

OpenSS7 NETPERF Utility Installation and Reference Manual

Version 2.3 Edition 7
Updated 2008-10-31
Package netperf-2.3.7

Brian Bidulock <bidulock@openss7.org> for
The OpenSS7 Project <<http://www.openss7.org/>>

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Preface

Notice

This version of `netperf` is a version modified by [The OpenSS7 Project](#) to support network performance testing and benchmarking of the OpenSS7 Linux Kernel Native and STREAMS implementations of Stream Control Transmission Protocol (SCTP) as described in RFC 2960. To support testing of the emerging SCTP protocol, specific stream, request/response and connect/close tests were added to test the SCTP protocol in a fashion similar to Transmission Control Protocol (TCP). The objective of retaining as much compatibility as possible to the TCP tests was to provide a basis for comparison between TCP and SCTP implementations on the Linux and HP-UX operating systems.

In addition, XTI tests have been enhanced and are used to test the OpenSS7 STREAMS XTI INET implementation, See [Section “Top” in *OpenSS7 STREAMS INET Driver*](#). The OpenSS7 STREAMS INET implementation is an implementation XTI STREAMS over Sockets for the Linux operating system. Tests in the XTI API test group compared against equivalent tests in the Sockets API test group provide an indication of the overheads introduced by running XTI over Sockets. The OpenSS7 STREAMS INET driver also provides XTI over Sockets for the Linux Native SCTP implementation and comparisons between the XTI over Sockets and pure STREAMS approaches to SCTP can be made.

Abstract

This manual provides a *Installation and Reference Manual* for *OpenSS7 NETPERF Utility*.

Objective

The objective of this manual is to provide a guide for the *STREAMS* programmer when developing *STREAMS* modules, drivers and application programs for *OpenSS7 NETPERF Utility*.

This guide provides information to developers on the use of the *STREAMS* mechanism at user and kernel levels.

STREAMS was incorporated in UNIX System V Release 3 to augment the character input/output (I/O) mechanism and to support development of communication services.

STREAMS provides developers with integral functions, a set of utility routines, and facilities that expedite software design and implementation.

Intent

The intent of this manual is to act as an introductory guide to the *STREAMS* programmer. It is intended to be read alone and is not intended to replace or supplement the *OpenSS7 NETPERF Utility* manual pages. For a reference for writing code, the manual pages (see [STREAMS\(9\)](#)) provide a better reference to the programmer. Although this describes the features of the *OpenSS7 NETPERF Utility* package, [OpenSS7 Corporation](#) is under no obligation to provide any software, system or feature listed herein.

Audience

This manual is intended for a highly technical audience. The reader should already be familiar with *Linux* kernel programming, the *Linux* file system, character devices, driver input and output, interrupts, software interrupt handling, scheduling, process contexts, multiprocessor locks, etc.

The guide is intended for network and systems programmers, who use the *STREAMS* mechanism at user and kernel levels for *Linux* and *UNIX* system communication services.

Readers of the guide are expected to possess prior knowledge of the *Linux* and *UNIX* system, programming, networking, and data communication.

Revisions

Take care that you are working with a current version of this manual: you will not be notified of updates. To ensure that you are working with a current version, contact the [Author](#), or check [The OpenSS7 Project](#) website for a current version.

A current version of this manual is normally distributed with the *OpenSS7 NETPERF Utility* package, `netperf-2.3.7`.¹

Version Control

```
netperf.texi,v
Revision 0.9.2.19  2008-09-20 11:04:24  brian
- added package patchlevel

Revision 0.9.2.18  2008-08-03 06:03:27  brian
- protected agains texinfo commands in log entries

Revision 0.9.2.17  2008-04-25 11:50:43  brian
- updates to AGPLv3

Revision 0.9.2.16  2007/08/12 06:43:48  brian
- updated licenses in manuals

Revision 0.9.2.15  2007/02/28 06:30:21  brian
- updates and corrections, #ifdef instead of #if

Revision 0.9.2.14  2006/09/18 01:06:18  brian
- updated manuals and release texi docs

Revision 0.9.2.13  2006/08/28 10:46:52  brian
- correction

Revision 0.9.2.12  2006/08/28 10:32:43  brian
- updated references

Revision 0.9.2.11  2006/08/27 12:26:32  brian
- finalizing auto release files

Revision 0.9.2.10  2006/08/26 18:31:36  brian
- handle long urls

Revision 0.9.2.9   2006/08/26 09:16:18  brian
```

¹ <http://www.openss7.org/tarballs/netperf-2.3.7.tar.bz2>

```
- better release file generation

Revision 0.9.2.8 2006/08/23 11:00:25 brian
- added preface, corrections and updates for release

Revision 0.9.2.6 2006-03-22 03:01:58 -0700 brian
- added makefile target index

Revision 0.9.2.5 2006-03-03 04:56:43 -0700 brian
- 64-bit compatibility

Revision 0.9.2.4 2005-07-08 07:15:37 -0600 brian
- updates to documentation

Revision 0.9.2.3 2005-07-01 01:29:37 -0600 brian
- updates for LE2005 build

Revision 0.9.2.2 2005-06-24 07:38:58 -0600 brian
- added troubleshooting section to manuals

Revision 0.9.2.1 2005-05-30 02:44:01 -0600 brian
- moved documentation for RHEL4 build

Revision 0.9 2005-05-30 02:44:01 -0600 brian
file netperf.texti was initially added on branch HP.
```

ISO 9000 Compliance

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As with most open source projects, this project would not have been possible without the valiant efforts and productive software of the *Free Software Foundation* and the *Linux Kernel Community*.

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- France Telecom
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- SysMaster Corporation
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- Vodare Ltd.
- Excel Telecommunications

Contributors

The primary contributor to the *OpenSS7 OpenSS7 NETPERF Utility* package is **Brian F. G. Bidulock**. The following is a list of significant contributors to *The OpenSS7 Project*:

- Per Berquist
- John Boyd
- Chuck Winters

- Peter Courtney
- Tom Chandler
- Gurol Ackman
- Kutluk Testicioglu
- John Wenker
- Others

Authors

The authors of the *OpenSS7 OpenSS7 NETPERF Utility* package include:

- [Brian Bidulock](#)

See [\[Index of Authors\]](#), page 156, for a complete listing and cross-index of authors to sections of this manual.

Maintainer

The maintainer of the *OpenSS7 OpenSS7 NETPERF Utility* package is:

- [Brian Bidulock](#)

Please send bug reports to bugs@openss7.org using the ‘`send-pr`’ script included in the package, only after reading the ‘BUGS’ file in the release, or See [Section 8.2 \[Problem Reports\]](#), page 103.

Web Resources

The [OpenSS7 Project](#) provides a website dedicated to the software packages released by the [OpenSS7 Project](#).

Bug Reports

Please send bug reports to bugs@openss7.org using the ‘`send-pr`’ script included in the *OpenSS7 NETPERF Utility* package, only after reading the ‘BUGS’ file in the release, or See [Section 8.2 \[Problem Reports\]](#), page 103. You can access the [OpenSS7 GNATS database](#) directly via the web, however, the preferred method for sending new bug reports is via mail with the ‘`send-pr`’ script.

Mailing Lists

The [OpenSS7 Project](#) provides a number of general discussion [Mailing Lists](#) for discussion concerning the *OpenSS7 OpenSS7 NETPERF Utility* package as well as other packages released by [The OpenSS7 Project](#).

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The mailing lists are as follows:

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The mailing list is blocked from messages of greater than 40k. If you have attachments (patches, test programs, etc.) and you mail them to the list, it will bounce to the list administrator. If you are interested in making your patches, test programs, test results or other large attachments available to the members of the mailing list, state in the message that you would like them posted and the list administrator will place them in the mail archives.

Quick Start Guide

OpenSS7 NETPERF Utility

Package netperf-2.3.7 was released under AGPLv3 2008-10-31.

Netperf is a general purpose tool for benchmarking bandwidth and performance of the *Internet Protocol* suite. The *OpenSS7 Modified OpenSS7 NETPERF Utility* package is an **OpenSS7 Project** release of the of the *Hewlett-Packard* ‘netperf’ package configured to run with *OpenSS7 STREAMS SCTP (Stream Control Transmission Protocol)* and the *OpenSS7 STREAMS XNS, XTI/TLI* and *INET* packages.

The *OpenSS7 NETPERF Utility* package provide primarily the **netperf(1)** and **netserver(8)**, C Language programs that act as *Netperf* client or server for testing connections and networking. The **netserver(8)** program is executed on one host acting as a server, and then **netperf(1)** is executed on another host acting in client mode. Characteristics of the connection or association can be altered when formed. Reporting formats and sample intervals can also be altered when the connection or association is formed. Users executing **netperf(1)** do not need to have shell access to the **netserver(8)** host.

This is a fork of the *Netperf* package released by *Hewlett-Packard* modified by the **OpenSS7 Project** for use with *OpenSS7 STREAMS XNS, XTI/TLI, INET* and *SCTP* packages. This *OpenSS7* release of the package is based on the ‘Netperf-2.3’ release from *Hewlett-Packard*.

Modifications to the package are derived from the *OpenSS7 STREAMS XNS, XTI/TLI, INET* and *SCTP* implementations and are released under the *GNU Affero General Public License (AGPL) Version 3*. The *Netperf* tool itself is licensed under specific terms by *Hewlett-Packard*. Please see file ‘LICENSES’ for the *Hewlett-Packard Netperf* copyright notices and licensing restrictions. The *Netperf* tool is

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See the *Hewlett-Packard* License in the ‘LICENSES’ file for complete details.

Please note that this modified version of the *Netperf* package is not endorsed by *Hewlett-Packard* in any way and that neither the original copyright holders nor *OpenSS7 Corporation* will take any responsibility in it.

This distribution is only currently applicable to *Linux* 2.4 and 2.6 kernels and was targeted at *ix86, x86_64, ppc* and *ppc64* architectures, but should build and install for other architectures as well.

Release

This is the netperf-2.3.7 package, released 2008-10-31. This ‘2.3.7’ release, and the latest version, can be obtained from the **download area** of **The OpenSS7 Project** website using a command such as:

```
$> wget http://www.openss7.org/tarballs/netperf-2.3.7.tar.bz2
```

The release is available as an **autoconf(1)** tarball, ‘src.rpm’ or ‘dsc’, as a set of binary ‘rpm’s or ‘deb’s, or as a **yum(8)** or **apt(8)** repository. See the **download page** for the

`autoconf(1)` tarballs, `src.rpm`'s, `dsc`'s, or repository access instructions. See the [netperf package page](#) for tarballs, source and binary packages.

