RealAudio Server

Administrator's Guide

Release 2.0

Progressive Networks, Inc.

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Chapter 1
Overview

Welcome to the world of RealAudio, the premier Internet audio delivery system! By setting up a RealAudio Server and providing audio libraries, you are becoming an active participant in the exciting new world of real-time audio on the World Wide Web.

RealAudio technology provides real-time audio-on-demand and comprises two components: the RealAudio Player and the RealAudio Server. In addition, encoding tools are provided to enable the generation of RealAudio content from raw audio input.

- The RealAudio Player lets you listen to audio files that have been encoded into the RealAudio format. The Player plays RealAudio files in real times across a TCP/IP network. It is available for download at no charge from Progressive Network's Website at `http://www.realaudio.com/`. RealAudio Players are available for Microsoft Windows, Apple Macintosh and Unix operating systems.

- The RealAudio Server is sophisticated software which runs on a Windows NT, Macintosh and UNIX platforms. It enables audio streams to be sent over the Internet to RealAudio Players. The Server operates similarly to Internet Web servers.

- The RealAudio Encoder enable users and Server operators to encode standard PC and UNIX audio files into the RealAudio format. RealAudio files containing compressed audio data can be streamed by the Server in real time over low bandwidth connections, such as 14.4kbaud modem connections.

This documentation provides instructions for the installation, operation and management of your RealAudio Server, as well as information about recording RealAudio files. It assumes that you have a basic knowledge of the Internet and basic Web server operation.

RealAudio Method of Operation

RealAudio Player users typically gain access to audio content via the World Wide Web. References to RealAudio files are embedded in HTML documents provided by a Web server. The method of interaction between the RealAudio Server and the Web browser is shown in Figure 1-1.

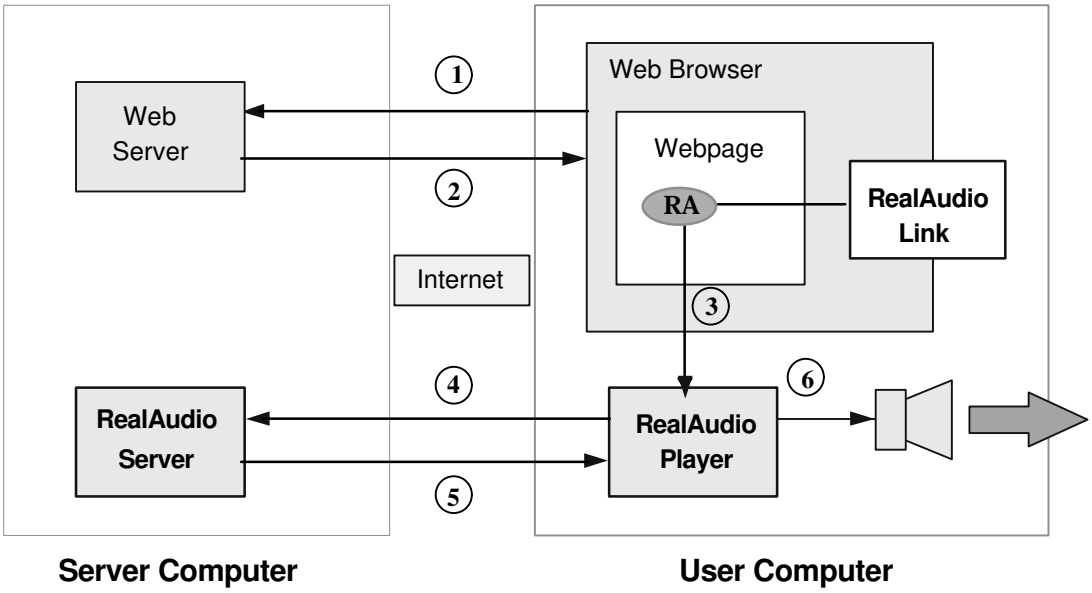

Figure 1-1. Information delivery pathway employed by the Web browser when activating RealAudio files.

When the user clicks on a RealAudio link (1),[1] the HTML document on the Web page accesses a *metafile*. The metafile is a document that contains the Universal Resource Locator (URL) of the audio file on your RealAudio Server.[2] The URL is sent by the Web server to the user's browser (2), and then to the RealAudio Player (3). The RealAudio Player requests the audio file from the RealAudio Server (4), which delivers the audio stream to the Player (5), where it is played (6).

[1] Provided the RealAudio Player is installed on the user's computer and the RealAudio MIME type is recognized by the Web browser.

[2] *Metafiles* are stored in files with the *.ram* extension, the RealAudio data itself is stored in files with the *.ra* extension.

There is virtually no time delay between the user clicking and the audio starting to play. The RealAudio Server opens the requested audio file and sends via User Datagram Protocol (UDP) packets to the user's computer where it is uncompressed and played through the local sound system. The RealAudio Player maintains communication with the RealAudio Server, allowing the user to control the audio stream in a manner similar to a cd player.

The RealAudio system has been specially designed to permit continuous audio playback, even over dialup connections.

Streams

The RealAudio Server and the accompanying encoding tools enable you to create and deliver RealAudio content. The number of simultaneous users who can listen to content sent from your server at any given time is referred to as the "number of streams." The number of streams a server can deliver depends upon three factors: the type of RealAudio Server you have licensed, the power of your server machine and the bandwidth between your server and the Internet (each audio stream requires 10kbits per second of network bandwidth).

RealAudio Server Features

Key features of the RealAudio Server:

- support for full random access on a per-stream basis
- support for many simultaneous streams
- generation of log files, thus allowing system administrators to gather statistics and generate billing and usage information
- tools for creating RealAudio content files on your server platform

This documentation provides instructions for the installation, operation and management of your RealAudio Server, as well as information about recording RealAudio files. It assumes that you have a basic knowledge of the Internet and how Web servers operate.

Operating Systems Supported

At present, the Server is available for the following Architectures and Operating Systems

Intel 486, Pentium

- Microsoft Windows NT 3.5
- BSDI 2.0
- LINUX 1.x

Sun SPARC

- SunOS 4.1x
- Solaris 2.x

Silicon Graphics

- IRIX version 5.2

Memory and CPU Requirements

The RealAudio Server has a relatively small memory footprint. A 100-stream NT Server, for example, has a memory footprint of approximately 2Mb. A system connected by a T1 line is likely to run out of bandwidth before it runs out of memory. Keep in mind that this estimate assumes that system resources are not overtaxed by other applications.

The Server is modest in its CPU impact. A 100-stream server operating on a 90MHz Pentium consumes less than 30% of the CPU.

Disk Space Requirements

The software requires approximately 4Mb of disk space. Compressed audio documents will require approximately 1kB (1024 bytes) per second of audio, yielding 3.6Mb of disk requirement per hour of audio.

Bandwidth Requirements

The RealAudio Player only requires approximately 10k baud,[3] a need easily met by a 14.4k baud modem. The RealAudio Server requires at least that bandwidth to the Internet backbone for each client connected. Therefore, a 56k baud leased line can only accommodate approximately four simultaneous connections. A T1 line, by contrast, can accommodate over 100 simultaneous connections, and is recommended for RealAudio Server applications. Keep in mind that the bandwidth consumed by other applications (e.g., the Web server) should be taken into account while estimating the number of simultaneous users that can be accommodated. The 100-stream Server is configured to allow a T1 line to be used for both RealAudio and moderate Web data traffic.

Web Server Compatibility

Except in specialized applications, users access RealAudio files via links embedded in World Wide Web pages, as described above. Therefore, you will most likely need to have a Web server installed and configured to recognize the RealAudio MIME types. The details of this configuration are discussed in the next chapter. It is also important to appreciate that, although a Web server is needed to make best use of RealAudio, it does not need to be located on the same machine as your RealAudio Server. Although in smaller configurations they can be located on the same machine, typically they are not.

The RealAudio Server has been tested with the following Web servers:

- Netscape Netsite
- EMWAC HTTPS 0.96
- NCSA HTTPD (v1.3 or v1.4)
- CERN HTTPD (v 3.0)
- O'Reilly Website NT

[3] k baud = kilobits per second, not to be confused with Kb/s = kilobytes per second which is 10x as much (8 bits = byte + start + stop bits)

In general, the RealAudio Server can be configured to work with any Web server which supports configurable MIME types. Please e-mail Progressive Networks, at server2@prognet.com or consult our Web page for more information.

Conventions

This manual uses the following conventions:

`Courier font`	Represents commands typed in or information displayed on the screen.
`<filename>`	Used to show where to insert information. For example, the name and location of a file, or configuration parameter.
Bold	For names of files and folders provided in the Progressive Networks server distribution.
Italics	To reference other sections in this manual.

Terminology

For the purposes of this manual, the following terms are used as defined.

client	A client is the application from the user's machine that connects to a Web site. In this manual, it will always refer to the RealAudio Player, which is the only proper interface for playing RealAudio files from the RealAudio Server.
metafiles	Metafiles are text files that refer the RealAudio Player to the RealAudio file. The only information contained in the metafile is the URL location of the .ra file they refer to. They are described in Chapter 3, in the section titled *Creating Metafiles (files with a .ram extension).*
RealAudio files	RealAudio files are audio files that have been encoded into the RealAudio format.
.ram files	Metafiles have the .ram extension, and are sometimes referred to as .ram files.

.ra files	RealAudio files have the .ra extension.

Chapter 2

Installing and Administering the RealAudio Server

This chapter discusses the installation, testing, and administration of the RealAudio Server. The topics covered include:

Installation

- Copying or downloading the RealAudio distribution archive file
- Expanding the archive and installing the files in the appropriate directories on your server system
- Editing the RealAudio and system configuration files on your server to allow the RealAudio Server to startup and run properly on your system
- Editing the configuration of your Web server to support the RealAudio MIME types
- Testing your RealAudio Server

Administration

- Starting, stopping, and reinitializing the Server
- Using the Monitor Application to track Server operations

Instructions are provided for both UNIX and Windows NT. To assist you during the setup process, a pull-out checklist is provided in Appendix E.

Installing the RealAudio Server

Before you can download and install the RealAudio Server, you must have authorization from Progressive Networks. As an authorized customer, you will be sent a URL for use in downloading the software.

The URL provided to you is your password to gain access to the server archive.

When you connect to the URL using a Web browser,[4] you will be presented with an online copy of the Progressive Networks Server License Agreement. You must accept the terms of this agreement online before you can proceed to download the Server.

Once you have accepted the license you will be prompted to download the Server. Use your Web browser to download the server distribution to your local machine. The version of the RealAudio Server that will download has been customized to your needs.

After you have obtained the server distribution, create a directory for it. We suggest the directory be named "pnserver." If you downloaded the Server to a different machine than the one on which you will run it, you must move the distribution file to the correct machine before you uncompress it. Use a utility such as ftp for this purpose. On Windows NT, the distribution is in the form of a **ZIP** file. On UNIX it is in the form of a compressed **tar** file.

