Development Tools Overview

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About This Manual

This is the Runtime Library Release 2.4 version of the *Development Tools Overview* manual.

It describes the available programmer tools, graphic artist tools, sound artist tools, other common tools and also explains how to develop independent tools for the PlayStation 2.

Changes Since Last Release

New

Related Documentation

Note: the Developer Support Web site posts current developments regarding the Libraries and also provides notice of future documentation releases and upgrades.

Typographic Conventions

Certain Typographic Conventions are used throughout this manual to clarify the meaning of the text:

Convention	Meaning
`courier`	Indicates literal program code.
italic	Indicates names of arguments and structure members (in structure/function definitions only).
medium bold	Indicates data types and structure/function names (in structure/function definitions only).
blue	Indicates a hyperlink.

Developer Support

Sony Computer Entertainment America (SCEA)

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Order Information	Developer Support
In North America:	*In North America:*
Attn: Developer Tools Coordinator Sony Computer Entertainment America 919 East Hillsdale Blvd. Foster City, CA 94404, U.S.A. Tel: (650) 655-8000	E-mail: PS2_Support@playstation.sony.com Web: http://www.devnet.scea.com/ Developer Support Hotline: (650) 655-5566 (Call Monday through Friday, 8 a.m. to 5 p.m., PST/PDT)

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Programmer Tools

The following programming tools are provided on the Developer Support website.

ToolChain

ToolChain is a development tool kit consisting of compilers, etc. that runs on Linux. It is a GNU tool with gcc at its core and has been customized for the EE and IOP. It includes the following primary tools.

Table 1

Tool	Function
ee-ar	Archiver
ee-as	Assembler
ee-dvp-as	DVP assembler Supports pseudo-instructions for including DMA tags, VIF codes, GIF tags and VU microprograms.
ee-gcc	C compiler
ee-gdb	Debugger
ee-g++	C++ compiler
ee-ld	Linker
ee-nm	Tool to output a list of symbols in an elf object.
ee-objcopy	Tool to convert the format of elf object files and delete specific sections.
ee-objdump	Tool to display the contents of an elf object.
ee-strip	Tool to delete symbolic information from an elf object.

Table 2

Tool	Function
iop-ar	Archiver
iop-as	Assembler
iopfixup	Tool to convert elf format relocatable objects to IOP relocatable executable format (.irx).
iop-gcc	C compiler
iop-ld	Linker
ioplibdump	Tool to display entries of resident libraries called by irx.
ioplibgen	Tool to create entry tables and link data files (.ilb) based on library entry definition files.
ioplibld	Tool to create call table structures for calling resident libraries.
iop-nm	Tool to output a list of symbols in an object.
iop-ranlib	Tool to generated index information for an archive.
iop-strip	Tool to delete symbolic information from an object.

Runtime Library

A Runtime Library is a library available during the running of a program. Runtime libraries allow an application to take advantage of the functions and performance of the PlayStation 2. Various runtime libraries are provided that include driver libraries for controlling the hardware blocks, various libraries for graphics / sound / animation / network processing, and libraries to support development work such as debugging.

The libraries for the EE are implemented in a statically linked archive format, and those for the IOP are implmented as dynamically linked modules.

Sample Code / Sample Data

Sample programs and sample data are provided that perform many different types of basic processes. PlayStation 2 application notes are also provided for the purpose of describing VU programming and various types of graphics algorithms.

Of course, these samples contain programming references and are appropriately structured to be incorporated into title applications. However, it may be the case that due to usage conventions, error handling may not be sufficient such that required processes have been omitted, so care must be exercised. Also, please be aware that there may be portions of sample code that should not be used in title applications.

dsnet

dsnet is a package of tools for controlling the DTL-T10000 from a development computer. It is comprised of client programs that perform various requests for dsnetm, which runs internal to the DTL-T10000. The main client programs are shown below.

Table 3

Tool	Function
dsreset	Tool to reset the DTL-T10000.
dsedb	EE debugger
dsidb	IOP debugger
dsecons	Console program to display output from an EE target program.
dsicons	Console program to display output from an IOP target program.
dsistart	Tool to load and start IOP modules.
dsilist	Tool to display a list of modules running on the IOP.

dsicons can also be used to execute the IOP thread monitoring program "Simple Thread Monitor" provided in the DTL-T10000. If the Simple Thread Monitor is used, the state of each thread running on the IOP and the CPU usage rate as well as the state of the semaphores and event flags can be examined.

DTL-T10000 Management Tool / Initial Screen Package

The DTL-T10000 management tool "PStoolSetup" is used to set up the DTL-T10000 network and to update the internal software. It is built-in to the DTL-T10000 and runs from a development computer using a Web browser.

The initial screen package "gstool" is internal software that performs screen display when the DTL-T10000 starts up. Updates to this software are available on the developer support website.

Kanji Font Data

The Kanji font data in the ROM of the Playstation 2 is compressed. Consequently, it cannot be used for title applications. Since identical font data is provided separately, use it as graphic data as necessary.

The specifications of the Kanji font are as follows.