Please see the `'NEWS'` file for release notes and history of user visible changes for the current version, and the `'ChangeLog'` file for a more detailed history of implementation changes. The `'TODO'` file lists features not yet implemented and other outstanding items.

Please see the `'INSTALL'`, `'INSTALL-netperf'` and `'README-make'`, files (or see [Chapter 7 \[Installation\]](#), page 53) for installation instructions.

When working from `cvs(1)` or `git(1)`, please see the `'README-cvs'`, file (or see [Section 7.2.8 \[Downloading from CVS\]](#), page 62). An abbreviated installation procedure that works for most applications appears below.

This release of the package is published strictly under Version 3 of the *GNU Affero Public License* which can be found in the file `'COPYING'`. Package specific licensing terms (if any) can be found in the file `'LICENSES'`. Please respect these licensing arrangements. If you are interested in different licensing terms, please contact the copyright holder, or [OpenSS7 Corporation <sales@openss7.com>](#).

See `'README-alpha'` (if it exists) for alpha release information.

Prerequisites

The quickest and easiest way to ensure that all prerequisites are met is to download and install this package from within the *OpenSS7 Master Package*, `openss7-0.9.2.G`, instead of separately.

Prerequisites for the OpenSS7 NETPERF Utility package are as follows:

1. *Linux* distribution, somewhat *Linux Standards Base* compliant, with a 2.4 or 2.6 kernel and the appropriate tool chain for compiling out-of-tree kernel modules. Most recent *Linux* distributions are usable out of the box, but some development packages must be installed. For more information, see [Section 6.2 \[Compatibility\]](#), page 40.
 - A fairly LSB compliant GNU/Linux distribution.¹
 - Linux 2.4 kernel (2.4.10 - 2.4.27), or
 - Linux 2.6 kernel (2.6.3 - 2.6.26);
 - glibc2 or better.
 - GNU groff (for man pages).²
 - GNU texinfo (for info files).

(Note: If you acquired `netperf` a part of the *OpenSS7 Master Package*, then the dependencies listed below will already have been met by unpacking the master package.)

2. *OpenSS7 Linux Fast-STREAMS*, `streams-0.9.2.4`.³
3. *OpenSS7 STREAMS Compatibility Modules*, `strcompat-0.9.2.7`.
4. *OpenSS7 STREAMS XNS*, `strxns-0.9.2.7`.
5. *OpenSS7 STREAMS XTI/TLI*, `strxnet-0.9.2.12`.
6. *OpenSS7 STREAM Network Services Library*, `strnsl-0.9.2.4`. (Optional.)

¹ See [Section 6.2.1 \[GNU/Linux Distributions\]](#), page 40, for more information.

² If you are using a Debian release, please make sure to install the groff extension package (`'groff_ext'`), as it contains the `refer` or `grefer` commands necessary for including references in the manual pages.

³ Although, at one time, this package supported *LiS*, *LiS* is now deprecated and unsupported.

7. *OpenSS7 STREAMS INET*, [strinet-0.9.2.7](#).
8. *OpenSS7 STREAMS SCTP*, [strsctp-0.9.2.9](#).
9. *OpenSS7 STREAMS Channels*, [strchan-0.9.2.4](#).
10. *OpenSS7 STREAMS X.25*, [strx25-0.9.2.1](#).
11. *OpenSS7 STREAMS ISO*, [striso-0.9.2.4](#).
12. *OpenSS7 STREAMS ISDN*, [strisdn-0.9.2.4](#).
13. *OpenSS7 STREAMS SS7*, [strss7-0.9a.8](#).
14. *OpenSS7 STREAMS SIGTRAN*, [sigtran-0.9.2.4](#).
15. *OpenSS7 STREAMS VoIP*, [strvoip-0.9.2.4](#).

When configuring and building multiple *OpenSS7 Project* release packages, place all of the source packages (unpacked tarballs) at the same directory level and all build directories at the same directory level (e.g. all source packages under `‘/usr/src’`).

When installing packages that install as kernel modules, it is necessary to have the correct kernel development package installed. For the following distributions, use the following commands:

```
Ubuntu:  $> apt-get install linux-headers
Debian:  $> apt-get install kernel-headers
Fedora:  $> yum install kernel-devel
```

You also need the same version of `gcc(1)` compiler with which the kernel was built. If it is not the default, add `‘CC=kgcc’` on the line after `‘./configure’`, for example:

```
$> ../netperf-2.3.7/configure CC='gcc-3.4'
```

Installation

The following commands will download, configure, build, check, install, validate, uninstall and remove the package:

```
$> wget http://www.openss7.org/tarballs/netperf-2.3.7.tar.bz2
$> tar -xjvf netperf-2.3.7.tar.bz2
$> mkdir build
$> pushd build
$> ../netperf-2.3.7/configure --enable-autotest
$> make
$> make check
$> sudo make install
$> sudo make installcheck
$> sudo make uninstall
$> popd
$> sudo rm -rf build
$> rm -rf netperf-2.3.7
$> rm -f netperf-2.3.7.tar.bz2
```

If you have problems, try building with the logging targets instead. If the make of a logging target fails, an automatic problem report will be generated that can be mailed to [The OpenSS7 Project](#).⁴ Installation steps using the logging targets proceed as follows:

⁴ Please see [Section 8.2 \[Problem Reports\]](#), page 103, or the file `‘PROBLEMS’` in the release directory for more information on filing a proper *Problem Report*.

```

$> wget http://www.openss7.org/tarballs/netperf-2.3.7.tar.bz2
$> tar -xjvf netperf-2.3.7.tar.bz2
$> mkdir build
$> pushd build
$> ../netperf-2.3.7/configure --enable-autotest
$> make compile.log
$> make check.log
$> sudo make install.log
$> sudo make installcheck.log
$> sudo make uninstall.log
$> popd
$> sudo rm -rf build
$> rm -rf netperf-2.3.7
$> rm -f netperf-2.3.7.tar.bz2

```

See `'README-make'` for additional specialized make targets.

For custom applications, see the `'INSTALL'` and `'INSTALL-netperf'` files or the see [Chapter 7 \[Installation\]](#), page 53, as listed below. If you encounter troubles, see [Chapter 8 \[Troubleshooting\]](#), page 99, before issuing a bug report.

Brief Installation Instructions

The OpenSS7 NETPERF Utility package is available from the [downloads area of The OpenSS7 Project website](#) using a command such as:

```
$> wget http://www.openss7.org/tarballs/netperf-2.3.7.tar.bz2
```

Unpack the tarball using a command such as:

```
$> tar -xjvf netperf-2.3.7.tar.bz2
```

The tarball will unpack into the relative subdirectory named after the package name: `netperf-2.3.7`.

The package builds using the GNU `autoconf` utilities and the `'configure'` script. To build the package, we recommend using a separate `'build'` directory as follows:

```

$> mkdir build
$> cd build
$> ../netperf-2.3.7/configure

```

In general, the package configures and builds without adding any special options to the `'configure'` script. For general options to the `'configure'` script, see the GNU `'INSTALL'` file in the distribution:

```
$> less ../netperf-2.3.7/INSTALL
```

For specific options to the `'configure'` script, see the `'INSTALL-netperf'` file in the distribution, or simply execute the configure script with the `'--help'` option like so:

```
$> ../netperf-2.3.7/configure --help
```

After configuring the package, the package can be compiled simply by issuing the `'make'` command:

```
$> make
```

Some specialized makefile targets exists, see the `'README-make'` file in the distribution or simply invoke the `'help'` target like so:

```
$> make help | less
```

After successfully building the package, the package can be checked by invoking the ‘check’ make target like so:

```
$> make check
```

After successfully checking the package, the package can be installed by invoking the ‘install’ make target (as root) like so:

```
$> sudo make install
```

The test suites that ship with the package can be invoked after the package has been installed by invoking the ‘installcheck’ target. This target can either be invoked as root, or as a normal user, like so:

```
$> make installcheck
```

(Note: you must add the ‘--enable-autotest’ flag to ‘configure’, above for the test suites to be invoked with ‘make installcheck’.)

The package can be cleanly removed by invoking the ‘uninstall’ target (as root):

```
$> sudo make uninstall
```

Then the build directory and tarball can be simply removed:

```
$> cd ..  
$> rm -rf build  
$> rm -rf netperf-2.3.7  
$> rm -f netperf-2.3.7.tar.bz2
```

Detailed Installation Instructions

More detailed installation instructions can be found in the [Chapter 7 \[Installation\]](#), page 53, contained in the distribution in ‘text’, ‘info’, ‘html’ and ‘pdf’ formats:

```
$> cd ../netperf-2.3.7  
$> less doc/manual/netperf.txt  
$> lynx doc/manual/netperf.html  
$> info doc/manual/netperf.info  
$> xpdf doc/manual/netperf.pdf
```

The ‘text’ version of the manual is always available in the ‘**MANUAL**’ file in the release.

The current manual is also always available online from *The OpenSS7 Project* website at:

```
$> lynx http://www.openss7.org/netperf\_manual.html
```


1 Introduction

This manual documents the design, implementation, installation, operation and future development schedule of the *OpenSS7 NETPERF Utility* package.

1.1 Overview

This manual documents the design, implementation, installation, operation and future development of the *OpenSS7 NETPERF Utility* package.

Netperf is a benchmark that can be used to measure various aspects of networking performance. Its primary focus is on bulk data transfer and request/response performance using SCTP, TCP or UDP, the X/Open XTI/TLI XNS 5.2 interface and the Berkeley Sockets interface. There are optional tests available to measure the performance of DLPI, Unix Domain sockets and STREAMS, the Fore ATM API and the HP HiPPI LLA interface.

This tool is maintained and informally supported by the IND Networking Performance Team. It is **NOT** supported via any of the normal Hewlett-Packard support channels. You are free to make enhancements and modifications to this tool.

1.2 Organization of this Manual

This manual is organized (loosely) into several sections as follows:

Chapter 1 [Introduction], page 15.	This introduction
Chapter 2 [Objective], page 17.	Objective of the package
Chapter 3 [Reference], page 19.	Contents of the package
Chapter 4 [Tests], page 23.	Tests included in the package
Chapter 5 [Conformance], page 37.	Conformance of the package
Chapter 6 [Releases], page 39.	Releases of the package
Chapter 7 [Installation], page 53.	Installation of the package
Chapter 8 [Troubleshooting], page 99.	Troubleshooting of the package

We thank you in advance for your comments, and hope that you find this tool useful.

The maintainers of netperf.

"How fast is it? It's so fast, that ..." ;-)

1.3 Conventions and Definitions

This manual uses *texinfo* typographic conventions.

You may not be familiar with some of the conventions and definitions used by this manual. Generally, items of particular importance, command line options, and commands will be in **boldface** type. Filenames and command line items requiring user substitution will appear in *italicized* type.

