Installation and Configuration Guide for Linux

I/O Libraries

Printing History

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Contents

1
Introduction

Welcome to the *I/O Libraries Installation and Configuration Guide for Linux*. This guide provides an overview of the I/O Libraries and explains how to install and configure the libraries on the RedHat Linux version 9 (Linux kernel 2.4.20-6 or 2.4.20-8) operating system. Also listed in this guide are other documentation which you can use to develop I/O applications and instrument drivers with the I/O Libraries. A summary of the contents of this guide follows:

■ **Chapter 1** provides an overview of the I/O Libraries.

■ **Chapter 2** - Installing and Configuring the I/O Libraries explains how to install and configure the libraries on Linux.

■ **Chapter 3** - Documentation for the I/O Libraries provides a list of the other manuals and online help you can follow either to use or develop I/O applications and instrument drivers with the libraries.

This guide also contains the following appendices:

■ **Appendix A**- Editing the hwconfig.cf File describes a manual process to configure SICL interfaces.
■ **Appendix B**- Removing Interface Cards explains how to remove an interface card from your system.
■ **Appendix C**- Removing I/O Libraries Software explains how to remove one or both of the libraries from your system, and how to remove the SICL LAN server capability.

■ **Index**.

Overview of the I/O Libraries

The I/O Libraries consist of the following libraries:

- **Standard Instrument Control Library (SICL)** is an I/O library developed by HP/Agilent that is portable across many I/O interfaces and systems.

- **Virtual Instrument Software Architecture (VISA)** is an I/O library designed according to the VXIplug&play System Alliance that allows software developed from different vendors to run on the same system.

  Use VISA if you wish to use VXIplug&play instrument drivers in your applications, or if you want the I/O applications or instrument drivers that you develop to be compliant with VXIplug&play standards.

Note   Since VISA and SICL are different libraries, you *cannot* use VISA functions and SICL functions in the same I/O applications.

The subsections that follow provide a more detailed description of these libraries.

SICL

SICL (Standard Instrument Control Library) is an I/O library (originally developed by Hewlett Packard/Agilent) that is portable across many I/O interfaces and systems. I/O applications written in C/C++; using this library can be ported at the source code level from one system to another without, or with very few, changes.

Support   SICL is supported on RedHat Linux version 9 with the following interfaces: GPIB/HP-IB, GPIO, RS-232, VXI, and LAN.

Users   SICL is intended for instrument I/O and C/C++ programmers who are familiar with the Linux operating system.

VISA

VISA (Virtual Instrument Software Architecture) is an I/O library that can be used to develop I/O applications and instrument drivers that comply with the VXIplug&play standards. Applications and instrument drivers developed with VISA can execute on VXIplug&play system frameworks that have the VISA I/O layer. Therefore, software from different vendors can be used together on the same system.

Support   VISA is supported on RedHat Linux 9 with the following interfaces: GPIB, VXI, Serial, and LAN. Note that LAN support within VISA occurs via an address translation such that a GPIB interface can be accessed remotely over a computer network.

Users   VISA has two specific users. The first user is the instrumentation end user who wants to use VXIplug&play instrument driver in his or her applications. The second user is the instrument driver or I/O application developer who wants to be compliant with VXIplug&play standards.

Software development using VISA is intended for instrument I/O and C/C++ programmers whoare familiar with the Linux operating system.

Where to Go Next

Now that you have a better understanding of the SICL and VISA libraries, you are ready to install the I/O Libraries. Please go on to the next chapter, "Installing and Configuring the I/O Libraries."

2
Installing and Configuring the I/O Libraries

This chapter explains how to install and configure the I/O Libraries, including VISA and SICL, on your Linux system. The main sections of this chapter are:

- Preparing to Install the I/O Libraries

- Installing the I/O Libraries

- Configuring the I/O Libraries

Preparing to Install the I/O Libraries

■ Product package

■ Hardware requirements

■ Software requirements

Verifying the Product Package

Ensure you have received the following with your I/O Libraries purchase:

■ I/O Libraries installation software, which is supplied on one CD-ROM

■ SICL manual set (on the same CD-ROM as the installation software),
  including:

  ❑ *I/O Libraries Installation and Configuration Guide for Linux*

  ❑ *SICL User's Guide*

■ VISA manual set (on the same CD-ROM as the installation software),
  including:

  ❑ *VISA User's Guide*

Verifying the Hardware Requirements

You need to have one of the following computers to use the I/O Libraries:

■ An Intel (or x86) clone that supports RedHat Linux 9

SICL supports the following I/O interfaces on RedHat Linux 9:

■ RS-232
■ LAN
■ TAMS 80100B PCI-VXI Controller
■ Interfaces with their own drivers (TAMS 80488 HP-IB, TAMS 81622 GPIO)

Contact your local sales office for a complete (or updated) list of interfaces supported by the I/O Libraries.

