_connections, so that your link isn't overloaded. The movie_folder item lets you specify where all your streaming files are stored. We've chosen /usr/local/movies.

4 Further down in the file, you can select options for logging. We've chosen to put files in /var/streaming/logs/ – make sure the path ends with a / and that the directory you name does exist. You also need to give names for the log and error files. Other options in the file allow the server to restart if there are problems, and control what happens when links appear to be congested, but for now, you don't need to change the defaults.

5 After editing the configuration file, change to the directory where you installed the server, and start it running. The command here is simple:./QuickTimeStreamingServer; with the Apple Binaries, the file to run is DarwinStreamingServer. The command prompt will reappear almost immediately, as the server runs itself in the background.

9 First, you'll need to configure your web server to give the right MIME type for files ending with specific extensions. In the mime.types file add a line:
application/x-rtsp rts rtsp
Save the file. You'll need to restart the web server for it to take notice of the changes you've made, and ensure that web browsers are configured to use the QuickTime plug-in to play this type of content.

10 Now, on your web server, you use a similar trick to the one employed by RealNetworks. Create a small file, with the extension .rts, for each media clip that you want to use. The file should include the full RTSP URL of the clip, and needn't necessarily point to the same server. You can create the file in notepad or simply on the Unix terminal by typing cat > filename.rts followed by the URL, as in step 7, then press enter and Ctrl-D to close the file.

11 And here are the results – a link automatically starts playing the streaming clip using the QuickTime plug-in, on both Netscape and Internet Explorer, regardless of whether it's a PC or a Macintosh system. So with just a few steps, you can start streaming information in-house, using completely free software.

Apple's QuickTime Streaming Server is part of Mac OS X server. It's also a key technology in the company's Open Source initiative, so you can download it as Darwin Streaming Server and compile it on your own systems.

There are no costs, and it serves an unlimited number of streams. Add to that the fact that you can find binaries on the Internet for Solaris, BSD and Linux on a variety of architectures, and it becomes a very attractive proposition for anyone who wants to start streaming on their own network or using their own hardware.

Streaming media may seem like a black art at first, and it's certainly not the most straightforward web technology available, with competing standards and quality suffering on congested links. However, it can be surprisingly simple to get good results.

Follow the workshops, and you will see just how quickly you can start to stream over the Internet or your own LAN.

QUICK TIP

Good tutorials and information on streaming media can be found at www.streamingserver.org, webdevelopersjournal.com, and streamingmediaworld.com. The first site also has QuickTime server binaries for a variety of systems.