A *sizespec* is a one or two item list passed with a command line option that can set the value of one or two netperf parameters. If you wish to set both parameters to separate values, items should be separated by a comma, for example: "**parm1**, **parm2**". If you wish to set the first parameter without altering the value of the second, you should follow the first item with a comma, for example: "**parm1**,". Likewise, precede the item with a comma if you wish to set only the second parameter, for example "**,parm2**". An item without a comma will set both parameters. This last mode is the one most frequently used.

Netperf has two types of command line options. The first are global command line options. They are essentially any option that is not tied to a particular test, or group of tests. An example of a global command line option is the test type. The second options are test specific options. These are options that are only applicable to a particular test. An example of a test specific option would be the send socket buffer size for a *TCP-STREAM* test. Global command line options are specified first, test specific options second. They must be separated from each other by a "--" (two dashes). If you wish to give test specific options only, they must be preceded by "--".

For example:

```
$ netperf -- -m 1024
```

2 Objective

3 Reference

3.1 Files

NETPERF installs the following utility programs in the system binary directory, `‘/usr/sbin/’`:

```
‘sctp_stream_script’
‘tcp_stream_script’
‘udp_stream_script’
‘sctp_rr_script’
‘tcp_rr_script’
‘udp_rr_script’
‘sctp_range_script’
‘tcp_range_script’
‘snapshot_script’
‘arr_script’
‘packet_byte_script’
‘netserver’
```

NETPERF installs the following user programs in the user binary directory, `‘/usr/bin/’`:

```
‘netperf’
‘netperf_arr’
‘netperf_packet_byte’
‘netperf_sctp_range’
‘netperf_sctp_rr’
‘netperf_sctp_stream’
‘netperf_snapshot’
‘netperf_tcp_range’
‘netperf_tcp_rr’
‘netperf_tcp_stream’
‘netperf_udp_range’
‘netperf_udp_rr’
‘netperf_udp_stream’
```

NETPERF installs the following info files in the system info directory, `‘/usr/share/info/’`:

```
‘netperf.info’
‘netperf.info-1’
‘netperf.info-2’
```

These files contain this manual in *GNU info* format.

NETPERF installs the following manpage macros and reference database files in the system man directory, `‘/usr/share/man/’`:¹

```
‘netperf.macros’
```

This file contains manual page macro definitions included by the manual pages included in the package.

¹ Note that macro and reference database files are not installed if the package is configured for cooked manpages.

`'netperf.refs'`

This file contains a reference database referenced by the manual pages included in the package.

NETPERF installs the following manual pages in the system man directory, `'/usr/share/man/man1/'`:

`'netperf.1'`
`'netperf_arr.1'`
`'netperf_packet_byte.1'`
`'netperf_sctp_range.1'`
`'netperf_sctp_rr.1'`
`'netperf_sctp_stream.1'`
`'netperf_snapshot.1'`
`'netperf_tcp_range.1'`
`'netperf_tcp_rr.1'`
`'netperf_tcp_stream.1'`
`'netperf_udp_range.1'`
`'netperf_udp_rr.1'`
`'netperf_udp_stream.1'`

NETPERF installs the following manual pages in the system man directory, `'/usr/share/man/man2/'`:

NETPERF installs the following manual pages in the system man directory, `'/usr/share/man/man3/'`:

NETPERF installs the following manual pages in the system man directory, `'/usr/share/man/man4/'`:

NETPERF installs the following manual pages in the system man directory, `'/usr/share/man/man5/'`:

`'netperf.5'`
 manual page for the `netperf(5)` package.

NETPERF installs the following manual pages in the system man directory, `'/usr/share/man/man7/'`:

NETPERF installs the following manual pages in the system man directory, `'/usr/share/man/man8/'`:

`'sctp_range_script.8'`
`'sctp_rr_script.8'`
`'sctp_stream_script.8'`
`'tcp_range_script.8'`
`'tcp_rr_script.8'`
`'tcp_stream_script.8'`
`'udp_rr_script.8'`
`'udp_stream_script.8'`
`'snapshot_script.8'`
`'arr_script.8'`
`'packet_byte_script.8'`
`'netserv.8'`

3.2 Drivers

3.3 Modules

3.4 Libraries

3.5 Utilities

3.6 Development

4 Tests

4.1 Design

4.1.1 Design Basics

Netperf is designed around the basic client-server model. There are two executables – `netperf` and `netserver`. Generally you will only execute the `netperf` program – the `netserver` program will be invoked by the other system's `inetd`.

When you execute `netperf`, the first thing that happens is the establishment of a control connection to the remote system. This connection will be used to pass test configuration information and results to and from the remote system. Regardless of the type of test being run, the control connection will be a TCP connection using BSD sockets.

Once the control connection is up and the configuration information has been passed, a separate connection will be opened for the measurement itself using the APIs and protocols appropriate for the test. The test will be performed, and the results will be displayed.

Netperf places no traffic on the control connection while a test is in progress. Certain TCP options, such as `SO_KEEPAALIVE`, if set as your system's default, may put packets out on the control connection.

4.1.2 CPU Utilization

CPU utilization is a frequently requested metric of networking performance. Unfortunately, it can also be one of the most difficult metrics to measure accurately. Netperf is designed to use one of several (perhaps platform dependent) CPU utilization measurement schemes. Depending on the CPU utilization measurement technique used, a unique single-letter code will be included in the CPU portion of the test banner for both the local and remote systems.

The default CPU measurement technique is based on the use of "loopers" which will sit in tight little loops consuming any CPU left over by the networking. This method is not without its added overhead, but wherever possible, care has been taken to keep that overhead to a minimum. If you would like to get an estimate of the overhead, run one test with CPU utilization, and one test without, and compare the throughputs. Use of loopers in measuring CPU utilization is indicated by the letter code "L".

NOTE: For accurate CPU utilization on MP systems, it is **crucial** that `netperf` and `netserver` know the number of processors on the system. For some systems (*HP-UX*) this can be determined programmatically. Other systems require the use of the `-n` global command line argument.

HP-UX 10.X offers a zero additional overhead, very accurate CPU utilization mechanism based on the `pstat()` system call. If you are compiling on *HP-UX 10*, you should replace the `-DUSE_LOOPER` in the `makefile` with `-DUSE_PSTAT` and recompile. When this method is being used, the letter code "T" will be displayed.

Other codes may be included in later versions of `netperf`. When the CPU utilization mechanism is unknown, either a "U" or a "?" will be displayed.

Great care should be exercised when looking at CPU utilization. Be certain you are familiar with the technique being used, and its implications. For example, a mechanism that is based solely on CPU charged to the `netperf` (`netserver`) process alone will likely under-report

the real CPU utilization **significantly**. Much network processing takes place away from the user process context. Caveat Benchmark!

4.1.3 Supported Interfaces

Sockets	BSD/POSIX Sockets Interface
XTI	X/Open Transport Interface (XTI/TLI) XNS 5.2 Interface
IPv6	BSD/POSIX IPv6 Sockets Interface
Unix	BSD/POSIX Unix Domain Sockets Interface
DLPI	X/Open XNS 5.2 Data Link Provider Interface (DLPI)
DNS	Directory Name Service

4.1.4 Supported Protocols

SCTP

TCP

UDP

UNIX

DL

DNS

4.1.5 Supported Tests

STREAM

MAERTS

SENDFILE

RR

NBRR

CRR

TRR

CC

DNS

4.2 Stream Tests

4.2.1 Available bulk data transfer performance tests

4.2.1.1 Forward Unidirectional Stream Performance Test (STREAM)

The intent of the *STREAMS* performance tests is to test forward unidirectional bulk data transfer in the direction from client to server. This is similar to the *MAERTS* tests, with the exception that the data transfer is in the forward direction. The basic test sequence is as follows:

```
server: bind()
server: listen()
client: bind()
client: connect()
server: accept()
client: send() [repeated]
server: recv() [repeated]
client: shutdown()
client: close()
server: close()
test complete
```

There are three interface types that are of interest:

Stream This is a connection-oriented reliable unidirectional bulk data transfer without regard for message boundaries. Protocols supporting this type of data transfer are SCTP, TCP, UNIX CO, and DLPI CO. Interfaces supporting this type of data transfer are Sockets, XTI, IPv6, UNIX and DLPI.

This interface type has been traditionally tested by `netperf`, however, connection-oriented tests have been lumped together with connectionless tests. Supported tests are:

```
SCTP_STREAM
    SCTP BSD/POSIX IPv4 Sockets Interface (SOCK_STREAM)

TCP_STREAM
    TCP BSD/POSIX IPv4 Sockets Interface (SOCK_STREAM)

SCTPIPv6_STREAM
    SCTP BSD/POSIX IPv6 Sockets Interface (SOCK_STREAM)

TCPIPv6_STREAM
    TCP BSD/POSIX IPv6 Sockets Interface (SOCK_STREAM)

STREAM_STREAM
    Unix Domain BSD/POSIX Sockets Interface (SOCK_STREAM)

DLCO_STREAM
    DLPI Connection-Oriented (DLCO)
```

Datagram This is a connectionless unreliable unidirectional bulk data transfer regarding message boundaries. Protocols supporting this type of data transfer are UDP, UNIX CL and DLPI CL. Interfaces supporting this type of data transfer are Sockets, XTI, IPv6, UNIX and DLPI.

This interface type has been traditionally tested by `netperf`, however, connection-oriented tests have been lumped together with connectionless tests. Supported tests are:

```

UDP_STREAM
UDPIPv6_STREAM
DLCL_STREAM
FORE_STREAM

```

Packet This is a connection-oriented reliable unidirectional bulk data transfer regarding message boundaries. Protocols supporting this type of data transfer are SCTP, and DLPI CO. Interfaces supporting this type of data transfer are Sockets, XTI, IPv6 and DLPI.

