realsystem G2

Production Guide



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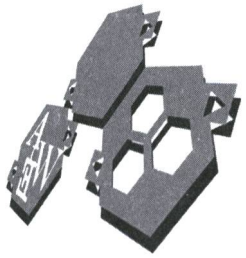
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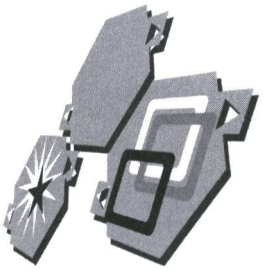
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INTRODUCTION

Welcome to RealSystem G2, the most sophisticated system for streaming multimedia files across a network. This manual will help you produce your multimedia presentation, whether you simply want to stream a video from your home page or create a multimedia extravaganza with video, audio, animation, images, and text.

Note

The HTML version of this manual, available at **http://service.real.com/help/library/encoders.html**, contains multimedia examples you can view with RealPlayer G2.

How this Manual is Organized

This manual tells how to assemble a RealSystem G2 presentation. Although it gives tips on producing great content, the more you know about producing audio, video, and graphics in general, the faster you'll put together a great streaming presentation. If you know the basics of HTML, you'll find it easy to pick up SMIL, the language used to assemble RealSystem G2 presentations.

Additional Information

This manual does not explain how to use RealSystem tools like RealProducer. For specific information about running a tool, refer to the tool's manual or online help.

Chapter 1: What's New in RealSystem G2?

If you're familiar with previous versions of RealSystem, this chapter will give you a quick update on the many changes in RealSystem G2.

Chapter 2: Creating RealSystem Presentations

If you are new to streaming media, this chapter walks you through the steps you take to put together a RealSystem G2 presentation.

Chapter 3: Targeting Bandwidth
This chapter explains how to target bandwidth connections, an important step for creating a streaming media presentation.

Chapter 4: Producing Audio
This chapter gives you pointers on capturing and digitizing high-quality audio. It then gives you the background you need to encode a RealAudio file.

Chapter 5: Producing Video
Read this chapter to learn how to capture high-quality video and optimize it for conversion to RealVideo.

Chapter 6: Producing Animation
Macromedia's Flash animation paired with a RealAudio soundtrack produces dazzling RealFlash presentations. This chapter tells you how to create RealFlash content.

Chapter 7: Assembling a Presentation with SMIL
After you create your multimedia clips, you write a SMIL file that pulls the presentation together. This chapter explains how to use SMIL to specify when and how each part of your presentation plays.

Chapter 8: Playing Clips in a Web Page
If you want to integrate your presentation seamlessly into your Web page, follow the instructions in this chapter.

Chapter 9: Inserting Ads in a Presentation
This chapter explains how to use SMIL to insert ads into your streaming presentation.

Chapter 10: Delivering a Presentation
This chapter provides step-by-step instructions for moving your presentation files to RealServer and linking your Web page to them. It also explains how to use a Web server to deliver simple presentations.

Chapter 11: Broadcasting a Presentation
Refer to this chapter if you plan to broadcast an audio or video event.

Appendix A: Quick Steps for Streaming Clips
If you are new to RealSystem streaming, this appendix helps you get started quickly by listing the basic steps you take to create simple presentations.

Appendix B: Advanced Production Techniques

For advanced users, this appendix conveys useful production techniques that help you get the most out of RealSystem G2.

Appendix C: SMIL Quick Reference

Once you understand SMIL as described in Chapter 7, use Appendix C as a reference when writing SMIL files.

Appendix D: File Type Reference

This appendix provides a quick reference for common file types used in RealSystem G2 streaming.

Appendix E: SMIL Language Codes

If you create clips in different languages, you can use these codes in the SMIL file to indicate language choices.

Conventions in this Manual

The following table explains the conventions used in this manual.

Notational Conventions

Convention	Meaning
variables	Italicized text represents variables. Substitute values appropriate for your situation.
emphasis	Bolded text is used for emphasis.
`[options]`	Square brackets indicate optional values you may or may not need to use.
`choice 1|choice 2`	Vertical lines separate values you can choose between.
...	Ellipses indicate nonessential information omitted from the example.

Additional RealSystem G2 Resources

In addition to this manual, you may need the following RealNetworks resources, available at **http://service.real.com/help/library/index.html**:

- *RealText Authoring Guide*

  This manual explains how to create streaming text. You can use RealText, for example, to create a stock ticker or provide video subtitles.

- *RealPix Authoring Guide*

  With RealPix you can create streaming slideshows of still images. *RealPix Authoring Guide* explains how to put a RealPix presentation together with special effects such as fades and zooms.

- *RealServer Administration Guide*

  The basic reference for the RealServer administrator, this manual explains how to set up, configure, and run RealServer to stream multimedia. You need this manual only if you are running RealServer yourself.

- *Embedded RealPlayer Extended Functionality Guide*

  This guide supplements *RealSystem G2 Production Guide*. It explains how to use JavaScript or VBScript to control RealPlayer functions for a presentation embedded in a Web page.

- RealSystem G2 Authoring Kit

  The Authoring Kit contains production tools, utilities, and manuals in a single, convenient bundle. It is available through registration at **http://www.real.com/products/tools/authkit/index.html**.

- RealSystem G2 Software Development Kit (SDK)

  The RealSystem G2 SDK lets you integrate applications with RealSystem or create new plug-ins for RealServer or RealPlayer. Knowledge of programming is required to use the SDK. Register for and download the SDK from **http://www.real.com/devzone**.

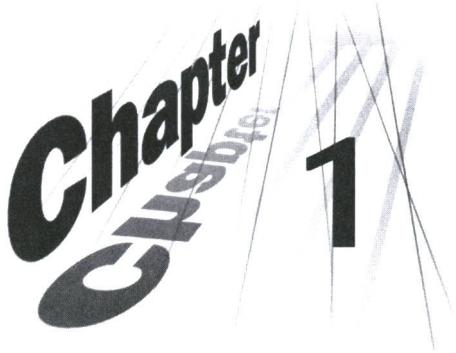
Technical Support

For technical support with RealSystem G2, please fill out the form at:

- **http://service.real.com/contact/email.htm**

The information you provide in this form will help technical support personnel to give you a prompt response. For general information about RealNetworks' technical support, visit:

- **http://service.real.com/help/call.html**



WHAT'S NEW IN REALSYSTEM G2?

The open, end-to-end architecture of RealSystem™ G2 changes the nature of streaming multimedia, giving you more possibilities for creating Web-based multimedia than before. If you're familiar with past versions of RealSystem, this chapter gives you a quick look at the many changes in RealSystem G2.

New Streaming Possibilities

Text and Still Images Now Stream

RealText™ and RealPix™ let you stream text and create streaming slideshows that use special effects such as fades and zooms. In RealSystem G2, they join RealAudio®, RealVideo®, and RealFlash™ as standard RealSystem clip types. In addition, RealPlayer® G2 and RealPlayer Plus™ G2 can display JPEG and GIF images.

Additional Information

See "Choosing Media to Stream" on page 11.

Popular File Formats Stream Natively

With RealSystem, you can now stream many popular audio and video formats. Stream WAV files without conversion to RealAudio, for example, AVI without conversion to RealVideo. Note, however, that these file formats typically do not stream over networks as easily and robustly as RealAudio and RealVideo.

Additional Information

See "Choosing Media to Stream" on page 11.

Open Plug-In Architecture Streams New File Types

RealSystem's open architecture lets RealNetworks' development partners create plug-ins to stream virtually any file type. Automatic download of plug-ins ensures that RealPlayer G2 users can play new RealSystem streaming file types as soon as they are introduced.

Additional Information

Visit **http://www.real.com/devzone/realdevelopers/** for information on joining the RealNetworks developer program.

Advancements in RealAudio and RealVideo

SureStream™ Technology Encodes Single Clips for Multiple Bandwidths

The new SureStream technology available exclusively in RealSystem G2 lets you encode a single RealAudio or RealVideo clip for up to six separate bandwidths. All Web page visitors click the same link to play the clip, but their RealPlayers receive different encodings appropriate for their various connection speeds.

Additional Information

See "Using SureStream Clips for Multiple Bandwidths" on page 35 for an overview of SureStream.

New RealAudio Codecs Provide Superior Sound Quality

RealSystem G2 introduces a new family of RealAudio codecs that provides fast encoding, superior sound, and the ability to encode a single clip for delivery at different bit rates using SureStream technology.

Additional Information

"Choosing RealAudio Codecs" on page 45 lists the new codecs.

Multiple Audio Streams Play through the Same Codec

RealPlayer G2 removes the restriction that two RealAudio streams played simultaneously must be encoded with different codecs. RealPlayer G2 can now play multiple streams that use the same codec.

New RealVideo Codec Provides Fast Encoding for Multiple Bandwidth Clips

RealSystem G2 introduces a new RealVideo codec that provides faster encoding and lets you use SureStream technology to encode a single RealVideo clip for up to six different bandwidths.

Additional Information

See "Choosing RealVideo Codecs" on page 57 for more information.

Easier Presentation Assembly

SMIL Files Coordinate Presentations

For presentations that include more than one clip, you create a SMIL file to specify how and when each clip plays. SMIL, which stands for Synchronized Multimedia Integration Language, is a standardized language that uses a simple mark-up similar to HTML to coordinate a streaming presentation.

> **Additional Information**
>
> For a look at SMIL features, see "Writing a SMIL File" on page 18. Refer to Chapter 7 beginning on page 75 for instructions on using SMIL.

Bandwidth Negotiation through Multiply-Encoded Clips or SMIL

RealSystem G2 introduces simpler methods for supporting multiple bandwidth connections. As described previously, the new SureStream technology allows you to encode a single RealAudio or RealVideo clip for multiple connection speeds. Or you can let RealPlayer choose between different versions of a presentation based on bandwidth parameters in the SMIL file. Either way, you need just one link on your Web page, and your encoded clips do not need to conform to any naming conventions.

> **Additional Information**
>
> See "Supporting Multiple Bandwidth Connections" on page 34 for an overview.

RealPlayer Launched Automatically

The Ramgen feature of RealServer™ G2 can launch RealPlayer automatically. This means you do not need to create a Ram file (extension `.ram` or `.rpm`) manually. In your Web page, you link to a SMIL file or media clip, including in the URL a Ramgen parameter that causes the Web browser to launch RealPlayer and give it the SMIL file or clip.

> **Additional Information**
>
> See "Linking your Web Page to RealServer" on page 147.

Enhanced Protocol Support

RTSP Protocol Now Used

Because it still supports the PNA protocol, RealServer G2 is backwards compatible with RealSystem 3.0 through 5.0. But it introduces as its primary protocol the RealTime Streaming Protocol (RTSP), an open, standards-based protocol for multimedia streaming. Because of this, URLs that point to media clips on RealServer G2 now begin with rtsp://.

RealSystem Interoperates with RTP-Based Servers and Clients

When communicating with RealPlayer G2, RealServer G2 uses RealTime Streaming Protocol (RTSP) as its control protocol and RealNetworks' proprietary RDT as its packet protocol. But because RealSystem G2 also supports international standards for streaming media, RealServer and RealPlayer interoperate with RTP-based media servers and clients. The following table lists the protocols used with different mixes of servers and clients.

RealSystem Protocols

Server	Client	Control Protocol	Packet Protocol
RealServer G2	RealPlayer G2	RTSP	RDT
RealServer G2	RTP-based client	RTSP	RTP
RTP-based server	RealPlayer G2	RTSP	RTP
RealServer G2	RealPlayer 3.0 to 5.0	PNA	PNA
RealServer 3.0 to 5.0	RealPlayer G2	PNA	PNA

Compatibility with Previous Releases

RealSystem G2 is fully compatible with presentations developed for RealSystem 3.0 through 5.0. You do not need to change any existing content. RealPlayer G2 can play back clips streamed by an earlier version of RealServer. As well, RealServer G2 can stream presentations originally created for an earlier version of RealSystem. When you create a RealSystem G2 presentation, you can use different techniques to make it compatible with earlier versions of RealPlayer.

SureStream has a Backwards-Compatibility Option

With RealSystem G2's SureStream technology, you can encode a single RealAudio or RealVideo clip at multiple bandwidths for RealPlayer G2. When you encode the clip, you select a backwards-compatibility option to include an encoding for earlier versions of RealPlayer. This works only when streaming from RealServer G2, however, because Web servers cannot serve SureStream clips.

Additional Information

For more on backwards compatibility with SureStream, see "Encoding RealAudio with RealSystem Tools" on page 48 and "Encoding RealVideo with RealSystem Tools" on page 58.

RealServer can Stream Alternate Clips through a Single URL

If you cannot use a single SureStream clip, create two clips, one for RealPlayer G2 and one for earlier versions of RealPlayer. (The RealPlayer G2 clip should use the RealAudio G2 codecs for superior sound.) You can then use RealServer G2's `altplay` option for Ramgen to deliver either clip through a single URL. If not using Ramgen, you can create a Ram file that lists both files.