- Style: Heisei square Gothic (Font used in browsers and system configuration screens.)
- Character types: JIS Level 1 standard (2965 characters), JIS Level 2 standard (3390 characters), Non-kanji (524 characters), Non-JIS / gaiji (604 characters)
- Character size: Two types: 22 x 22 dots, 26 x 26 dots (left and right 2 dots are margins)
- Color format: IDTEX4 (16 levels: CLUT is created separately)

Stream Converter

The stream converter is a tool used to create animation data. A Linux version (ps2str) and a Windows version (ps2strw) are available.

The main functions are as follows.

- Conversion from MPEG2 streams to IPU streams.
- ADPCM compression and format conversion of uncompressed sound data.
- Multiplexing of element streams (video / audio / data).
- Demultiplexing of multiplexed streams.

3D Icon Viewer

This is a tool for previewing 3D icons used in PS2 memory cards on the DTL-T10000. Up to 20 icons can be displayed.

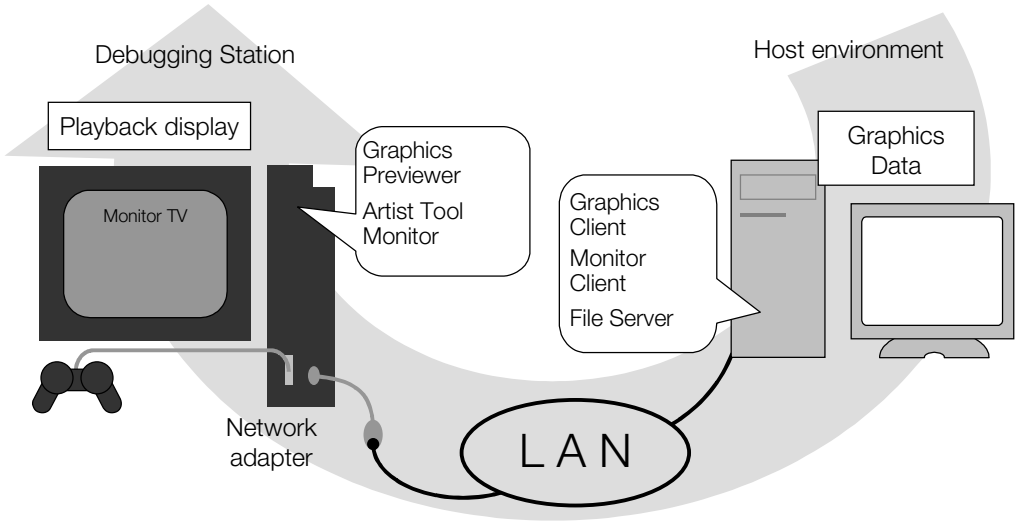
Graphics Artist Tools

The following tools for managing graphics are provided on the Developer Support website.

Graphics Previewer

The graphics previewer is a tool for playing back and displaying 3D graphics data created using various commercial graphics software programs, on a Debugging Station. In this way, graphics data can be verified to see how it will appear on an actual PS2 console. A Debugging Station is connected to a LAN via a USB-Ethernet/network adapter, and the graphics previewer then transfers graphics data from a Linux host to the Debugging Station where it can be displayed. In addition to ordinary animation playback, by operating the Debugging Station controller, the graphics previewer can change the direction and position of the camera, display specific frames, and move forward and reverse.

Figure 1: Operational overview of graphics previewer



eS Package

The eS package provides converters for 3D graphics data. These are described below.

- hmd2es (Linux version / Windows version / Linux version source code)
  Converts 3D graphics data output in conventional HMD format to eS format.
- esconv (Linux version / Windows version / Linux version source code)
  Converts eS format 3D graphics data to the high-level graphics library "HiG" and graphics plug-in library "HiP" formats. Can also output runtime data for the graphics previewer.
- libesp
  eS format parser library.
- libestd
  Library for constructing eSTD namespace data.

Sound Artist Tools

The following tools for managing sound are provided on the Developer Support website.

Sound Authoring Tool (JAM)

JAM runs on a Power Macintosh and is provided as an authoring tool for sound data. JAM's primary functions are to edit and create PlayStation 2 sound data (HD / BD / SQ) and play back sound previews.

Editing and creating sound data is handled using functions which register multiple phoneme data (VAG), set up splits, crossfades, envelopes, pitch modulation and amp modulation for creation of bank data (HD / BD). Sequence data (SQ) can be created by registering multiple standard MIDI files (SMF) and setting the playback sequence. An SQ can be easily recreated by modifying the SMF after creating the SQ.

Previewing is performed using the Debugging Station connected to a LAN and the sound previewer, or the DTL-H800 connected to a PCI bus slot. In addition to previewing HD / BD / SQ data, JAM can also use MIDI devices such as a real keyboard or a keyboard displayed in the JAM window for realtime playback.

