Sun™ MediaCenter™ One Software Guide

Solaris 2.6

Includes Sun MediaCenter One (Server) and Java™ Client Software

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Preface

Sun MediaCenter One Software Guide tells you how to use two pieces of an end-to-end video “solution”:

- Sun™ MediaCenter™ One

  Software that enables your Sun machine to act as a video server.

- Sun MediaCenter Java™ Client for Sun

  Software that enables you to decode and display video received from a Sun MediaCenter server on a Sun workstation.

This guide presumes that you are familiar with entering commands in a UNIX® shell and with the use of a web browser. You need not have any knowledge of digital video.

Using UNIX Commands

This document may not contain information on basic UNIX commands and procedures such as shutting down the system, booting the system, and configuring devices.

See one or more of the following for this information:

- *Solaris 2.x Handbook for SMCC Peripherals*
- AnswerBook™ online documentation for the Solaris™ 2.x software environment
- Other software documentation that you received with your system

Typographic Conventions

TABLE P-1 Typographic Conventions

Typeface or Symbol	Meaning	Examples
`AaBbCc123`	The names of commands, files, and directories; on-screen computer output.	Edit your `.login` file. Use `ls -a` to list all files. `% You have mail`.
`AaBbCc123`	What you type, when contrasted with on-screen computer output.	`% su` `Password:`
AaBbCc123	Book titles, new words or terms, words to be emphasized. Command-line variable; replace with a real name or value.	Read Chapter 6 in the *User's Guide*. These are called *class* options. You *must* be `root` to do this. To delete a file, type `rm` *filename*.

Shell Prompts

TABLE P-2 Shell Prompts

Shell	Prompt
C shell	*machine_name*%
C shell superuser	*machine_name*#
Bourne shell and Korn shell	$
Bourne shell and Korn shell superuser	#

Related Documentation

TABLE P-3 Related Documentation

Application	Title	Part Number
Installation	*Sun MediaCenter Server Installation and Service Manual*	805-0488-10
Software / Content Loading	*Sun MediaCenter Server Administrator's Guide*	805-0374-10
Programmatic Interfaces	*Sun MediaCenter Server Programmer's Guide*	805-0376-10

Ordering Sun Documents

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TABLE P-4 SunExpress Contact Information

Country	Telephone	Fax
Belgium	02-720-09-09	02-725-88-50
Canada	1-800-873-7869	1-800-944-0661
France	0800-90-61-57	0800-90-61-58
Germany	01-30-81-61-91	01-30-81-61-92
Holland	06-022-34-45	06-022-34-46
Japan	0120-33-9096	0120-33-9097
Luxembourg	32-2-720-09-09	32-2-725-88-50
Sweden	020-79-57-26	020-79-57-27
Switzerland	0800-55-19-26	0800-55-19-27
United Kingdom	0800-89-88-88	0800-89-88-87
United States	1-800-873-7869	1-800-944-0661
World Wide Web: `http://www.sun.com/sunexpress/`		

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CHAPTER 1

Sun MediaCenter One Software

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This chapter describes the Sun MediaCenter One software. This version of the Sun MediaCenter server software is restricted to a single output stream.

1.1 Introduction

Sun MediaCenter One software enables any Sun workstation or server to stream video from its local filesystem, which is usually the UNIX File System (UFS) or Network File System (NFS). The software provides the same Application Programmer's Interfaces (APIs) for content loading, browsing, and playback as the Sun MediaCenter "Classic" product, so that you can use applications written for the Sun MediaCenter Classic server with the Sun MediaCenter One version without any modification.

The Sun MediaCenter One product is shipped in the form of Solaris™ packages for software and man pages (installation is described in the manual *Vendor Value-Added Software*). These packages include three pieces of content:

- "SMCnews_0.15Mbs"
- "SMCnews_0.46Mbs"
- "SMCnews_1.24Mbs"

Each piece of content has about a one-minute, twenty-second play time. The encoding rate for each title is embedded in its name. For example, "SMCnews_1.24Mbs" is encoded at a bit rate of 1.24 Mbps. The encoding rate indicates the amount of network bandwidth the playing of a title consumes.

Sun MediaCenter One software is shipped in conjunction with the Sun MediaCenter Java Client for Sun Workstations, shipped in the Solaris package `SUNWsmcjc` and described in Chapter 2.

1.2 Sun MediaCenter Software Comparison

Sun MediaCenter One software is a pared-down version of the Sun MediaCenter Classic software that is factory installed on Sun MediaCenter servers. The following is a comparison of Sun MediaCenter Classic and Sun MediaCenter One features.

TABLE 1-1 Comparison of Classic and One Features

Feature	SMC Classic	SMC One
Media File System (instead of UFS)	Yes	No
Customized network interface drivers	Yes	No
Guaranteed output throughput	Yes	No
Video bit pump	Yes	Yes
Media Stream Manager that provides a programmatic interface to the Media File System and bit pump	Yes	Yes
Media Stream Manager Client API that presents a VCR-like interface to the video server functions	Yes	Yes

TABLE 1-1 Comparison of Classic and One Features *(Continued)*

Feature	SMC Classic	SMC One
Content Manager that handles the movement of MPEG titles to and from the video server	Yes	Yes
Content Manager Client API that gives a programmer easy access to content loading and copying functions	Yes	Yes
Set of utilities for loading content and monitoring the server	Yes	Yes

The Media File System and the network interface drivers, not present in the Sun MediaCenter One software, are critical for the Sun MediaCenter Classic server, to support the guaranteed throughput required for the delivery of dozens of streams. For the delivery of one or a few streams—the capacity of Sun MediaCenter One software—the video bit pump is the key element.

Where the Sun MediaCenter Classic software is tightly coupled with a specific set of hardware components—disks, network interfaces, CPU, and memory—the Sun MediaCenter One software can run on any moderately powerful SPARC™ machine that has sufficient network bandwidth to support 1.5 Mbps between the server and a client.

The current release of Sun MediaCenter One software is based on the Sun MediaCenter Classic software release 2.0.1.