This interface type has **not** been traditionally tested by `netperf`; however, with the introduction of SCTP as a test protocol, these tests have been added to the `netperf` framework. Supported tests are:

```

SCTP_PACKET
    SCTP BSD/POSIX IPv4 Sockets Interface (SOCK_SEQPACKET)
SCTPIPv6_PACKET
    SCTP BSD/POSIX IPv6 Sockets Interface (SOCK_SEQPACKET)

```

4.2.1.2 Reverse Unidirectional Stream Performance Test (MAERTS)

The intent of the *MAERTS* performance tests is to test reverse unidirectional bulk data transfer in the direction from server to client. This is similar to the *STREAM* tests, with the exception that the data transfer is in the opposite direction. The basic test sequence is as follows:

```

server: bind()
server: listen()
client: bind()
client: connect()
server: accept()
server: send() [repeated]
client: recv() [repeated]
server: shutdown()
server: close()
client: close()
test complete

```

Supported tests are:

```

SCTP_MAERTS
    IPv4 SCTP BSD/POSIX Sockets Interface
TCP_MAERTS
    IPv4 TCP BSD/POSIX Sockets Interface

```

4.2.1.3 Paged Unidirectional Stream Performance Test (SENDFILE)

The intent of the *SENDFILE* performance tests is to test paged unidirectional stream bulk data transfer in the direction from client to server. This is similar to the *STREAM* tests with the variation that the BSD-style `sendfile()` system call is used to transfer data directly from a `mmap`'ed file to the connection. The basic test sequence is as follows:

```

server: bind()
server: listen()
client: bind()
client: connect()
server: accept()
client: sendfile()
server: recv() [repeated]
client: shutdown()
client: close()
server: close()
test complete

```

This test has traditionally only been available for *TCP* under `netperf`; however, OpenSS7 has added *SCTP* as another protocol for *SENDFILE* testing. These tests only used the BSD/POSIX IPv4 Sockets interface. Supported tests are:

`SCTP_SENDFILE`

IPv4 SCTP BSD/POSIX Sockets Interface

`TCP_SENDFILE`

IPv4 TCP BSD/POSIX Sockets Interface

4.2.2 Using Netperf to measure bulk data transfer performance

The most common use of `netperf` is measuring bulk data transfer performance. This is also referred to as "stream" or "unidirectional stream" performance. Essentially, these tests will measure how fast one system can send data to another and/or how fast the other system can receive it.

4.2.2.1 SCTP Stream Forward Performance

4.2.2.2 SCTP Stream Reverse Performance

4.2.2.3 SCTP Stream Sendfile Performance

4.2.2.4 TCP Stream Forward Performance

The TCP stream performance test is the default test for the `netperf` program. The simplest test is performed by entering the command:

```
$ netperf -H remotehost
```

which will perform a 10 second test between the local system and the system identified by *remotehost*. The socket buffers on either end will be sized according to the systems' default and all TCP options (e.g. *TCP_NODELAY*) will be at their default settings.

To assist in measuring TCP stream performance, two script files are provided with the `netperf` distribution. They are `'tcp_stream_script'` and `'tcp_range_script'`. `'tcp_stream_script'` will invoke `netperf` based on the setting of script variables controlling socket and send sizes. `'tcp_range_script'` will perform a similar set of tests, with the difference being that where `'tcp_stream_script'` tests specific data points, `'tcp_range_script'` will perform tests at points within a specified range.

If you would like to perform tests other than those done by the scripts, you can invoke `netperf` manually. Some of the options you will likely want to experiment with are:

- `-s sizespec` which will set the local send and receive socket buffer sizes to the value(s) specified. [Default: system default socket buffer sizes]
- `-S sizespec` which behaves just like `-s` but for the remote system
- `-m value` set the local send size to *value* bytes. [Default: local socket buffer size]
- `-M value` which behaves like `-m`, setting the receive size for the remote system. [Default: remote receive socket buffer size]
- `-I value` set the test length to *value* seconds when *value* is > 0 and to $|value|$ bytes when *value* < 0
- `-D` set the `TCP_NODELAY` option to true on both systems

This is not a complete list of options that can affect TCP stream performance, but it does cover those options that are used most often. A complete list of `netperf` options can be found in "Test Options".

4.2.2.5 TCP Stream Reverse Performance

4.2.2.6 TCP Stream Sendfile Performance

4.2.2.7 UDP Stream Performance

A UDP stream performance test is very similar to a TCP stream test. One difference is that the send size cannot be larger than the smaller of the local and remote socket buffer sizes. What this means is that you must make certain that when you specify the `-m` option, you use a value that is less than or equal to the socket buffer sizes (`-s` and `-S`). Also, since the UDP stream test is not the default test, the `-t testname` option must be specified, with the *testname* set to `UDP_STREAM`. So, a simple UDP stream test command might look something like this:

```
$ netperf -H remotehost -t UDP_STREAM -- -m 1024
```

There is a script provided that performs various UDP stream performance tests. It is called 'udp_stream_script'. As with TCP stream performance, you can use the script provided, or perform tests yourself to get data points not covered by the script.

NOTE: UDP is an unreliable protocol. It is important that you examine the results carefully as the reported send rate can be much higher than the actual receive rate. Great care should be taken when reporting `UDP_STREAM` test results to make sure they are not misleading. For example, one should **always** report both send and receive rates **together** for a `UDP_STREAM` test. If you are going to report a single number, you should report the receive rate.

NOTE: If you would like to "pace" the send rate of the `UDP_STREAM` test, add a "`-DINTERVALS`" to the 'makefile', do a 'make clean' and recompile. You can then use the `-b` and `-w` global options to set the burst size (sends) and wait time (milliseconds) respectively.

4.2.2.8 XTI SCTP Stream Performance

4.2.2.9 XTI TCP Stream Performance

The XTI TCP stream performance test is quite similar to the *TCP_STREAM* test. XTI requires a device file to be opened – as the device file is placed in different locations on different systems, it generally must be specified. The simplest XTI TCP stream test on *HP-UX* is performed by entering the command:

```
$ netperf -H remotehost -t XTI_TCP_STREAM -- -X /dev/inet_cots
```

which will perform a 10 second test between the local system and the system identified by *remotehost*. The STREAMS buffers on either end will be sized according to the systems' default and all TCP options (e.g. *T_TCP_NODELAY*) will be at their default settings.

The test parameters for an *XTI_TCP_STREAM* test are the same as for a *TCP_STREAM* test with the addition of:

-X devspec

set the local/remote XTI device file name from *devspec*.

4.2.2.10 XTI UDP Performance

The XTI UDP stream performance test is quite similar to the *UDP_STREAM* test. XTI requires a device file be opened. As the device file is placed in different locations on different systems, it generally must be specified. The simplest XTI UDP stream test on *HP-UX* is performed by entering the command:

```
$ netperf -H remotehost -t XTI_UDP_STREAM -- -X /dev/inet_clts
```

The test parameters for an *XTI_UDP_STREAM* test are the same as for a *UDP_STREAM* test with the addition of:

-X devspec

set the local/remote XTI device file name from *devspec*.

NOTE: UDP is an unreliable protocol. It is important that you examine the results carefully as the reported send rate can be much higher than the actual receive rate. Great care should be taken when reporting *UDP_STREAM* test results to make sure they are not misleading. For example, one should **always** report both send and receive rates **together** for a *UDP_STREAM* test. If you are going to report a single number, you should report the receive rate.

NOTE: If you would like to "pace" the send rate of the *UDP_STREAM* test, add a "*-DINTERVALS*" to the 'makefile', do a 'make clean' and recompile. You can then use the *-b* and *-w* global options to set the burst size (sends) and wait time (milliseconds) respectively.

4.2.2.11 SCTP IPv6 Stream Forward Performance

4.2.2.12 TCP IPv6 Stream Forward Performance

4.2.2.13 UDP IPv6 Stream Forward Performance

4.2.2.14 DLPI Connection Oriented Stream Performance

NOTE: DLPI tests are not compiled-in by default with *netperf*. If you wish to measure performance over DLPI, you will need to add a *-DDO_DLPI* to the 'makefile' and perhaps add to the "LIBS=" and recompile *netperf* and *netserver*.

A DLPI Connection Oriented Stream test (*DLCO_STREAM*) looks very similar to a TCP Stream test – they both use reliable, connection oriented protocols. The DLPI tests differs from the TCP test in that the message size must always be less than or equal to the local interface's MTU – DLPI does not provide TCP-style segmentation and reassembly.

The simplest DLPI Connection Oriented Stream test would look something like this:

```
$ netperf -H remotehost -t DLCO_STREAM -- -m 1024
```

Here are some of the DLPI-specific command line options:

- D *devspec*** specify the local and/or remote DLPI device file name(s) (fully qualified). Syntax is the same as that of *sizespec*.
- m *value*** specify the send size, in bytes, for the local system. This must be less than or equal to the link MTU.
- M *value*** which behaves like **-m**, setting the receive size for the remote system.
- p *ppaspec*** set the local and/or remote DLPI PPA(s). Syntax is the same as that of a *sizespec*.
- r *value*** specify the request size, in bytes, for the test.
- R *value*** specify the response size, in bytes, for the test.
- s *value*** specify the 802.2 SAP for the test. This should not conflict with any assigned SAPs.
- w *sizespec*** specify the local send/rcv window sizes in frames (where available).
- W *sizespec*** specify the remote sned/rcv window sizes in frames (where available).

4.2.2.15 DLPI Connectionless Stream Performance

NOTE: DLPI tests are not compiled-in by default with `netperf`. If you wish to measure performance over DLPI, you will need to add a `-DDO_DLPI` to the 'makefile' and perhaps add to the "LIBS=" and recompile `netperf` and `netserver`.

A DLPI Connectionless Stream test (*DLCL_STREAM*) is analogous to a *UDP_STREAM* test. They both make use of unreliable, connectionless transports. The DLPI test differs from the UDP test in that the message size must always be less than or equal to the link MTU – DLPI does not provide IP-like segmentation and reassembly functionality, and the `netperf` benchmark does not presume to provide one.

The simplest DLPI Connectionless Stream test command line would look something like this:

```
$ netperf -H remotehost -t DLCL_STREAM -- -m 1024
```

Here are some of the DLPI-specific command line options for the *DLCL_STREAM* test:

- D *devspec*** specify the local and/or remote DLPI device file name(s) (fully qualified). Syntax is the same as that of *sizespec*.

- m *value*** specify the send size, in bytes, for the local system. This must be less than or equal to the link MTU.
- M *value*** which behaves like **-m**, setting the receive size for the remote system.
- p *ppaspec***
set the local and/or remote DLPI PPA(s). Syntax is the same as that of a *sizespec*.
- r *value*** specify the request size, in bytes, for the test.
- R *value*** specify the response size, in bytes, for the test.
- s *value*** specify the 802.2 SAP for the test. This should not conflict with any assigned SAPs.
- w *sizespec***
specify the local send/rcv window sizes in frames (where available).
- W *sizespec***
specify the remote sned/rcv window sizes in frames (where available).

4.2.2.16 Unix Domain Stream Sockets Performance

NOTE: Unix Domain Socket tests are not compiled into **netperf** by default. If you wish to measure the performance of Unix Domain Sockets, you must recompile **netperf** and **netserver** with **-DDO_UNIX** added to the **'makefile'**.

A Unix Domain Stream Socket Stream test (*STREAM.STREAM*) is very much like a *TCP.STREAM* test.