Before installing the server distribution, it is also important to ensure that you are logged in as a user with the correct privileges.

To extract the server distribution from the compressed distribution file, proceed as follows:

On Windows NT:

You should be logged on as a user with administrative privileges. This will allow you to successfully install the Server as a System Service.

Copy the ZIP file to your pnserver directory and execute the following command:

```
pkunzip /d pnserver.zip
```

[4] Note that since RealAudio playing is not involved in the download, you can use any Web browser to access and download the Server. Therefore, it is suggested that you download directly onto your Server host, if possible; even if a RealAudio Player is not available there.

Note that the /d option to pkunzip is important!

On UNIX:

You should be logged on as the super-user. Although the RealAudio Server can operate without root privileges, it may not operate to its full potential because certain system calls made by the Server to allocate system resources can only be made by the super-user (see *Starting the Server Manually* later in this chapter).

Copy the compressed tar file to your pnserver directory and execute the following command:

```
uncompress -c irix-server.tar.Z | tar xf -
```

Contents of the Server Archive

Once unzipped, the files will reside in the following subdirectories:

```
doc
bin
logs
rafiles
```

The `rafiles` directory tree is the root directory for your RealAudio files.

Once the Server has been installed, set up the configuration files using the instructions in the next section.

A quick reference for configuration parameters is available in Appendix A.

Configuring the Server

The RealAudio Server's operational characteristics are controlled by a configuration file. The configuration file provides information to the Server about the setup of your RealAudio system such as the location of RealAudio files and the number of simultaneous streams to offer on the network. The configuration file is also used to indicate the location of the server log files, which record accesses made to your server and any error messages.

A default example of a configuration file is provided with the distribution in the file **pnserver.conf**. You can edit this file using your preferred text editor.

The configuration consists of a number of tokens, separated by white space. For example:

```
# TCP/IP port for RealAudio Server Connections
PnaPort      7070
```

Any line beginning with a # character is treated as a comment.

Configurable parameters for the RealAudio Server are described below.

Licensing Information

When you receive the license information for your RealAudio Server, you must enter it into the Server's configuration file. You must enter the exact information or the Server will not become operational. The following licensing information needs to be entered into the **pnserver.conf** file.

```
CustomerName                <betatestername>
StartDate                   <date>
ExpirationDate              <date>
LicensedAudioConnections    <max#ofconnections>
LicenseKey                  <encryptedkey>
```

If you wish to extend your Server past the expiration date, you will need to contact Progressive Networks before the expiration date for new information for these five fields.

PNA Protocol Port

All Internet services receive calls from clients by listening at a particular port number. The RealAudio Server normally operates on TCP port 7070. In order to specify a different port number, enter the following line into your **pnserver.conf** file.

```
PnaPort             <portNumber>
```

The `<portNumber>` should not exceed 32767. The only reason to use a port other than the default is to allow several servers to coexist on one system, or to maintain some privacy when serving information by using an unusual port number.

Maximum Audio Connections

The maximum number of simultaneous audio connections your server can support is determined by the license you have purchased. This entry allows you to set a

limit less than or equal to this number. To specify a lower value, enter the following line in the **pnserver.conf** file:

```
AudioConnections     <AudioConnections>
```

The maximum number of connections cannot usefully exceed the maximum number that the bandwidth of your Internet connection will support. A 56k frame relay or ISDN connection will support approximately 10 connections, while the T1 line will support approximately 100.

Connection Timeout

Since every connection consumes valuable resources, users should not be permitted to "go idle" for long periods of time. Playing audio does not constitute going idle, of course. The user is idle only if the connection is used to pause audio, or the Player has reached the end of the audio program without disconnecting.

By default, the Server will "hang up" on a connection after five minutes of idle time. To set a different value, you must add the following line to **pnserver.conf**:

```
Timeout              <Seconds>
```

The client will automatically reconnect after being timed out by the Server if the user hits the play button.

Maximum Monitor Connections

The Monitor is a Windows application used to track the operation of a running RealAudio Server. Its use is described later in this chapter. The Monitor connects to the Server over a TCP/IP connection and the maximum number of these connections should be restricted to the number of consoles from which you anticipate the monitor software will be run.

The maximum number of monitor connections defaults to 2, and is independent of the number of audio connections. To specify a different value, enter the following line in **pnserver.conf** file:

```
MonitorConnections    <MaximumMonitorConnections>
```

Monitor Password

To ensure that unauthorized users cannot monitor your server, you must insert the following into **pnserver.conf**.

```
MonitorPassword        <passwordOfYourChoice>
```

You can share this password for diagnostic purposes.

Base Path

All RealAudio documents delivered by your server will reside in, or beneath, the directory specified by the **base path**. Enter the full pathname of this directory using the following format into the **pnserver.conf** file:

```
BasePath      <basepath>
```

It is suggested that this path point to the **rafiles** subdirectory of your server installation directory, as this directory contains several sample documents.[5]

Log Path

The RealAudio Server will log information regarding every access to your server into the file specified by the **log path**. Enter a line using the following format into the **pnserver.conf** file:

```
LogPath       <logpath>
```

It is suggested that this path point to the file **pnlog** in the **log** subdirectory of your server installation directory.

Error Log Path

The RealAudio Server will log client identification and information about errors which occur during the operation of your server to the PN Error Log specified by the **error log path**. Enter a line using the following format into **pnserver.conf**:

```
ErrorLogPath <errorpath>
```

It is suggested that this path point to the file **pnerrlog** in the **log** subdirectory of your server installation directory.

[5] Note that both the / and \ characters are accepted on Windows NT as a field separator. Only / can be used on UNIX.

User and Group ID (UNIX Only)

As stated above, in order to allocate additional system resources for delivering a large number of RealAudio streams, the Server must be started under the super-user account. Once the program has started, however, and these resources have been allocated, the Server is free to change its identity to a less privileged user and group id.

Use the following format to indicate the names of the user and group names which you wish the Server to assume once it has started:

```
User        <UserName>

Group       <GroupName>
```

For example:

```
User        fred

Group       people
```

Process ID Log (UNIX Only)

For your convenience in reinitializing the Server on UNIX, it records its process id in a file, if requested. You can use the following format to specify the filename for the process id log:

```
PidPath     <pid file>
```

It is suggested that this path point to a file in same directory as your log files.

Configuring Web Servers for Use with RealAudio

Before the Web server will handle RealAudio metafiles[6] properly, you must configure it to recognize them as the following MIME type:

[6] *Metafiles* are text files that refer the RealAudio Player to the RealAudio file. They are described in Chapter 3, in the section titled *Creating Metafiles (files with a .ram extension).*

audio/x-pn-realaudio

This MIME type is communicated in the HTML header sent to the user's Web browser. It tells the Web browser to activate the RealAudio Player on their computer. If you do not configure the MIME type correctly, the user's Web browser will try to download the RealAudio file rather than activating the RealAudio Player.

The procedure for creating this association varies from one Web server to another. The following list gives information on MIME type additions for some of the most common Web servers in use today. If you are in doubt, or your Web server is not on our list, please consult your Web server documentation or the online documentation at the Progressive Networks Web site at http://www.realaudio.com/.

Webstar and Mac HTTPD

Open the Admin program for the Webstar server and pull down the Configure menu and select Suffix Mapping. When the Suffix Mapping dialog window opens, enter the MIME type information into its associated fields exactly as shown in the following example (these fields are case sensitive):

Action: TEXT

File Suffix: .ram

File Type: PNRM

MIME Type: audio/x-pn-realaudio

Creator: PNst

Select the Add button to update the MIME types directory.

Netscape Netsite Server

Add the following to the "MIME.types" file:

type=audio/x-pn-realaudio exts=ra,ram

Add the following line to the Server's main configuration file (called "magnus.conf" in the examples given in the Netsite documentation):

```
Init fn=load-types mime-types=mime.types
```

and then reinitialize the Web server.

Windows NT (EMWAC HTTPS 0.96)

In the HTTP server applet in the Control Panel, click on the button along the right hand side of the window marked "New mapping."

A dialog window will display existing MIME type mappings, along with a "Filename extension" text entry box along the top. Type the filename extension "RAM" into the extension field, and then enter the full MIME type:

```
audio/x-pn-realaudio
```

into the text entry field just below the words "MIME type:" and above the scrollable list of existing MIME types. Finally, select OK to add the new MIME type to the main list. You will then need to reinitialize the Web server for the changes to take effect.

NCSA HTTPD (v. 1.3 and 1.4)

For NCSA, two approaches are possible.

1. Edit the file "MIME.types" in the SERVER_ROOT/conf subdirectory. Add the following line:

   ```
   audio/x-pn-realaudio    ram
   ```

2. Edit the file "srm.conf" in the SERVER_ROOT/conf subdirectory. Add the following line:

   ```
   AddType audio/x-pn-realaudio     ram
   ```

Either approach will work, but the "MIME.types" file on many installations is often left as distributed by NCSA, and local configuration is done by adding the AddType directive to the "srm.conf" file. Once the MIME type is added using either approach (but not both), reinitialize the Web server.

CERN HTTPD (v.3.0)

Add the following line to the "httpd.conf" file under the Server's root directory:

```
AddType        .ram    audio/x-pn-realaudio        binary
```

and then reinitialize the Web server.

O'Reilly Website NT

To change the MIME type on the O'Reilly NT Web Server, use the admin tool on the mapping page to change the content type by giving the following command:

```
.ram audio/x-pn-realaudio
```

Adding Links for the RealAudio Player

Once the Server is configured, you should add a link on your Web page pointing to

```
http://www.RealAudio.com/
```

so that visitors to your site can obtain the RealAudio Player.

Running the Server

Once it has been installed and configured, the RealAudio Server should be started and tested. For testing, the Server should be started manually from the command line. When it has been confirmed that it works correctly, the system can be configured to start the RealAudio Server automatically every time the system is booted.

Starting the Server Manually

NOTE: If this is the first time that you are starting the RealAudio Server, you must configure the Server before starting it. Refer to the Sections *Starting the RealAudio Server for the First Time* and *Configuring the RealAudio Server* in this chapter for instructions.

To start the Server manually from the command line, proceed as follows.

For Windows NT:

In the command prompt window, type:

```
bin\pnserv20 <configfile>
```

For example:

```
bin\pnserv20 pnserver.conf
```

If everything is successful the message:

```
RealAudio Server, Version 1.00(c) 1994, 1995
Progressive Networks Inc.
All Rights Reserved
```

will appear.

For UNIX:

Since the RealAudio Server runs on a high-numbered, unprivileged port, it is not necessary to start the Server as the super-user (root). However, super-user privileges are necessary when the Server needs to configure itself to use additional system resources, as it would when there are a large number of concurrent connections (See *User and Group ID*). If the Server is started as super-user (root), it will change its user id once the resource limits are adjusted, and will assume the user and group entered into the configuration file.