Verifying the Software Requirements

The I/O Libraries for Linux have the following software requirements:

- RedHat Linux 9with the stock kernel (versions 2.4.20-6 or 2.4.20-8 uniprocessor kernel - the SMP kernel is not currently supported).

- You will need at least 9MB of free disk space in /opt/.

- Supported compilers for SICL and VISA:

  - ❏ gcc
  - ❏ g++

Installing the I/O Libraries

This section explains how to install the I/O Libraries on your Linux system. This installation uses the RedHat Package Manager (RPM) tools and should take under 10 minutes to complete. Verify that your system meets all the hardware and software requirements, as described in the previous two sections, before continuing with this installation.

The RPM installation program (**rpm**) allows you to install **.rpm** files/ packages on your Linux system. If you are not familiar with the RPM tool, see the **rpm** man page for additional instructions.

To install the I/O Libraries, do the following.

1. Become the **root** user on the server for a diskless cluster or on a stand-alone system.

2. Insert your I/O Libraries CD-ROM and, if your system does not automount the CD-ROM, mount it. See the **mount (1m)** man page for information on the **mount** command.

   /bin/mount /dev/cdrom /mnt/cdrom

   where **/dev/cdrom** is the CD-ROM drive and **/mnt/cdrom** is the mount-point.

3. Change to the directory where the **.rpm** is.

   cd /mnt/cdrom/iolibs

4. Use RPM to install the package. Arichitecture-specific versions of the software have been provided for systems running the i586, i686, and Athlon kernels; the whichrpm.sh program returns the name of the correct RPM for your system. (Note the use of backquotes (') rather than single quotes (').)

   /bin/rpm -Uvh `./whichrpm.sh`

5. Once the installation is complete, unmount the CD.

```
cd /
/bin/umount /mnt/cdrom
```

6. Once the CD is unmounted, you may remove the media from the drive
   and store it in a safe place.

Note
You can run the **rpm** command to ensure that the I/O Libraries filesets were
installed on your system. See the **rpm** man page for information on running
this command. The following is an example of verifying the I/O Libraries
package:

```
rpm -V T82091
```

If the package is installed, it will list the files in the package. If the package
is not installed, it will tell you.

Where to Go Next

Once you have completed installing the I/O Libraries on Linux, continue
with the next section, "Configuring the I/O Libraries."

Configuring the I/O Libraries

Before you can begin programming with SICL or VISA, you need to configure each of your systems to operate with an I/O interface or interfaces. This configuration involves either running **/opt/sicl/bin/iosetup** (recommended) or manually editing the **hwconfig.cf** file. See Appendix A,"Editing the **hwconfig.cf** File," and the documentation that came with your interface cards for details on editing this file.

Where to Go Next

Once you have completed all the I/O Libraries installation and configuration procedures, continue with the next chapter, "Documentation for the I/O Libraries."

3
Documentation for the I/O Libraries

After you have followed the instructions in Chapter 2 of this guide to install and configure the I/O Libraries, you can begin to use SICL or VISA.

This chapter lists the manuals and online help you should follow next to use SICL or VISA.

SICL Documentation

To use SICL, you should now go on to Chapter 1, "Introduction," of the
SICL User's Guide.

The following documentation is also helpful when using SICL:

- *SICL Language Reference* in the *SICL User's Guide* provides the
  function syntax and description of each SICL function.

- *SICL Online Help* is provided in the form of Unix man pages.

- *SICL Example Programs* are provided in /opt/sicl/share/
  examples/ to help you develop SICL applications more easily.

The following VXIbus Consortium specifications may also be helpful when
using SICLover LAN:

- *TCP/IP Instrument Protocol Specification* - VXI-11

- *TCP/IP-VXIbus Interface Specification* - VXI-11.1

- *TCP/IP-IEEE 488.1 Interface Specification* - VXI-11.2

- *TCP/IP-IEEE 488.2 Instrument Interface Specification* - VXI-11.3

VISA Documentation

To use VISA, you should now go on to Chapter 1, "Introduction," of the *VISA User's Guide*.