The simplest Unix Domain Socket Stream test command line would look something like this:

```
$ netperf -t STREAM_STREAM
```

The **-H** global command line option is not valid for Unix Domain Socket test and should not be specified.

Here are some of the Unix Domain-specific command line options for the *STREAM_STREAM* test:

- m *value*** set the local send size to *value* bytes. [Default: local socket buffer size]
- M *value*** which behaves like **-m**, setting the receive size for the remote system. [Default: remote receive socket buffer size]
- p *dirspec***
set the directory where pipes will be created. [Default:system default for the `tempnam()` call]
- s *sizespec***
which will set the local send an receive socket buffer sizes to the value(s) specified. [Default: system default socket buffer sizes]
- S *sizespec***
which behaves just like **-s** but for the remote system.

4.2.2.17 Unix Domain Datagram Sockets Performance

NOTE: Unix Domain Socket tests are not compiled into `netperf` by default. If you wish to measure the performance of Unix Domain Sockets, you must recompile `netperf` and `netserver` with `-DDO_UNIX` added to the ‘makefile’.

A Unix Domain Datagram Socket stream test (*DG_STREAM*) is very much like a *TCP_STREAM* test except that message boundaries are preserved. The simplest Unix Domain Datagram Socket stream test command line would look something like this:

```
$ netperf -t DG_STREAM
```

The `-H` global command line option is not valid for a Unix Domain Socket test and should not be specified. Here are some of the test specific command line options available in a *DG_STREAM* test.

- `-m value` set the local send size to *value* bytes. [Default: local socket buffer size]
- `-M value` which behaves like `-m`, setting the receive size for the remote system. [Default: remote receive socket buffer size]
- `-p dirspec`
set the directory where pipes will be created. [Default: system default for the `tempnam()` call]
- `-s sizespec`
which will set the local send and receive socket buffer sizes to the value(s) specified. [Default: system default socket buffer sizes]
- `-S sizespec`
which behaves just like `-s` but for the remote system.

4.2.2.18 Fore ATM API Stream Performance

NOTE: Fore ATM API tests are not compiled into `netperf` by default. If you wish to measure the performance of connections over the Fore ATM API, you must recompile `netperf` and `netserver` with `-DDO_FORE` added to the ‘makefile’.

A Fore ATM API stream test (*FORE_STREAM*) is very much like a *UDP_STREAM* test.

NOTE: The Fore ATM API explores an unreliable protocol. It is important that you examine the results carefully as the reported send rate can be much higher than the actual receive rate. Great care should be taken when reporting *FORE_STREAM* test results to make sure they are not misleading. For example, one should **always** report both send and receive rates **together** for a *FORE_STREAM* test. If you are going to report a single number, you should report the receive rate.

The simplest Fore ATM API stream test command line would look something like this:

```
$ netperf -t FORE_STREAM -H remotehost
```

Here are some of the test specific command line options applicable to a *FORE_STREAM* test.

- `-a AAL` use the ATM Adaptation Layer number *AAL* to encapsulate packets. Specifying 3 or 4 will yield AAL3/4, and 5 will yield AAL5. [Default: 5 -> AAL5]

- b *sizespec***
set the mean burst target and/or minimum in units of kilobit packets. The first value is target and the second is minimum. [Default: 0,0]
- d *devspec***
set the name of the ATM device file to be opened. [Default: /dev/atm]
- m *value*** set the local send size to *value* bytes. This must not be larger than the ATM MTU. [Default: ATM MTU]
- M *value*** which behaves like -m, setting the receive size for the remote system. [Default: ATM MTU]
- p *sizespec***
set the peak bandwidth target and/or minimum in units of kilobits/s. The first value is target and the second is minimum. [Default: 0,0 -> network assigned]
- P *sizespec***
set the mean bandwidth target and/or minimum in units of kilobits/s. The first value is target and the second is minimum. [Default: 0,0 -> network assigned]

4.3 Request/Response Tests

4.3.1 Available request/response performance tests

4.3.1.1 Request/Response Performance Test (RR)

4.3.1.2 Non-Blocking Request/Response Performance Test (NBRR)

4.3.1.3 Connect/Request/Response Performance Test (CRR)

4.3.1.4 Transaction Request/Response Performance Test (TRR)

4.3.1.5 Connect/Close Performance Test (CC)

4.3.2 Using Netperf to measure request/response performance

Request/response performance is the second test that can be investigated with `netperf`. Generally speaking, `netperf` request/response performance is quoted as "transactions/s" for a given request and response size. A transaction is defined as the exchange of a single request and a single response. From a transaction rate, one can infer one way and route-trip average latency.

4.3.2.1 SCTP Request/Response Performance

4.3.2.2 SCTP Non-Blocking Request/Response Performance

4.3.2.3 SCTP Request/Response Connect Performance

4.3.2.4 SCTP Request/Response Transaction Performance

4.3.2.5 SCTP Connect/Close Performance

4.3.2.6 TCP Request/Response Performance

The TCP request/response test can be invoked with `netperf` through the use of the `-t` option with an argument of `TCP_RR`. So, a "default" request/response command would look something like this:

```
$ netperf -H remotehost -t TCP_RR
```

and will use the system default socket buffer sizes, a default request size of 1 byte, and a default response size of 1 byte.

As with the stream performance tests, a script is available to assist you in generating TCP request/response performance numbers. It is called `'tcp_rr_script'`. However, if you should need to generate numbers at point of your own choosing, these command line options will be of use:

- `-r sizespec`
set the request and/or response sizes based on *sizespec*.
- `-I value` set the test duration based on *value*. For *value* > 0, test duration will be *value* seconds. Otherwise, test duration will be $|value|$ transactions.
- `-s sizespec`
which will set the local send and receive socket buffer sizes to the value(s) specified. [Default: system default socket buffer sizes]
- `-S sizespec`
which behaves like `-s` but for the remote system
- `-D` set the `TCP_NODELAY` option to true on both systems

The request and response sizes will be buffer sizes posted to send and receive. The `-m` and `-M` options are not meaningful for a `TCP_RR` test. As TCP is a stream protocol and not a message protocol, it is necessary to loop on receives until the entire message is delivered. The buffer pointer passed to the first receive for an individual transaction will be aligned and offset as requested by the user. It will be incremented by the number of bytes received each time until the entire request/response is received. The buffer pointer will be realigned and offset for the next transaction.

4.3.2.7 TCP Non-Blocking Request/Response Performance

`TCP_NBRR` is the same as `TCP_RR` except that it uses POSIX non-blocking sockets.

4.3.2.8 TCP Request/Response Connect Performance

The `TCP_CRR` test is a test which mimics the http protocol used by most web servers. Instead of simply measuring the performance of request/response in the same connection, it establishes a new connection for each request/response pair. The test-specific parameters are the same as the `TCP_RR` test with one addition:

- `-p max[,min]`
set the minimum or maximum port numbers used by the client side.

It is important that this test run for a reasonable length of time – at least two minutes. This is related to the behaviour of various TCP implementations. If you run the test for shorter periods of time, the results could be higher than seen in a steady-state condition. So, a good *TCP_CRR* command line to simulate a web-server might look like:

```
$ netperf -t TCP_CRR -I 120 -H remotehost -- -r 32,1024
```

4.3.2.9 TCP Request/Response Transaction Performance

4.3.2.10 TCP Connect/Close Performance

4.3.2.11 UDP Request/Response Performance

UDP request/response performance works just like TCP request/response performance. All the options available for TCP are available for UDP with the exception of the *-D* option: *TCP_NODELAY* has no meaning for a UDP test. To invoke a UDP request/response test, use an argument of *UDP_RR* with the *-t* option to produce the a command something like this:

```
$ netperf -H remotehost -t UDP_RR
```

Again, a script is provided which will generate results for some of the more common data points. It is named 'udp_rr_scrip'.

4.3.2.12 XTI SCTP Request/Response Performance

4.3.2.13 XTI TCP Request/Response Performance

The XTI TCP request/response test can be invoked with *netperf* through the use of the *-t* option with an argument of *XTI_TCP_RR*. Not all systems put the requisite device files in the same location, so, a "default" request/response command on *HP-UX* would look something like this:

```
$ netperf -H remotehost -t XTI_TCP_RR -- -X /dev/inet_cots
```

and will use the system default socket buffer sizes, a default request size of 1 byte, and a default response size of 1 byte.

The command line options for the *XTI_TCP_RR* test are the same as the *TCP_RR* test, with the following additions:

-X devspec

set the local/remote XTI device file name from *devspec*.

The request and response sizes will be the buffer sizes posted to send and receive. As TCP is a stream protocol and not a message protocol, it is necessary to loop on receives until the entire message is delivered. The buffer pointer passed to the first receive for an individual transaction will be aligned and offset as requested by the user. It will be incremented by the number of bytes received each time until the entire request/response is received. The buffer pointer will be realigned and offset for the next transaction.

4.3.2.14 XTI UDP Request/Response Performance

The XTI UDP request/response test can be invoked with *netperf* through the use of the *-t* option with an argument of *XTI_UDP_RR*. Not all systems put the requisite device files

in the same location, so, a "default" request/response command on *HP-UX* would look something like this:

```
$ netperf -H remotehost -t XTI_UDP_RR -- -X /dev/inet_clts
```

and will use the system default socket buffer sizes, a default request size of 1 byte, and a default response size of 1 byte.

The command line options for the *XTI_UDP_RR* test are the same as the *UDP_RR* test, with the following additions:

-X devspec

set the local/remote XTI device file name from *devspec*.

The request and response sizes will be the buffer sizes posted to send and receive.

4.3.2.15 SCTP IPv6 Request/Response Performance

4.3.2.16 TCP IPv6 Request/Response Performance

4.3.2.17 UDP IPv6 Request/Response Performance

4.3.2.18 DLPI Connection Oriented Request/Response Performance

4.3.2.19 DLPI Connectionless Request/Response Performance

4.3.2.20 Unix Domain Stream Socket Request/Response Performance

4.3.2.21 Unix Domain Datagram Socket Request/Response Performance

4.3.2.22 Unix Domain Stream Socket Request/Response Light-Weight Process Performance

4.3.2.23 Unix Domain Datagram Socket Request/Response Light-Weight Process Performance

4.3.2.24 Fore ATM API Request/Response Performance

4.4 Global Options

4.5 Test Options

5 Conformance

6 Releases

This is the OpenSS7 Release of the OpenSS7 NETPERF Utility package, modified for use with OpenSS7 Stream Control Transmission Protocol (SCTP) Linux Native Kernel and *Linux Fast-STREAMS* or *Linux STREAMS*¹ SVR 4.2 STREAMS releases.