You can start the Server by changing directories into the top level directory of the server distribution and typing:

```
bin\pnserver <configfile>
```

For example:

```
bin\pnserver pnserver.conf
```

Note that the Server will "detach" from the shell and run in the background as a daemon process; the prompt will return immediately. If everything is successful the message:

```
RealAudio Server, Version 1.00(c) 1994, 1995
Progressive Networks Inc.
All Rights Reserved
```

will appear.

If your Server does not start, review the error messages in the error log file and, on Windows NT, the PN Server Log as described in Appendix B, *Server Log Formats*.

WARNING: If you have not configured your Web server to recognize RealAudio MIME types, clients will receive unrecognizable text instead of audio when they click on a RealAudio link. For configuration instructions, refer to *Configuring Web Servers for Use with RealAudio* for instructions.

Testing the Server

Once the Server is successfully started, you can test it by attempting to play the clips provided in the directory `rafiles`. To play the clips, start the RealAudio Player on a Windows or Macintosh computer.

Figure 2-1. RealAudio Player.

Use the Open Location dialog, on the File menu to enter the URL of the test file **sound1.ra**.

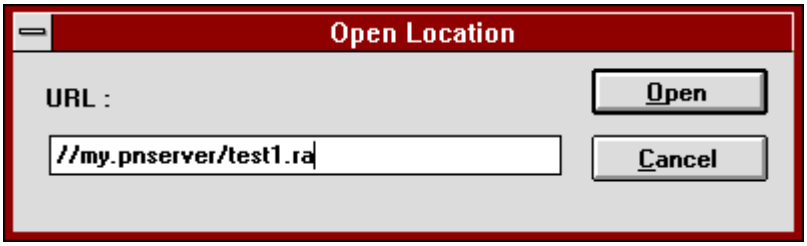

Figure 2-2. Open Location Dialog Box.

The file **sound1.ra** should play correctly.

Troubleshooting the RealAudio Server

If you are experiencing problems with the RealAudio Server, you will need to use the RealAudio Player to test links on your site to isolate the source of the problem. Before you try to connect to your site, launch the RA Server Setup Application to see if the Server already has the maximum number of connections, and to ensure that the maximum number of connections have not been made. If a client appears to stay connected after the audio clip should be finished, a connection may be hung (this may happen when a client's system has crashed). If you suspect that there is an inactive connection to your server, click on the inactive connection in the display window, and click the disconnect button at the bottom of the window.

Some problems will generate the following error messages.

If the Server IP address has been typed incorrectly or is non-existent, you will receive an invalid file message from the Player:

Figure 2-3. URL Error Message Box.

If the Server IP address is wrong or non-existent, you will also see the following error message from the Player:

Figure 2-4. Error Opening Document Message Box.

Correct the IP address and try again.

If the Player IP address is valid, but the filename portion of the URL is invalid, then you will see the following error message. Check the filename and try again.

Figure 2-5. Error Message Box.

Additionally, there are several error messages generated by the RealAudio Player that may be received while testing the Server.

No document by that name available at the requested location. If the Player is unable to locate the document, it may indicate that the URL address referenced in the .ram file is incorrect.

Document is empty. If the document does not download correctly, you may see this message. Try clicking on the file again. If there are still problems, the audio file may not have encoded properly. You may need to encode it again.

Server disconnected. The server is probably too busy at this time. You will need to make a connection later. Use the Monitor to check activity on your Server before attempting a new connection.

Server disconnected. Player cannot receive UDP packets on port 7070. If the Player is behind a firewall, or if the connection to the Internet is through The Internet Access (TIA), it will prevent the Player from receiving audio packets sent by the Server. Firewalls must be configured to allow RealAudio to play through them, (see *Appendix C*, *Firewalls* for details).

Insufficient information to specify the target document. When you use the Player File menu option to request a file, an incorrect URL designation will return this error.

If the problem persists, you should check the following:

Is the Server running on the host machine?

Use ps (on UNIX), or pview (on Windows NT) to check this. If the Server is not running, repeat the procedure for manually starting the server, as described above.

Is the IP address of the host machine correctly configured in the network routers?

If the Player cannot access the Server over the network, then you cannot expect audio to play. Configuring IP address and routers is a complex issue. Contact a networking specialist for help on this.

Is the machine you are using to test the audio connected to the network used by the Server host computer?

You must have a network connection between Player and Server for audio to play. Contact a networking specialist for help on this.

Is there a firewall between the Player and the Server?

Firewalls need to be configured to allow RealAudio to play through them, (see *Appendix C, Firewalls* for details)

Can you connect to the Server with the RealAudio Monitor?

The Monitor application will help you to diagnose the problem by validating communications between the Player computer and the Server and allowing you to view the running state of the connection during attempts to play back audio.

Is there unreadable text displaying on the screen instead of audio?

You have not configured your Web server to recognize RealAudio MIME types. Refer to the section *Configuring Web Servers for Use with RealAudio*.

The Server log also records errors made by the RealAudio Server. For instructions about how to open and interpret the Server log, see Appendix B, *RealAudio Server Log Formats*.

If you still have problems after considering these possibilities, please send email to Progressive Networks at server2@prognet.com.

Launching the Server Automatically

Once the Server has tested satisfactorily you should configure it to start automatically each time the system is rebooted.

The methods for doing this differ between Windows NT and UNIX.

For Windows NT:

The RealAudio Server is installed as a "Service" under Windows NT. This means that it can be controlled from the "Services Control Panel" and will start and stop automatically when the system is booted or terminated.

To install the RealAudio Server as a Service, you must logon as a user with Administrative privileges. To install the RealAudio Service, execute the program **crtsvc.exe** provided with the RealAudio Server distribution, as follows:

```
crtsvc <root:\pnserver\exe\path> <root:\config\file\path>
```

where `<root:\pnserver\exe\path>` is the path to crtsvc.exe, and `<root:\config\file\path>` is the path to the Server configuration file. The following example shows what a typical crtsvc command line might look like:

```
crtsvc c:\pnserver\pnserv20.exe c:\pnserver\server.cnf
```

Entries have now been placed in the system registry for use by the Service Manager. If at a later date you wish to remove the RealAudio Service use the command:

```
delsvc pnserv20.
```

You should receive the response

```
RealAudio Service Removed Successfully.
```

If you have changed the path for the Server execute or configuration files, you can run **crtsvc.exe** again with the new parameters.

To start and configure the RealAudio Service, use the NT Services Control Panel:

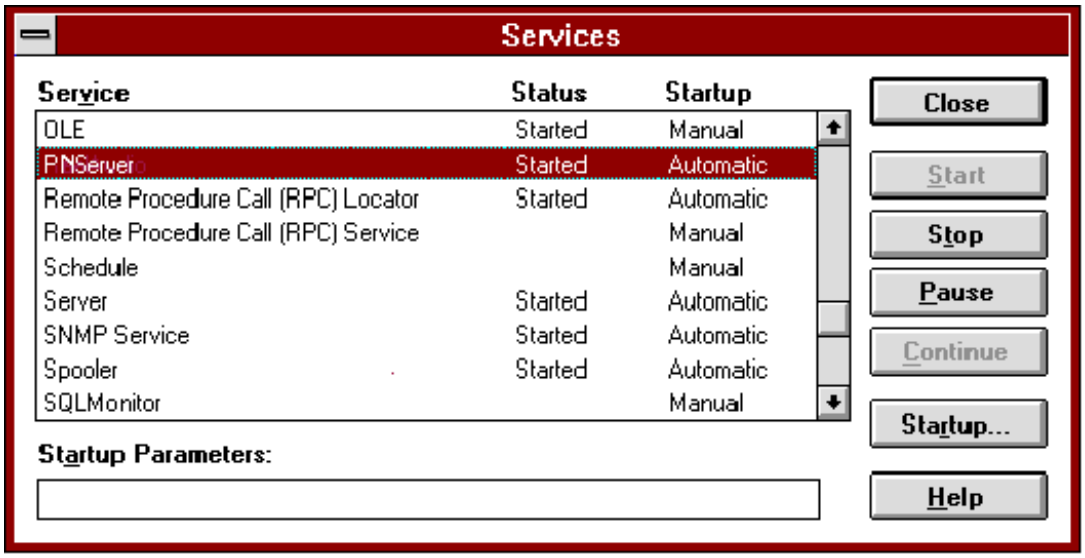

Figure 2-6. The Windows NT Services Control Panel.

Within the Services Control Panel, select the RealAudio Service. You can now start, pause, continue, and stop the service, using the buttons on the right.

The "Startup" button takes you to the following dialog box, which is used to configure the Server startup parameters. For automatic operation, the settings should be as shown in Figure 2-7. The Startup Type is set to Automatic and the Service is set to run with System Privileges.

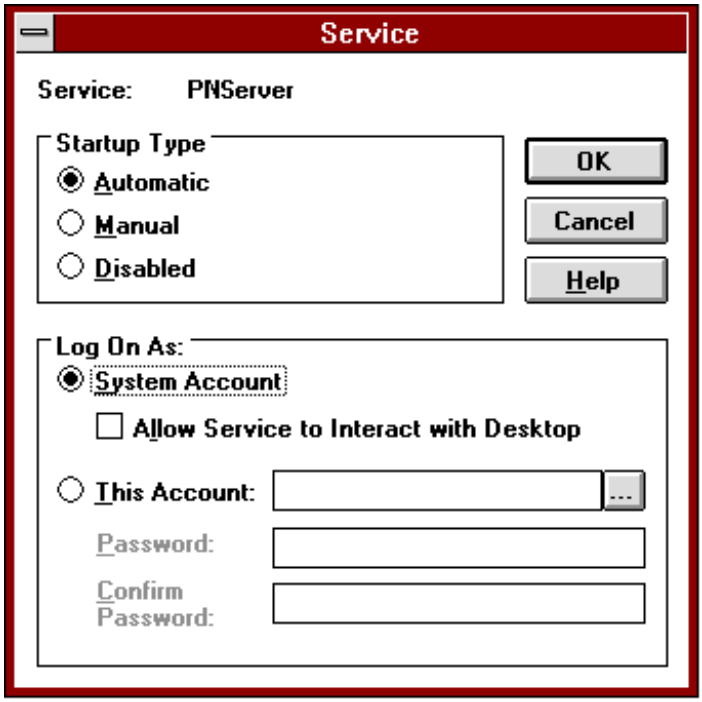

Figure 2-7. Service Startup Dialog Box.

For UNIX:

It is suggested that a command to start the Server be added to the boot-time scripts of your UNIX system by your system administrator. (The boot-time scripts generally reside in files or directories beneath the /etc subdirectory.)

