Emulation

for Sun Workstations

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Introduction

Overview

The OptImage emulator allows you to preview disc image files created by the OptImage Disc Building utilities. The emulator duplicates the data delivery characteristics of an optical disc. The emulator passes data directly to the CD-I player so you can see how the title will play when replicated. If any problems are discovered, they can be corrected before the image is replicated.

The disc image file can be any of the following types: CD-I™, CD-I Ready, CD-DA, and CD-ROM XA. The disc image file is stored on the emulator hard disk drive, which is formatted for use with a Sun Workstation®. A disc image built from files contained on your Sun is accessed by the emulator directly from the hard disk.

The emulation software includes utilities for both Sun-3™ and Sun-4™ Workstations. The following utilities can be used to emulate a CD:

- **emulate** (Sun-3 and Sun-4) is a command line utility for emulating compact disc images on the OptImage emulator.

- **emutool** (Sun-4) is a SunView™ graphical user interface for controlling CD emulation and recording.

About this manual

This manual includes three sections: *Using emulate* explains how to emulate a disc image file using **emulate**, *Using emutool* explains how to emulate a disc image using **emutool**, and an appendix of technical notes is included for those who wish to have a more in-depth understanding of emulator operation.

Conventions

The following typeface conventions are used throughout the pages of this manual:

- The names of programs, directories, and files are shown in a bold Helvetica typeface:

  /h0/myimage

- The names of keys on the keyboard are italicized:

  Enter, Escape, Delete

- When two keys are to be pressed simultaneously, they are shown connected by a hyphen:

  Control-C

- The names of items in the user interface are shown in bold:

  Cancel, O.K., Options

Emulation

The following sections explain how to use the **emulate** and **emutool** utilities for emulating a disc image. Before proceeding, be sure the emulator hardware and software are installed as described in the *Disc Building Installation* manual.

Using emulate

emulate uses a command line to start emulation. The syntax for
emulate is shown below:

emulate *[option...] {filename} [option...]*

where

emulate	is a keyword and must be typed exactly as it appears in the syntax command line.
filename	is the filename of a disc image created by **master.**
option	is replaced by any option described in the following section. Zero or more options can be used before or after the *filename* element.

Options

-?	displays help about **emulate** usage.
-a	specifies that the disc image being emulated is CD-ROM-XA. CD-I, CD-I Ready, and CD-DA do not require a command line option to specify the image type.

-d=*/device_name*

specifies an emulator hard disk device descriptor
for the location of the disc image. Use this option
when the disc image is not on **/h2,** which is the
default. The following are the available
descriptors:

Descriptor	SCSI ID
/h0	0
/h1	1
/h2	2
/h3	3
/h4	4

-f   forces creation of a new image sector map. Use this option if your disc image was last emulated with any version of **emulate** prior to version 2.0.

-g   enables debug messages. These messages are displayed on the Sun during emulation.

-l   enables the emulation of worst-case seek time delays.

-t=*TOC_file*   specifies the TOC (table of contents) file for a disc image containing multiple tracks. All images, with the exception of single-track CD-I images, must have a TOC file generated.

For example, the following command line shows the **emulate** command along with the -t option designating a TOC file (**demo.cdi.toc**) to use for emulating the disc image **demo.cdi**. Also included on the command line is the -f option to force creation of a new image sector map, and the -d=/h0 option to specify /h0 as the device descriptor for the location of the disc image.

emulate -t=demo.cdi.toc demo.cdi -f -d=/h0

Emulating a disc image

To emulate a disc image using the **emulate** command line, follow the steps below:

1. Change directory to the directory that contains the disc image you want to emulate.

2. Type **emulate** along with the filename of the disc image and any other options , then press *Return*.

3. Click the **CD-I** button on the CD-I player startup screen to begin playing the title.

4. To stop the emulation in progress, press *Control-C* on the Sun, then reset the CD-I player. Stopping the emulation may leave the CD-I player in an indeterminate state. Reset corrects this condition.

