About This Document

This manual describes how to write I/O driver routines for the WSIO interface on HP 9000 workstations (Series 700 and others) and servers (Series 800 and others). Except where noted, this manual is applicable to all workstations and servers using Release 11i v1. The manual is organized as follows:

Chapter 1, “Overview of the Driver Environment.” — The I/O subsystem’s structure and how drivers fit into this environment.

Chapter 2, “HP-UX I/O Subsystem Features.” — Features of the I/O subsystem, such as types of drivers, memory mapping, flow of I/O requests, data structures, and interrupt handling.

Chapter 3, “Multiprocessing.” — Covers the kernel services that handle synchronization used by drivers on multiprocessor systems.

Chapter 4, “Writing a Driver.” — A step-by-step strategy for writing drivers. It includes descriptions of routines used by device drivers, interface drivers and combined drivers.

Chapter 5, “Installing Your Driver.” — Installing the driver in the kernel and configuring it to communicate with the hardware.

Chapter 6, “Creating Networking Device Drivers.” — Designing and writing networking device drivers.

Chapter 7, “LAN Commands.” — Provides the user with the ability to scan and administer LAN interfaces on an HP-UX system.

Chapter 8, “Tracing and Logging in LAN Drivers.” — Aids in troubleshooting network problems.

Chapter 9, “SAM Support for LAN Drivers.” — HP-UX system administration tool, that provides both GUI and TUI based interface to configure system resources.

Chapter 10, “CKO and Transport IOCTLs.” — Explains the interaction between the HP-UX transport layers and the DLS providers to create a data transfer mechanism between the layers in a networking stack.


Chapter 12, “Writing a SCSI Interface Driver.” — Provides information on designing and developing SCSI transport drivers, also known as a Host Bus Adapter (HBA).

Chapter 13, “Writing SCSI Device Drivers.” — How to write SCSI bus device driver routines.

Chapter 14, “Writing PCI Device Drivers.” — How to write PCI bus driver routines.

Chapter 15, “On-Line Addition / Replacement.” — Driver requirements when adding or removing a PCI card with power on.

Chapter 16, “Writing a DLKM Driver.” — Adding a kernel module to a running UNIX system without rebooting the system or rebuilding the kernel.

Chapter 17, “How to Make Pre 11.0 Drivers 64-Bit Safe.” — How to modify a Release 10.20 32-bit driver to run in a Release 11.0 32-bit or 64-bit environment.

Chapter 18, “Interrupt Migration.” — How to use this mechanism for managing interrupt assignments.

Chapter 19, “Creating a Software Depot.” — Describes the Software Depot (SD) creation techniques.
Intended Audience

This document is intended for system administrators or developers responsible for porting or writing drivers. Developers are expected to have:

- Experience writing programs in the C language.
- Working knowledge of the basic concepts of writing a driver.
- An understanding of the functionality of the hardware for which the driver is being written.
- Read the HP-UX System Administration Tasks manual and performed system administration.
- Working knowledge of the virtual memory, I/O, and file system areas in the HP-UX and/or UNIX operating systems.

This document is not a tutorial.

Using this Manual

Reading this manual provides information on the tasks that need to be performed to write a new driver and port and existing driver. Various steps will differ depending on the task being performed.

**NOTE**

This book contains many examples of C programs to help design device drivers. Because of page width restrictions, some long lines of code exceed the space available and break in unintended places. Please treat these “broken” lines as one line. We recommend that you use the sample files included with this manual when possible, rather than retyping the examples.
Typographical Conventions

This document uses the following conventions.

*audit* (5)  An HP-UX manpage. In this example, *audit* is the name and 5 is the section in the *HP-UX Reference*. On the web and on the Instant Information CD, it may be a hot link to the manpage itself. From the HP-UX command line, you can enter “*man audit*” or “*man 5 audit*” to view the manpage. See *man* (1).

*Book Title*  The title of a book. On the web and on the Instant Information CD, it may be a hot link to the book itself.

*KeyCap*  The name of a keyboard key. Note that *Return* and *Enter* both refer to the same key.

*Emphasis*  Text that is emphasized.

**Bold**  Text that is strongly emphasized.

**Bold**  The defined use of an important word or phrase.

*ComputerOut*  Text displayed by the computer.

*UserInput*  Commands and other text that you type.

*Command*  A command name or qualified command phrase.

*Variable*  The name of a variable that you may replace in a command or function or information in a display that represents several possible values.

[ ]  The contents are optional in formats and command descriptions. If the contents are a list separated by |, you must choose one of the items.

{}  The contents are required in formats and command descriptions. If the contents are a list separated by |, you must choose one of the items.

...  The preceding element may be repeated an arbitrary number of times.

|  Separates items in a list of choices.

HP Encourages Comments

HP encourages your comments concerning this document. We are truly committed to providing documentation that meets your needs.

Please send comments to: netinfo_feedback@cup.hp.com

Please include document title, manufacturing part number, and any comment, error found, or suggestion for improvement you have concerning this document. Also, please include what we did right so we can incorporate it into other documents.

Email & Internet Resources

Interface program and developer resource materials are available at the following locations:

- **Hardware Provider Program** at http://www.hp.com/dspp/hphp
- **Interface Program E-mail** at interface@fc.hp.com
- **Developer Resource** at http://www.hp.com/dspp

Support/Compatibility Disclaimers

Since drivers function at the level of the kernel, Hewlett-Packard Company (HP) reminds you of the following:
Adding your own driver to HP-UX requires relinking the driver into HP-UX. With each new release you should plan on recompiling your driver in order to reinstall it into the new HP-UX kernel. Many header files do not change. However, drivers typically use some header files that could change across releases (i.e., you can have some system dependencies).

HP provides support services for HP products, including HP-UX. Products, including drivers, from non-HP parties receive no support, other than the support of those parts of a driver that rely on the documented behavior of supported HP products.

Should difficulties arise during the development and test phases of writing a driver, HP may provide assistance in isolating problems to determine if:

- HP hardware is not at fault; and
- HP software (firmware) is not at fault by removing user-written kernel drivers.

When HP hardware, software, and firmware are not at fault, you should seek help from the third party from whom you obtained software or hardware.
Reference Documentation

- **Hewlett-Packard Company**
  - Dealer Configuration File Creation Guide, HP Part No. D2230-90001
  - HP-UX Managing Systems and Workgroups, HP Part No. B2355-90664
  - HP-UX Reference, HP Part No. B2355-90052
  - HP-UX System Administration Tasks, HP Part No. B2355-90079
  - HP C Programmer’s Guide, HP Part No. 92434-90002
  - Configuring HP-UX for Peripherals, HP Part No. B2355-90053
  - Installing and Updating HP-UX, HP Part No. B2355-90078
  - PA-RISC 1.1 Architecture and Instruction Set Reference Manual, HP Part No. 09740-90039
  - PA-RISC Procedure Calling Conventions Reference Manual, HP Part No. 09740-90015
  - Managing HP-UX Software with SD-UX, HP Part No. B2355-90044

- **Other References**
  - PCI Local Bus Specification, Revision 2.1, PCI Special Interest Group
  - PCI System Design Guide, Revision 1.0, PCI Special Interest Group
  - Data Link Provider Interface Specifications, Unix International