Changing the Configuration of a Running Server

The Server can be forced to reload and change its configuration without stopping. For example, you may wish to authorize an additional monitor connection (see *Maximum Monitor Connections*) or fewer audio connections (see *Maximum Audio Connections*).[7]

[7] Keep in mind that if you launch the server as super-user but instruct it to change to another user ID after startup (See User ID in *Setting Configuration Parameters* above), you may not be able to raise the maximum number of audio

For Windows NT:

To reload the configuration file in Windows NT, open the Server Monitor after you have made the necessary changes to the configuration file. On the Monitor menu, pull down Options, and select Server Configuration. When the Server Configuration file opens, you will see a button on the lower left side that reads "Reload Configuration." Push this button to reload the configuration file.

For UNIX:

There are two methods for reloading the configuration file in UNIX.

For the first method, the UNIX monitor needs to be in the interactive mode (see The RealAudio Command Line Monitor for UNIX). Use command `r` to reload the edited configuration file.

For the second method, you will need the process id of the Server. If you do not know it, check the **pid** file or run `ps` to obtain the process id. The exact parameters for `ps` depend upon the version of UNIX you are using.

On BSDI, LINUX, SUNOS, use:

```
ps -aux
```

On SOLARIS and IRIX, use:

```
ps -ef
```

After making the desired changes to the configuration file, deliver a HUP signal to the Server to force it to re-examine its configuration.

```
kill -HUP <processId>
```

Stopping the Server

For Windows NT:

connections above an OS-dependent threshold without shutting down and restarting the server. This is because the server cannot regain root privileges once it has changed its user ID.

Open the Services Control Panel and locate the RealAudio Server. You can use the Stop button on the right side of the control panel to terminate the Server (see Figure 2-6).

For UNIX:

Once you have obtained the process id (see the previous section), use the following procedure, while logged on with the same user id as the Server (or as super-user):

```
kill <processid>
```

To verify that the Server is stopped, use the appropriate `ps` command for your system.

The RealAudio Server Monitor for Windows NT

The RealAudio Server Monitor provides continuously updated information about current connections to the RealAudio Server. The Monitor contains three windows where you can view clients currently connected, files being played, and a graphical interpretation of all connections for the past two minutes. This highly versatile interface allows you to choose how you would like connection information interpreted and displayed. For example, you may wish leave the Monitor open on a corner of your screen with the Player connections shown as a graph, and the other Monitor windows closed. This way, if the graph suddenly plummets to zero when it usually hovers around forty, it could be an indication that the Server has stopped running.

The Monitor can be opened from any computer that has a network connection to the Server files.

Once the Server has been started, you can initiate operation of the Monitor by opening the bin directory of the Server distribution, and double-clicking on the MONITOR.exe file.

The Monitor window will be blank when it opens. To start the Monitor, pull down the File menu and select New or Open. When the Open Connection window displays, choose the Server that you want to monitor from the selections shown (see Figure 2-8).

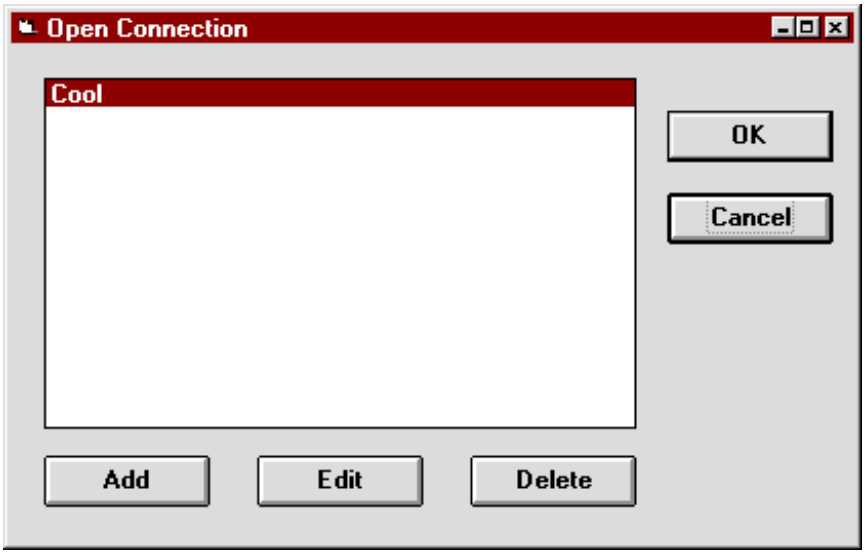

Figure 2-8. Open Connection Box for Monitor.

If the Server you want to monitor is not in the list, you will need to add it to the Monitor's selection menu. To do this, select the Add button. When the Add Connection window opens, put a name for the connection in the Connection Name box. The name of the machine that has the Server that will be monitored needs to be entered in the Machine Name or IP Address box. The Machine Port is the port number that the Monitor will use to reach the Server. The default is 7070. The Password is the same password that you put into the Server configuration file. Once you have entered all of the information, select OK to save the information. The Monitor windows may take several minutes to open because the Client window of the monitor provides the domain name of clients, so IP addresses need to be looked up before that window can be activated. Since some IP addresses cannot be traced, the Monitor may hang a few seconds before moving on to the next address.

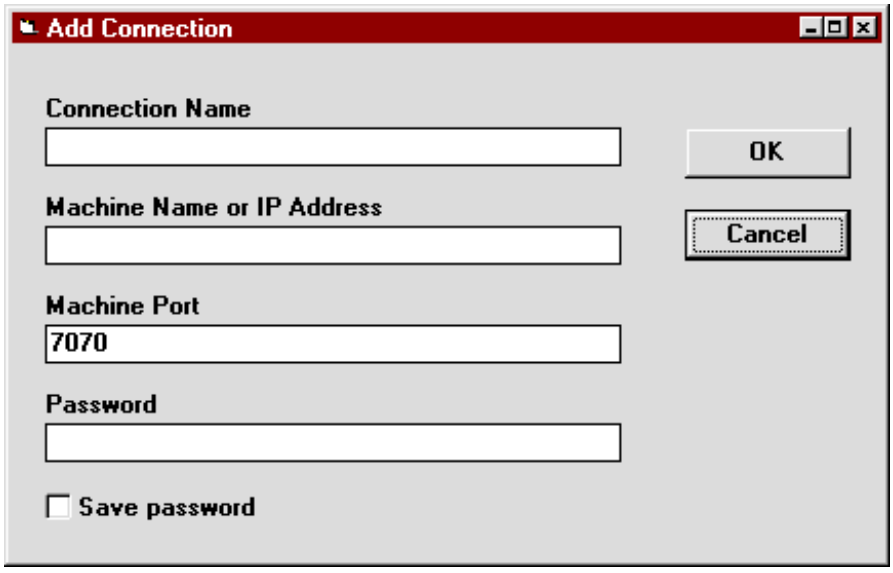

Figure 2-9. Add Connection window.

The Monitor can be configured to save connection information for all of your RealAudio Servers. The number of monitors that can be opened on any particular Server is only limited by the number of connections entered into the Server's configuration file. If you have more than one RealAudio Server running, you can open Monitors for each Server on the same machine, and leave them open continuously for as long as the Server is running.

To edit the connection configuration, select Edit from the Open Connection window to open the Add Connection window. After editing the information in the window, select OK to save the configuration.

To delete a disabled connection, click on the connection name in the Open Connection window and select Delete.

When a connection is opened, you will see three windows cascaded: Graph, Files, and Clients (see Figure 2-10). At the bottom of each window, the following information is displayed:

Total. Total current connections (Monitors and Players)/Total possible connections

Players. Total Players currently connected/Total Player connections allowable

Monitors. Total Monitors currently connected/Total Monitor connections allowable

Unknowns. The total number of unidentified clients currently negotiating a connection to the Server

Uptime. The total time that the Server has been running since last started, shown in days followed by hours:minutes:seconds

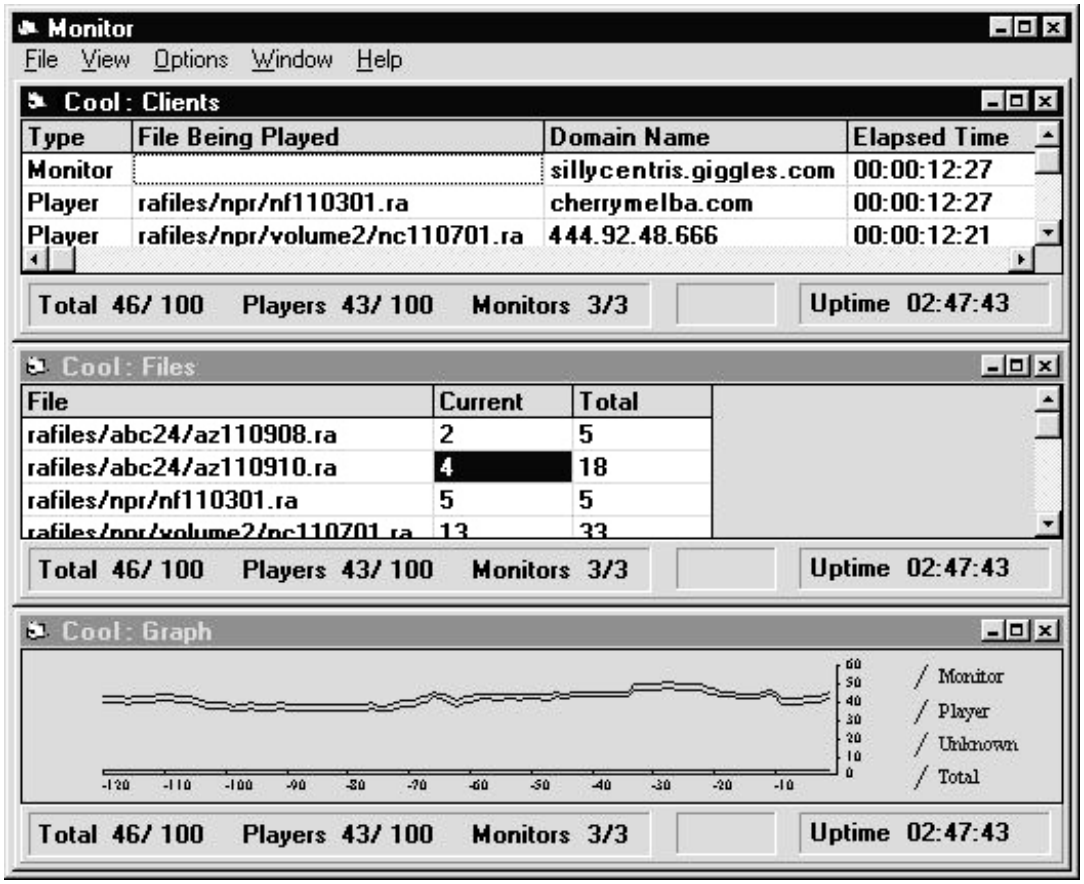

Figure 2-10. Monitor window.

If you would like all of the windows to be displayed in the Monitor, go to Window on the menu bar and select Tile Horizontal or Tile Vertical.