Using emutool

emutool is a graphical user interface for controlling emulation and CD recording in a SunView window. **emutool** is available only for Sun-4 platforms.

emutool is executed using the following command line syntax:

emutool *[option...]*

where

emutool	is a keyword and must be typed exactly as it appears in the syntax command line.
option	is replaced by any option described in the following section. Zero or more options can be used after the **emutool** keyword.

Options

-d=*path*	sets working directory to *path*. This is the directory that the pull-down menus first display when selecting a disc image file and a TOC file. The default directory is the current directory.
-g	enables debug messages. These messages are displayed in the **emutool** window during emulation.
-s=*device*	specifies the Sun serial port connected to the emulator. The default is **/dev/ttyb** (19200 Baud, 8 bits, no parity).

Configuring emutool

When **emutool** is executed, it uses two environment variables to determine the emulator serial port and the initial file browser path:

EMU_PATH   is the pathlist to the directory displayed by drop-down menus. If not defined, **emutool** defaults to the current directory. You may override the default or **EMU_PATH** with the **-d**=*path* option.

EMU_PORT   is the emulator serial port. If it is not defined, the serial port defaults to **/dev/ttyb** (19200 baud, 8 bits, no parity). You may override the default or **EMU_PORT** with the **-s**=*device* option.

Starting emutool

To execute **emutool** and display the **emutool** window:

1. Open a command shell.

2. Type **emutool** followed by any options you wish to use.

NOTE: *You may add* **emutool** *to your* **.sunview** *file to display the window each time you enter SunView.*

The **emutool** window appears as shown in Figure 1-1.
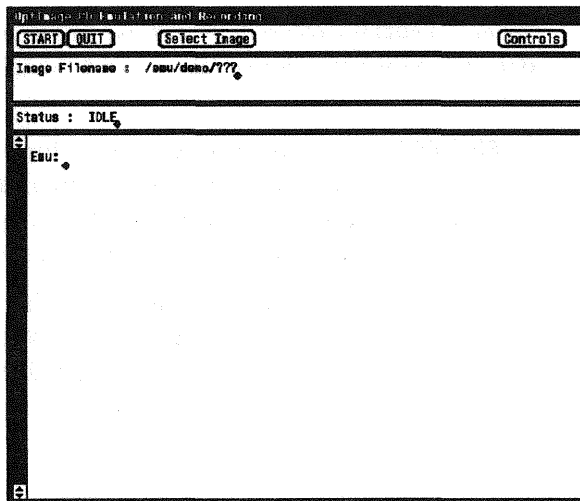
Figure 1-1:   emutool window

Emulating a disc image

To emulate a disc image using **emutool**, follow the steps below:

1. Click the **Controls** button to view the controls window.

2. Click the **Select Image** button and select the disc image to emulate.

3. Click the **Select TOC** button and select the TOC file for the disc image, if needed.

4. Click the **Start** button to begin emulation.

5. Click the **CD-I** button in the CD-I player startup screen to play the title on the CD-I player.

6. Click the **Stop** button to stop emulating.

7. Reset the CD-I player.

These steps are explained in the following sections.

The controls window

Clicking the **Controls** button in the **emutool** window displays the pop-up window shown in Figure 1-2.

```
Emulator Hard Disk:  •
Image Match:  *
TOC Match  :  *.toc

Operation  :  ⟳ Emulate
Image Type :  ⟳ CD-I/CD-DA/CD-I Ready

Create New Map :  ⟳ When Needed

[CLOSE]
```
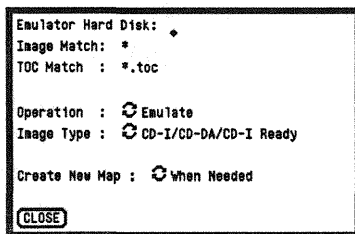
Figure 1-2:   Controls window

The controls window allows you to select the following items.

Emulator Hard Disk

The **Emulator Hard Disk** field allows you to select the hard disk containing the disc image. The default for this field is **/h2** and is not displayed.