Additional Information

See "Using Ramgen" on page 148. For information on creating a Ram file, see "Creating a Ram File Manually" on page 153.

Older RealPlayers Receive Upgrade Notice

To add a new RealSystem G2 feature such as RealText to an existing presentation, you need to update the presentation. This includes creating a SMIL file and changing the URL in your Web page. Older versions of RealPlayer will not be able to play the presentation. But when viewers with older versions of RealPlayer click the new link, they are asked to upgrade to RealPlayer G2.

CREATING REALSYSTEM PRESENTATIONS



RealSystem G2 gives you the power to create compelling, complex multimedia presentations streamed over a network. It includes RealServer G2, the most advanced streaming media server available, along with RealPlayer G2 and RealPlayer Plus G2, the world's most popular desktop applications for playing streaming media clips. This chapter explains the basics of how you use RealSystem G2 to put together stunning multimedia presentations.

> **Tip**
>
> To experience the many possibilities of streaming media, download RealPlayer G2 from **http://www.real.com**, and visit **http://realguide.real.com** and **http://www.real.com/showcase**.

Streaming Multimedia Clips

A RealSystem presentation can consist of one clip, such as a single RealAudio clip, or multiple clips played in sequence or in parallel. RealSystem *streams* these presentations over a network. If you have ever *downloaded* a video or audio clip to your Web browser, you know that it can take several minutes to receive a clip that plays for a few seconds. In contrast, a clip streamed by RealServer G2 begins to play back almost immediately.

Choosing Media to Stream

RealSystem G2 gives you many possibilities for combining media clips into presentations. There are two basic types of file formats you can stream with RealSystem G2:

- Standard or "open" formats

  Editing programs typically let you save or export files to a standard, "open" format. Video editing programs usually let you export files as AVI or QuickTime, for example. RealSystem can stream several standard formats, but these formats may not be optimized for network streaming.

- Streaming formats

  Formats such as RealAudio and RealVideo are highly compressed for network streaming. These formats give the best results. You can convert a file from a standard format to a streaming format with an encoding tool. Some editing programs can also export files directly to streaming formats.

Audio

Chapter 4 beginning on page 39 discusses the audio formats you can stream:

- RealAudio (.rm)
- AIFF (.aif)
- AU (.au)
- WAV (.wav)

Video

Chapter 5 beginning on page 51 describes the video formats you can stream:

- RealVideo (.rm)
- ASF (.asf)
- AVI (.avi)
- QuickTime (.mov)
- Vivo (.viv)

Animation

RealFlash, which pairs Macromedia Flash animation with a RealAudio soundtrack, lets you stream animated presentations. See Chapter 6 beginning on page 63 for details.

Images

RealSystem presentations can include still images in these formats:

- JPEG (.jpg)

  RealPlayer G2 can display RGB baseline JPEGs. Progressive and grayscale JPEGs are not supported.

- GIF87, GIF89, and animated GIF (.gif)

  Both interlaced and noninterlaced GIFs will work, but noninterlaced GIFs are recommended.

You can also assemble JPEG and GIF images in a RealPix presentation to create eye-catching slideshows with special effects such as dissolves and zooms.

Additional Information

Download *RealPix Authoring Guide* from **http://service.real.com/help/library/encoders.html**.

Text

RealText streams text at specific times within a presentation. You can use RealText to add subtitles to a video, for example, or lay out text from a live source to create a real-time stock ticker.

Additional Information

Get *RealText Authoring Guide,* available at **http://service.real.com/help/library/encoders.html**.

Additional Streaming Formats

RealSystem's plug-in technology lets it stream nearly any type of clip or live event. Check **http://www.real.com/devzone** for the availability of plug-ins that let RealSystem stream additional video and audio formats, as well as exciting new types of media.

Clip Types Played by Previous RealPlayer Releases

Most RealPlayer users upgrade when a new version of RealPlayer becomes available. If you need to create presentations playable by older versions of RealPlayer, though, take into account RealPlayer and clip type compatibility. The table below indicates which RealPlayer versions, such as RealPlayer G2 or

RealPlayer 5.0, can play which types of clips. RealPlayer 4.0, for example, plays only RealAudio and RealVideo.

RealPlayer Compatibility with RealSystem G2 Clips

Clip Type	G2	5	4	3	2	1
RealAudio	X	X	X	X	X	X
RealVideo	X	X	X	–	–	–
RealFlash	X	X	–	–	–	–
RealPix	X	–	–	–	–	–
RealText	X	–	–	–	–	–
Open formats such as WAV and AVI	X	–	–	–	–	–
SMIL	X	–	–	–	–	–

Note that this table covers general clip compatibility, not codec compatibility. Later versions of RealPlayer typically introduce new RealAudio and RealVideo codecs. Earlier versions of RealPlayer cannot play the new RealAudio G2 codecs, for example. So when planning for backwards compatibility, make sure you encode RealAudio or RealVideo clips with a codec available in your targeted versions of RealPlayer.

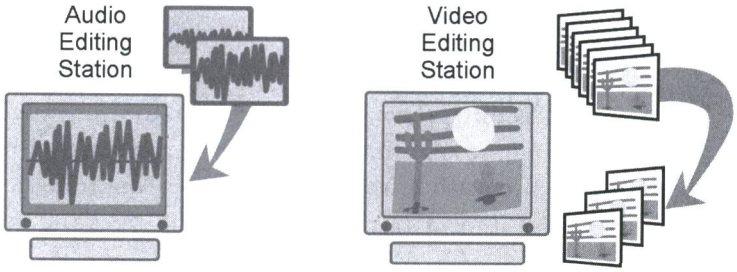
Additional Information

See also "Compatibility with Previous Releases" on page 8. For more on codecs, see "Choosing RealAudio Codecs" on page 45 and "Choosing RealVideo Codecs" on page 57.

Using Editing and Production Tools

After choosing your streaming media formats, gather content and use your preferred editing tools to prepare your source files. Sound editing software, for example, lets you optimize an audio clip's dynamic range. With video editing software you can set the video's window size. RealSystem does not require you to use specific editing tools. Just ensure that your editing tools can save files in streaming formats, or in open formats you can easily convert to streaming formats.

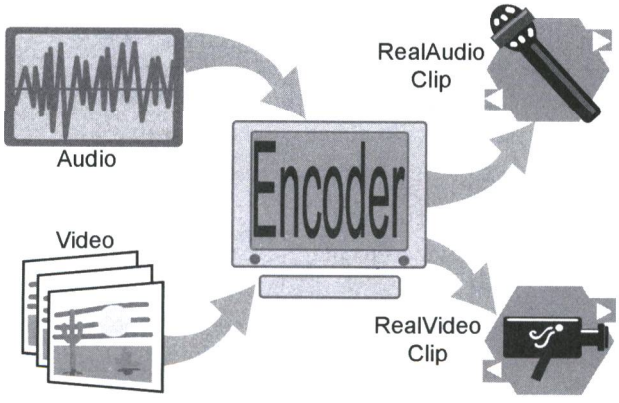
Use Your Favorite Editing Tools to Prepare Media Files



RealNetworks Production Tools

If your editing program does not export files to the streaming format you want, you can use an encoding tool to convert the file. RealNetworks provides free, basic tools, and sells enhanced tools for converting popular sound and video formats to RealAudio and RealVideo. In addition, plug-ins for popular programs such as Adobe Premiere and Microsoft PowerPoint let you save presentations directly as RealVideo.

RealNetworks Production Tools Create Streaming Clips



Additional Information

Check **http://www.real.com/products/tools/** for the tool that's right for you.

Additional Tools

RealSystem G2 provides virtually unlimited possibilities for streaming media. It does not lock you into a small set of streaming formats or a specific set of

tools. In addition to new types of streaming media, RealNetworks' partners and other parties are continually producing new tools that help you put together sophisticated presentations.

Tip

Visit **http://www.realstore.com** to find out about the many tools available to help you create streaming media. Also check **http://www.real.com/devzone** frequently for information about new media types and tools.

Working with Timelines and Bandwidths

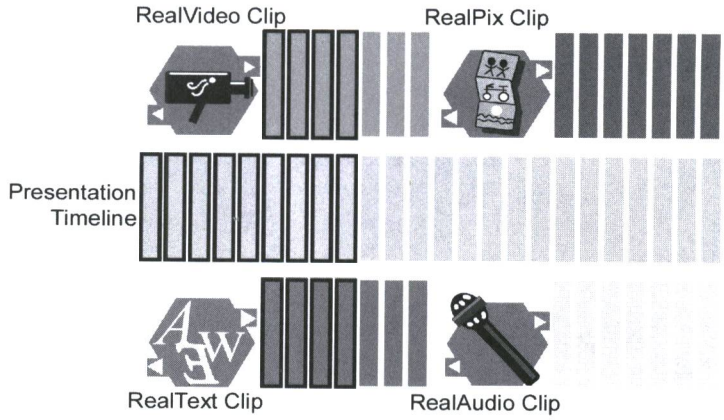
As you create streaming media clips, you need to consider how to keep the clips synchronized to a single presentation timeline. You also need to create presentations for specific bandwidths. These are two important, interrelated steps for producing streaming multimedia presentations.

Synchronizing Clips to a Timeline

Because a static Web page has no timeline, images and text download without a preset order. You may notice when browsing a Web page that one image may download partially, then another image begins to appear, then the first image completes, and so on. A Web page does not have an internal timeline, so exactly when a certain image gets to the browser doesn't matter. What matters is that the entire page downloads as soon as possible.

When you stream multimedia, though, clips have timelines and must flow smoothly once they've started to play back. Imagine how jarring it would be for the visual track of a video to play silently for a minute, then pause as its audio track catches up to it a minute later. When you stream multimedia, therefore, it's important that your presentation keeps clips synchronized.

Clip Timelines Coordinate with an Presentation Timeline



There are three aspects of timelines you may work with:

- Clips with Internal Timelines

  Audio, video, and animation have internal timelines. In a two-minute video, for instance, each frame corresponds to a specific point in a two-minute timeline. Each second of audio meshes with each second of the visual image throughout the clip's overall timeline. Your video, audio, or animation editing program is your main tool for manipulating the clip's timeline, which is woven into the fabric of the clip.

- Clips with Variable Timelines

  With RealPix or RealText, you define timing tags that set when each image or text block appears. You thereby control exactly how long each image or text chunk stays on the screen. When combining clips, it's typically easier to produce audio, video, or animation first. Then set the RealPix and RealText timelines to coordinate with those clips.

  Additional Information

  Get the RealPix and RealText authoring guides from **http://service.real.com/help/library/encoders.html**.

- SMIL Timing Commands

  A SMIL file assembles your presentation and can include its own timing elements. Timing a presentation with SMIL can be as simple as starting one clip as soon as another one stops. But you can also use explicit timing commands to delay playback for ten seconds, for example, or start a clip

playing at 30 seconds into its internal timeline. SMIL's timing commands are optional, but they give you an extra level of flexibility you may need when putting multimedia clips together.

Additional Information

"Writing a SMIL File" on page 18 provides an overview of SMIL. For specifics on SMIL timing, see "Specifying Timing" on page 84.

Keeping a Bandwidth Budget

Any presentation streamed over a network has a *bandwidth* budget because each person viewing streaming clips has a network connection with a top speed, such as 28.8 Kilobits per second. Even when your clips are perfectly synchronized, the presentation may stall if at some point it requires more bandwidth than the viewer has available. This happens because RealServer needs to transmit at a certain point in the timeline more data than can get through the network connection to RealPlayer.

When you develop a streaming media presentation, you need to consider the bandwidth constraints your audience will have. This is crucial for creating presentations that start to play back quickly and flow smoothly. Web users don't like to wait more than a few seconds for something to happen after they click a link. And if your clips stop and restart frequently, viewers are not likely to stay watching. Fortunately, RealSystem offers sophisticated features that let you create a single presentation that looks good over a slow connection and great over a fast one.

Additional Information

Chapter 3 beginning on page 27 provides the details for considering bandwidth in streaming presentations.

Writing a SMIL File

With your clips in their streaming formats, you put your presentation together with SMIL. Pronounced "smile," SMIL stands for "Synchronized Multimedia Integration Language." A SMIL file is not necessary to stream just one clip. But when you have multiple clips, SMIL's simple mark-up language specifies how and when the clips play.

Advantages of Using SMIL



Here are some of the many advantages of using SMIL:

- Avoid Using Container Formats

  Because RealSystem can stream many media formats, you do not need to merge clips into a single streaming file. To alter your presentation, for example, you simply edit the SMIL file rather than merge the clips again into a different container file.

- Use Clips in Different Locations

  Because a SMIL file lists a separate URL for each clip, you can put together presentations using clips in any locations. You can use a video clip from one server, for example, and a text clip from another.