The Clients Window

The Clients window is the only place where you can find out the length of time that clients are connecting to files on your Server. The information is presented in a way that allows you to make an interpretation about the type of audience visiting your site. You can view the following information in the Clients window:

Type. The type of client connected, either Player or Monitor

File Being Played. Name of the file being played from your RealAudio Server

Domain Name. The name of the client computer

Elapsed Time. The length of time that the client has been connected to that file

The Clients window can be scrolled up or down to view all current connections to your Server. The window is continuously updated.

The Files Window

The Files window tells what files are being accessed as well as keeping a running tab of the number of times each file is being played. This will help you determine which files are most and least popular, which could help you decide what new files to add or remove to improve the popularity of your site. You can view the following information in the Files Window:

File. Name of the file currently being played

Current. Number of clients currently connected to that file

Total. Total number of connections made to this file since the Monitor was started

The Files window can be scrolled up or down to view all current connections to your Server. The window is continuously updated.

The Graph Window

The Graph window gives a graphical interpretation of selected connections made to your Server in the past two minutes. Variables and method of analysis are configurable parameters.

Configuring and Interpreting the Monitor Graph

For an up-to-the minute analysis of current connection data, shown in an easily recognized format, the Monitor has a Graph window. A quick glance at the graph can indicate whether or not your Server is presently making connections. If left open on the corner of your computer screen, you can monitor Server operation throughout the day.

The Graph shows the time in seconds along the X-axis, and the total possible number of connections along the Y-axis (see Figure 2-11). Lines on the graph represent connections to the RealAudio Server by Monitors and Players, Unknown (attempted connections that have not yet been resolved), and Total.

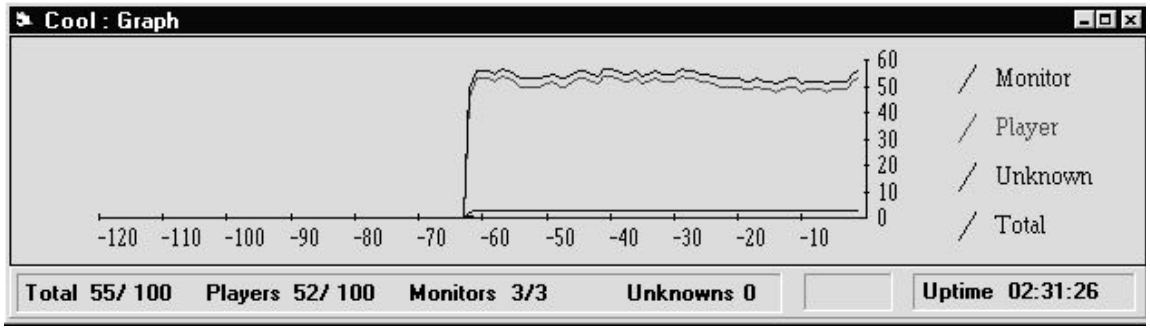

Figure 2-11. Graph window.

To configure the parameters of the graph, pull down Options on the menu bar, and select Graph. The following window will open.

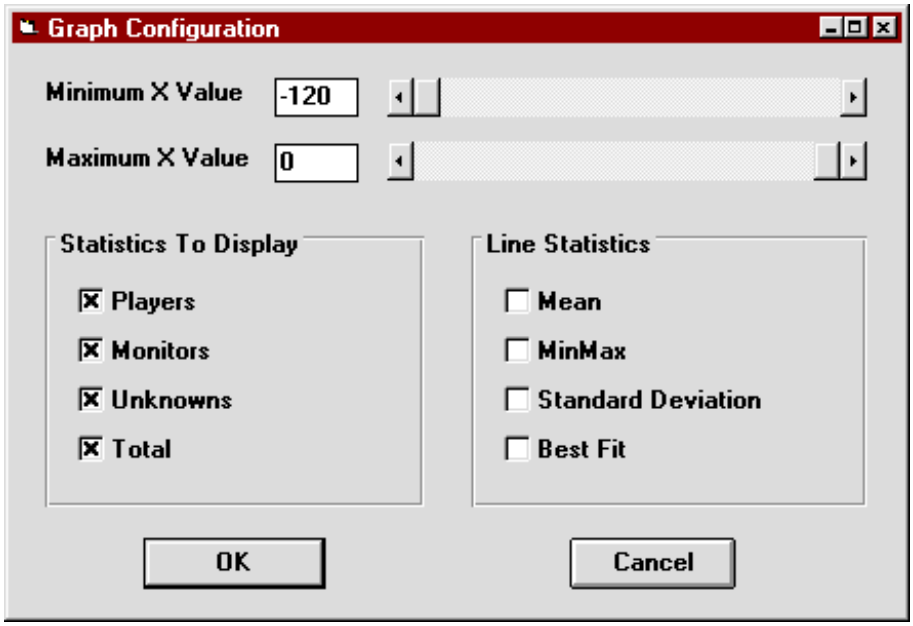

Figure 2-12. Graph Configuration window.

The Minimum X Value refers to the starting point in seconds that you want the graph to start from. The default is set to -120 (two minutes ago). The Maximum X Value is defaulted to zero. The maximum cannot be set lower than this value.

The Statistics To Display refers to the individual lines displayed on the graph. It is recommended that you only select Players if you plan to change the Line Statistics.

Line Statistics provides alternative statistical interpretations of connections to the Server. The graph line showing all connections will still be displayed on the Graph window, but there will also be lines displayed to indicate the position of the mean, minimum and maximum, standard deviation, or best fit, depending upon your selection. Following is a brief explanation of these forms of analyses.

Mean. The point that is central to the minimum and maximum value of X

MinMax. Two lines show the maximum and minimum X values

Standard Deviation. Deviations from the mean X value are squared, then their mean is calculated. The square root of this mean is the standard deviation of the graph

Best Fit. Indicates whether the average number of connections are increasing, decreasing, or remaining stable

When you have finished configuring the parameters of the graph, select OK to close the Graph Configuration window.

The RealAudio Command Line Monitor for UNIX

The RealAudio Command Line Monitor is used to continuously monitor connections made to your RealAudio Server. This information can then be used to monitor activity on the RealAudio Server on a regular basis. Information provided by the Monitor includes number and status of Player connections, Monitor connections, Unknown connections, which are connections that are currently being negotiated with the Server, and Total connections, which includes all of these.

The Monitor runs in two modes: interactive and non-interactive. When the Monitor is in the non-interactive mode, information is automatically appended to STDOUT every 5 minutes, unless that time span is modified by the -l command. The interactive mode is started with the -i command, which enables the monitor to print prompts and accept commands from the command line (command options are listed in Table 2-1).

The Monitor resides in the bin directory. The command line syntax used to enable the Monitor is:

```
monitor [-l<sec>] [-k] [-i] <host>[:port]
```

where `-l <sec>` is the interval in seconds between updates for the “o” command, `-k` is used to force the Monitor to perform reverse DNS lookups on connections before starting, `<host>` is the DNS hostname of the Server you wish to monitor, and `port` is the TCP port which the Server uses to accept clients. Commands `-l`, `-i`, and `-k` are the only options used when starting the Monitor.

The Monitor's default startup process does not include performing a reverse DNS lookup on the connection information provided by the Server. This is to speed up the startup phase, especially in those cases when summary statistics are needed (rather than detailed information). You can turn on reverse DNS lookup either with a command line option, such as the one described above, or using the "k" command , as described in Table 2-1.

Table 2-1. Command options used to control the function of the Command Line Monitor in the interactive mode after monitor has been started.

Command	Function
h/?	Prints a list of commands.
s	Prints a single line of summarized status information.
o	Prints # of players, monitors, unknowns, and total connections to STDOUT every five minutes, or the number of seconds specified by the "-l" option on the command line. This command must toggled to start and stop.
u	Continuous display. Updates whenever a client status changes.
l	Provides the current list of connected clients.
r	Forces the Server to reload configuration (Not implemented for version 1.0 Servers).
k	Begins collating hostname information for connected clients by doing reverse DNS lookups on the IP numbers provided by the server.
x	Exit the program.

Once it has been started, the monitor will prompt you for the Server's monitor password. Without the password you will be unable to connect to the Server. In the pre-beta version, the password is visible as you type it. In future versions, the password will be hidden and/or an option will be provided to give the password on the command line.

When the monitor password is validated, the Monitor initiates contact with the Server and begins to receive information from it on the current number of connections, uptime, and so on. The information will be displayed as follows:

```
<client>  <name>
```

where <client> would be the type of client connected, i.e., monitor or Player, and <name> is the domain name or IP address for that client. For example, a typical display might look like the following:

```
monitor 204.71.154.93

Player  204.71.153.24
```

When the u command is enabled, you will receive messages every time the connection status changes. In this case, the monitor will provide the following information:

```
<time> <event> <name> <filename>
```

where <time> would be the time the client connected, <event> would tell whether the client was able to connect or not, <name> is the domain name or IP address for that client, and <filename> is the name of the file being played. For example, a typical display might look like the following:

```
16:20:07  Disconnected  12.345.67  hello.ra
```

If you would prefer to received Monitor information in a report rather than in a display, use the -l command[8] to append information to a file. To do this, start the Monitor with the following command:

```
monitor -l<seconds> <hostname>[:port] > monitor.txt
```

where <seconds> is the number of seconds between reports, <hostname> is the host name where your report is located, and monitor.txt is the name of the report that the information will be appended to. An example display is as follows:

```
monitor -l300 Hal:6970 > monitor.txt
```

After using this command, you will be prompted for the password (the prompt is sent to STDERR), and then it will print data to the monitor.txt file every <seconds>. The data is in the same format as the data printed by the 'o' command. Use the password from the Server's password file. When this command is used, you will not see information displayed on the screen. As long as the monitor is running, information will continue to be added to the report.

[8] Where l is a lower case L.

Network Performance Issues

The Internet is not a perfect medium: there are a number of factors that can interfere with the quality of the audio being delivered to your users. Audio packets can be lost during delivery through the Internet if they hit slow routers, or if the network is especially busy. Recurrent problems may indicate that you need to modify your connection to your Internet service provider.

To monitor audio quality, you should occasionally use the RealAudio Player to make an Internet connection to the links on your Web page. Do not use the Open File option from the RealAudio Player if you wish to check the Internet connections, because that connection operates over the LAN. When the connection is made, open the Statistics window for the RealAudio Player to monitor the percentage of packet loss that is occurring. If the audio quality is poor, odds are that your users will be experiencing the same.

If you determine that there is a high packet loss level, your first step will be to consult your Internet provider. You may need a faster Internet connection, or there may be other problems with your Internet service.

Since RealAudio files use 10k baud/second while downloading, you should check the configuration file for the number of connections to ensure that your Internet connection can handle the peak throughput (see *Maximum Audio Connections*).

Chapter 3

Producing RealAudio Content

Now that your server has been installed and tested, you are ready to produce RealAudio files for your Web site. The Encoder compresses files in .au, .wav, and raw .pcm sample formats into the RealAudio format. The resultant RealAudio file can then be attached to World Wide Web pages where it is seen in a user-friendly graphical form.