The following documentation is also helpful when using VISA:

■ *VISA Language Reference* in the *VISAUser's Guide* provides the function syntax and description of each VISA function.

■ *VISA Online Help* is provided in the form of Unix man pages.

The following documents may also be helpful when using VISA:

■ VXIplug&play System Alliance *VISA Library Specification 4.3*

■ *IEEE Standard Codes, Formats, Protocols, and Common Commands* - ANSI/IEEE Standard 488.2-1992

The following VXIbus Consortium specifications may also be helpful when using VISA over LAN:

■ *TCP/IP Instrument Protocol Specification* - VXI-11

■ *TCP/IP-VXIbus Interface Specification* - VXI-11.1

■ *TCP/IP-IEEE 488.1 Interface Specification* - VXI-11.2

■ *TCP/IP-IEEE 488.2 Instrument Interface Specification* - VXI-11.3

Documentation for the I/O Libraries
VISA Documentation

A
Editing the `hwconfig.cf` File

This appendix explains how to manually edit the `hwconfig.cf` file. The `hwconfig.cf` file contains the configuration details for SICL interfaces.

The Procedure

This SICL configuration procedure involves editing the **hwconfig.cf** file to specify your SICL I/O interfaces. You may need to reboot your system or reload driver modules for third-party TULIP drivers. See the documentation that came with your interface card for specifics.

Note

The following procedure must be performed on each node of a diskless cluster that will be using SICL. You only need to configure the server of a diskless cluster if you plan to run applications on the server.

1. Login as **root** on the system to be configured.

2. Edit the /etc/opt/sicl/hwconfig.cf file. If you are executing on a diskless cluster, note that the /etc/opt/sicl directory must be NFS diskless client private, and all files in it will be client-specific.

   You need to have one entry for each I/O interface in the system. The default **hwconfig.cf** file should contain entries (which are commented out) for the I/O interfaces already installed in your system. Therefore, un-comment and edit the entries that you want to use in your system.

Note

You must ensure that each address and interrupt line (IRQ) is unique and does not conflict with an address or IRQ line used by any other interface.

The Hardware Configuration File

Each entry in the hwconfig.cf file corresponds to an interface that will be used for instrument I/O. There is only one line for each interface in the system..

The format of each line is as follows:

lu sym_name interface_name location [*interface specific values*]

Where:

lu

Logical unit number of the interface ($0 < lu < 10000$). Each interface must have a unique logical unit number. The actual value used is not important, but you must remember this number, or the *sym_name*, in order to address the interface properly in your application.

sym_name

A symbolic name for your interface. Each interface must have a unique symbolic name. This name may be used instead of the logical unit number to address an interface. The default symbolic name for your first GPIB/HP-IB card should be **hpib**. Possible values for additional GPIB/HP-IB cards include (but are not limited to) **hpib2**, **xhpib**, etc.

interface_name

The specific name of the interface. This is used to determine which driver to use.

location

The location of the interface. This is going to vary from interface to interface. See the documentation for the interface you are configuring for exact meaning of this field.

The values specified as numbers may be represented in either hexadecimal (using 0x...), octal (using 0...), binary (using 0b...), or decimal (default).

See the documentation that came with your interface or in the comments in the `hwconfig.cf` file for the specific meanings of the fields for your driver.

RS-232 Hardware Configuration

lu sym_name **lx232** *location irq baud parity cbits sbits flow SRQ*

Where:

location

> Corresponds to which port is being used: 0 for
> `/dev/sicl/serial0`, 1 for `/dev/sicl/serial1`, etc.

irq

> This is currently ignored. 0 is the recommended value.

baud

> Baud rate. Can be 50, 75, 110, 134, 150, 200, 300, 600, 1200, 1800,
> 2400, 4800, 9600, 19200, 38400, or 57600.

parity

> Parity bit. Can be: 0x00 for NONE, 0x08 for ODD, or 0x18 for EVEN.
> ZERO (SPACE) and ONE (MARK) are not currently supported.

cbits

> Bit per character (width). Use 0x02 for 7, or 0x03 for 8.

sbits

> Number of stop bits. Use 0x00 for 1, or 0x04 for 2.

flow

> Flow. Can be: 0x00 for NONE, 0x01 for XON_XOFF, or 0x02 for
> RTS/CTS. DTR/DSR is not currently supported.

SRQ

> Service Request. Use 0x00 for RI, or 0x01 for DSR. SRQs are not
> currently supported, so this has no effect.