- Support Multiple Languages

  A SMIL file can list different language options for clips. To create a video with soundtracks in different languages, for example, you produce one video clip with no soundtrack, then create audio clips in each language. Your Web page needs just one link to the SMIL file. When a visitor clicks that link, the visitor's RealPlayer chooses a soundtrack based on its language preference.

- Support Multiple Bandwidths

  A SMIL file can also list presentation choices for different bandwidths. RealPlayer then chooses which clips to receive based on its available bandwidth. You can thereby support multiple connection speeds through a single hypertext link, rather than separate links for modem users, ISDN users, T1 users, and so on.

  Note

  RealSystem G2's SureStream technology also lets you support multiple bandwidth connections within a single clip. For more information, see "Supporting Multiple Bandwidth Connections" on page 34.

- Put Together Customized Presentations

  Because a SMIL file is a simple text file, you can generate it automatically for each visitor. You can therefore create different presentation parts, then assemble a customized SMIL file based on preferences recorded in the visitor's browser.

- Time and Control the Presentation

  The SMIL file lets you easily control the presentation timeline. You can start an audio clip playing at 2.5 seconds into its internal timeline, for example, without changing the encoded clip.

- Lay Out the Presentation

  When your presentation includes multiple clips, such as a RealVideo clip playing simultaneously with a RealPix slideshow, you use SMIL to define the layout.

- Include Ads

  You can use SMIL along with RealServer's Advertising Application to insert ads into your presentation. RealServer can deliver image banner ads, as well as rich media ads in formats such as RealVideo and RealFlash.

  Additional Information

  Chapter 7 beginning on page 75 describes the SMIL file syntax. Chapter 9 beginning on page 137 explains ad insertion.

Hosting a Presentation on a Server

When your presentation is complete, you move the streaming media clips and SMIL file to RealServer G2 or a Web server for delivery. You can play back your presentation in RealPlayer or directly in your Web page. The latter option, which uses RealPlayer's Netscape plug-in or ActiveX Control, requires mark-up tags in your Web page that specify how the presentation displays.

Additional Information

Beginning on page 145, Chapter 10 explains how to link your Web page to a RealSystem presentation hosted on a server. For information on embedding a presentation in your Web page, see Chapter 8 on page 117.

Using RealServer G2 or a Web Server

RealServer G2 is the preferred host for RealSystem presentations. Designed specifically to stream multimedia over networks, RealServer keeps multiple clips synchronized and uses many advanced features to ensure that clips stream smoothly under adverse network conditions. Although you can use a standard Web server to host some streaming presentations, you will not get the results you'll experience when using RealServer.

Tip

If you don't have RealServer G2 available, check out the hosting services of Real Broadcast Network (RBN) at **http://www.real.com/rbn**. RBN provides full services for encoding, hosting, and broadcasting events to small or large audiences.

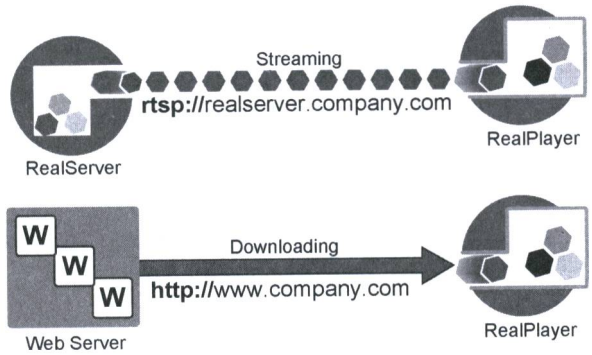
Web Server HTTP and RealServer RTSP

A Web server uses the HTTP protocol, as you can see in Web page URLs that begin with `http://`. The HTTP protocol downloads files without regard to timelines, making clips with timelines more likely to stall. Although RealPlayer can play back clips as they download, the HTTP protocol does not give RealPlayer the ability to adjust the download to compensate for changing network conditions.

In contrast, URLs for media clips streamed by RealServer begin with `rtsp://`, because RealServer uses Real-Time Streaming Protocol (RTSP), which is designed specifically to stream clips that have timelines. RTSP lets RealPlayer

G2 and RealServer G2 exchange information about a presentation in progress and adjust the streaming data to keep the clips playing smoothly.

RealServer RTSP Streaming vs. Web Server HTTP Downloading



When two clips play side-by-side, for example, RealPlayer uses RTSP to communicate with RealServer about each clip's progress, indicating how much data it needs to keep the presentation synchronized. RealServer can then adjust the data flow, reducing low priority data if necessary to ensure that crucial data gets through. Communication like this is not possible when a Web server sends clips to RealPlayer.

You don't need to know the specifics of RTSP to create great presentations. You just need to ensure that RealServer G2 is available to stream your clips. If only a Web server is available, you can still create multimedia presentations, but you won't be able to use all RealSystem features. In either case, make sure you have a good understanding of RealSystem G2 production as described in this manual before you start creating your clips. This helps ensure that your presentation harmonizes with the server that hosts it.

Additional Information

For information on RealSystem features that do not work with Web server hosting, read "Limitations on Web Server Playback" on page 151.

Launching a Presentation

Because some browsers may not be configured to launch RealPlayer when they receive a SMIL file or a media clip, you need to ensure that RealPlayer launches when a visitor to your Web page clicks the link to your presentation. When RealServer G2 hosts your presentation, you simply include a Ramgen parameter in the Web page URL to launch RealPlayer.

Additional Information

For more on Ramgen, see "Streaming Clips from RealServer G2" on page 146.

When a Web server hosts your presentation, you launch RealPlayer by linking your Web page to a Ram file instead of a SMIL file or a media clip. When the browser receives the Ram file, it launches RealPlayer and gives it the Ram file, which contains the URLs to your media clips or SMIL file. RealPlayer uses this information to request the presentation from the Web server. Because the Ram file is a small text file, this interaction takes little time.

Additional Information

For more on Web server playback, see "Playing Clips from a Web Server" on page 149.

Working with the RealServer Administrator

Because earlier versions of RealServer do not handle SMIL files and many of the RealSystem G2 clip types, make sure you have RealServer G2 available to host your presentation. When you host a presentation on RealServer G2, the RealServer administrator will give you the basic URL parameters, such as the server address and its RTSP and HTTP port parameters. The RealServer administrator can also set up many content delivery and security features, such as:

- live broadcasts
- pay-per-view content
- automatic ad insertion
- password authentication

Additional Information

RealServer Administration Guide, available at **http://service.real.com/help/library/servers.html**, explains RealServer features.

Using RealNetworks Logos

When you create RealSystem G2 content, RealNetworks encourages you to add RealSystem G2 logos to your Web page. You can provide a RealPlayer G2 download link button, for example, so that users can get RealPlayer G2 from RealNetworks' site and view your content. You can read RealNetworks'

trademark policy and get RealSystem G2 and RealPlayer G2 logos from **http://www.real.com/company/guide/index.html**.

Playing Clips Back Locally

Although the main function of RealSystem is to stream media clips over a network, you can also create presentations that play back from a user's local machine. An example is a multimedia-enhanced book written with HTML and containing links to RealSystem clips. Users then download all the book files to their local machines and play back the media clips in RealPlayer.

In this case, you produce clips as described in this manual, except that you don't have to target specific network bandwidths. When you put the presentation together, you simply use URLs that point to clips on the user's machine instead of on RealServer or a Web server.

Additional Information

For more on local URLs, see "Linking to Local Clips" on page 80.

Viewing a Presentation with RealPlayer

With RealPlayer G2 installed, you simply click the presentation link in your Web page to view the media clips. RealPlayer buffers the clips for a few seconds, then begins to play the presentation back in its own window or your browser. RealPlayer downloads are available from RealNetworks at **http://www.real.com**.

Protecting Copyrighted Content

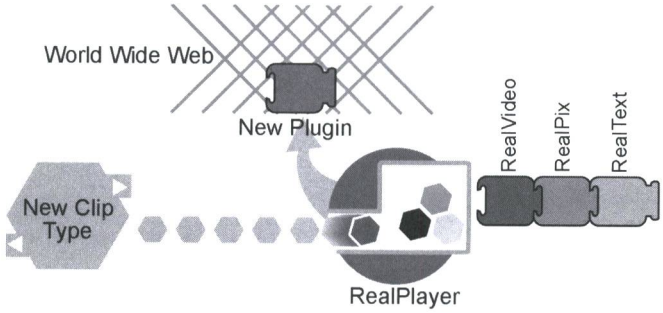
Unlike a Web browser, RealPlayer does not store clips in a disk cache or allow users to copy or download still images. This helps you keep copyrighted material secure when you stream clips from RealServer. Optionally, RealNetworks tools let you encode video and audio clips so that viewers can record the streamed clips to their local machines.

Downloading RealPlayer Plug-Ins

RealPlayer can play virtually any streaming clip because of its plug-in technology. RealPlayer plug-ins function like Web browser plug-ins. When RealPlayer receives a streaming RealVideo clip, for example, it uses its

RealVideo plug-in to play the clip on your computer screen. If RealPlayer doesn't have a plug-in needed to play a certain streaming clip, it downloads that plug-in from the Internet.

RealPlayer Downloading a New Plug-in

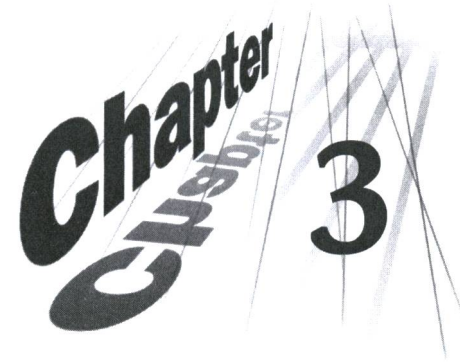


Plug-in downloading lets you confidently develop presentations using the latest streaming file types available for RealSystem. If visitors to your Web page don't have a plug-in needed to play your presentation, RealPlayer quickly downloads the plug-in and can play the presentation without having to restart. Because RealPlayer is the world's most popular application for playing streaming media, you can be sure that your RealSystem G2 presentation can reach the widest audience possible.

Additional Information

For information about developing RealPlayer plug-ins or building RealPlayer capabilities into an application, visit **http://www.real.com/devzone/realdevelopers/**.

TARGETING BANDWIDTH



Targeting a network connection's bandwidth is crucial for delivering a successful streaming media presentation. Web users with 28.8 Kbps modems, for example, need to view presentations that require less than 28.8 Kilobits of data per second. As the first step in building your presentation, target a bandwidth and create content with that connection speed in mind. This helps ensure that the presentation streams smoothly.

Note

The only time you do not need to consider bandwidth is when all clips in your presentation reside on users' local computers rather than on RealServer or a Web server.

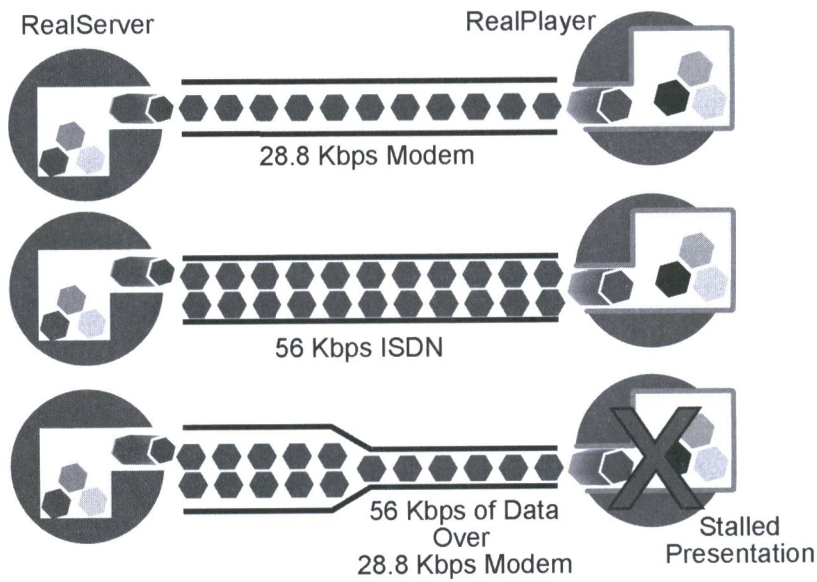
What is Bandwidth?

Total bandwidth is the upper limit on how much data can pass through a network connection per second. Internet bandwidth is described in Kilobits per second (Kbps). A 28.8 Kbps modem, for example, can receive data at any speed up to 28.8 Kbps. Bandwidth is analogous to a speed limit, such as 60 m.p.h. A presentation's bit rate is analogous to car speed. Based on variables such as weather and traffic, a car may be able to travel only 30 m.p.h. Due to network congestion and server load, a 28.8 Kbps modem may receive 11 Kbps of data one minute, 22 Kbps of data another.

When you drive on a highway, you have no control over weather and traffic that makes you slow down. Under good conditions, though, you can observe the speed limit. Likewise with your presentation, you have no control over server load and network congestion when someone views your presentation. You can, however, ensure that your presentation does not exceed the user's bandwidth. On the highway, breaking the speed limit gets you a ticket. On the Internet, exceeding bandwidth stalls your presentation.