You will need to record and pre-process audio clips with software designed for that purpose. Once recorded, audio files can be encoded into the RealAudio format (files shown with an .ra extension) using one of the Encoder products:

- **The RealAudio Encoder for Windows and Macintosh** is a user-friendly utility with a graphical interface available for Windows (in 16- and 32-bit versions) and for the Macintosh (either 68K or PowerPC).

- **The RealAudio Command Line Encoder** is intended for batch-mode applications and other applications where the Encoder will be placed in a script or batch file. Versions exist for all supported UNIX platforms, and for use in the Windows NT command window.

The command line Encoder appropriate for your server platform comes packaged with the server distribution. Encoder versions for Windows and Macintosh can be downloaded free of charge from our World Wide Web site.

Recording Audio Files

The RealAudio Encoder puts sound files through advanced compression while preparing them for use with the RealAudio Server, resulting in a loss of some sound information. To compensate for this, you must start with a quality recording: satellite signals, Digital Audio Tapes (DATs) or Compact Discs (CDs), for example, will result in much higher quality RealAudio files. You will have better

results if you use simpler audio signals rather than very complex signals such as background music playing simultaneously with voices.

Pre-processing the sound file before encoding also contributes to higher quality sound. For an in-depth explanation about pre-processing audio, see "Getting the Best Sound out of RealAudio" on the Progressive Networks Web site at:

```
http://www.realaudio.com/tech_notes/audiohints.html
```

Information on this page will be expanded as our research progresses.

There are a number of shareware software packages available for recording sound, such as Cooledit for Windows, available at

```
http://www.ep.se/cool/
```

or you can search the Yahoo directory at:

```
http://www.yahoo.com/Computers/Music/Software/
```

to find recording software for other platforms.

The audio file used for input to the RealAudio Encoder should use the full range of available amplitude, without exceeding the maximum input level. "Clipping" results if this level is exceeded, and it is heard as a pop or click in the resulting file. When encoded, a RealAudio file with clipping will have high-frequency background noise or static.

If the full amplitude range is not used, the RealAudio files will sound rough. To adjust for this, use the audio editor's "Increase Amplitude" or "Increase Volume" command to adjust the range before encoding the file. Some sound editors have a "Normalize" function that will maximize levels automatically.

Keep in mind that audio files take up a lot of disk space before they are encoded. You can use Table 3-1 to calculate how much space you will need for your recording. Once the files are encoded into the RealAudio format, they will use 60k/minute (3.6MB/hour) of disk space, a significant savings over other audio formats.

Before converting a sound file to the RealAudio format, the Encoder needs information about the sampling rate used to digitize the audio into a file. Since the file itself does not contain this information, it must be attached to the file via the file extension. You may need to rename the file, using the appropriate file extension, to help the Encoder to identify your file. You can refer to Table 3-1 for file extension information.

NOTE: PCM files are assumed to have the native byte order of the operating system on which the Encoder is running. This will normally be the case. The freely available UNIX tool `sox` is an excellent choice for the conversion of other audio files to one of the following audio formats.

Table 3-1. Audio Files Reference Table

File Type	Extension	Disk Space Required for each Minute of Audio Play Time
All Windows .WAV files	.WAV	662KB @11KHz 1.32MB @ 22KHz
Sun 8-kHz .AU files (u-law)	.AU	480kB
Sun 11-kHz .AU files (u-law)	.A11	660kB
Sun 22-kHz .AU files (u-law)	.A22	1.32MB
Sun 44-kHz .AU files (u-law)	.A44	2.64MB
PCM (raw 16-bit) 8-kHz data	.PCM	960kB
PCM (raw 16-bit) 11-kHz data	.P11	1.32MB
PCM (raw 16-bit) 22-kHz data	.P22	2.64MB
PCM (raw 16-bit) 44-kHz data	.P44	5.28MB

Many audio packages for Windows, such as the shareware program Cooledit, can be used to convert files from other formats not already supported by the Encoder.

Encoding RealAudio Files

The RealAudio Encoder allows you to encode files or live streams to RealAudio files or directly to the RealAudio Server for live broadcasts. The Encoder encodes files in real time. You can browse folders and select files for encoding, or drag and drop files directly onto the Encoder icon. The Encoder window displays information about the audio file's sampling rate and size

before and after compression. You can also enter author, title, and copyright information. This information will then appear in the RealAudio Player window when the user plays the file.

The RealAudio Encoder

To open the Encoder, double-click on encoder.exe. The Encoder will open and Process window 1 will be displayed (see Figure 3-1).

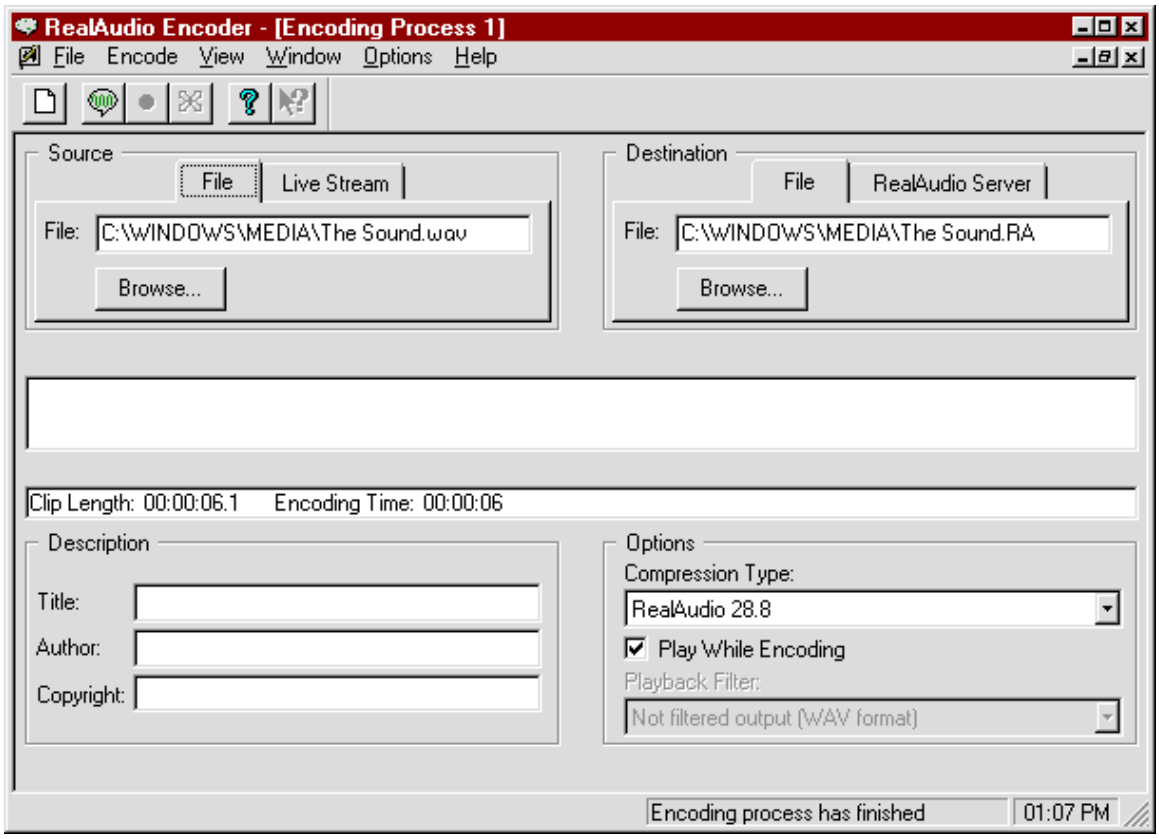

Figure 3-1. Encoder Window.

The Encoder Process Window

Each time you open a new file to encode, a new Process window will open in the Encoder. The left side of the Encoder Process window contains information about the source file you are encoding from, and the right side of the window is used to provide Destination information for the file once it has been encoded into the RealAudio format.

The Source and Destination boxes at the top of the Process window can be toggled to provide the following options, as shown in Figures 3-2 and 3-3.

Audio Source Encoded From

- **File.** A previously digitized audio file
- **Live Stream.** A live feed from an event or in a studio, or audio from a cd, tape, satellite feed or other source

Encoded File Delivered To

- **File.** A file that can be accessed from a Web page or through a LAN
- **RealAudio Server.** To be broadcast live over the Internet

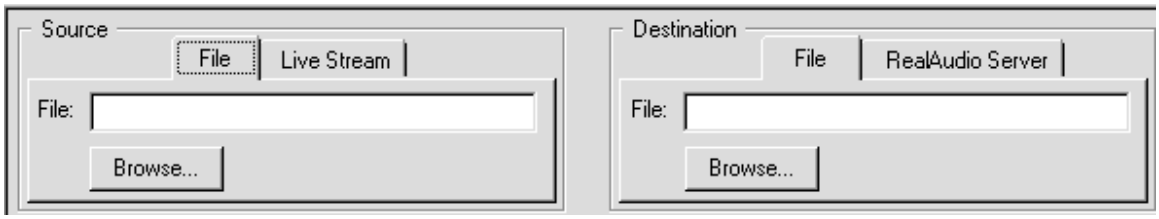

Figure 3-2. Source and Destination with File Option Selected.

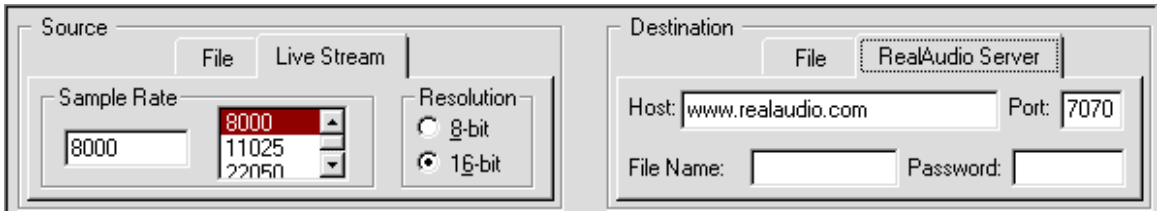

Figure 3-3. Source and Destination Boxes Displaying Setup for Delivering a Live Source to the Internet.

The central area of the Process window will show the progress of the encoding file. The left side shows the original wave form as the right side displays the compressed audio wave as it is being encoded.

If you want to deselect the option to view the audio file as a wave file, close all Process windows and pull down Options from the Encoder menu. Deselect "Show Audio Signal." Then use the File menu to select New. The central portion of the Encoder will now show encoding progress with a bar, and provide information about file length and encoding status in a status bar.

The lower left side of the Process window has a Description box for the audio file. You have the option of providing the title, author and copyright information about the audio file into the corresponding areas. This information will then be displayed in the RealAudio Player window when the user plays the file. For example, if you type in the following information into the Encoder window:

```
Title:      ABC News 3 PM 19 July 1995 Pacific Time
Author:     ABC News and Information Network
Copyright:  1995
```

The Player will display the information as shown in Figure 3-4, when playing the clip.