The purpose of providing a separate release of this package was to provide support for SCTP as well as providing the ability to use GNU autoconf tools for maintenance and binary RPM release of the package; also, to separate the OpenSS7 NETPERF Utility tools, headers, drivers and modules from the *Linux STREAMS*² package for use with both *Linux STREAMS*³ and *Linux Fast-STREAMS* in preparation for replacement of the former by the later.

The following sections provide information on OpenSS7 NETPERF Utility releases as well as compatibility information of OpenSS7 release to the original HP releases of the OpenSS7 NETPERF Utility package, as well as Linux kernel compatibility.

6.1 Prerequisites

The quickest and easiest way to ensure that all prerequisites are met is to download and install this package from within the *OpenSS7 Master Package*, `openss7-0.9.2.G`, instead of separately.

Prerequisites for the OpenSS7 NETPERF Utility package are as follows:

1. *Linux* distribution, somewhat *Linux Standards Base* compliant, with a 2.4 or 2.6 kernel and the appropriate tool chain for compiling out-of-tree kernel modules. Most recent *Linux* distributions are usable out of the box, but some development packages must be installed. For more information, see [Section 6.2 \[Compatibility\]](#), page 40.
 - A fairly LSB compliant GNU/Linux distribution.⁴
 - Linux 2.4 kernel (2.4.10 - 2.4.27), or
 - Linux 2.6 kernel (2.6.3 - 2.6.26);
 - glibc2 or better.
 - GNU groff (for man pages).⁵
 - GNU texinfo (for info files).

(Note: If you acquired `netperf` a part of the *OpenSS7 Master Package*, then the dependencies listed below will already have been met by unpacking the master package.)

2. *OpenSS7 Linux Fast-STREAMS*, `streams-0.9.2.4`.⁶
3. *OpenSS7 STREAMS Compatibility Modules*, `strcompat-0.9.2.7`.
4. *OpenSS7 STREAMS XNS*, `strxns-0.9.2.7`.
5. *OpenSS7 STREAMS XTI/TLI*, `strxnet-0.9.2.12`.

¹ *Linux STREAMS* is buggy, unsupported and deprecated. Do not use it.

² *Linux STREAMS* is buggy, unsupported and deprecated. Do not use it.

³ *Linux STREAMS* is buggy, unsupported and deprecated. Do not use it.

⁴ See [Section 6.2.1 \[GNU/Linux Distributions\]](#), page 40, for more information.

⁵ If you are using a Debian release, please make sure to install the groff extension package (`'groff_ext'`), as it contains the `refer` or `grefer` commands necessary for including references in the manual pages.

⁶ Although, at one time, this package supported *LiS*, *LiS* is now deprecated and unsupported.

6. *OpenSS7 STREAM Network Services Library*, [strnsl-0.9.2.4](#). (Optional.)
7. *OpenSS7 STREAMS INET*, [strinet-0.9.2.7](#).
8. *OpenSS7 STREAMS SCTP*, [strsctp-0.9.2.9](#).
9. *OpenSS7 STREAMS Channels*, [strchan-0.9.2.4](#).
10. *OpenSS7 STREAMS X.25*, [strx25-0.9.2.1](#).
11. *OpenSS7 STREAMS ISO*, [striso-0.9.2.4](#).
12. *OpenSS7 STREAMS ISDN*, [strisdn-0.9.2.4](#).
13. *OpenSS7 STREAMS SS7*, [strss7-0.9a.8](#).
14. *OpenSS7 STREAMS SIGTRAN*, [sigtran-0.9.2.4](#).
15. *OpenSS7 STREAMS VoIP*, [strvoip-0.9.2.4](#).

If you need to rebuild the package from sources with modifications, you will need a larger GNU tool chain as described in See [Section 7.2.8 \[Downloading from CVS\]](#), page 62.

6.2 Compatibility

This section discusses compatibility with major prerequisites.

6.2.1 GNU/Linux Distributions

OpenSS7 NETPERF Utility is compatible with the following *Linux* distributions:⁷

- CentOS Enterprise Linux 3.4 (centos34) TBD
- CentOS Enterprise Linux 4.0 (centos4) TBD
- CentOS Enterprise Linux 4.92 (centos49) TBD
- CentOS Enterprise Linux 5.0 (centos5)
- CentOS Enterprise Linux 5.1 (centos51)
- CentOS Enterprise Linux 5.2 (centos52)
- Debian 3.0r2 Woody (deb3.0) TBD
- Debian 3.1r0a Sarge (deb3.1) TBD
- Debian 4.0r1 Etch (deb4.0)
- Debian 4.0r2 Etch (deb4.0)
- Debian 4.0r3 Etch (deb4.0)
- Fedora Core 1 (FC1) TBD
- Fedora Core 2 (FC2) TBD
- Fedora Core 3 (FC3) TBD
- Fedora Core 4 (FC4) TBD
- Fedora Core 5 (FC5) TBD
- Fedora Core 6 (FC6) TBD
- Fedora 7 (FC7)
- Fedora 8 (FC8)

⁷ Items marked as 'TBD' are scheduled to have support deprecated. That is, in a future release, the distributions marked 'TBD' will not longer be validated before release.

- Fedora 9 (FC9)
- Gentoo 2006.1 (untested) TBD
- Gentoo 2007.1 (untested) TBD
- Lineox 4.026 (LEL4) TBD
- Lineox 4.053 (LEL4) TBD
- Mandrakelinux 9.2 (MDK92) TBD
- Mandrakelinux 10.0 (MDK100) TBD
- Mandrakelinux 10.1 (MDK101) TBD
- Mandriva Linux LE2005 (MDK102) TBD
- Mandriva Linux LE2006 (MDK103) TBD
- Mandriva One (untested)
- RedHat Linux 7.2 (RH7)
- RedHat Linux 7.3 (RH7)
- RedHat Linux 8.0 (RH8) TBD
- RedHat Linux 9 (RH9) TBD
- RedHat Enterprise Linux 3.0 (EL3) TBD
- RedHat Enterprise Linux 4 (EL4)
- RedHat Enterprise Linux 5 (EL5)
- SuSE 8.0 Professional (SuSE8.0) TBD
- SuSE 9.1 Personal (SuSE9.1) TBD
- SuSE 9.2 Professional (SuSE9.2) TBD
- SuSE OpenSuSE (SuSEOSS) TBD
- SuSE 10.0 (SuSE10.0) TBD
- SuSE 10.1 (SuSE10.1) TBD
- SuSE 10.2 (SuSE10.2) TBD
- SuSE 10.3 (SuSE10.3) TBD
- SuSE 11.0 (SuSE11.0)
- SLES 9 (SLES9) TBD
- SLES 9 SP2 (SLES9) TBD
- SLES 9 SP3 (SLES9) TBD
- SLES 10 (SLES10)
- Ubuntu 5.10 (ubu5.10) TBD
- Ubuntu 6.03 LTS (ubu6.03) TBD
- Ubuntu 6.10 (ubu6.10) TBD
- Ubuntu 7.04 (ubu7.04) TBD
- Ubuntu 7.10 (ubu7.10)
- Ubuntu 8.04 (ubu8.04)
- WhiteBox Enterprise Linux 3.0 (WBEL3) TBD
- WhiteBox Enterprise Linux 4 (WBEL4) TBD

When installing from the tarball (see [Section 7.5.3 \[Installing the Tar Ball\]](#), page 86), this distribution is probably compatible with a much broader array of distributions than those listed above. These are the distributions against which the current maintainer creates and tests builds.

6.2.2 Kernel

The *OpenSS7 NETPERF Utility* package compiles as a *Linux* kernel module. It is not necessary to patch the *Linux* kernel to build or use the package.⁸ Nor do you have to recompile your kernel to build or use the package. OpenSS7 packages use `autoconf` scripts to adapt the package source to your existing kernel. The package builds and runs nicely against production kernels from the distributions listed above. Rather than relying on kernel versions, the `autoconf` scripts interrogate the kernel for specific features and variants to better adapt to distribution production kernels that have had patches applied over the official kernel.org sources.

The *OpenSS7 NETPERF Utility* package is compatible with 2.4 kernel series after 2.4.10 and has been tested up to and including 2.4.27. It has been tested from 2.6.3 up to and including 2.6.26 (with Fedora 9, openSUSE 11.0 and Ubuntu 8.04 patchsets). Please note that your mileage may vary if you use a kernel more recent than 2.6.26.4: it is difficult to anticipate changes that kernel developers will make in the future. Many kernels in the 2.6 series now vary widely by release version and if you encounter problems, try a kernel within the supported series.

UP validation testing for kernels is performed on all supported architectures. SMP validation testing was initially performed on UP machines, as well as on an Intel 3.0GHz Pentium IV 630 with HyperThreading enabled (2x). Because HyperThreading is not as independent as multiple CPUs, SMP validation testing was limited. Current releases have been tested on dual 1.8GHz Xeon HP servers (2x) as well as dual quad-core SunFire (8x) servers.

It should be noted that, while the packages will configure, build and install against XEN kernels, that problems running validation test suites against XEN kernels has been reported. *XEN kernels are explicitly not supported.* This may change at some point in the future if someone really requires running OpenSS7 under a XEN kernel.

6.2.3 Architectures

The *OpenSS7 NETPERF Utility* package compiles and installs on a wide range of architectures. Although it is believed that the package will work on all architectures supported by the Linux kernel being used, validation testing has only been performed with the following architectures:

- ix86
- x86_64
- ppc (MPC 860)
- ppc64

32-bit compatibility validation testing is performed on all 64-bit architectures supporting 32-bit compatibility. If you would like to validate an OpenSS7 package on a specific machine architecture, you are welcome to sponsor the project with a test machine.

⁸ At a later date, it is possible to move this package into the kernel, however, with continued resistance to STREAMS from within the *Linux* developer community, this is currently unlikely.

6.2.4 Linux STREAMS

The *OpenSS7 NETPERF Utility* package is currently compatible with *Linux STREAMS*,⁹ however, to use the *OpenSS7 NETPERF Utility* package with *LiS* requires use of the OpenSS7 release packages of *LiS*. The *OpenSS7 NETPERF Utility* package is compatible with the OpenSS7 **LiS-2.18.7** release that is available from the [The OpenSS7 Project Downloads Page](#). But, do not use *LiS*: it is buggy, unsupported and deprecated. Use *Linux Fast-STREAMS* instead.

6.2.5 Linux Fast-STREAMS

The *OpenSS7 NETPERF Utility* package is currently compatible with *Linux Fast-STREAMS (LfS)*. The *OpenSS7 NETPERF Utility* package is compatible with the OpenSS7 **streams-0.9.2.4** release that is available from the [The OpenSS7 Project Downloads Page](#).