1.3 Hardware / Software Requirements

Sun MediaCenter One software runs on Solaris 2.5.1 and Solaris 2.6. As far as hardware, testing has confirmed that it can run on a typical desktop machine, for example, a SPARCstation™ 10 with 64 MB of RAM.

As important as CPU and memory is a relatively clear network path between the server and its clients. If the server is close to its maximum for video output (about 4 Mbps of output bandwidth) and is delivering video over a shared Ethernet, through a router or two, clients might receive choppy video and audio. A better solution is to connect the server to switched Ethernet and that there be zero or one router between the server and its clients.

Note – The Sun MediaCenter One software is limited to a single stream. Current clients support only MPEG-1. As a result of these two factors, the machine running the Sun MediaCenter One software will not be called upon to deliver more than about 1.5 Mbps (a typical encoding rate for MPEG-1 streams) of output. At this output, available network bandwidth remains as a consideration, but a less significant one than for the "unshackled" Sun MediaCenter One software.

No specification of hardware requirements for a video server would be complete without a discussion of disk space. MPEG files use lots of it. The three 80-second clips shipped with the server software consume over 18 MB of disk space. Figure on 10.7 MB of disk space for each minute of an MPEG-1 title encoded at 1.5 Mbps.

You should know that you cannot compress MPEG files. MPEG-format files (content) are already compressed, so you cannot use `compress` or `zip` to compress them further.

1.4 Installation

You install the Sun MediaCenter One software using the `pkgadd` program. The installation procedure is described in the manual *Vendor Value-Added Software*, which accompanies the Solaris 2.6 Supplements CD.

Sun MediaCenter One installation installs device drivers that use the kernel's DDI/DKI interfaces, as do any Solaris unbundled device drivers. See the discussion of device drivers, below. During installation, you have the option of installing the Sun MediaCenter FTP daemon. The advantages of using this daemon are described in a following subsection.

Upon completion of the `pkgadd` installation procedure, your machine is a fully-capable video server. This means that clients, such as our SPARC and PC Java clients, can request and display videos from your machine.

1.4.1 Sun MediaCenter One Device Drivers

The device drivers added by the `pkgadd` of the Sun MediaCenter One software are:

- `vvod`

  The scheduler that schedules disk reads for streaming video.

- `pump`

  The bit pump that schedules the transmission of the video data.

- `le_pump`

  The driver that forwards all data from the pump to the `le` network driver.

- `hme_pump`

  The driver that forwards all data from the pump to the `hme` network driver.

1.4.2 Sun MediaCenter FTP Daemon

When you install Sun MediaCenter One software, the `pkgadd` script gives you the option of replacing the standard `/etc/inet/inetd.conf` (saving the original) with a file of the same name with the following difference: instead of invoking the standard FTP daemon, `/usr/sbin/in.ftpd`, the new file invokes `/opt/SUNWsms/bin/smc.ftpd`.

With the Sun MediaCenter FTP daemon, you retain all of the features and functions of the standard FTP daemon, with the addition that you can use `ftp` to load video content onto your machine. “Loading content” is different from simply copying MPEG files onto your machine. In loading content, you copy the files *and* perform housekeeping tasks that enable you to play the video from the server.

Use of `ftp`, in conjunction with the Sun MediaCenter FTP daemon, is the most convenient way to load content onto a Sun MediaCenter server. If you do not use `ftp`, you must use `smc_tar`, which imposes requirements for content preparation that `ftp` does not.

1.5 Playing Videos

You have installed Sun MediaCenter One software and rebooted and now you want to play videos. How do you do it? You now face an elemental truth about video servers: Without clients, they are useless.

From a video consumer’s point of view, a video server is a passive entity. Clients make requests and video servers deliver (or not). Though the Sun MediaCenter software has utilities that allow you to initiate stream delivery from the server itself, in general, the initiation of stream delivery occurs in response to remote client requests.

Install the `SUNWsmcjc` package on a Sun machine running Solaris 2.5 or later. The Java client enables you to point your Java-capable web browser at a Sun MediaCenter server and play video from it. Installation of the Java client is described in the manual *Vendor Value-Added Software*. Chapter 2 describes the use of the Java client.

You can install the Java client software on the machine running Sun MediaCenter One software and play video to yourself (so to speak). More useful though, and closer to the server software's intended purpose, is to play to a remote client over a network.

1.6 Content Requirements

As much as you might enjoy the snippets of MPEG content we provide, you might, at some point, want to see something different. To do so, you will have to obtain some content.

While the Sun MediaCenter server (both One and Classic) support MPEG-1 and MPEG-2 streams, as of the date of this publication, our clients support only MPEG-1.

One would hope that you could play any MPEG-1-conformant bit stream. It turns out, however, that encoders can vary quite a bit and still, apparently, be within the MPEG-1 spec. Our clients play streams from a variety of vendors without a hiccup. Other streams play poorly or not at all.

There is a pre-screening test that you can make of a stream, using the `mpegcheck` utility that is shipped with the Sun MediaCenter One software. Assume you have downloaded an MPEG-1 file `weather.mpg` from a local university site.

Run:

```
% /opt/SUNWsms/msm/bin/mpegcheck weather.mpg
```

If `mpegcheck` returns with something like the following output, you probably (but not necessarily) have a playable stream. The ultimate test is the playing of the stream a Sun MediaCenter-compatible client.

```
MPEG1 system stream
Mux rate = 1411.200 Kbps
Computed optimum bit rate = 1411.200 Kbps
Jitter @ 1411.200 Kbps = 0.01 msec late, 0.00 msec early
Drift @ 1411.200 Kbps = 0 ppm
Play time @ 1411.200 Kbps = 10.2 sec
```

In the `mpegcheck` output above, note the "Computed optimum bit rate". Use this value, converted to bits per second, when you load a stream. In the example above, the encoding bit rate is 1,411,200 bits per second.

The copying of an MPEG-1 file to a local filesystem is not sufficient to make a title available to the Sun MediaCenter software. You must use `ftp` to load content.

There is a wealth of MPEG clips on the web. You can use the site listed below as a starting point, or use the string “mpeg-1 movies” (or something similar) as input to your favorite search engine.

```
http://www.mpeg.org/~tristan/MPEG/bitstreams.html
```

The preceding URL is up-to-date as of the date of this publication. It is, of course, subject to change.