For example, a 28.8 Kbps connection can still play a presentation that requires a 56 Kbps stream. But the modem takes around two seconds to receive the data that RealPlayer has to play every second. In other words, data has to be displayed faster than it comes in over the modem. Consequently, RealPlayer does not begin playback until it receives and stores ("buffers") enough data to play the presentation without halting. For a long presentation, this may take a few minutes. Viewers are not likely to wait that long.

Presentation Data Must Fit RealPlayer's Bandwidth



Designing content suitable for viewers' available bandwidths is crucial to delivering compelling multimedia presentations. Because most Internet users have 28.8 Kbps modems, content available to the public should target that bandwidth. If your presentation is for high-speed intranet use only, you may be able to target a higher minimum bandwidth. Additionally, you can target multiple bandwidths with a single clip that looks good at low bandwidths and great at high bandwidths.

What is Preroll?

Preroll is the initial data that RealServer sends to RealPlayer before playback begins. Before it delivers a presentation, RealServer looks at the clip sizes and the timeline. Weighing these against the connection bandwidth, RealServer determines how much data RealPlayer must receive before starting to play the

presentation. The preroll helps ensure that once RealPlayer commences playback, it does not need to halt the presentation while it receives more data.

As a general rule, you want preroll to be under 15 seconds, ideally under 10 seconds. If your presentation requires more bandwidth than the user's connection can supply, the presentation can still play back, but it requires a lengthy preroll and users are not likely to watch long while nothing happens on screen. Sticking to your bandwidth target helps keep presentation preroll to an acceptable level.

Choosing a Target Bandwidth

The target bandwidth of a RealSystem G2 presentation is the maximum bandwidth available for a network connection, such as a 28.8 Kbps modem. The presentation's total bit rate must be at or below the target bit rate. The total bit rate comprises two main parts:

- Maximum bit rate consumed by all streaming clips. For a multiclip presentation, this can vary over time. You therefore want to consider what part of your presentation consumes the most bandwidth and use that peak point as your guideline.
- 25% of target bit rate for overhead (noise, data loss, and packet overhead). This is an approximation. Overhead can vary depending on the type of connection and general network conditions. A 56 Kbps modem typically requires more overhead than a 56 Kbps ISDN connection, for example.

If your target bit rate is 28.8 Kbps, for example, take 75% of that rate as the bandwidth available for your streaming clips. For a 28.8 Kbps connection, you have approximately 20 Kbps total for your presentation. The following table lists the recommended maximum bit rates for streaming presentations over various network connections.

Bit Rates Available for Streaming Clips

Target Connection Speed	Recommended Maximum Bit Rate for Streaming Clips
14.4 Kbps modem	10 Kbps
28.8 Kbps modem	20 Kbps
56.0 Kbps modem	32 Kbps
56.0 Kbps ISDN	45 Kbps
112 Kbps dual ISDN	80 Kbps

Developing a Bandwidth Strategy

Once you know the bit rate or rates available for your streaming clips, you can begin to develop your bandwidth strategy. If you want to stream just one clip, your strategy is straightforward. Things become more complex, though, when you combine different clips into one presentation. But with some practice, you will quickly learn how to balance bandwidth requirements with presentation quality.

Understanding Clip Bandwidth Characteristics

The first step in planning your multimedia presentation is to understand the bandwidth characteristics of your clip or clips. The following sections describe characteristics for standard RealSystem media types. If you stream other types of clips, make sure you understand each clip's bandwidth characteristics.

RealAudio

RealAudio consumes bandwidth at a flat rate determined by the codec used to encode the clip. If you have a RealAudio clip encoded with an 8 Kbps codec, for example, that clip will steadily consume 8 Kbps of bandwidth as long as it plays. And with SureStream technology described in "Using SureStream Clips for Multiple Bandwidths" on page 35, you can encode a single RealAudio clip for up to six bandwidths.

Additional Information

See "Choosing RealAudio Codecs" on page 45.

RealVideo

RealVideo consumes bandwidth at a flat rate for a given bandwidth target. If you target 20 Kbps and use an 8 Kbps RealAudio codec for the soundtrack, the image track steadily consumes 12 Kbps. RealVideo encoders vary a clip's frame rate and image quality to produce the best possible quality for the bandwidth target. SureStream technology described in "Using SureStream Clips for Multiple Bandwidths" on page 35 lets you encode a single RealVideo clip for up to six bandwidths.

Additional Information

See "Choosing RealVideo Codecs" on page 57. For tips on shooting video, see "Recording Video" on page 53.

RealFlash

The Shockwave Flash component of a RealFlash presentation has a spiky bandwidth characteristic, meaning it consumes a lot of bandwidth at certain points in its timeline, little bandwidth at other points. RealNetworks provides tools that help you optimize RealFlash for a specific bandwidth.

Additional Information

If you plan to create streaming animation, read "Preparing a RealFlash Clip" on page 63.

RealText

RealText consists of a text file that contains the RealText mark-up. Because it uses just a simple text file, RealText consumes little bandwidth. This makes it easy to add RealText to any presentation.

Additional Information

For more on RealText, get *RealText Authoring Guide* from **http://service.real.com/help/library/encoders.html**.

RealPix

RealPix consists of still images streamed to RealPlayer. Its bandwidth consumption depends on the number and size of the images, as well as how quickly you stream them. RealPix therefore gives you a lot of control over bandwidth usage through your choice of images and how you construct the RealPix timeline.

Additional Information

For more on RealPix and its bandwidth characteristics, refer to *RealPix Authoring Guide*, which is available at **http://service.real.com/help/library/encoders.html**.

Images

By default, JPEG and GIF images rendered directly in RealPlayer (that is, images that are not part of a RealPix presentation) stream at 12 Kbps. You can modify this bit rate through a SMIL file.

Additional Information

See "Defining Image Options" on page 111 for more on using SMIL to change image clip bandwidth use.

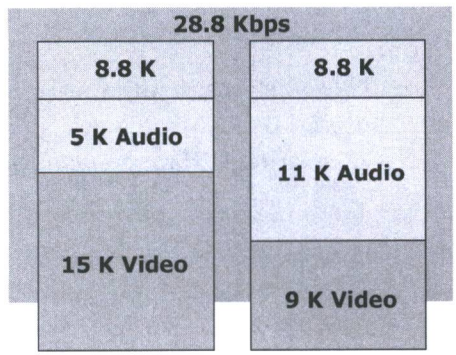
Delivering a Single Media Clip

Suppose you want to create an audio clip that Web users with 14.4 Kbps modems can play. You can simply create a RealAudio clip that consumes 8 Kbps of bandwidth. Anyone with a 14.4 Kbps or higher connection can then listen to your presentation. However, when a clip has multiple streams, such as a video that contains a visual track and an audio track, you need to consider how much bandwidth goes to each stream.

Suppose you want to stream a RealVideo clip at 28.8 Kbps. How much bandwidth should you give to the visual track and how much to the audio track? The answer depends on the content. Because music has a greater frequency range than voice, a music video requires more audio data than a "talking heads" interview. Hence a soundtrack with music consumes more bandwidth than one that uses just speech.

The more you increase the audio track's bandwidth, however, the more you have to decrease the visual track's bandwidth. If you start with a huge video source file, your RealVideo encoding tool may discard a lot of the source data to make the encoded RealVideo data fit a certain bandwidth. Although the RealVideo clip will be playable, you may not like the results. Motion might appear too jerky, for example, or fast-moving images might not resolve visually.

Possible Audio and Video Tracks in a 20 Kbps RealVideo Clip



The point here is that even when you stream just a single clip, your bandwidth target affects how you create content. If you know you'll have only a small bandwidth for video, for example, you can optimize the visual content to display in a small window at a slow frame rate. You may need to jettison panoramic and fast action shots that won't fare well under these constraints.

Additional Information

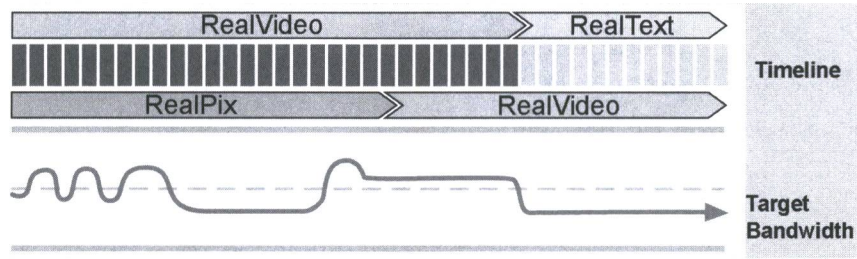
See "Recording Video" on page 53.

Developing Multiclip Presentations

An exciting aspect of RealSystem G2 is that you can develop multimedia presentations, such as slideshows with audio voice-overs, or video with scrolling subtitles. When multiple clips play together, you need to consider how much presentation bandwidth to allot each clip. While it's exciting to create presentations that include video, slideshows, audio, and scrolling text all at once, viewing such presentations over slow modems may be difficult.

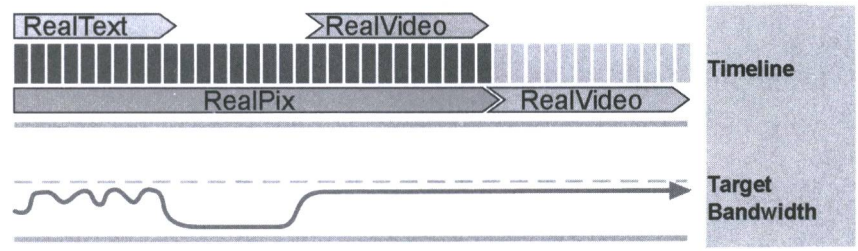
The following figure illustrates a poor presentation for a low-bandwidth connection. The multiclip presentation starts with RealVideo and RealPix clips that require more than the target bandwidth at first. Bandwidth use, illustrated by the solid line, peaks again when the second RealVideo clip begins to play concurrently with the first video clip. To even out the bandwidth spikes, RealSystem streams a high preroll for the RealPix and RealVideo clips, making the presentation slow to start and likely to stall during transitions between clips.

Poor Bandwidth Use in a Multiclip Presentation



The next figure shows better bandwidth management. The presentation starts with a low-bandwidth RealText clip that does not interfere with streaming the images in the RealPix clip. A RealVideo clip starts after the RealPix clip has streamed all its images and does not need bandwidth. The second RealVideo clip starts after the first RealVideo clip has ended, so the two video clips do not compete for bandwidth.

Improved Bandwidth Use in a Multiclip Presentation



Tips for Creating Multiclip Presentations

When developing a streaming multimedia presentation, keep the following tips in mind:

- Consider the presentation timeline carefully to eliminate bandwidth bottlenecks. These typically occur when two or more high-bandwidth clips play simultaneously. You may need to omit high-bandwidth pairings, combining high-bandwidth with low-bandwidth clips instead.
- Stagger the times when clips begin to play back. Every clip requires a certain preroll before RealPlayer can play it. Your presentation will play more smoothly if RealServer does not need to send more than one clip's preroll at a time.
- Start presentations with low-bandwidth clips. Use RealText to display credits, for example. Or begin with a highly compressed RealAudio narration before bringing in video. RealSystem can take advantage of the extra bandwidth to begin streaming higher bandwidth data to RealPlayer "behind the scenes."

  Additional Information

  See "Smoothing Transitions between Clips" on page 173.

- Test presentations in "real world" circumstances, replicating your audience's bandwidth conditions. Clips may play back fine when the files reside on your desktop computer. The presentation may bog down, though, when you stream the clips over a modem.

Supporting Multiple Bandwidth Connections

To reach a wide audience on the Internet, you need to provide content that can play over slow connections. You can encode a RealAudio clip at 8 Kbps, for

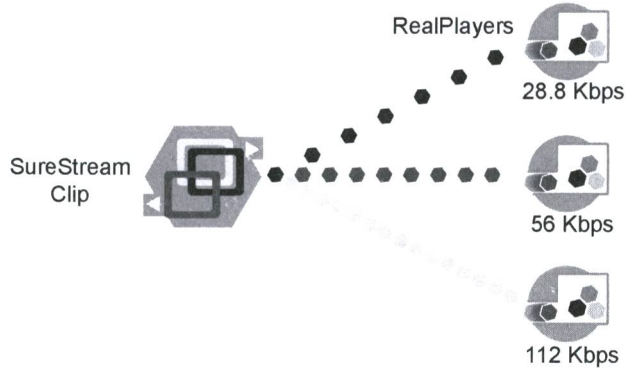
example, so that anyone with a 14.4 Kbps or higher connection can play it. This clip will have good quality sound. But the same clip encoded as a 16 Kbps clip will have better sound. Encoded for 32 Kbps delivery, the clip will have even greater frequency response and dynamic range.