6.2.6 HP Netperf

This section addresses compatibility issues between *OpenSS7* and *Hewlett-Packard* releases of *netperf*.

netperf-2.3.7 and Netserver Compatibility

OpenSS7 modifications to support SCTP does not alter the data structures or exchange between the *netperf* client and the *netserver* server. New structures and test definitions have been added for SCTP that are largely consistent with those of TCP. Specifically, a *netperf-2.3* client should be able to connect and perform tests with a *netperf-2.3.7* server. Also, a *netperf-2.3.7* client should be able to connect and perform tests (other than SCTP) with a *netperf-2.3* server.

netperf-2.3.7 and Option Compatibility

OpenSS7 releases provide all options compiled-in to the client and server. This obviates the need for editing makefiles and recompiling the client or server from source as is described in the *Hewlett-Packard Company* documentation.

netperf-2.3.7 and SCTP Compatibility

SCTP Socket API tests are (likely) only compatible with the OpenSS7 Sockets implementations of SCTP. The reason for this is that the OpenSS7 Sockets implementations use the POSIX standard socket API rather than the non-standard socket API described in documents such as *draft-stewart-tsvwg-sctpsocket-xx.txt*.

SCTP XTI API tests are (likely) only compatible with the OpenSS7 STREAMS implementation of SCTP, and the OpenSS7 XTI over Sockets implementation (see [Section “Introduction” in OpenSS7 STREAMS INET Driver](#)) with the OpenSS7 Linux Native SCTP Sockets implementation. The reason for this is that the OpenSS7 STREAMS implementation uses the X/Open XNS 5.2 SUSv2 UNIX'98 standard XTI interface rather than the non-standard socket API described in documents such as *draft-stewart-tsvwg-sctpsocket-xx.txt*.

⁹ *Linux STREAMS* is buggy, unsupported and deprecated. Do not use it.

6.3 Release Notes

The sections that follow provide information on **OpenSS7** releases of the OpenSS7 NETPERF Utility package as well as compatibility information of **OpenSS7** releases to the original **Hewlett-Packard Company** releases.

Major changes for release netperf-2.3.7

This is the seventh full release of the *OpenSS7 NETPERF Utility* package.

This release is largely a maintenance release that provides support for more distributions and architectures as well as tracking feature updates on related packages.

Major features since the last public release are as follows:

- Minor documentation corrections.
- License upgrade to *AGPL Version 3*.
- Support for flex 2.5.33 in maintainer mode.
- Ability to strap out major documentation build and installation primarily for embedded targets.
- Improvements to common build process for embedded and cross-compile targets.
- Updated tool chain to 'm4-1.4.12', 'autoconf-2.63' and 'texinfo-4.13'.
- Conversion of RPM spec files to common approach for major subpackages.
- Updated references database for manual pages and roff documents.
- Build system now builds yum(8) repositories for RPMs and apt-get(8) repositories for DEBs. Installation documentation has been updated to include details of repository install sourcesref.
- Added MODULE_VERSION to all modules and drivers.
- Fixed long_options termination error.
- Added -I option to SCTP tests to permit the addresses to bind to for both the local netperf client and remote netserver server. This permits addresses to be excluded from the bind for testing in single-homed and limited multi-homed configurations.
- Updated documentation for the bind feature.

This is a public stable production grade release of the package: it deprecates previous releases. Please upgrade to the current release before reporting bugs.

As with other OpenSS7 releases, this release configures, compiles, installs and builds RPMs and DEBs for a wide range of Linux 2.4 and 2.6 RPM- and DPKG-based distributions, and can be used on production kernels without patching or recompiling the kernel.

This package is publicly released under the *GNU Affero General Public License Version 3* as well as the HP license (see 'LICENSE' in the distribution for more information.) The release is available as an autoconf tarball, SRPM, DSC, and set of binary RPMs and DEBs. See the [downloads page](#) for the autoconf tarballs, SRPMs and DSCs. For tarballs, SRPMs, DSCs and binary RPMs and DEBs, see the [netperf package page](#).

See <http://www.openss7.org/codefiles/netperf-2.3.7/ChangeLog> and <http://www.openss7.org/codefiles/netperf-2.3.7/NEWS> in the release for more information. Also, see the 'netperf.pdf' manual in the release (also in html http://www.openss7.org/netperf_manual.html).

For the news release, see http://www.openss7.org/rel20081029_7.html.

Major changes for release netperf-2.3.6

This is the sixth full release of the *OpenSS7 NETPERF Utility* package.

This release is largely a maintenance release that provides support for more distributions and architectures as well as tracking feature updates on related packages.

Major features since the last public release are as follows:

- Support build on openSUSE 10.2.
- Support build on Fedora 7 with 2.6.21 kernel.
- Support build on CentOS 5.0 (RHEL5).
- Support build on Ubuntu 7.04.
- Updated to gettext 0.16.1.
- Supports build on Fedora Core 6.
- Support for recent distributions and tool chains.

Major changes for release netperf-2.3.5

This is the fifth full release of the *OpenSS7 NETPERF Utility* package.

This release is largely a maintenance release that provides support for more distributions and architectures as well as tracking feature updates on related packages.

Major features since the last public release are as follows:

- Support for autoconf 2.61, automake 1.10 and gettext 0.16.
- Support for Ubuntu 6.10 distribution and bug fixes for i386 kernels.
- The package now looks for other subpackages with a version number as unpacked by separate tarball.

Major changes for release netperf-2.3.4

This is the fourth full release of the *OpenSS7 NETPERF Utility* package.

This release is largely a maintenance release that provides support for more distributions and architectures as well as tracking feature updates on related packages:

- Updates to permit use with `strinet-0.9.2.7` second generation *UDP* driver, `strsctp-0.9.2.9` *STREAMS* SCTP driver, `sctp-0.2.27` *Sockets* SCTP driver.
- Added `send-pr` scripts for automatic problem report generation. (Please do not report bugs on LiS.)
- Added `--disable-devel configure` option to suppress building and installing development environment. This feature is for embedded or pure runtime targets that do not need the development environment (static libraries, manual pages, documentation).
- Improved compiler flag generation and optimizations for recent `gcc` compilers and some idiosyncratic behaviour for some distributions (primarily SUSE). Optimized compilation is now available also for user level programs in addition to kernel programs. Added new `'--with-optimize'` option to `configure` to accomplish this.
- Better detection of SUSE distributions, release numbers and SLES distributions: support for additional *SuSE* distributions on `ix86` as well as `x86_64`. Added distribution support includes *SLES 9*, *SLES 9 SP2*, *SLES 9 SP3*, *SLES 10*, *SuSE 10.1*.

- Many documentation updates for all **OpenSS7** packages. Automated release file generation making for vastly improved and timely text documentation present in the release directory.
- Now builds 32-bit compatibility libraries and tests them against 64-bit kernel modules and drivers. The `'make installcheck'` target will now automatically test both 64-bit native and 32-bit compatibility versions, one after the other, on 64-bit platforms.
- Includes results of performance testing of the new second generation UDP driver (implemented completely in STREAMS instead of using an internal socket).
- Includes workup of benchmark scripts for SCTP, TCP and UDP. Added a `scls_show` option to perform `'scls -c'` (see `scls(1)`) to show *STREAMS* module and driver statistics between test sample points when verbosity is set to 2 and XTI is being used. This assists with performance testing as it shows the counts accumulated to put and service routine throughout the *Stream*. It was used in *UDP2* testing of the `strinet` package and will come in handy for the *SCTP* testing.

Major changes for release netperf-2.3.4.rc3

Third release candidate. This is a *maintenance* release candidate. This release candidate includes:

- Automated release file generation making for vastly improved and timely text documentation present in the release directory.
- Many documentation updates (for all **OpenSS7** packages).
- Includes the changes made to the `strsctp` drivers at the *2006 SCTP Interop* at the *University of British Columbia*. This version was interoperability tested with all implementations present.
- Provides support for additional *SuSE* distributions on `ix86` as well as `x86_64`. Added distribution support includes *SLES 9*, *SLES 9 SP2*, *SLES 9 SP3*, *SLES 10*, *SuSE 10.1*.
- Includes workup of benchmark scripts for SCTP, TCP and UDP. Added a `scls_show` option to perform `'scls -c'` (see `scls(1)`) to show *STREAMS* module and driver statistics between test sample points when verbosity is set to 2 and XTI is being used. This assists with performance testing as it shows the counts accumulated to put and service routine throughout the *Stream*. It was used in *UDP2* testing of the `strinet` package and will come in handy for the *SCTP* testing.

This was an internal alpha test release candidate and was not released publicly. This release was only available to subscribers to and sponsors of the **OpenSS7 Project**.

Major changes for release netperf-2.3.4.rc2

Second release candidate. This is a *maintenance* release candidate. This release candidate includes:

- Includes results of performance testing of the new second generation UDP driver (implemented completely in STREAMS instead of using an internal socket).
- Includes support for *SuSE 10.1*.

This was an internal alpha test release candidate and was not released publicly. This release was only available to subscribers to and sponsors of the **OpenSS7 Project**.

Major changes for release `netperf-2.3.4rc1`

First release candidate for Mark Fugate. This is a *maintenance* release candidate. This release candidate includes:

- Added ‘`--enable-devel`’ configure option for embedded targets.
- Added `send-pr` script for automatic problem report generation.

This was an internal alpha test release candidate and was not released publicly. This release was only available to subscribers to and sponsors of the [OpenSS7 Project](#).

Major changes for release `netperf-2.3.3`

This release is primarily to support additional compilers (gcc 4.0.2), architectures (x86_64, SMP, 32-bit compatibility), recent Linux distributions (EL4, SuSE 10, LE2006, OpenSuSE) and kernels (2.6.15).

Corrections for and testing of 64-bit clean compile and test runs on x86_64 architecture. Some bug corrections resulting from gcc 4.0.2 compiler warnings.

Major changes for release `netperf-2.3.2`

Many corrections (but not enough) are included to use the package for XTI INET testing. UDP works now, but TCP is not completely corrected yet (and, therefore, neither is SCTP). These capabilities could not have possibly worked in the original *netperf-2.3* release. The next release should have TCP and SCTP corrected for XTI.

Corrections included to make the package cross-build for *NexusWare* as well as recent 2.6.14 (FC4) kernels.

What remains to be done is to merge in the latest upstream release of netperf into this package and contribute XTI corrections back upstream.

Initial release `netperf-2.3.1`

Initial autoconf/RPM packaging of the `netperf` release. It is based on the [Hewlett-Packard Company](#) *netperf-2.3* release.

This release provides modifications to support the Stream Control Transmission Protocol (SCTP) and provides tests for the Sockets API for the OpenSS7 Linux Native Kernel version of SCTP as well as tests for the XTI API for the OpenSS7 STREAMS version of SCTP. In addition, use of the XTI API for TCP and UDP tests is supported using the OpenSS7 STREAMS INET package.