1.7 Loading Content

You load content onto the Sun MediaCenter server with `ftp`, using `ftp`’s `put` command. Suppose you have downloaded the clip `weather.mpg` from a web site, have it on a local filesystem, and have run `mpegcheck` on it, with good results. You’re now ready to enter the following commands:

```
% cd <directory where weather.mpg is stored>
% ftp smc_server
Connected to smc_server.
220 smc_server FTP server (UNIX(r) System V Release 4.0) ready.
Name (smc_server:your login): your login or CR
331 Password required for your login.
Password: enter password
230 User your login logged in.
ftp> bin                    This step is critical!
200 Type set to I.
ftp> put weather.mpg smc:title=weather,type=data,rate=1411200,format=MPEG1SYS
200 PORT command successful.
150 Binary data connection for weather (129.144.90.32,33771).
226 Transfer complete.
local: weather.mpg remote:
smc:title=weather,type=data,rate=1411200,format=MPEG1SYS
1806340 bytes sent in 0.41 seconds (4.3e+03 Kbytes/s)
ftp> quit
221 Goodbye. Thanks for using the SunMediaCenter.
```

You must perform the `ftp` loading even if the MPEG file is stored locally. In other words, you might have to `ftp` to yourself.

You want to check on the availability of your new title, so you enter:

```
% /opt/SUNWsms/bin/smc_ls
Title                Usage    NPT       Format   Available Speeds
SMCnews_0.15Mbs       FREE     00:01:21  MPEG1SYS 1000,
SMCnews_0.46Mbs       FREE     00:01:20  MPEG1SYS 1000,
SMCnews_1.24Mbs       FREE     00:01:20  MPEG1SYS 1000,
weather               FREE     00:00:10  MPEG1SYS 1000,
```

At this point, you can use our Java client to play the `weather` clip.

To delete a clip, use the Sun MediaCenter software's `smc_rm` rather than the Solaris `rm` command. See the Sun MediaCenter customer documentation, available on the Sun web site (see URL below), or the product man pages for instructions on the use of the product's utilities.

A word on the Sun MediaCenter FTP daemon: On a Sun MediaCenter server, `ftp` works as it normally does, unless the daemon sees the `smc:` keyword. With that keyword, the daemon realizes that it's dealing with video content and uses the facilities of the Content Manager to perform the specified `ftp` command. See "Sun MediaCenter FTP Daemon" on page 1-5 for further discussion.

For Sun MediaCenter documentation and sample MPEG-1 content, see:

```
http://www.sun.com/products-n-solutions/hw/servers/smc_external.html
```

1.8 Administering and Monitoring the Server

The Sun MediaCenter customer documentation describes a set of utilities that enable you to monitor activity on the server. For example, the client admin tool, available in the Java client software, is extremely useful. You can even do video multicasts with this tool.

A video server MIB is part of the Sun MediaCenter software; this MIB enables you to use Solstice Domain Manager or another SNMP-conformant tool to monitor your Sun MediaCenter server.

1.9 Stream Capacity

The Sun MediaCenter One software is constrained to deliver a single stream. Without that constraint, the software supports a maximum output bandwidth in the range from 100 Kbps to 4 Mbps, depending on UFS disk bandwidth or NFS bandwidth. Network congestion between server and client is an additional factor in the video quality at the client end.

CHAPTER 2

Sun MediaCenter Java Client for Sun Workstations

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This chapter describes the Sun MediaCenter Java client software for Sun workstations. It describes the Java applet that you can use to display video content from a Sun MediaCenter server in a Java-capable web browser or in standalone mode.

2.1 Overview

The Sun MediaCenter Java client allows you to use a Java applet to display video content from a Sun MediaCenter server in a web browser window on a client system. The Java applet, named SunMediaCenterPlayer, is an applet that uses Java class libraries to implement a simple video player on the client system. FIGURE 2-1 shows the transfer of video data from a Sun MediaCenter server to the video player applet in a client's browser.

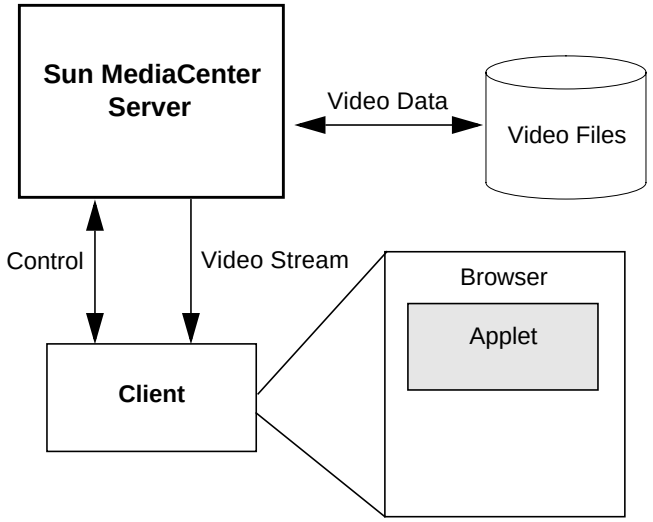

FIGURE 2-1 Display of Video Data from Sun MediaCenter Server to Browser

The Sun MediaCenter server delivers MPEG bit streams to clients at a constant bit rate. Loading video content onto the Sun MediaCenter server is described in the *Sun MediaCenter Server Administrator's Guide*, which is available on Sun's web site, at:

```
http://www.sun.com/products-n-solutions/hw/servers/smc_external.html
```

Note – While the Sun MediaCenter server supports MPEG-1 and MPEG-2 formats, the video content that is played in the client applet must be in MPEG-1 (`MPEG1SYS`) format. The decode and display software used by the applet does not support MPEG-2 streams.

FIGURE 2-2 shows an example of a web browser with the video player applet.