Image Match, TOC Match

The **Image Match** field limits the filenames displayed in the **Select Image** menu in the **emutool** window. Likewise, the **TOC Match** field limits the filenames displayed in the **Select TOC** menu. Both fields use the standard UNIX® wildcards * and ? to limit the names displayed.

The default for the **Image Match** field is *, which displays every filename in the directory displayed in the **Select Image** menu. The default for **TOC Match** is *.toc, which limits the filenames displayed in the **Select TOC** menu to those that end in **.toc**.

Operation

The operation field allows you to select the operation you want to perform. To select an operation, either click on the **Operation** field with the left button to cycle through the selections, or press and

hold the right button to select the operation from a pull-down menu. One of three operations may be selected:

- **Emulate**
- **Record CD (Philips CDD 521)**
- **Record CD (Yamaha YPE-101/YPR-201)**

The **Emulate** option is the default and is used to emulate the disc image. The two **Record CD** options are functional only if you have purchased the corresponding recording package, either the _CDD 521 Recording Software_, or the _Yamaha PDS Recording Software_.

Image Type

Image Type selects the type of disc image to record. Two options are available for the image type:

- **CD-I/CD-DA/CD-I Ready** (the default selection)
- **CD-ROM XA (Mode 2)**

Create New Map

Create New Map determines when a new disc image map is created. The choices are to create the map **When Needed** or to create it **Always. When Needed** is the default selection.

CLOSE

After making your selections, you may click **CLOSE** to close the controls window.

Selecting the disc image

Click the **Select Image** button at the top of the **emutool** window to select the disc image. A drop-down menu appears with the names of files contained in the current directory. Figure 1-3 shows the **Select Image** drop-down menu.
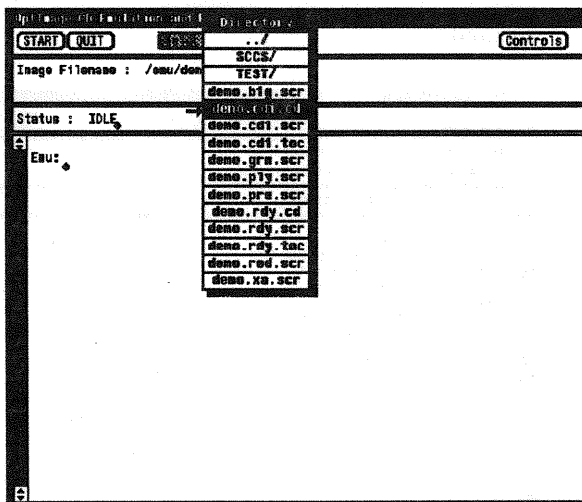
Figure 1-3:   Select Image menu

Select a file from the drop-down menu by highlighting the file
and clicking the left button.

Selecting a TOC file

The **Select TOC** button appears next to the **Select Image** button
after the disc image is selected (see Figure 1-4). Clicking the **Select
TOC** button displays a drop-down menu that allows you to select
a TOC file. If you select a TOC file, the filename appears in the
TOC Filename field.

Starting emulation

Clicking **START** begins emulation. When the emulation begins,
the **Status** field displays "CD EMULATION IN PROGRESS" and
messages appear in the bottom area of the window. The **Start**
button changes to **Stop** to allow you to stop emulation at any time.