Default RS-232 Interface:

9 COM1 Ix232 0 0 9600 0x00 0x03 0x00 0x00 0x00

The following can be used for COM2:

10 COM2 Ix232 1 0 9600 0x00 0x03 0x00 0x00 0x00

Note	`/dev/sicl/serial0-serial1` are links to `/dev/sicl/ttyS0-ttyS1`. If you have additional serial ports, you can create additional links to those serial ports device files as `/dev/sicl/serial2-serial16`. Depending on the features supported by the additional serial ports, some functionality may be absent.

Note	An RS-232 port which is configured for use by SICL should not be used with non-SICL functions, and vice versa.

LAN Client Hardware Configuration

lu sym_name **ilan 0 0** *server_timeout client_timeout_delta
chain_sigpipe log_errors*

Where:

server_timeout

> Timeout value (in seconds) used by the LAN server when applications
> either use the default timeout value, or set the timeout to 0 (infinity).

client_timeout_delta

> Value (in seconds) added to the server timeout value to determine the
> LAN client timeout value.

chain_sigpipe

> If a non-zero value is specified, the library will call a previously
> installed SIGPIPE handler, if one existed.

log_errors

> If a non-zero value is specified, the library will log errors.

Note

The previous timeout values are only used by the LAN software if the
application has *not* called **ilantimeout** to manually set the LAN client
timeout value. See the *SICL User's Guide* for more information about
these timeout values.

Default LAN Client Interface:

30 lan ilan 0 0 120 25 1 1

TAMS 80100B PCI-VXI Controller

lu symname t80100 *pci_slot vladder vslot vint vmeonly maxsvt shmem bto dipsw movwin*

Where:

pci_slot

> PCI device number. This value can be found by running
> `/opt/sicl/bin/t80100`.

vladdr

> VXI logical address. 0 is the required address of the VXI system
> controller.

vslot

> VXI slot number. The VXI slot number of the VXI controller card.

vint

> VXI interrupt. Internal VME interrupt for use by the 80100 controller. 7
> is suggested but this value can be changed to avoid conflict. It is
> suggested that this interrupt be dedicated for use by the 80100.

vmeonly

> VME only interrupts. No VXI processing will happen for these
> interrupts. This value can be entered as a 7 bit binary number of the form
> 0bxxxxxxx where the most significant bit is VME interrupt 7 and the
> least significant bit is VME interrupt 1.

maxsvt

> Maximum servant address. The largest address of the servant range for
> this interface. Normally 255.

shmem

> Shared Memory Enable. The following values control the availability of
> the 2MB of on card shared memory: 0 for no shared memory, 1 for
> memory mapped to A24, and 2 for memory mapped to A32.

bto

VME BTO. The following values set the VME bus timeout value: 0, 5, or 256 for a 256 microsecond BTO (the default), 1 or 16 for a 16 microsecond BTO, 2 or 32 for a 32 microsecond BTO, 3 or 64 for a 64 microsecond BTO, 4 or 128 for a 128 microsecond BTO, and 6 or 512 for a 512 microsecond BTO.

dipsw

DIP switch setting. External DIP switch setting for distinguishing multiple cards in a single system. Normally this is 0.

movwin

The number of movable windows in A32 space. Valid values are 1 through 6. The default is 4.

Editing the hwconfig.cf File
The Hardware Configuration File

B
Removing Interface Cards

This appendix describes how to remove an interface card from your system, or to have the I/O Libraries ignore the interface card.

To remove one or more interface cards from your system, do the following:

1. Login as **root** on the system.

2. Run /opt/sicl/bin/iosetup (recommended) or manually edit **hwconfig.cf**. Comment out or delete the entries/lines corresponding to the interface cards you are removing.

Removing Interface Cards

C
Removing I/O Libraries Software

This appendix describes the process to remove the I/O Libraries from a system. It also explains how to remove the SICL LAN server capability from a computer node.

Removing the I/O Libraries Software

This procedure describes how to remove the I/O Libraries from your Linux system using **rpm**. You should not remove the I/O Libraries from your system until you have removed any third party TULIP drivers that rely upon this package.

Become the **root** user on the server for a diskless cluster, or on a stand-alone system.

1. Remove the package using **rpm**.

   rpm -e T82091

Removing SICL LAN server capability

To remove the SICL LAN server capability from your system

1. Log in as root.

2. Stop the SICL LAN daemon.

   ```
   /etc/init.d/siclland stop
   ```

3. Remove the initd scripts.

   ```
   rm /etc/init.d/siclland
   rm /etc/rc.d/rc?.d/*siclland
   ```

Index