To provide good content for users with slower connections and great content for those with faster connections, you can use two methods, and even mix them depending on your needs. With the first method, you create a single clip that targets different bandwidths. In the second method, you create separate clips for each bandwidth target and let RealPlayer choose which set of clips to play. Either way, you add to your Web page just one link for all visitors. You don't need separate links for modems and ISDN connections, for example.

Using SureStream Clips for Multiple Bandwidths

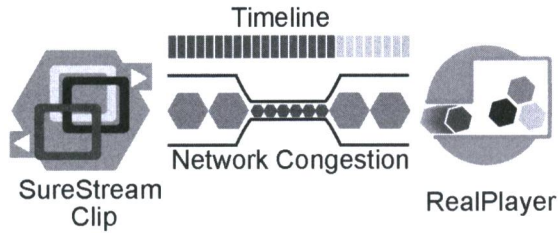
With RealSystem's SureStream technology, you can encode a RealAudio or RealVideo clip for up to six different bandwidths using new RealSystem G2 codecs. For example, you can encode a single RealAudio music clip for 28.8 Kbps modems, 56 Kbps modems, 112 Kbps dual ISDN, and T1 connections. Your Web page links to this single clip, and when a visitor clicks the link, RealPlayer and RealServer determine which encoding to use based on the available bandwidth. The following figure illustrates this.

SureStream Clip Encoded for Multiple Bandwidths



RealServer and RealPlayer can even adjust this choice to compensate for network conditions. If a fast connection becomes bogged down because of high network traffic, RealServer seamlessly switches to a lower bandwidth encoding to prevent the presentation from stalling. When the congestion clears, RealServer switches back to the higher bandwidth encoding.

Switching Bandwidths During Network Congestion



Additional Information

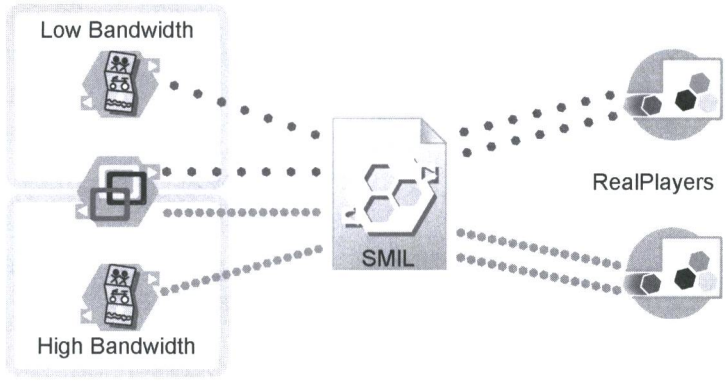
For more on RealAudio and SureStream, see "Choosing RealAudio Codecs" on page 45. See also "Choosing RealVideo Codecs" on page 57.

Letting RealPlayer Choose between Multiple Clips

If your presentation uses clips other than RealAudio or RealVideo, you can create multiple versions of the clips for different bandwidths. When you assemble your presentation, you use a SMIL file to designate a bandwidth connection for each of the different groups. When a user clicks your Web page link, RealPlayer receives the SMIL file and chooses which clip group to play based on its own connection speed.

The following figure illustrates a SMIL file that lists two choices between RealPix clips, a high-bandwidth choice and a low-bandwidth choice. RealPlayer chooses which clip to receive based on its connection speed and the SMIL file's bandwidth parameters. Both presentations use the same RealAudio file, which has been encoded for multiple bandwidths.

Bandwidth Choices through SureStream Clip and SMIL

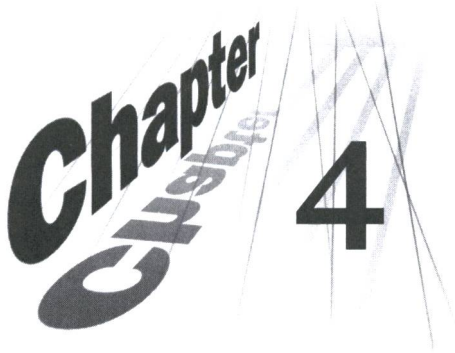


Because each connection speed uses a different set of clips, RealServer cannot switch between the different encodings as it can with a single SureStream clip. RealServer employs other techniques, however, to compensate for network congestion. Its advanced stream thinning capabilities let it drop low-priority data to decrease the presentation bandwidth temporarily. When the congestion clears up, it continues to stream all the presentation data.

Additional Information

"Setting Bandwidth Choices" on page 90 explains how to use a SMIL file to designate different bandwidth groups. See also "Switching with SureStream Clips" on page 176.

PRODUCING AUDIO

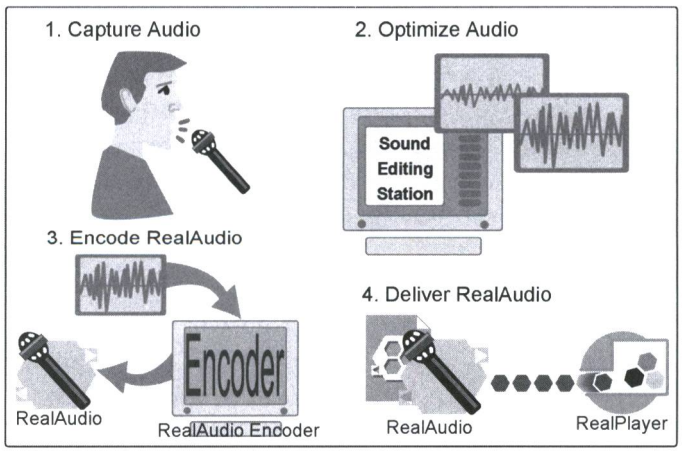


RealNetworks pioneered streaming audio with RealAudio, the first streaming media product for the Internet. Since its debut in 1995, RealAudio has become the standard for network audio, delivering stereo sound over 28.8 Kbps modems, and CD-quality sound at high connection speeds. RealSystem G2 can stream other audio formats as well. This chapter explains how to prepare and encode your sound files for streaming.

Steps for Streaming RealAudio

To produce a great RealAudio clip, you need to use great source material, high-quality equipment, and good production practices. This section provides a quick overview of the steps involved in streaming a RealAudio clip.

Creating a RealAudio Clip



➤ **To create a streaming RealAudio clip, follow these basic steps:**

1. Capture audio.

   You start audio production by capturing audio from a source, such as a person speaking into a microphone. You might also start with a digitized audio source file from a compact disc, for example.

   Additional Information

   "Capturing Audio" on page 41 provides guidelines for capturing audio.

2. Optimize audio.

   With the audio file digitized in a common file format, such as WAV or AIFF, you next use a sound editor to optimize the audio for streaming. When broadcasting live, however, you encode the streaming audio directly from the source, optimizing the audio source during the capture.

   Additional Information

   See "Optimizing Audio" on page 43 for tips on sound editing. For more on live broadcasting, read Chapter 11 starting on page 159.

3. Encode RealAudio clip.

   With your digitized file optimized or your live broadcast ready to go, you encode your source in the RealAudio format. When you do this, you choose a codec or set of codecs that target a network bandwidth.

   Additional Information

   "Creating RealAudio Clips" on page 44 explains RealAudio and its codecs. As described in "Streaming Other Audio Formats" on page 49, RealSystem G2 can stream other audio formats as well.

4. Deliver RealAudio clip.

   With your presentation is ready to go, you make your RealAudio clip or broadcast available through your Website. To combine sound with another streaming clip, such as RealPix, you write a SMIL file.

   Additional Information

   Chapter 7 starting on page 75 explains how to create a SMIL file. See Chapter 10 beginning on page 145 for

instructions on linking your Web page to a RealAudio clip or a SMIL file.

Capturing Audio

A streaming audio clip reflects the quality of the audio source. Degradations in sound quality within the audio source affect the final streaming audio clip. The following sections will help you capture high-quality audio source files or broadcasts.

Broadcasting live audio introduces several issues beyond those you need to consider when creating a standard clip. This is because you cannot edit a broadcast the way you can edit a digitized audio file. When broadcasting, though, you can set up your sound equipment to capture high-quality sound before encoding it.

Additional Information

For pointers on producing video, see "Recording Video" on page 53.

Use High-Quality Source Media

If you plan to stream existing material, start with the best source possible. Use the cleanest recording with the least amount of unwanted noise. Compact disc (CD) and digital audio tape (DAT) are good source media, although well-recorded analog sources such as records, reel-to-reel tapes, and chrome (type II) cassettes can sound just as good. Try to avoid "consumer grade" recording media such as Type I cassettes and VHS tapes.

Choose Professional Recording Equipment

Every piece of equipment in the audio chain—microphone, mixer, sound card, and so on—affects sound quality. If you intend to provide professional-quality audio content, invest in professional audio equipment and software. Poor-quality equipment can add hiss and distortion, degrading sound clarity.

Use Shielded Cables

It is important to use high-quality, shielded cables. Unshielded cables increase the chance of introducing line noise and Radio Frequency Interference (RFI) into recordings. Keep audio cables physically separated from power cords to minimize the introduction of noise. Also be sure to ground all equipment properly.

Set Input Levels Correctly

Setting correct input levels is crucial. All audio equipment has a signal-to-noise ratio, the ratio between the loudest possible sound the equipment can reproduce without distortion and its inherent noise floor. This distortion is known as "clipping," and is audible as a high-frequency crackling noise.

To get the best signal-to-noise ratio, set the input level on each audio device in the signal chain so that it utilizes its full range of available amplitude without distortion during the program's loudest sections. The signal chain typically includes a microphone, a mixing desk, a compressor, and a sound card. For each piece of equipment, set levels as close as possible to 0 dB without going over.

Check at each point in the signal chain for signal distortion. Perform several test runs and make sure there are no peaks above maximum amplitude. Adjust levels on your sound card mixer so the input approaches but does not exceed the maximum. Be conservative, though. Levels might suddenly increase if, for instance, an interviewee suddenly speaks loudly or a crowd at a sports event roars.

Prepare Volume Levels for Live Broadcasts

When broadcasting live audio, it is useful to have a dynamics compressor (gain compression, not data compression), which is a piece of audio equipment that automatically adjusts the volume level. By providing a consistent level, the compressor allows you to "set and forget" the input levels to the RealAudio encoder.

Use Optimum RealAudio Sampling Rates

Try to capture sound with a sampling width of 16 bits. RealAudio codecs have different sampling rates that produce the best sound, however. If your sound card allows it, capture audio at the optimum sampling rate for the codec you intend to use. The RealAudio encoder will convert the file to the optimum rate if necessary, but this is recommended only for static files. For live broadcasts, use a sound card that supports the optimum rate. This avoids the overhead of converting the rate while encoding in real-time.

Additional Information

The tables beginning on page 46 list the optimum sampling rates for each codec.

Tip

You do not need to capture stereo sound if you plan to use a mono codec. However, many sound cards simply discard the right input channel in mono mode. If you have a mixing desk, pan all inputs to the center so the conversion to mono loses nothing.

Optimizing Audio

If you are not broadcasting audio live, you work with a digitized audio source file in a supported format such as WAV, QuickTime, or AIFF. You then edit the audio file to optimize it. To do this, you need to be familiar with the editing functions your audio editing program offers. The following sections give some optimization tips you can carry out with your audio editing software.

DC Offset

DC Offset is low-frequency, inaudible noise that results from equipment grounding problems. If you don't remove it, it can skew the results of subsequent sound editing. Use your sound editor's **DC Offset** function immediately after recording a digital audio file.

Tip

If your sound editing program allows it, eliminate DC offset during recording. This saves you an editing step.

Normalization

Set sensible input levels when recording, then use normalization to maximize levels after recording. Your streaming files sound best when your digitized source has the highest possible gain without clipping. Digital audio files that do not utilize their full amplitude range produce low-quality streaming clips. If the amplitude range is too low, use your sound editor to adjust the range and increase the amplitude.

Tip

Most sound editors have a **Normalize** function that maximizes levels automatically. Because some systems have trouble with files normalized to 100%, normalize to 95% of maximum, or to -0.5dB.

Dynamics Compression

Normalization maximizes the input level of the audio file's loudest sections. Consequently, quiet sections may not encode as well. Dynamics compression evens out input levels by attenuating (turning down) the input when it rises above a threshold. Check your audio software for a **Compression** or **Dynamics** feature. You can control attenuation by specifying a compression ratio. This turns down the loudest sections, and you can readjust input levels accordingly.

> **Tip**
>
> For multipurpose dynamics compression, set the threshold to -10dB, the ratio to 4:1, and the attack and release times to 100ms. Adjust the input level to get around 3dB of compression and an output level around 0dB.

Equalization

Equalization (EQ) changes the tone of the incoming signal by "boosting" (turning up) or "cutting" (turning down) certain frequencies. Using EQ, you can emphasize certain frequencies and cut frequencies that contain noise or unwanted sound. EQ can compensate for RealAudio codecs that do not have flat frequency responses (that is, codecs for which certain frequencies are not as loud after encoding). You can therefore use EQ to make a RealAudio clip sound as close as possible to the initial recording.