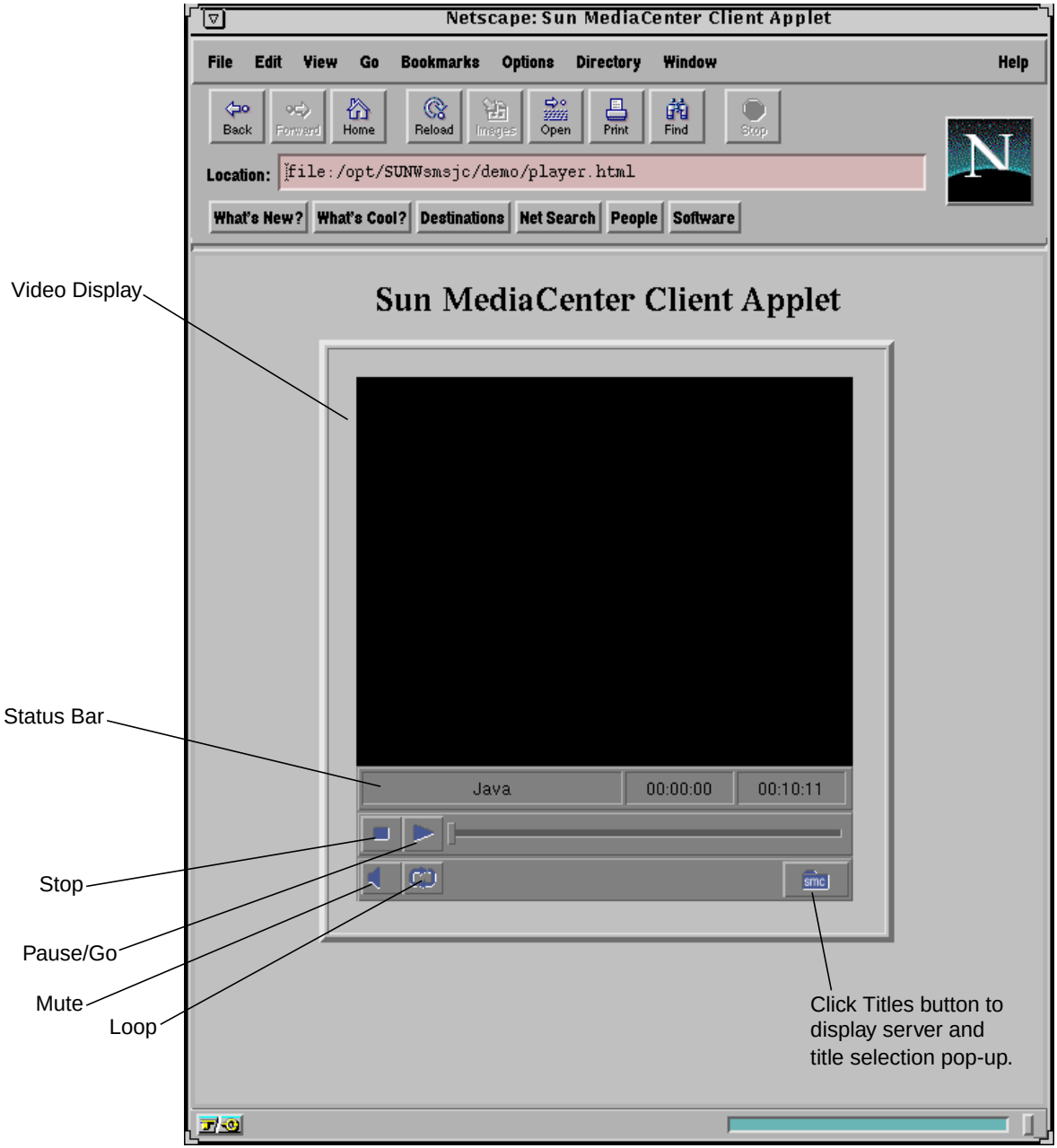

FIGURE 2-2 Example of Applet in Web Browser

Along with the window that contains the video content, the applet displays status and control bars that allow you to control the playing of the video stream. The Titles button displays a pop-up window that allows you to browse a list of titles on a specified Sun MediaCenter server. An example pop-up window is shown in FIGURE 2-3.

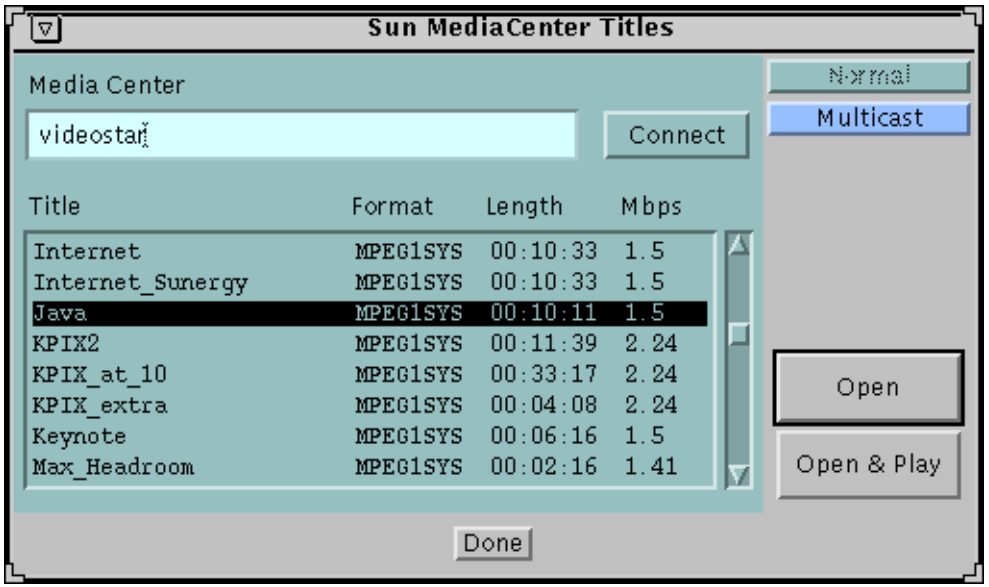

FIGURE 2-3 Example of Titles Pop-up Window

The buttons at the upper right of the Titles pop-up toggle between Normal and Multicast. Most often you play a “normal” stream, that is, unicast; server to a single client. The Sun MediaCenter server is also capable of delivering, and the Java client capable of receiving, multicast streams. Playing multicast streams is discussed in Section 2.5, “Multicasting,” on page 2-8.