AIFF2VAG

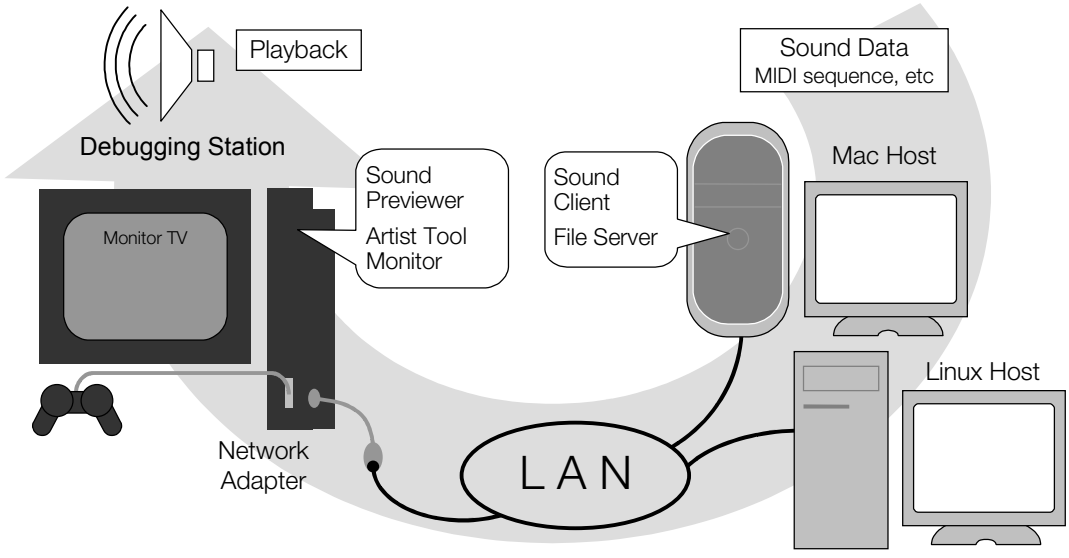
AIFF2VAG is a tool for converting sampled sound data to VAG format waveform data. Supported input data formats are the Audio Interchange File Format (AIFF), Windows WAV format, and 16-bit straight PCM data (headerless). Macintosh, Windows, and Linux versions are available although there are differences in functionality between the versions.

Sound Previewer

The sound previewer is a tool for sending HD / BD / SQ data or MIDI streams created in JAM to the Debugging Station via a LAN for playback. In addition to the Power Macintosh, Linux hosts can also use JAM.

MIDI stream playback is handled by realtime transfers from the MIDI sequencer via OMS. On a Linux host, stream transfers are performed in realtime from a MIDI device.

Figure 2: Operational overview of sound previewer



Other Common Tools

The following additional tools are provided on the Developer Support website.

PlayStation 2 HDD Utility

The PlayStation 2 HDD utility is a tool for supporting development of title applications that use the hard disk drive. The tool can create and verify the file / directory structure on a hard disk drive, and return a hard disk drive to its unformatted state. Both the DTL-T10000 and the DTL-H10000 are supported.

PlayStation 2 Master Disc Checker

The PlayStation 2 Master Disc Checker (MCHECK2.EXE) is a tool for checking that a master CD-R / DVD-R disk of a title application has been created correctly.

VU Command Line (VCL)

The VU Command Line (VCL) is a tool for optimizing the source code of VU microprograms. The VCL runs as a preprocessor for the DVP assembler. It can change the sequence of instructions and perform optimization by folding loops. Subsequently, the VCL will automatically generate prologue and epilogue code, generate code to perform register shunting, and change constants as necessary. The VCL also has a function to automatically assign registers so that programs can use variable names instead of register names.

Artist Tool Monitor

The Artist Tool Monitor is a software application that functions as a platform for the graphics previewer and the sound previewer.

Exception Library

The exception library (libexcep) is a library that provides message output and exception handler registration functions for debugging. It is only used for debugging and cannot be incorporated into title applications.

USB-Ethernet I/F Driver

The USB-Ethernet I/F driver an986.irx is provided for use during development of network applications. This driver is compatible with different types of commercial USB-Ethernet adapters and provides an Ethernet connection usng the INET protocol. Since the an986.irx is provided for use during development, it cannot be incorporated into title applications.

Reference Modem Driver

The reference modem driver rsaq.irx is provided as a reference for developing modem drivers for the INET protocol stack. This driver is compatible with the USB RS-232C of IO Data Corp. as well as USB-RSAQ / USB-RSAQ2 and can be used to verify the operation of a PPP connection using an analog modem. Since rsaq.irx is only provided for use as a comparative reference during development, it cannot be incorporated into title applications.

Developing Independent Tools

The following software and resources are provided for individuals who want to create their own development tools.

DECI2

DECI2 is a protocol group provided for performing general data transfers between a development computer and programs running on the EE / IOP. The DECI2 Manager and the various protocol drivers run on the EE / IOP and utilize the DECI2 protocol to perform communication with dsnetm that runs on an external processor (i.e. the communications processor internal to the DTL-T10000). Communication between dsnetm and a tool such as dsedb on the development computer is handled by TCP/IP sockets.

Artist Tool Monitor

Independent previewers can be developed for handling graphics or sound data in other formats. The "Artist Tool Monitor" is provided as a common platform for a previewer that runs on the Debugging Station. Sample code as well as technical material for the previewer is also provided.