> **Tip**
>
> For voice-only content, you can make the file more intelligible by cutting frequencies below 100 Hz and carefully boosting frequencies in the 1-4 kHz range.

Creating RealAudio Clips

RealAudio is a compressed format suitable for streaming over the Internet or intranets. A RealAudio clip generally uses `.rm` as its file extension, but `.ra` is also acceptable. Because RealAudio is compressed, you typically start with a sound file in a digitized, uncompressed format such as WAV or AIFF. You then create a RealAudio clip from this source file through an encoding tool. Your encoding tool should be able to accept some or all of these input formats:

- Audio Interchange Format (`.aif`)
- Audio (`.au`)

- MPEG-1 (.mpg)
- QuickTime (.mov)
- Sound (.snd)
- WAV (.wav)

Additional Information

RealAudio production tools are available at **http://www.real.com/products/tools/**.

Choosing RealAudio Codecs

RealAudio uses a "lossy" compression scheme that discards parts of the audio source file to achieve a highly reduced file size. A RealAudio clip encoded from a WAV source file, for example, may be 10 to 20 times smaller than the WAV file. Although discarding audio information during encoding lowers the clip's frequency response and dynamic range, carefully choosing codecs minimizes the impact of compression.

A RealAudio encoding tool uses a codec to compress the original sound file and create a RealAudio clip. RealPlayer uses the same codec to decompress the streamed RealAudio clip for playback. When you encode a RealAudio clip, you choose a codec (or series of codecs) based on two criteria:

1. Bandwidth

   As Chapter 3 beginning on page 27 explains, you need to decide how much bandwidth each part of your presentation will consume. When you have a bandwidth target for your audio component, you can choose a codec that encodes RealAudio at or below that target.

2. Audio Content

   RealAudio uses different codecs for music and spoken voice. Voice codecs focus on the standard frequency range of the human voice. Music codecs have broader frequency response to capture more of the high and low frequencies.

The following tables provide a reference for all RealAudio codecs. Note that your encoding tool may not include all codecs listed. The tables give the following information:

- G2, 5, 4, 3, 2, 1

  An "X" in these columns indicates that a clip encoded with this codec can be played by RealPlayer G2, 5.0, 4.0, and so on. With RealSystem's SureStream technology, you can encode a single clip for up to six bandwidths using the RealAudio G2 codecs. Only RealServer G2 can stream SureStream clips, though, as they require a large download time if played back from a Web server.

- Rate

  Using a codec's optimum sampling rate in your audio source file ensures that the audio stays synchronized with other media and prevents pitch shifting in audio resampling. Audio quality degrades if you use lower than the optimum sampling rate. If you use a higher sampling rate, it is best to use a multiple of the optimum rate. If the optimum rate is 8 kHz, for example, use a higher rate of 16 kHz or 32 kHz.

- Resp.

  This column lists the codec's frequency response in kHz. A codec with a higher frequency response reproduces a wider range of sound than a codec with a lower response. A measure of codec quality, the frequency response does not affect how you produce audio.

RealAudio Low Bandwidth Codecs

RealAudio Codec	G2	5	4	3	2	1	Rate	Resp.	Comments
5 Kbps Voice	X	X	–	–	–	–	8 kHz	4 kHz	Lowest bit rate for speech or speech with music.
6.5 Kbps Voice	X	X	X	–	–	–	8 kHz	4 kHz	Low bit rate for speech or speech with music.
6 Kbps Music–G2 Mono	X	–	–	–	–	–	8 kHz	3 kHz	Use with SureStream clips.
8 Kbps Voice	X	X	X	X	X	X	8 kHz	4 kHz	Original voice codec. Superseded by 8.5Kbps Voice.
8 Kbps Music–G2 Mono	X	–	–	–	–	–	8 kHz	4 kHz	Use with SureStream clips.
8 Kbps Music	X	X	X	–	–	–	8 kHz	4 kHz	DolbyNet codec.
8.5 Kbps Voice	X	X	X	–	–	–	8 kHz	4 kHz	High-quality voice codec for voice or voice with music.
11 Kbps Music–G2 Mono	X	–	–	–	–	–	11.025 kHz	5 kHz	Use with SureStream clips.
12 Kbps Music	X	X	X	–	–	–	8 kHz	4 kHz	DolbyNet codec.

RealAudio Medium Bandwidth Codecs

RealAudio Codec	G2	5	4	3	2	1	Rate	Resp.	Comments
15.2 Kbps Voice	X	X	X	X	X	–	8 kHz	4 kHz	Superseded by 16 Kbps Voice.
16 Kbps Voice-Mono	X	X	–	–	–	–	16 kHz	7 kHz	High-quality wideband for voice or voice with music.
16 Kbps Music-G2 Mono	X	–	–	–	–	–	22.05 kHz	8 kHz	Use with SureStream clips.
16 Kbps Music-Mono Low Response	X	X	X	X	–	–	8 kHz	4 kHz	DolbyNet codec.
16 Kbps Music-Mono Medium Response	X	X	X	X	–	–	11.025 kHz	4.7 kHz	DolbyNet codec for pop/rock music.
16 Kbps Music-Mono High Response	X	X	X	X	–	–	11.025 kHz	5.5 kHz	DolbyNet codec for classical music.
20 Kbps Music-G2 Mono	X	–	–	–	–	–	22.05 kHz	10 kHz	Use with SureStream clips.
20 Kbps Music-G2 Mono High Response	X	–	–	–	–	–	44.1 kHz	17 kHz	High frequency response. Use with SureStream clips.
20 Kbps Music-G2 Stereo	X	–	–	–	–	–	11.025 kHz	5 kHz	Use with SureStream clips.
20 Kbps Music-Stereo	X	X	X	X	–	–	8 kHz	4 kHz	DolbyNet codec.

RealAudio High Bandwidth Codecs

RealAudio Codec	G2	5	4	3	2	1	Rate	Resp.	Comments
32 Kbps Voice-G2 Mono	X	–	–	–	–	–	22.05 kHz	11 kHz	Use with SureStream clips.
32 Kbps Music-G2 Mono	X	–	–	–	–	–	44.1 kHz	16 kHz	Use with SureStream clips.
32 Kbps Music-G2 Mono High Response	X	–	–	–	–	–	44.1 kHz	22 kHz	High frequency response. Use with SureStream clips.
32 Kbps Music-G2 Stereo	X	–	–	–	–	–	44.1 kHz	8 kHz	Use with SureStream clips.
32 Kbps Music-Mono	X	X	X	–	–	–	16 kHz	8 kHz	DolbyNet codec.
32 Kbps Music-Stereo	X	X	X	–	–	–	11.025 kHz	5.5 kHz	DolbyNet codec.
40 Kbps Music-Mono	X	X	X	X	–	–	22.05 kHz	11 kHz	DolbyNet codec.
40 Kbps Music-Stereo	X	X	X	X	–	–	16 kHz	8 kHz	DolbyNet codec.
44 Kbps Music-G2 Mono	X	–	–	–	–	–	44.1 kHz	20 kHz	Use with SureStream clips.
44 Kbps Music-G2 Stereo	X	–	–	–	–	–	44.1 kHz	11 kHz	Use with SureStream clips.
64 Kbps Voice-G2 Mono	X	–	–	–	–	–	44.1 kHz	20 kHz	Use with SureStream clips.
64 Kbps Music-G2 Mono	X	–	–	–	–	–	44.1 kHz	20 kHz	Use with SureStream clips.

(Table Page 1 of 2)

RealAudio High Bandwidth Codecs (continued)

RealAudio Codec	G2	5	4	3	2	1	Rate	Resp.	Comments
64 Kbps Music-G2 Stereo	X	–	–	–	–	–	44.1 kHz	16 kHz	Use with SureStream clips.
80 Kbps Music-Mono	X	X	X	X	–	–	44.1 kHz	20 kHz	DolbyNet codec.
80 Kbps Music-Stereo	X	X	X	X	–	–	32 kHz	16 kHz	DolbyNet codec.
96 Kbps Music-G2 Stereo	X	–	–	–	–	–	44.1 kHz	24 kHz	Use with SureStream clips.

(Table Page 2 of 2)

Encoding RealAudio with RealSystem Tools

When you encode RealAudio clips with a RealSystem G2 encoding tool, you simply set parameters such as audio type (voice or music) and compatibility with earlier versions of RealPlayer. You can also specify multiple bandwidth targets for the clip, such as both 28.8 Kbps modems and ISDN connections. The tool then chooses the best codec or codecs to use. The following sections give tips on using RealSystem tools.

Additional Information

See the tool's manual or online help for step-by-step instructions on encoding RealAudio. RealSystem encoding tools are available for purchase or free download at **http://www.real.com/products/tools/**.

Note

Not all RealSystem tools may include the features described here. Check the product description or documentation for information on supported features.

Retain Source Files

Always keep a copy of the original audio source file. To edit the RealAudio clip or encode it with a different codec, modify the source file as necessary, then encode the file again as RealAudio. You cannot convert RealAudio clips to other audio formats.

Using RealAudio in a MultiClip Presentation

When you encode a RealAudio clip, consider whether it will play in parallel with another clip such as a RealPix. If you target 28.8 Kbps modems when encoding, for example, the tool may select a 20 Kbps codec, leaving no bandwidth for the second clip. Make sure you specify that the RealAudio clip

is just one part of the presentation. The tool then lets you choose a lower bandwidth codec, such as 8 or 12 Kbps.

Multiple Encoding in a Single SureStream Clip

You can create a single RealAudio clip encoded for up to six bandwidths with SureStream technology introduced in RealSystem G2. You can also specify backwards compatibility with earlier versions of RealPlayer. The encoding tool then encodes the clip for your selected bandwidths with the new RealAudio G2 codecs. It also includes in the clip an encoding that uses an older codec and targets the lowest bandwidth choice.

For example, you can encode a single clip at 8, 16, and 32 Kbps using RealAudio G2 codecs. In the RealSystem encoding tool, you choose backwards compatibility to create an additional 8 Kbps stream with an older codec. Depending on its connection speed, RealPlayer G2 receives the 8, 16, or 32 Kbps RealAudio G2 stream. Earlier versions of RealPlayer receive the 8 Kbps stream encoded with the older codec regardless of their connection speeds.

> **Note**
>
> To support multiple bandwidths with codecs other than RealAudio G2 codecs, you must encode a separate clip with each codec. You then use SMIL to specify bandwidth choices. For more on bandwidth selection through SMIL, see "Setting Bandwidth Choices" on page 90.

Batch Encoding

Your encoding tool may have a batch mode that lets you encode several clips at once. The batch encoder may run through a command-line interface or a graphical user interface.

Streaming Other Audio Formats

RealSystem can stream several audio formats in addition to RealAudio. The following table lists the streamable formats and shows whether RealPlayer G2 for different operating systems (Windows 95 or NT, Macintosh, and UNIX) can play the audio. RealSystem typically does not stream audio formats that have been compressed with a codec. Where codec compression is supported,

codecs are not included with RealPlayer G2 and must reside on the playback machine already.

Streamable Audio Formats

Format	Codec compression	Win32	Mac	UNIX
AIFF (.aif)	uncompressed	**yes**	**yes**	**yes**
AU (.au)	uncompressed	**yes**	**yes**	**yes**
WAV (.wav)	compressed	**yes**	no	no
	uncompressed	**yes**	**yes**	**yes**

Note

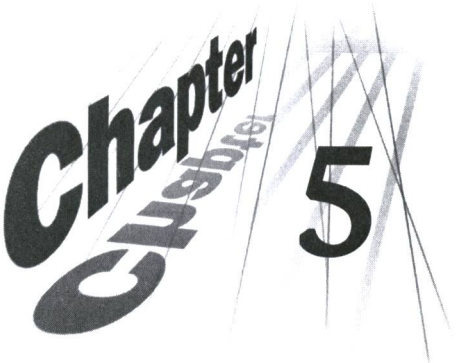
RealSystem plug-ins may exist for additional audio formats. Check **http://www.real.com/devzone** for information about other audio formats you can stream.

Tips for Streaming other Audio Formats

Observe the following points when streaming audio formats other than RealAudio:

- Test whether a codec-compressed audio clip plays in RealPlayer by copying the clip to each platform and opening it locally with RealPlayer.
- A-law compression is not supported for the AU format. It is supported for WAV, however.
- Most uncompressed WAV files work on Macintosh and Unix. Some may not, however. Before streaming an uncompressed WAV file, test playback locally by opening the file with RealPlayer G2 on these platforms.
- The audio formats listed above may not work for low bandwidth connections. Test bandwidth consumption by opening the file in RealPlayer G2 and watching the status panel, which will list the streaming bit rate. If the rate is too high, convert the file to RealAudio.