Figure 3-4. RealAudio file information displayed by RealAudio Player.

The lower right portion of the Process window provides Options for the encoded file. This is where you select the Compression Type needed for compressing your audio file. There are two options available: 14.4 and 28.8. The 14.4 compression yields a file that plays with AM quality, and which can be played over a 14.4 modem. When compressed to 28.8, the audio will sound like mono FM, but a 28.8 modem is needed to listen to the file. If you choose the 14.4 compression, you will need to ensure that you have 1.0 kB of disk

space available per second of audio. The 28.8 compression requires 1.6 kB of disk space per second of audio.

If you would like to listen to the audio file as it is being encoded, select this option in the Option box. If selected, it may slow down the encoding process.

When all relevant information has been entered, select Process. A window will appear that allows you to select a file name and directory for the new file. An option is also available for creating a new folder to store the file. Select Save. The file will now be encoded into the RealAudio format, signified by the .ra extension. You should leave the .ra extension to ensure file compatibility with other platforms.

When the Encoder finishes the encoding process, it places the compressed audio data in a RealAudio file with the same name as the raw audio file, but with the extension **.ra**. This file, when moved into the RealAudio Server directory tree, is ready for delivery to users of the RealAudio Player.

Drag and Drop Encoding

Audio files can also be encoded by clicking on the file name that is to be encoded, and dragging and dropping it onto the Encoder.exe file. The following window will than display so you can provide sample rate, format, and resolution information about the audio file.

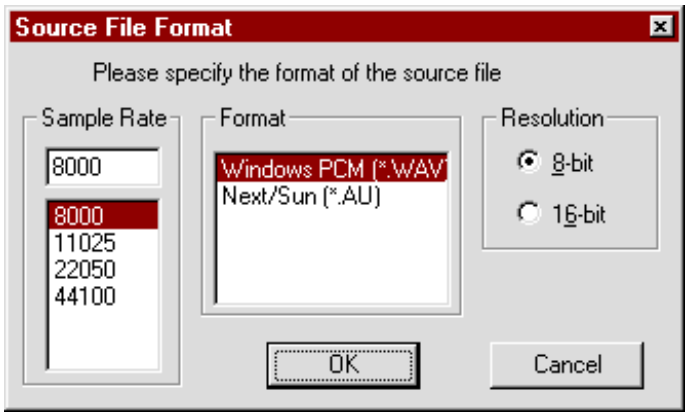

Figure 3-5. File Format Information Window.

Server Setup for Live Events

Live events can be sent over the Internet in real-time using the new RealAudio Live Encoder and the LTA Application included with the RealAudio Server. Events can then sent directly from the RealAudio Server to the Internet. To set up the RealAudio System for live events, the machine that has the RealAudio Encoder needs to be located where the sound is to be transmitted from, and the machine that holds the LTA needs to be located at the place where there is bandwidth available for transmission to the Internet, and there needs to be a network connection between these two machines.

When live events are going to be sent directly from the Encoder to the RealAudio Server for delivery over the Internet, they need to be processed through the Live Transfer Agent (LTA) before being sent to the RealAudio Server. The Live Transfer Agent must be located on the same machine as the RealAudio Server.

Live audio will be fed into the Encoder's computer through a line that runs from a microphone to the computer's incoming line (see Figure 3-6). The audio will then be encoded into the .ra format by the RealAudio Encoder through the computer's sound card. As soon as the audio is encoded, it is sent directly to the Server computer, where it is processed by the LTA and delivered to the RealAudio Server. The Server sends the .ra packets to users who are listening to the live event through a link on a Web page.

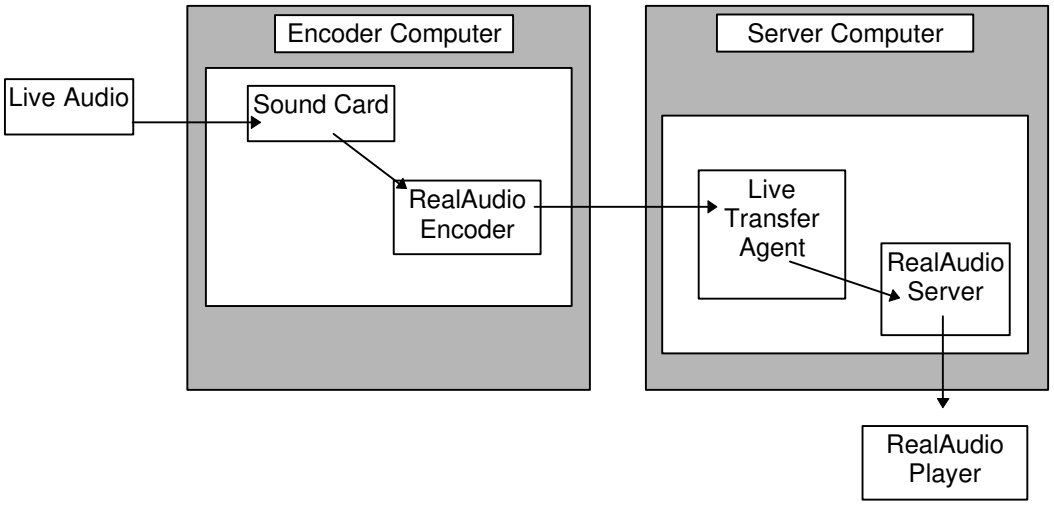

Figure 3-6. Data Flow for Live Events.

To start the LTA, use a command line that begins with LTA followed by the path to the directory where the files should be stored, the port number from which the LTA will receive data from the Encoder, and a password that can be used by the Encoder to access the LTA. The password protects the live event from being accessed by outsiders during broadcasting. The LTA command line will look like the following:

```
lta -b <path/to/rafiles/filename.ra> -p <port#> -w
<password>
```

where `<path/to/rafiles/live.ra>` is the path to the directory and name of file where the LTA will place the encoded files received from the Encoder, `<port#>` is the port on which files are received from the Encoder, and `<password>` is the password shared by the LTA and Encoder. If the `-p` command is left out of the command line, default port 7069 will be used. For commands options available for the LTA command line, use the following command:

```
lta -v
```

to view options.

Once the LTA is started, the RealAudio Encoder can be opened and set up to start the encoding process. The encoding process occurs in real time. As soon as audio is fed into the Encoder, it is encoded and sent to the Server computer. The computer that holds the Encoder must have a TCP/IP connection to the Server computer.

On the Encoder window, select Live Stream for the audio Source, and RealAudio Server for the file Destination (see Figure 3-7).

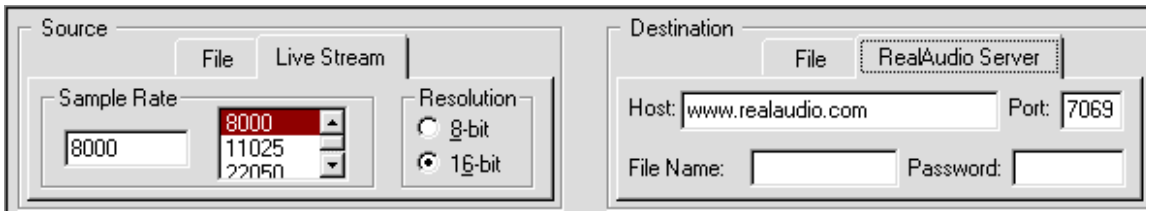

Figure 3-7. Source and Destination Boxes Displaying Setup for Delivering a Live Event.

For the Live Stream Source, you will need to choose a sample rate and resolution for encoding the file. Live broadcasts must be encoded in real time so that audio packets can be sent to the Server at the same rate they are being received by the Encoder. Since higher sampling rates require a more powerful processor, you must choose a sampling rate your Encoding computer can maintain comfortably at real time without falling behind. For faster computers, you may be able to use sampling rates higher than 8 KHz, but you should test the Encoder, LTA, and Server combination on your hardware before raising the sampling rate from its default.

If you would like to have a description of the live event to be displayed by the RealAudio Players that connect to it on the Web site, then you will need to fill in the Description box at the bottom of the encoding window. The description options include Title, Author, and Copyright.

The Destination box of the Encoder must contain the same information that you used when starting the LTA. The Host is the name of the computer where the Server resides. The file name will be used to access the live event from RealAudio Players. It will also be a normal RealAudio file once the line event finishes. Port is the port number that the Encoder will use to send the encode .ra data. Password must be the same password used to start the LTA. If the

information in this box does not correspond with information in the LTA command line, then the encoded information will not be received by the LTA.

Options for the encoded file are found at the bottom of the Encoder. You must choose the Compression Type that is needed for the live event. The 14.4 compression will allow people with 14.4 k baud modems to listen to the event, and the 28.8 compression limits the audience to those who have 28.8 modems. However, while the 14.4 compression delivers audio at AM quality, the 28.8 compression sounds like mono FM sound. If you decide to use the 28.8 compression, put this information on the Web page somewhere so users know what to expect. You will need 1.0 kB of disk space per second of audio play when encoding using 14.4, and 1.8 kB per second of audio play when encoding using 28.8.

Now that the LTA and Encoder have been set up to your satisfaction, the line from the live audio feed must be plugged into the back of the Encoder's computer where it says "Line In." When it is time to start the live broadcast, pull down Encode from the menu at the top of the Encoder and select Start Encoding.

At the end of the live broadcast, go to Encode on the Encoder menu and select Stop Encoding. When the LTA stops receiving data, it sends header data to the audio file. If you would like to save the file for your archives, rename the generated RealAudio file and move it to the directory you wish to store it in. Each time that you start the LTA, if you use the same file name, then that file will be written over, so you must be sure that you have saved the last live event before using the file name again.

It is recommended that you use a generic name for recurring live events. This way, you can reuse the .ram file, and save a lot of time. For example, if you broadcast news at 6:00 every night, you could have the LTA write to a file named `6pmnews.ra`. This way you could reference `6pmnews.ra` in your .ram file, and your Web page could always reference the same .ram file. A generic link could be placed on your Web page such as `Live Daily News at 6 p.m.` After you broadcast the news, save the file to an archive such as `081195.ra`.