2.1.1 Standalone Player Application

You can also run the Java client software as a standalone video player that does not use a browser. In this configuration, video content from a Sun MediaCenter server is displayed in a window, as shown in FIGURE 2-4. Status and control bars are similar to those displayed with the applet.

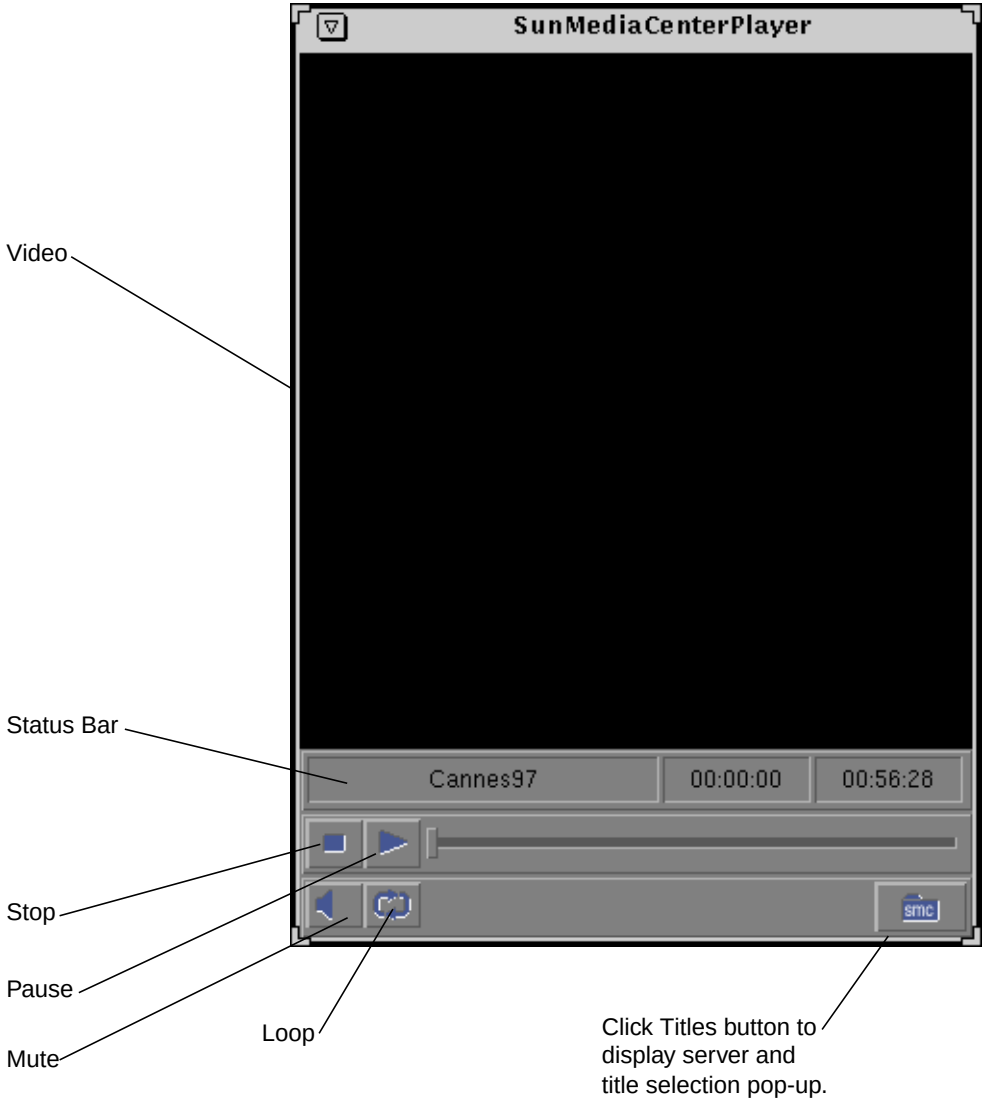

FIGURE 2-4 Example of Standalone Video Player Application

2.1.2 Client Components

The Java client software includes the following components:

- The video player applet SunMediaCenterPlayer.
- A program called MpegExpert (MPX) that decodes and displays MPEG-1 format video content.
- Java class libraries and a Solaris shared library to run the MPX program so that it displays inside an applet.
- Java class libraries to communicate with a Sun MediaCenter server using the Media Stream Manager (MSM) RPC protocol.
- Sample HTML files.
- A shell script that sets the environment variables to run the applet with the a Java-capable browser.

2.2 Client Requirements

This section describes the hardware and software required to run the client software.

2.2.1 Hardware

The client software is a CPU-intensive application that places a significant demand on your hardware resources. Sun recommends that you run the client software on an UltraSPARC™ machine with 64 MB of RAM and a Fast Frame Buffer (FFB). Toward the lower end of acceptability is a SPARCstation 10 with 64 MB. With less powerful machines, you run the risk of not being able to decode and display video quickly enough, with the result being jittery video and choppy audio.

Note – The MpegExpert software, used for MPEG-1 decoding, has special optimization to improve performance on 24-bit frame buffers.

Network bandwidth between the client and the video server must be able to support aggregate video streams. The link between the server and the client machines should be at minimum 10 Mbs switched Ethernet, or Fast Ethernet.

2.2.2 Software

The client workstation must have Solaris version 2.4 or later installed.

Note – The target operating environment for this release of the Java client is Solaris 2.6. With this release, you are assured of the correct environment for the Java client.

The `pkgadd` installation script looks for a Java-capable web browser, such as HotJava™ or Netscape. It also looks for the Java Developer's Kit (JDK). If the script does not find the JDK, it installs it. If you want, you can download the JDK from the `www.javasoft.com` web page.

2.3 Installing the Client Software

You install the Sun MediaCenter One software using the `pkgadd` program. The installation procedure is described in the manual *Vendor Value-Added Software*, which accompanies the Solaris 2.6 Supplements CD.