PRODUCING VIDEO

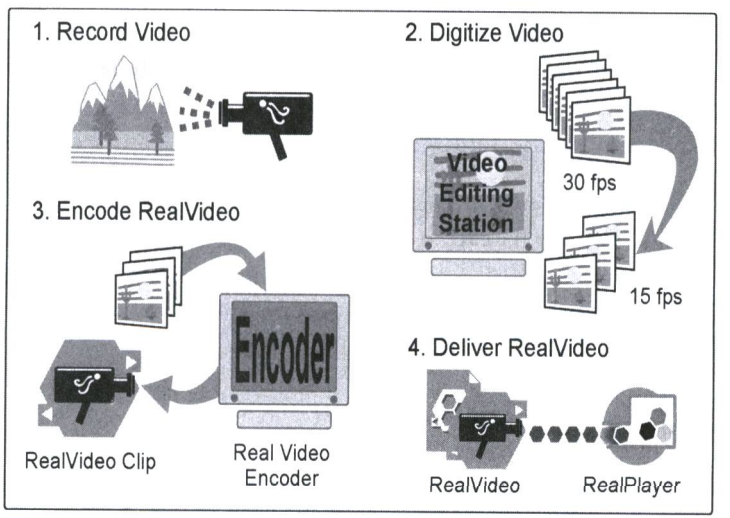


RealNetworks introduced RealVideo with RealSystem 4.0, making streaming video available over the Internet. This chapter covers RealVideo production and explains other video formats that RealSystem G2 can stream. It also provides tips for capturing high-quality video and working with digitized video source files.

Steps for Streaming RealVideo

When producing a RealVideo clip, you should choose the best source material and best equipment possible. The goal throughout the video production process is to get the best video quality with the smallest streaming file size.

Creating RealVideo Clips



➤ **The following steps summarize how to create a RealVideo clip:**

1. Capture video.

   To start video production, you capture video source by shooting a scene with a video camera, for example, or gathering prerecorded content from tape, satellite, laserdisc, or so on.

   Additional Information

   "Recording Video" on page 53 provides guidelines for shooting a video.

2. Digitize and edit video.

   You next digitize the video to a standard file format, such as AVI or QuickTime. With your preferred video editing software, you can then edit the video as necessary. If you are broadcasting live, however, you encode the streaming video directly from the source.

   Additional Information

   See "Digitizing Video" on page 54 for tips on video editing. For more on live broadcasting, read Chapter 11, starting on page 159.

3. Encode RealVideo clip.

   With your digitized file optimized or your live broadcast ready to go, you encode your source as RealVideo. When you do this, you target a network bandwidth or set of bandwidths, and choose a RealAudio codec or set of codecs for the audio track.

   Additional Information

   See "Creating RealVideo Clips" on page 57 for more on RealVideo production. "Choosing RealAudio Codecs" on page 45 explains RealAudio codecs.

4. Deliver RealVideo clip.

   With your presentation ready to go, you make your RealVideo clip or broadcast available through your Website. If you are combining video with another streaming clip, you write a SMIL file that assembles the pieces.

   Additional Information

   Chapter 7 starting on page 75 explains how to create a SMIL file. See Chapter 10 beginning on page 145 for

instructions on linking your Web page to a RealVideo clip or a SMIL file.

Recording Video

Observe the following points if you intend to shoot a new video rather than use existing video content. Because video loses image quality when compressed for streaming, always start with the best video source available.

Additional Information

For pointers on recording audio, see "Capturing Audio" on page 41.

Use a High-Quality Source Format

Whether you shoot a video yourself or digitize existing material, it's important to start with a high-quality video format. The following are common videotape formats in order of descending quality:

1. Betacam SP, also known simply as Beta. This format is common among video production professionals.
2. DV, miniDV, DVCam, or DVCPro.
3. Super-VHS (S-VHS) or HI-8mm.
4. VHS, 8mm.

Stage According to the Video's Final Size

It's important to consider the video's final frame size before you shoot the first frame. Reaching Web users with 28.8 Kbps modems requires a video window approximately 176x132 pixels. With this small size, you need to frame important visual elements well.

Additional Information

For more on window size, see "Digitizing Video" on page 54.

Minimize Scene Changes and Movement

The less that changes from frame to frame, the sharper the image will appear in the encoded video. RealVideo compression technology reuses existing data when frames are similar, so a video with relatively stationary subjects ("talking heads") will look better than a music video with rapid scene changes and a lot

of movement. You can do the following to cut down on unnecessary movement:

- Use a mounted rather than hand-held camera. This greatly reduces the movement you inadvertently introduce into the scene when recording.
- Don't have a rapidly moving object fill the entire frame. Keep in mind, though, that your streaming video may be a few square inches in size, so you don't want to pull the camera back too far.

Of course, you don't want to eliminate all dynamic elements! When you do include rapid movement, give enough time for objects to resolve. Because of low frame rates and high compression, objects coming to rest may appear blurry at first. If you have a dialog box popping up on a computer screen, for example, show that box stationary for a few seconds so that the image resolves.

Tip

RealPix makes a great companion to RealVideo. When presenting a lecture, for example, use RealVideo to show the speaker and a RealPix slideshow to present visual aids such as information written on a blackboard. For more on RealPix, see "Images" on page 12.

Use Uniform Colors and Good Lighting

Bright lighting at a constant exposure keeps the foreground detail crisp. Use uniform, dark colors for backgrounds, and uniform, light colors (but not whites) for clothing. Complex textures such as paisley and stripes degrade the final image quality with unwanted visual effects.

Digitizing Video

If you are not broadcasting RealVideo live, you digitize the source video (direct camera feed, tape, disc, or so on) on your computer or video editing station. You can then edit the file with your preferred video editing software before encoding it as RealVideo. The following sections provide tips for digitizing video.

Capture at 30 or 15 Frames per Second (fps)

Capture video at 15 or, for high-bandwidth streaming, 30 fps. RealVideo encoding tools use a frame rate that varies with the bandwidth target and the emphasis on smooth motion or image quality. RealVideo's Scalable Video Technology (SVT) also allows RealVideo clips to vary in frame rate from 30 fps

to 5 fps based on the RealPlayer computer's processor speed. This means you can produce high frame rate RealVideo clips that do not overburden the processors of slow machines during playback.

Use 24-bit Color Depth

Always use 24-bit color. Lower color resolution produces poor quality videos.

Use S-video Output

Video playback devices commonly have at least two common output types, S-video and composite. Use S-video, which produces better results.

Use a Fast Machine

Video capture places a large burden on a computer's CPU and hard drive. Be sure to have a fast machine. To avoid dropping frames during video capture, use a hard drive specially made for audio and video work. On Windows machines, you can use any video capture card that supports Video for Windows.

Capture at a 320x240 Pixel Window Size

Unless you are short on disk space or your video capture card recommends a different window size, capture video in a window 320 pixels wide by 240 pixels high. With your video editing software or RealVideo encoding tool, you can then reduce the window size if necessary before encoding the RealVideo clip.

The following table, which you should use as a general guideline only, shows three common RealVideo clip sizes that maintain the 4:3 aspect ratio used in television. You can produce RealVideo at any width-to-height ratio, however.

RealVideo Size and Bandwidth Guidelines at 10-15 fps

Width x Height Pixel Size	RealVideo Bandwidth	Image Quality
176 x 132	20-500 Kbps	Good to High
240 x 180	100-500 Kbps	High
320 x 240	200-500 Kbps	High

For each window size, the table lists bandwidth guidelines that assume a desired frame rate of 10 to 15 fps. The table shows that for 28.8 Kbps modems (20 Kbps usable bandwidth), you should use a window no larger than 176x132. Although its overall quality will be good, the image may encode at less than 10 fps. You'll get better quality when encoding for higher bandwidths.

Keep in mind that you *can* create a 240x180 window for bandwidths lower than 100 Kbps, or a 320x240 video for bandwidths lower than 200Kbps. But you're not likely to get high image resolution and 10-15 fps. The video might encode at 5-7 fps, for example, which may be acceptable for your audience. Experiment with different sizes, playing the encoded clip back in RealPlayer G2 to test its quality.

Tip

With your RealVideo encoding tool, you can choose to encode a large video for low bandwidths as a "slide show," which streams approximately one frame per second.

Additional Information

See Chapter 3 beginning on page 27 for details on targeting bandwidth.

Digitize in AVI on Windows or QuickTime on Macintosh

It is better to work with uncompressed formats. Otherwise, you compress the source once when you digitize it and again when you encode it as RealVideo. This double compression can decrease the image quality. Use a compressed source format only if your RealVideo encoding tool supports the file as input. You can use compressed AVI as long as the RealVideo encoding machine has the same Video for Windows (VFW) driver used to compress the AVI.

Additional Information

For more on RealVideo input formats, see "Creating RealVideo Clips" on page 57.

Ensure Enough Disk Space for Digitized Video

Use this formula to calculate the approximate size in Megabytes of a digitized video file:

$$\frac{\text{(pixel width) x (pixel height) x (color bit depth) x (fps) x (duration in seconds)}}{\text{8,000,000}}$$

Suppose you want to capture a three minute video at 15 frames per second with 24-bit color in a window that is 320x240 pixels. Your digitized source file would be approximately 622 Megabytes:

(320) x (240) x (24) x (15) x (180) / 8,000,000 = 622 Megabytes

If necessary, you can conserve disk space by decreasing the window size or lowering the frame rate.

Tip

Windows 95 and Macintosh operating systems limit a single video file to 2 Gigabytes (2048 Megabytes). At a 320x240 window size and 15 fps, this translates to about 9.5 minutes of video. To work around this, create separate source files, encode them as separate RealVideo clips, and merge the clips with editing tools included with your RealVideo production software.

Creating RealVideo Clips

RealVideo's high compression rate makes it well-suited for streaming video over the Internet or intranets. A RealVideo clip uses the file extension `.rm` and typically includes an embedded soundtrack encoded as RealAudio. You start with a video file in a digitized format, then encode a RealVideo clip from this source file using a RealVideo encoding tool. Your encoding tool should be able to accept at least one of these input formats:

- AVI (`.avi`), uncompressed (recommended) or compressed
- MPEG-1 (`.mpg`)
- QuickTime 2.0 (`.mov`), uncompressed (recommended) or compressed

Additional Information

RealVideo production tools are available at **http://www.real.com/products/tools/**.

Choosing RealVideo Codecs

Like RealAudio, RealVideo uses a "lossy" compression scheme that discards parts of the source file during encoding. The following table provides a reference for RealVideo codecs. An "X" in the G2, 5, or 4 column indicates that a clip encoded with this codec can be played by RealPlayer G2, 5.0, or 4.0. Earlier versions of RealPlayer do not play RealVideo.

RealVideo Codecs

RealVideo Codec	G2	5	4	Comments
RealVideo G2 with SVT (new default)	X	-	-	All features of RealVideo G2 codec, plus Scalable Video Technology (SVT) to scale frame rates for different connection speeds.
RealVideo G2 (old default)	X	-	-	Use for fast encoding and encoding a single clip for multiple bandwidths using SureStream.
Standard	X	X	X	Standard codec for past releases. No multiple encoding in a single clip.
Fractal (discontinued)	X	X	X	Discontinued in RealSystem G2 encoders. RealPlayer G2 can play existing fractal-encoded clips, though.

Encoding RealVideo with RealSystem Tools

When you encode RealVideo, you choose an overall bandwidth target or set of targets, then set parameters such as audio type (voice or music), compatibility with earlier versions of RealPlayer, and an emphasis on smooth motion or sharp images. After you make your choices, the encoding tool chooses the audio codec or codecs to use and encodes the clip using a variable frame rate. The following sections give tips on using RealSystem production tools.

Additional Information

See the tool's manual or online help for step-by-step instructions on encoding RealVideo, as well as more information about encoding options. RealVideo production tools are available for purchase or free download at **http://www.real.com/products/tools/**.

Note

Not all RealSystem tools may include the features described here. Check the product description or documentation for information on supported features.

Retain Source Files

Always keep a copy of the original video source file. To edit the RealVideo clip, modify the source file as necessary, then encode the file again as RealVideo. You cannot convert RealVideo clips to other video formats.

Using RealVideo in a MultiClip Presentation

When you encode a RealVideo clip, consider whether it will play in parallel with another clip. If so, you can set an option in your encoding tool so that the RealVideo clip does not consume all available bandwidth. For a 28.8 Kbps modem connection, for example, the encoder standardly encodes the clip to use 20 Kbps. You can alter this default value so that the video uses 12 Kbps, for example, leaving bandwidth free for another clip.

> **Additional Information**
>
> Chapter 3 beginning on page 27 explains more about target bandwidths.

Multiple Encoding in a Single SureStream Clip

You can create a single RealVideo clip encoded for up to six bandwidths with RealSystem's SureStream technology, which uses the RealSystem G2 video and audio codecs. You can also specify backwards compatibility with RealPlayer 5.0. The encoding tool then encodes the clip for your selected bandwidths with the RealVideo and RealAudio G2 codecs. It also includes in the clip an encoding that uses a codec compatible with RealPlayer 5.0 and targets the lowest bandwidth choice.