Creating RealAudio Links in Web Pages

If you have created HTML documents in the past, you know that links to other Web pages are shown in the HTML document as the URL address of the document you wish to access. Since RealAudio files are resident to the RealAudio Server and can only be retrieved by the RealAudio Player, a few extra steps must be taken to complete the network path that links to the audio file. It may be helpful if you imagine the Web page as a sheet of paper with directions to someone's house written on it. For most Web documents, you would follow the directions and arrive at the house you are looking for. For RealAudio files, the Web page is like a sheet of paper that gives you directions to a house, and once you arrive at the house, there is another piece of paper attached to the door with a set of directions to another house, which is your actual destination. The first sheet of paper represents a *metafile,* represented by a **.ram** extension, and the sheet of paper on the door represents the RealAudio file, represented by an .ra extension. Instead of pointing to the audio file, your HTML document will point to this metafile. Unlike the usual HTML link, the metafile does not display information through the browser, but rather, it provides the audio file's location on the RealAudio Server to the RealAudio Player. The Player uses this information to locate the file on the RealAudio Server. Remember that RealAudio files cannot be referenced directly by the Web page because this will cause them to be downloaded **in their entirety** before playback. In order for the audio files to be played in real time, they must be played through a RealAudio Player, and served by a RealAudio Server.

Metafiles are text files, with the extension .ram, which contain lines of the form:

```
pnm://hostname/path
```

For example:

```
pnm://www.realaudio.com/hello1.ra
```

might be the contents of the metafile:

```
hello1.ram
```

To insert a reference to this .ram file in your HTML, simply reference the metafile within a hyperlink, for example:

```
<A HREF="http://www.realaudio.com/hello1.ram">Hello!</A>
```

and then make sure your World Wide Web server is properly configured to understand that the extension .ram refers to the MIME type **x-pn-realaudio**

(detailed instructions for a variety of Web server software are available in the section *Configuring Web Servers for Use with RealAudio*).

You can create a metafile that contains several URLs on separate lines (with no blank lines); the Player will play those documents in sequence.

In addition, a beginning point in time other than the start of the document may be specified by appending the time to the URL, for example:

```
pnm://www.realaudio.com/hello1.ra$0:30
```

This URL specifies the same audio document as before, but beginning from the 30-second mark. The dollar sign signifies that the remainder of the URL specifies a position in time. Tenths of seconds, seconds, minutes, hours, and days may be specified (tenths of seconds are separated from seconds by a decimal point; the other values are always separated by colons). The standard form is:

```
$dd:hh:mm:ss.ss
```

The time will be interpreted from right to left, so it is not necessary to put a zero into every blank field, unless you are missing an increment between two other increments. For example, if you wished to show hours and seconds, but not minutes, you would need to put a zero into the minutes space so the time is interpreted correctly.

Appendix A

Server Configuration Table

Server Configuration Quick Reference	
For all Systems:	
PnaPort	<portNumber> (default 7070)
AudioConnections	<MaxAudioConnections>
Timeout	<Seconds> (default 300 seconds)
MonitorConnections	<MaximumMonitorConnections>
MonitorPassword	<passwordOfYourChoice>
BasePath	<basepath>
LogPath	<logpath>
ErrorLogPath	<errorpath>
For UNIX only:	
User	<UserName>
Group	<GroupName>
PidPath	<pid file>

Appendix B

RealAudio Server Log Formats

RealAudio Server Log

The RealAudio Server Log uses the common log file format used by most Web servers to record transactions by clients using the RealAudio Server. Each transaction is recorded on one line in fields and is delimited by white space. To view the Server log, open the file specified by the name used in your LogFilePath using Notepad, Microsoft Word or some other text editor.

Since new information is appended to the log each time a new connection is completed or attempted, it is possible that the log will grow quickly. When the log becomes too lengthy, you can delete it and a new log will be generated the next time that a connection is made to the RealAudio Server.

The purpose of the Server log is to help you monitor and manage your RealAudio Server. You can view how many clients have connected to your server, the name of the host machines, the clips they listened to, the times of day they connected, and errors that were generated by the RealAudio Server. This information can give you an idea of who your audience is and what clips are popular. By monitoring the log for errors, you can troubleshoot and correct possible problems on your site.

An example of a log entry might be as follows:

```
hamming.prognet.com - - [21/Jun/1995:13:44:32 -0800]
\"GET /html/pnaudio/gore_sta.ra PNA/4" 200 0 \
[PNPLAYER 101 ALPHA] [STAT1:50 3 2 0 0]
```

The following information is represented in each field.

1. Client IP Address or Hostname, e.g.:

```
hamming.prognet.com
```

2. Time Information. This records the time that the client made access. The format used is as follows:

   ```
   [day/mon/year:hh:mm:ss TZ (vs GMT)]
   ```

   For example:

   ```
   [21/Feb/1995:13:44:32 -0800]
   ```

3. Document requested by client. Information will appear in the following format:

   GET <*filename*>

   For example:

   ```
   GET /html/pnaudio/gore_sta.ra
   ```

4. Protocol version used by the client to obtain information from the Server and an identifier for the client's protocol. The first part should read "PNA" to reflect the RealAudio Server protocol. The protocol information will appear as follows:

   PNA/<X>

   where <X> is the protocol number (currently 4 or 5).

5. Return code (using HTTP standard error codes). By convention, World Wide Web servers use return code 200 to indicate that document transfer occurred with no errors or problems. The RealAudio Server follows this format. Currently, all entries in the access log should indicate a return code of 200.

6. Number of bytes transferred during playback. This field will often be lower than the total size of the RealAudio file, indicating partial playback of the file. If, however, this field is consistently low for some or all audio files, this may indicate that RealAudio Players are able to connect to your server, but are unable to play files. You may need to check your system error logs in such a situation for messages relating to network system errors.

7. Client Player id string. This field is not part of the standard format. The id string is text sent by the client that describes the version and type of RealAudio Player being used to access audio files.

   For example:

   ```
   [PNPLAYER 101 ALPHA]
   ```

8. Connection Statistics. When a Player completes playing a clip it can provide connection information to the Server. This information can be valuable for diagnostic purposes, especially if your clients are reporting difficulties with playback and you suspect network access problems. Client statistics are reported in the following format:

```
[STAT1:50   3   2   0   0]
```

The fields contain the following information:

Keyword. At this time the keyword is always STAT1, but additional keywords may be used in the future.

Total packets. This number indicates the total number of packets received by the client.

Out-of-order packets. This does not necessarily degrade the quality of the audio. The packets are reordered as they are being played by the client.

Missing packets. This is the most common problem reported on the PN Server Log. If the percentage of missing packets is low, then it will not have a serious affect on quality, but if it is high, then the audio will be seriously degraded. See *Network Performance Issues* in Chapter 2 for more information.

Early packets. If the client receives packets too early, then older packets will be discarded. This problem is very rare, and it may indicate that the client's machine is running too slow, or has a bad Internet connection. However, if this problem shows up very often, you may need to investigate further.

Late packets. If the client receives packets too late, the Player will have already passed that portion of the audio. This is also a very rare occurrence, and if it happens often, your Internet connection may not be fast enough.

The PN Error Log

The PN Error Log records errors made by the Server. The following errors are sent to this log:

Out of Memory

The "Out of Memory" error message is given if the Server is unable to dynamically allocate enough memory to create a new connection or manage existing connections. If you receive an **Out of Memory** message, you may require

additional memory or you may need to swap space for your server machine to use for dynamic memory allocation.

Document not Found

This error message indicates that the user tried to access a document and the document could not be found. It may be that the user tried to use the wrong URL and the Server kicked the request back. However, if you see this more than once for the same documents, you should check your metafile to ensure that the path pointing to the document is accurate.

SIGPIPE Signal Received (UNIX systems only)

The SIGPIPE signal is sent to the Server by the operating system when the client abruptly cuts the connection. No action is required for this error, it is simply an informational message

Exiting on Kill Signal (UNIX systems only)

This message is sent to the error logs when the Server is stopped by the system administrator using the `kill` command sequence outlined in chapter 2. No action is required since this message simply records the time at which the Server was stopped.

Accept Failed

If a new client tries to connect to the Server and is rejected, then this error will show up in the log. The UNIX implementation of TCP/IP has a small pending connection queue which can easily be filled at peak usage periods. This error will often show up both in the RealAudio Server error log and in your World Wide Web server logs, indicating that more truly simultaneous requests for documents occurred than the operating system would allow. If this error occurs frequently, you may need to contact your service representative at Progressive Networks to discuss potential solutions. For more information about the conditions under which this error occurs, consult a standard reference on the UNIX implementation of TCP/IP (see bibliography for suggested references).

Unable to bind listener socket to port

When starting the RealAudio server, the software attempts to bind itself to the port listed in the configuration file (or to TCP port 7070 if none is listed in the configuration file). The Server uses this port to listen for incoming connection requests. The Server will be unable to bind to this port in several circumstances. First, another copy of the RealAudio server may already be listening to that port. You can check for this condition using the `ps` command and looking in the process list for other copies of the **pnserver** application. Second, if you have specified that the Server listen on a TCP port numbered less than 1024, you will have to start the

Server as super-user, since only the super-user can bind to “privileged ports” below 1024. (UNIX system only.)

Appendix C

Firewalls

Use of the RealAudio Server or Player from behind a security firewall is a difficult issue requiring careful consideration of the risks and benefits. If possible, the safest way to use the RealAudio Server is from a dedicated host or hosts located outside your protected network.

If, however, your server is behind a firewall and you wish to permit outside hosts to contact your server, and if your firewall is of the packet filtering variety, you will need to permit incoming connections on TCP port 7070. You will also need to permit outgoing UDP packets on all ports between 6970 and 7170. These requirements are similar to those for an ftp server.

If your firewall is not a simple packet filter and requires the use of application-level gateways or "proxy" servers, we are working with firewall vendors to incorporate support for RealAudio into their products. Contact Progressive Networks for a list of firewall programs currently supported.

For more information on network firewalls and their configuration, the following sources are available on the Internet:

Firewalls mailing list archives	ftp.greatcircle.com	directory: /pub/firewalls
Internet firewall toolkit	ftp.tis.com	directory: /pub/firewalls
Papers and documentation	ftp.coast.purdue.edu	
Cisco router configuration	ftp.cisco.com	directory: /pub/acl-examples.tar.Z

Appendix D

Bibliography

To read more about:

Transmission Control Protocol

TCP/IP Illustrated, Volume 1, The Protocols, by W. Richard Stevens.

TCP/IP Illustrated, Volume 2, The Implementation by Gary R. Wright and W. Richard Stevens.

Firewalls

Firewalls and Internet Security: Repelling the Wily Hacker, by William R. Chesnick and Steven M. Bellovin, 1994, Addison-Wesley.

Internet Firewalls and Network Security, by Karanjit Siyan and Chris Hare, 1995, New Riders Publishing.

Appendix E

RealAudio Server Setup Checklist

To ensure complete installation of the RealAudio Server, use the following checklist.

√	Action Needed:
	Configure the RealAudio Server using the RA Server Setup Application.
	Install the RealAudio Encoder and use it to encode audio files into the RealAudio format (with an .ra extension).
	Save RealAudio files to a directory below the RealAudio Server directory.
	Create metafiles (with a .ram extension).
	Write links to metafiles in the Web page (HTML document).
	Configure the Web Server to recognize RealAudio MIME types.
	Start the RealAudio Server.
	Use the RealAudio Player to test your site.

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