The default installation directory is `/opt/SUNWsmsjc`, with the subdirectories: `/bin`, `/classes`, and `/lib`. When installation is complete, you can play videos from any Sun MediaCenter server, including a Sun machine running Sun MediaCenter One software.

2.4 Running the Client Software

The scripts `SMChotjava` and `SMCnetscape` in the `/opt/SUNWsmsjc/bin` directory set the environment variables needed by the applet and launches a Java-capable browser. For example:

```
host% /opt/SUNWsmsjc/bin/SMCnetscape /opt/SUNWsmsjc/demo/player.html
```

The preceding command launches the Netscape browser with an applet invoked with the parameters contained in the file `player.html`. (`SMChotjava` invokes the HotJava browser.) You receive a browser window such as shown the one shown in FIGURE 2-2 on page 2-3. The Titles pop-up window, shown in FIGURE 2-3, allows you to specify a Sun MediaCenter server on your site; enter the server name and

either press Return or click on the Connect button. The list of titles available on the server then displays. Select a title to play in the applet by double-clicking on a title name or by selecting a title, then clicking on the Open & Play button.

The `SMCnetscape` and `SMChotjava` script accepts command-line options, which correspond to the applet parameters described in Section 2.8.1, “Applet-Specific Parameters,” on page 2-13. You can, for example, invoke `SMChotjava` as follows:

```
host% /opt/SUNWsmsjc/bin/SMChotjava host=smc_server_one title=spartacus
```

The script `SMCplayer` in the `/opt/SUNWsmsjc/bin` directory runs the SunMediaCenterPlayer applet as a standalone video player that does not use a browser. For example:

```
host% /opt/SUNWsmsjc/bin/SMCplayer host=smc_server_one title=spartacus
```

The `SMCplayer` script accepts command-line arguments that correspond to the applet-specific parameters described in Section 2.8.1, “Applet-Specific Parameters.”

2.5 Multicasting

The Java client enables you to receive a multicast video stream from a Sun MediaCenter server. A multicast stream is one that is sent to a special IP address that is listened to by multiple receivers. The receiving of a multicast stream presumes you know the multicast address (IP address and port number) to which the stream is sent.

To receive a multicast stream, click on the Multicast button in Sun MediaCenter Titles pop-up. You receive the window shown in FIGURE 2-5.

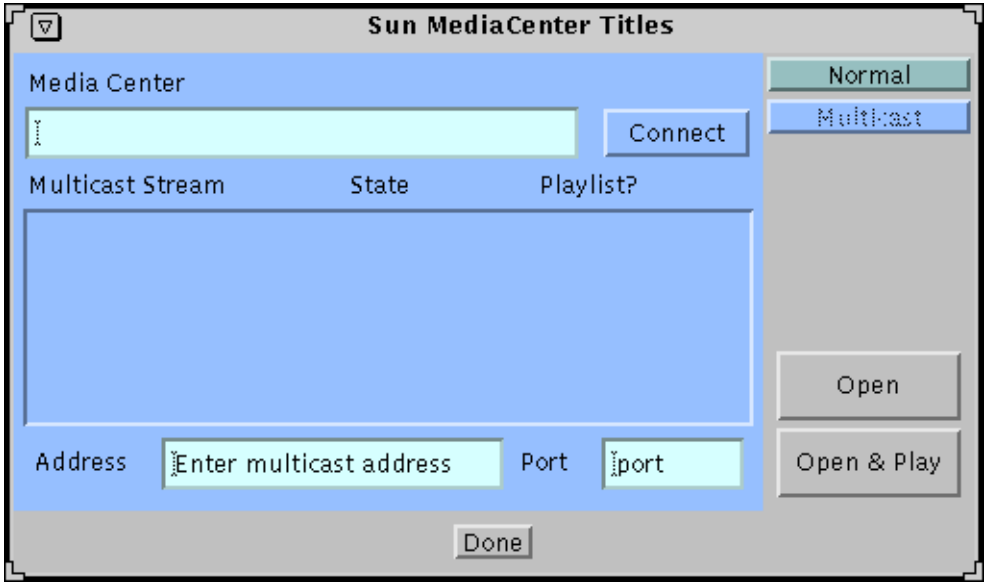

FIGURE 2-5 Multicast Pop-up

In the Multicast window, you have two ways of tuning into a multicast stream:

- Enter the name of a Sun MediaCenter server and press Return or click on Connect. You receive a list of titles that are being multicast from that server (if any).
- Enter the multicast IP address and port number, and click on Connect. In the title list display area, you receive the name of the multicast title available at the address you specified.

In the title list, the “Playlist?” heading (see FIGURE 2-5) indicates whether a title is part of a set of titles called a playlist. If a title is in a playlist, under “Multicast Stream”, the window displays the first title in the playlist, regardless of which title in the playlist is currently playing.

To play a multicast title, in the title list display area, select a title and click on Open to load the stream or Open & Play to load the stream and start playback. You receive the window shown in FIGURE 2-6.

FIGURE 2-6 Multicast Display

2.6 Admin Tool

The Java client is shipped with an Admin tool, intended for trained technical personnel. You invoke the tool as follows:

```
host% /opt/SUNWsmsjc/bin/SMCnetscape /opt/SUNWsmsjc/demo/admin.html
```

After entering the preceding command, you receive the window shown in FIGURE 2-7.