For example, you can encode a single clip for the target connections shown in the table below. Based on its connection speed, RealPlayer G2 receives the SureStream 20, 32, 45, or 80 Kbps stream. Earlier versions of RealPlayer receive the 20 Kbps backwards-compatible stream regardless of their connection speeds. Note that the RealAudio codec choices shown below are examples only. The encoding tool may choose other codecs depending on a voice or music soundtrack, and which features of the video you want to emphasize.

RealVideo SureStream Clip Example

Target Connection	Clip Bit Rate	RealAudio Codec	RealVideo Bandwidth
28.8 Kbps modem (backwards compatible)	20 Kbps	8 Kbps Music	12 Kbps
28.8 Kbps modem	20 Kbps	8 Kbps Music-G2 Mono	12 Kbps
56.0 Kbps modem	32 Kbps	11 Kbps Music-G2 Mono	21 Kbps
56.0 Kbps ISDN	45 Kbps	20 Kbps Music-G2 Stereo	25 Kbps
112 Kbps dual ISDN	80 Kbps	44 Kbps Music-G2 Stereo	36 Kbps

Additional Information

For information on RealAudio codecs, see "Choosing RealAudio Codecs" on page 45.

Note

To support multiple bandwidths without using SureStream and the new RealSystem G2 codecs, you must encode a separate clip with each codec. You then use a SMIL file to specify bandwidth choices. For more on bandwidth selection through SMIL, see "Setting Bandwidth Choices" on page 90.

Scaling Frame Rates with SVT

RealVideo's Scalable Video Technology (SVT) lets you encode a single, large RealVideo clip at a high frame rate, such as 30 frames per second. This gives viewers with fast machines and high bandwidth connections the best video quality possible. For viewers with slower machines, SVT automatically reduces the clip's frame rate to an optimal level. For example, SVT can smoothly scale down a RealVideo clip encoded at 30 fps to a minimum of 5 fps.

Tip

If you do not use the RealVideo G2 SVT codec, RealVideo clips encoded for 200 Kbps or higher bandwidths may have image quality and frame rates that overburden processors slower than 120 Mhz.

Video Window Cropping

When you encode with the new RealVideo standard codec, the encoding tool crops the video window to multiples of 4 pixels, so a 176x132 video stays its original size. With the older standard codec, the tool crops to multiples of 16 pixels, however, so a 176x132 video encodes at 176x128 pixels. Some encoding tools also let you manually crop or resize the video.

Batch Encoding

Your encoding tool may have a batch mode that lets you encode several clips at once. The batch encoder may run through a command-line interface or a graphical user interface.

Streaming Other Video Formats

RealSystem can stream several video formats in addition to RealVideo. The following table lists the streamable formats and shows whether RealPlayer G2 for different operating systems (Windows 95 or NT, Macintosh, and UNIX) can play back the video. RealSystem supports all Vivo codecs. For other video formats, however, it typically does not stream codec-compressed files. When codec compression other than Vivo is supported, codecs are not included with RealPlayer G2 and must reside on the playback machine already.

Streamable Video Formats

Format	Codec compression	Win32	Mac	UNIX
ASF 1.0 (.asf)	compressed	**yes**	no	no
	uncompressed	**yes**	**yes**	**yes**
AVI 1.0 (.avi)	compressed	**yes**	no	no
	uncompressed	**yes**	**yes**	**yes**
QuickTime 2.0 (.mov)	compressed	**yes**	no	no
	uncompressed	**yes**	**yes**	**yes**
Vivo (.viv)	compressed	**yes**	**yes**	**yes**

Note

RealSystem plug-ins may exist for other video formats. Check **http://www.real.com/devzone** for information about additional video formats you can stream.

Tips for Streaming other Video Formats

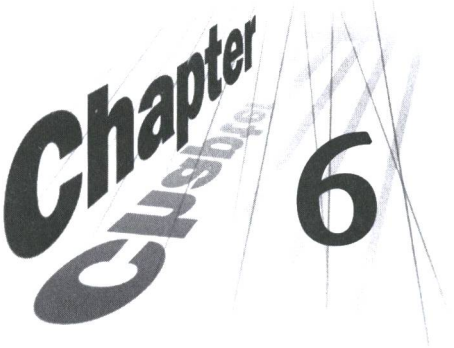
Observe the following points when streaming video formats other than RealVideo:

- Test whether a codec-compressed video clip plays in RealPlayer by copying the clip to each platform and opening it locally with RealPlayer.
- For the ASF and QuickTime formats, RealSystem ignores any tracks other than video or audio. It disregards scripting commands, for example.
- For QuickTime 2.0 on Windows, RealPlayer G2 supports CVID, Cinepak, and Indeo codec compression, provided those codecs are installed on the machine already.
- Because other video formats may not be as highly compressed as RealVideo, they may not be good for low bandwidth connections. Test

bandwidth needs by opening the file in RealPlayer G2 and watching the RealPlayer status panel, which will list the streaming bit rate. If the rate is too high for your target audience, use RealVideo instead.

- For high-bandwidth connections or videos that play back from a user's local disk, CPU power is a consideration. Play the file in RealPlayer G2 and monitor CPU use with the tool of your choice. Decide whether an "average" machine for your target audience can handle the load. If CPU use is too high, convert the video to a high-bandwidth RealVideo clip. This creates a high-quality video with a lower CPU requirement.

PRODUCING ANIMATION



RealFlash makes it easy to put animation on the World Wide Web. Combining the power of Macromedia Flash with the clarity of RealNetworks' RealAudio, RealFlash produces visually arresting animations with superb sound. This chapter explains how to create RealFlash content for different bandwidths. It also provides tips for optimizing RealFlash clips.

Additional Information

For exciting examples of streaming animation, visit **http://www.real.com/showcase/animation/**. For instructions about using Macromedia Flash, refer to Macromedia documentation. Find more information at **http://www.macromedia.com/software/flash/**.

Preparing a RealFlash Clip

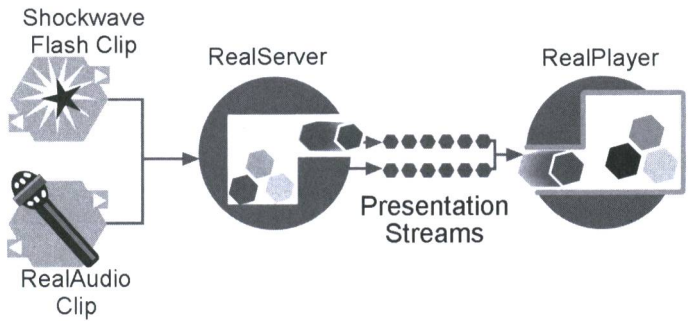
RealFlash is well-suited for linear presentations that have continuous audio and images synchronized along a timeline, including:

- full-length, television-like cartoons for entertainment and education,
- Internet or intranet demonstrations, training courses, and product overviews,
- product advertisements,
- movie trailers,
- and Karaoke.

A RealFlash clip consists of two separate files streamed in parallel: a Shockwave Flash animation file and a RealAudio soundtrack. To create these components, you develop animation in Macromedia Flash and synchronize it with an imported sound file, such as a WAV or AIFF file. You then export a Shockwave Flash file that contains the animation, and generate a RealAudio

file from the soundtrack. RealServer streams the clip to RealPlayer, ensuring that animation and sound stay synchronized.

RealFlash Clips Consist of Shockwave Flash and RealAudio



Tip

Macromedia Flash provides different methods for incorporating sound into an animation. For RealFlash clips, use the stream synchronization setting.

Note

RealPlayer G2 supports Macromedia Flash 2.0 features. It does not support most features introduced in Flash 3.0, such as alpha channels and transparency. Morphing ("shape tweening") is supported but should be used sparingly to keep the streaming file size low.

Choosing a Target Bandwidth

When you begin to develop your RealFlash clip, target an audience connection speed and create content with that bandwidth in mind. This helps ensure that both the Shockwave Flash animation and the RealAudio clip stream smoothly. If your target bit rate is 28.8 Kbps, for example, you have approximately 20 Kbps of bandwidth to divide between the RealAudio soundtrack stream and the Shockwave Flash animation stream.

Additional Information

For an overview of bandwidth considerations, see Chapter 3 beginning on page 27.

The good news is that designing Realflash content for a low bandwidth does not diminish the quality of the animation. RealFlash transmits vector information that the viewer's machine then renders. So unlike bitmap animations, Flash animation depends more on the machine's CPU and graphics capabilities than the amount of data downloaded. A well-designed 28.8 Kbps RealFlash animation can have the same visual impact as an animation requiring a significantly higher connection speed.

Dividing Bandwidth Between Shockwave Flash and RealAudio

Once you have determined the combined bit rate for Shockwave Flash and RealAudio, you need to divide the rate between the Shockwave Flash and RealAudio components. Your animation usually determines this division because it typically consumes more bandwidth. Although you may not have a final bandwidth figure until you create, export, and tune your animation, you should start with a target estimate. The table below lists possible RealAudio and Shockwave Flash bit rate combinations for a 28.8 Kbps connection (20 Kbps usable).

Recommended Bandwidth Divisions between RealAudio and Flash at 20Kbps

Presentation Type	RealAudio	Shockwave Flash
Emphasis on animation with good quality spoken soundtrack for RealPlayer G2 and 5.0	5 Kbps Voice	15 Kbps
Emphasis on animation with better quality spoken soundtrack for RealPlayer G2 and 5.0	6.5 Kbps Voice	13.5 Kbps
Emphasis on animation with high quality spoken soundtrack for RealPlayer G2 and 5.0	8.5 Kbps Voice	11.5 Kbps
Emphasis on animation with good quality music soundtrack for RealPlayer G2 and 5.0	8 Kbps Music	12 Kbps
Emphasis on animation with good quality music soundtrack for RealPlayer G2 only	6 Kbps Music-G2 Mono	14 Kbps
Emphasis on animation with higher quality music soundtrack for RealPlayer G2 only	8 Kbps Music-G2 Mono	12 Kbps
Emphasis on high quality music soundtrack with animation for RealPlayer G2 only	11 Kbps Music-G2 Mono	9 Kbps

Additional Information

See "Choosing RealAudio Codecs" on page 45 for a full list of codecs.

Tips for Choosing RealAudio Codecs

Here are some tips for selecting a RealAudio codec:

- Because RealAudio bandwidth consumption is flat, a soundtrack using an 8.5 Kbps codec, for example, will consistently consume 8.5 Kbps of bandwidth. The remainder of the combined bandwidth is available for Shockwave Flash.
- If sound quality takes precedence, start by selecting the RealAudio codec that supplies high-quality audio while leaving enough bandwidth for acceptable animation.
- When animation is complex, use low bit rate RealAudio codecs targeted for voice. This increases the bandwidth available for complex animation.
- The lowest bit rate for a RealSystem G2 music codec is 6 Kbps. The lowest bit rate for a music codec playable by RealPlayer G2 and RealPlayer 5.0 is 8 Kbps.
- With SureStream technology and the RealSystem G2 codecs, you can encode a single RealAudio file for multiple bandwidths. RealPlayer G2 then selects the bandwidth encoding appropriate to its connection speed.

Additional Information

For the basics of SureStream, read "Using SureStream Clips for Multiple Bandwidths" on page 35.

Adding RealPlayer 5.0 Compatibility

RealPlayer G2 and RealPlayer 5.0 can both play RealFlash presentations, but RealPlayer 5.0 does not support all the options available with RealPlayer G2:

- RealFlash for RealPlayer 5.0 supports only Flash 2.0 features.
- RealPlayer 5.0 cannot read SMIL files or play a presentation that includes RealPix or RealText.
- RealPlayer 5.0 cannot play soundtracks encoded with RealAudio G2 codecs.

To support RealPlayer 5.0 along with RealPlayer G2, avoid using Flash 3.0 features and use any of the following methods when encoding the soundtrack as RealAudio:

1. Create a RealAudio SureStream clip that uses RealAudio G2 codecs for one or more bandwidths. When encoding, choose the backwards-compatibility option to create an encoding for RealPlayer 5.0.

   Additional Information

   For more on SureStream and RealPlayer 5.0 compatibility, see "Multiple Encoding in a Single SureStream Clip" on page 49.

2. Create two separate encodings of the soundtrack: one that uses RealSystem G2 codecs and one that uses a codec playable by RealPlayer 5.0.

3. Create one soundtrack using a RealAudio 5.0 codec. This option does not deliver the highest-quality sound to RealPlayer G2 users, however.

   Additional Information

   For information about creating Web page links to these types of presentations, see "Supporting RealPlayer 5.0" on page 73.

Maximizing Flash Efficiency

Unlike RealAudio, Shockwave Flash does not consume bandwidth at an even rate. This is the nature of vector-based animation. At the start of a scene, for example, groups and symbols for the scene are streamed. This requires a lot of data transfer. After that, only "lightweight" instructions for manipulating groups and symbols are needed. This process results in bandwidth consumption like that shown in the following figure.