Figure 1-4 shows how the **emutool** window appears during emulation.


```
Optimage CD: Emulation and Recording
[STOP][QUIT]    [Select Image] [Select TOC]              [Controls]
Image Filename :  /emu/demo/demo.cd1.cd
TOC Filename   :  /emu/demo/demo.cd1.toc
Status :  CD EMULATION IN PROGRESS

Emu: cdem -s=16405200 -t
>>> Waiting to Receive Image Map <<<
>>> Waiting to Receive TOC <<<
diskread: Beginning Disk Caching
Image Type is CD-I
Track 01/00 -        0
Track 01/01 -      150

Emulation Started
stop    at sector     0
```
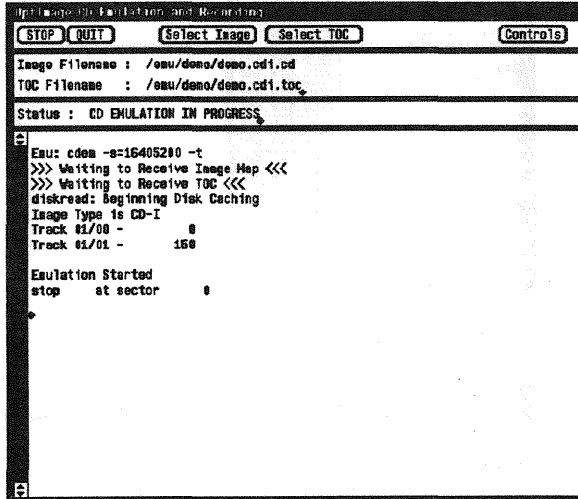
Figure 1-4:   emutool window during emulation

Quitting the emutool window

The **QUIT** button stops emulation and quits **emutool**.

Emulator Technical Notes

Overview

The OptImage CD-I emulator delivers CD data from a hard disk drive to a CD-I player in a manner that emulates the behavior of the CD drive. Additionally, the emulator can be connected to a WORM (write-once-read-many) compact disc recorder to record a disc. Packages for recording images on the Philips CDD 521 Compact Disc Recorder or the Yamaha Programmable Disc (PDS) system are optionally available and require the emulator for operation.

Hardware description

The OptImage emulator hardware consists of a single board computer containing a SCSI hard disk drive, floppy drive, CD-I EBU interface board, and power supply. The emulator comes standard with a 650MB Wren VI SCSI hard disk drive. Larger drives are available, and other SCSI peripherals such as disk or tape drives may be connected to the external SCSI bus.

Software description

The software is divided into system and application software. The system software consists of Industrial OS-9™ and the file

managers, device drivers, and utilities specific to the emulator hardware. This software resides on the emulator boot diskette.

The application software is divided further into host and emulation software. The host software is resident on the system sharing the hard disk drive with the emulator. It is responsible for interpreting its file system and creating the disc map used by the emulation. The host software also initiates and controls the emulation over a serial communications connection to the emulator. Status information from the emulation is also received and displayed by the host software.

The emulation software resides on the emulator boot diskette. It is responsible for supplying the image data to the player. Initialization and control information for the emulation (disc map and TOC file) is received from the host over a serial connection. Once emulation has begun, it provides data to the CD-I player in response to commands received from the player.

Because of the realtime requirements of emulation, the emulator software is implemented as two separate processes. One process reads data from the hard disk (using the image map) and places it in cache buffers. The other process accepts commands from the CD-I player and in response sends data from cache buffers to the player. Emulation continues until a terminate command is received from the host.

Theory of operation

The emulator operates by delivering data to a CD-I player at the same rate as an actual CD drive. The emulator connects directly to the CD-I player and intercepts the read requests the player sends to the CD drive and sends data from the disc image file stored on the emulator hard disk. Serial commands from the CD-I player (start, stop, jump, etc.) control the data from the emulator.

The data is obtained from a large capacity (>600MB) hard disk drive that is part of the emulator. The hard disk may be OS-9™ formatted, or may be formatted for another operating system. Currently, OS-9, SunOS™, Macintosh™ and PC-DOS operating systems are supported.

In the case of a non-OS-9 file system, the hard disk is connected to both the emulator SCSI interface and to the SCSI interface on the host system. The hard disk is "mounted" or otherwise made known to the host system as a file structured device but is treated as a raw device by the emulator. OS-9 formatted disks may be shared between the emulator and a CD-I player.

The emulation software reads data from the hard disk by physical address, without regard to the file system. This is done by using a "map" of the physical locations of the CD disc image file on the hard disk. This "disc map" is created on the host system, which understands the file system, and is sent to the emulator, which uses it to retrieve the disc image data. The idea behind this is that any file in any file system may be considered as simply groups of physical blocks of data on the disk.