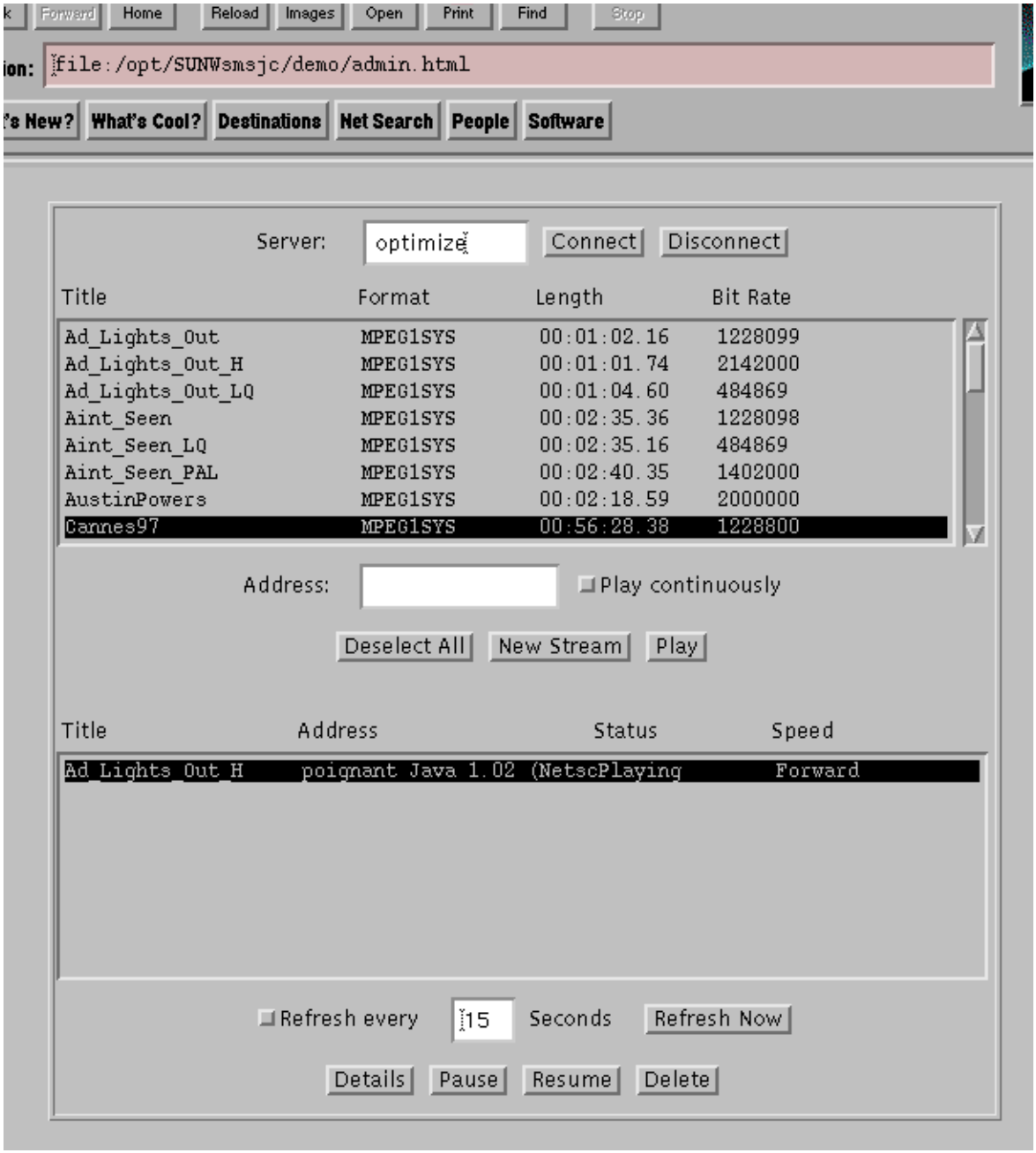

FIGURE 2-7 Admin Tool

The Admin tool enables you to view details of a stream that you are playing. It also allows you to send a stream from a Sun MediaCenter server to a third-party client. You do this by specifying an address, of the form spelled out the *Sun MediaCenter Server Programmer's Guide*, in the Address: field, then clicking on New Stream. Consistent with this feature, you can start a multicast stream on a local or remote server by connecting to a server and specifying a multicast address.

2.7 Environment Variables Used by Applet

The scripts that invoke the browser-based and standalone video applications make the following changes to the `PATH`, `LD_LIBRARY_PATH`, and `CLASSPATH` environment variables:

```
PATH=/opt/SUNWsmsjc/bin:${PATH}
LD_LIBRARY_PATH=/opt/SUNWsmsjc/lib:${LD_LIBRARY_PATH}
CLASSPATH=/opt/SUNWsmsjc/classes:${CLASSPATH}
```

These environment variable modifications have effect only in the context of the Java client scripts and the web browser invoked by the `SMChotjava` and `SMCnetscape` scripts.

2.8 SunMediaCenterPlayer Applet

The video player applet, SunMediaCenterPlayer, uses the Java class libraries to play titles on the Sun MediaCenter server. The applet has required applet attributes, as well as optional applet-specific parameters.

The syntax for the applet code is shown below:

```
<applet code="SunMediaCenterPlayer.class" width=width height=height>
<param name=host value="hostname"
<param name=title value="title"
<param name=parameter  value="parameter_value">
...
</applet>
```

The required applet attribute `code` is set to the name of the file that contains the main class of the applet, in this case it is `SunMediaCenterPlayer.class`. The applet attributes `width` and `height` are the dimensions, in pixels, of the applet. The applet-specific parameters are described in the next section.

If you use only the browser-based and standalone applications invoked by `SMChotjava`, `SMCnetscape`, and `SMCplayer`, you need not be concerned with the applet parameters. These parameters are of interest to those who want to modify HTML files that invoke the SunMediaCenterPlayer applet.

2.8.1 Applet-Specific Parameters

This section describes applet-specific parameters.

`host`

The name of the Sun MediaCenter server. This value can be a hostname or an IP address. If this parameter is not specified or if the server specified cannot be accessed, no video content is displayed in the applet. Click the Titles button to specify a different Sun MediaCenter server.

`title`

The name of a title to play. The title name is case-sensitive. If this parameter is not specified or if the title specified cannot be played, no video content is displayed in the applet. Click the Titles button to list the titles that are available for playback on a Sun MediaCenter server.

`start`

The offset from the start of the title to begin the playing of the video content. The value for this parameter can be in one of the following forms:

- *hours*:*minutes*:*seconds*.*hundredths_of_a_second* (for example, “1:45:15.25” means 1 hour, 45 minutes, 15.25 seconds)
- *minutes*:*seconds* (for example, “10:52” means 10 minutes, 52 seconds)
- *seconds* (for example, “10” means 10 seconds)

By default, a value of “0” is assumed, meaning start at the beginning of the title.

`duration`

The duration of the playing of the video content. The value for this parameter can be in one of the following forms:

- *hours*:*minutes*:*seconds*.*hundredths_of_a_second* (for example, “1:45:15.25” means 1 hour, 45 minutes, 15.25 seconds)
- *minutes*:*seconds* (for example, “10:52” means 10 minutes, 52 seconds)
- *seconds* (for example, “10” means 10 seconds)

By default, a value of “0” is assumed, meaning play to the end of the title. You can use the `smc_ls` utility to list the normal play time (NPT) for each title that is available for playback on a Sun MediaCenter server.

`loop`

Specifies whether the content is played continuously. A value of “true” means play the specified content in a loop. Note that this value only affects the initial state of the content; you can click the Loop button in the applet control bar to toggle continuous play off or on. The default value is “false” (if you do not specify this parameter, content is not played continuously).

`autoplay`

Specifies whether the content starts playing automatically in the applet. A value of “true” causes the content to play without user intervention. A value of “false” means that the client user must explicitly start the playing of the content, for example, by clicking the Play button in the control bar of the applet. The default value is “true” (if you do not specify this parameter, content starts playing automatically).

`img`

The URL of an image to be displayed when content is not being played. For example, you can display a logo in the applet.

`showStatus`

Displays a status bar beneath the applet that shows the title being played, the speed of the play (if trick play is available for the content), the current position of the content being played, and the duration of the play. A value of “true” displays this status bar, while a value of “false” causes the bar not to be displayed. The default value is “true” (if you do not specify this parameter, the status bar is displayed). For multicast streams, `showStatus` controls the status bar, as it does for unicast streams. However, the status bar for the multicast display contains only the multicast address at which the stream is being received.

`showControl`

Displays a control bar beneath the applet that allows you to pause or play the content, change the speed of the play, or change the current position of the content being played. A value of “true” displays this control bar, while a value of “false” causes the bar not to be displayed. The default value is “true” (if you do not specify this parameter, the control bar is displayed). For multicast streams, `showControl` controls whether buttons for starting and pausing the display of the stream are displayed.

`showOptions`

Displays a control bar beneath the applet that allows you to turn mute on or off, turn continuous play of the content on or off, and display the Titles pop-up window. A value of “true” displays this control bar, while a value of “false”

causes the bar not to be displayed. The default value is “true” (if you do not specify this parameter, the control bar is displayed). For multicast streams, `showOptions` controls whether the button for muting or unmuting the audio output is displayed.

`showTitle`

Either true or false (default is true). Determines whether to display the titles button—the button that brings up the content browser.

`multicast`

Displays a multicast MPEG stream in the applet. This value must be a multicast address, which is an IP address in the form *multicast_address*`:`*multicast_port_number*. If you use this parameter, then you should not specify the `host` or `title` parameters; values defined for the `host` and `title` parameters are ignored.

`cc_data`

The URL of a closed caption data file. The closed caption data file is an ASCII file containing the captions that are inserted in the video content.

`cc_index`

The URL of a closed caption index file. The closed caption index file is used for the synchronization of the closed captions (contained in the data file described above) with the video playback. The index file consists of a series of 16-byte records. Each record contains a 64-bit nanosecond timestamp; a 32-bit file offset, in bytes; and 32 bits of zero. The record maps a caption (pointed to by the file offset) to a point in a video clip (expressed by the timestamp). Time zero represents the beginning of the clip.

Note that you must use the SunTuner™ product, in conjunction with the encoding software available from the ISG internal web page, to create the closed caption data and index files.

2.8.2 Examples

The following applet code plays the title “Just_in_Time” on the server `videostar`:

```
<applet code="SunMediaCenterPlayer.class" width=704 height=530>
<param name=host value="videostar">
<param name=title value="Just_in_Time">
</applet>
```

Note – As described previously, the parameters for displaying the status and control bars do not have to be explicitly specified. The bars appear in the applet by default.

The following applet code plays the title “solemio” on the server `babysms` in a small applet. The title plays only when the user starts the play. An image is displayed when a title is not playing.

```
<applet code="SunMediaCenterPlayer.class" width=352 height=290>
<param name=host value="babysms">
<param name=title value="solemio">
<param name=img value="solemio.gif">
<param name=autoplay value="0">
</applet>
```

The following applet code plays repeatedly the second ten seconds of the title “cat” on the server `babysms`:

```
<applet code="SunMediaCenterPlayer.class" width=704 height=530>
<param name=host value="babysms">
<param name=title value="cat">
<param name=start value="10">
<param name=duration value="10">
<param name=loop value="true">
</applet>
```

The following applet code plays content from a multicast stream at address 224.0.0.2 on UDP port 50000:

```
<applet code="SunMediaCenterPlayer.class" width=704 height=530>
<param name=multicast value="224.0.0.2:50000">
</applet>
```

2.9 Troubleshooting

If you plan to play the SunMediaCenterPlayer applet within a browser, use of the `SMChotjava` or `SMCnetscape` script to launch the browser eliminates the possibility of a number of problems, as the script sets the necessary environment variables. If you do not use one of the browser scripts and the applet fails to start up

within a browser, make sure that the browser's Java classes are available. The classes must either be visible from the CLASSPATH environment variable or have been copied to an appropriate location when the browser was installed. See your browser documentation for more information.

If the progress slider in the video player moves, but the video does not appear, MpegExpert (MPX) is stopping for some reason. Run MPX by itself with the command mpx to get more information about configuration problems.

The most common problem that MPX has is that it cannot open /dev/audio or /dev/fb. Enter the following commands:

```
host% touch /dev/audio
host% touch /dev/fb
```

If you do not have write access to /dev/audio and /dev/fb, have your system administrator configure your system so that you do.

On rare occasions, the MPX process may be left running after the applet has terminated. As superuser, use the ps command to determine the process ID of MPX, then use the kill command to stop the MPX process. For example:

```
host# ps -ef | grep mpx
22029 ? S 6:43 install_directory/bin/mpx
9316 p5 S 0:00 grep mpx
host# kill 22029
```

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