SCTP Sockets API tests depend upon the availability of an the OpenSS7 Sockets implementation of SCTP in an OpenSS7 patched kernel. Some binary kernels and prepatched kernel source for popular architectures are provided as RPMs from [the OpenSS7 Project download page](#).

SCTP XTI API tests depend upon the availability of the OpenSS7 STREAMS implementation of SCTP. Some binary and source packages for *LiS STREAMS*, *Linux Fast-STREAMS*, the *strxnet* XTI/TLI library and the *strsctp* package are available from [the OpenSS7 Project download page](#). Section “Introduction” in *The OpenSS7 XNS/XTI Library Reference Manual*.

Under Linux, the TCP and UDP XTI API tests depend upon the availability of the OpenSS7 INET driver. Some binary and source packages for *LiS STREAMS*, *Linux Fast-STREAMS*,

the *strxnet* XTI/TLI library and the *strinet* package (see Section “Introduction” in *OpenSS7 STREAMS INET Driver*) are available from the [OpenSS7 Project download page](#). Section “Introduction” in *The OpenSS7 XNS/XTI Library Reference Manual*.

This release also provides updates to the antiquated *netperf-2.1* release documentation distributed with *netperf-2.3*.

6.4 Maturity

The *OpenSS7 Project* adheres to the following release philosophy:

- pre-alpha release
- alpha release
- beta release
- gamma release
- production release
- unstable release

6.4.1 Pre-Alpha Releases

Pre-alpha releases are releases that have received no testing whatsoever. Code in the release is not even known to configure or compile. The purpose of a pre-alpha release is to make code and documentation available for inspection only, and to solicit comments on the design approach or other characteristics of the software package.

Pre-alpha release packages ship containing warnings recommending that the user not even execute the contained code.

6.4.2 Alpha Releases

Alpha releases are releases that have received little to no testing, or that have been tested and contains known bugs or defects that make the package unsuitable even for testing. The purpose for an *alpha* release are the same as for the pre-alpha release, with the additional purpose that it is an early release of partially functional code that has problems that an external developer might be willing to fix themselves and contribute back to the project.

Alpha release packages ship containing warnings that executing the code can crash machines and might possibly do damage to systems upon which it is executed.

6.4.3 Beta Releases

Beta releases are releases that have received some testing, but the testing to date is not exhaustive. *Beta* release packages do not ship with known defects. All known defects are resolved before distribution; however, as exhaustive testing has not been performed, unknown defects may exist. The purpose for a *beta* release is to provide a baseline for other organizations to participate in the rigorous testing of the package.

Beta release packages ship containing warnings that the package has not been exhaustively tested and that the package may cause systems to crash. Suitability of software in this category for production use is not advised by the project; however, as always, is at the discretion of the user of the software.

6.4.4 Gamma Releases

Gamma releases are releases that have received exhaustive testing within the project, but external testing has been minimal. *Gamma* release packages do not ship with known defects. As exhaustive internal testing has been performed, unknown defects should be few. Please remember that there is NO WARRANTY on public release packages.

Gamma release packages typically resolve problems in previous *beta* releases, and might not have had full regression testing performed. Suitability of software in this category for production use is at the discretion of the user of the software. *The OpenSS7 Project* recommends that the complete validation test suites provided with the package be performed and pass on target systems before considering production use.

6.4.5 Production Releases

Production releases are releases that have received exhaustive testing within the project and validated on specific distributions and architectures. *Production* release packages do not ship with known defects. Please remember that there is NO WARRANTY on public release packages.

Production packages ship containing a list of validated distributions and architectures. Full regression testing of any maintenance changes is performed. Suitability of software in this category for production use on the specified target distributions and architectures is at the discretion of the user. It should not be necessary to preform validation tests on the set of supported target systems before considering production use.

6.4.6 Unstable Releases

Unstable releases are releases that have received extensive testing within the project and validated on a a wide range of distributions and architectures; however, is has tested unstable and found to be suffering from critical problems and issues that cannot be resolved. Maintenance of the package has proved impossible. *Unstable* release packages ship with known defects (and loud warnings). Suitability of software in this category for production use is at the discretion of the user of the software. *The OpenSS7 Project* recommends that the problems and issues be closely examined before this software is used even in a non-production environment. Each failing test scenario should be completely avoided by the application. *OpenSS7* beta software is more stable that software in this category.

6.5 Bugs

6.5.1 Defect Notices

OpenSS7 NETPERF Utility could contain unknown defects. This is a *beta* release. Some defects could be harmful. Validation testing has been performed by the *OpenSS7 Project* on this software for only a restricted set of systems. The software might fail to configure or compile on other systems. The *OpenSS7 Project* recommends that you **do not use this software for purposes other than validation testing and evaluation, and then only with care.** Use at your own risk. Remember that there is **NO WARRANTY**.¹⁰

¹⁰ See sections **Disclaimer of Warranty** and **Limitation of Liability** under [\[GNU Affero General Public License\]](#), page 111.

This software is *beta* software. As such, it might crash your kernel. Installation of the software might mangle your header files or Linux distribution in such a way as to make it unusable. Crashes could lock your system and rebooting the system might not repair the problem. You can possibly lose all the data on your system. Because this software might crash your kernel, the resulting unstable system could possibly destroy computer hardware or peripherals making them unusable. You might void the warranty on any system on which you run this software. YOU HAVE BEEN WARNED.

6.5.2 Known Defects

With the exception of packages not originally created by the *OpenSS7 Project*, the *OpenSS7 Project* software does not ship with known bugs in any release stage except *pre-alpha*. *OpenSS7 NETPERF Utility* had no known bugs at the time of release.

Nevertheless, the *OpenSS7 Project* does not validate the *OpenSS7 NETPERF Utility* package, but simply uses it for benchmark performance testing. Following are some of the expected difficulties with the package that have not yet been discovered:

1. The use of XTI Streams was incorrect in most places. Originally the package used socket system calls on Streams (which of course fails on TPI Streams). Some corrections have been made to allow the package to function properly with UDP under XTI using the ‘*strxnet*’ and ‘*strinet*’ packages. It is expected that there will be similar problems for TCP, SCTP, TI, DLPI and other Streams.
2. No bug fixes from the original Netperf development stream have been rolled back into this release. Therefore, any bugs reported on the regular Netperf release package probably still exist unfixed in this release package.

6.5.3 Defect History

This section contains historical bugs that were encountered during development and their resolutions. This list serves two purposes:

1. It captures bugs encountered between releases during development that could possibly reoccur (and the Moon is made of blue cheese). It therefore provides a place for users to look if they encounter a problem.
2. It provides a low overhead bug list between releases for developers to use as a ‘TODO’ list.

Bugs

001. 2007-07-21T20:50:14-0600

It was discovered that the `long_options` arrays were not zero terminated causing the netperf program to segfault when issued a non-existent option.

fixed in `netperf-2.3.7`.

6.6 Schedule

Things to do:

- Merge in upstream changes from the latest *Hewlett-Packard* release of the *Netperf* package into the *OpenSS7 Modified* version. I would really like to do this but don’t have the time for it right now. If someone is willing to dive in and give this a try, send me the patches.

- *Netperf* is capable of performing performance testing on *lksctp* as well. I would like to modify the *OpenSS7* version of *Netperf* to support both so that performance comparison testing can be done between *lksctp* (which sucks of course) and *OpenSS7 Linux Native Sockets* version.
- Get the *OpenSS7 NETPERF Utility* version working also with *OpenSS7 Linux Native Sockets SCTP* in addition to the current *STREAMS SCTP XTI* support. This would not only allow *Netperf* to be used successfully with *OpenSS7 Linux Native SCTP*, but it would also comparison tests between *STREAMS* and *Sockets* versions. This is something that I would really like to do. As *Linux Fast-STREAMS STREAMS*-based pipes beat FC4 Native pipes on 2.6.14 in a performance test, it would be interesting to see whether the *STREAMS* version can out perform the *Sockets* version. This would be an answer to the time old question as to whether *Sockets* or *STREAMS* is faster.
- Redo performance tests for *strxnet/strinet* package using recent release of *OpenSS7 NETPERF Utility*.
done
- Perform x86_64 HT SMP testing.
done

6.7 History

For the latest developments with regard to history of changes, please see the ‘ChangeLog’ file in the release package.

7 Installation

7.1 Repositories

The OpenSS7 NETPERF Utility package release can be accessed from the repositories of [The OpenSS7 Project](#). For `rpm(1)` based systems, the package is available in a `yum(8)` repository based on ‘`repomd`’ XML and may also be accessed using `zypper(8)` or `yast(8)`. For `dpkg(1)` based systems, the package is available in a `apt(8)` repository.

By far the easiest (most repeatable and manageable) form for installing and using *OpenSS7* packages is to install packages from the `yum(8)` or `apt(8)` repositories. If your distribution does not support `yum(8)`, `zypper(8)`, `yast(8)` or `apt(8)`, then it is still possible to install the RPMs or DEBs from the repositories using `rpm(1)`, `dpkg(1)`; or by using `wget(1)` and then installing them from RPM or DEB using `rpm(1)` or `dpkg(1)` locally.

If binaries are not available for your distribution or specific kernel, but your distribution supports `rpm(1)` or `dpkg(1)`, the next best method for installing and using *OpenSS7* packages is to download and rebuild the source RPMs or DSCs from the repository. This can also be performed with `yum(8)`, `zypper(8)`, `yast(8)`, `apt(8)`; or directly using `wget(1)`, `rpm(1)` or `dpkg(1)`.

If your architecture does not support `rpm(1)` or `dpkg(1)` at all, or you have special needs (such as cross-compiling for embedded targets), the final resort method is to download, configure, build and install from tarball. In this later case, the easiest way to build and install *OpenSS7* packages from tarball is to use the tarball for the *OpenSS7 Master Package*, `openss7-0.9.2.G`.

7.1.1 Repositories for YUM

To install or upgrade from the *OpenSS7* ‘`repomd`’ repositories, you will need a file in your ‘`/etc/yum.repo.d/`’ directory. This file can be obtained directly from the *OpenSS7 repository*, like so:

```
$> REPOS="http://www.openss7.org/repos/rpms"
$> wget $REPOS/centos/5.2/x86_64/repodata/openss7.repo
$> sudo cp -f openss7.repo /etc/yum.repo.d/
$> sudo yum makecache
```

This example assumes the the distribution is ‘`centos`’ and the distribution release is ‘`5.2`’ and the architecture requires is ‘`x86_64`’. Another example would be ‘`$REPOS/i686/suse/11.0/i686/repodata/openss7.repo`’, for using `yum(8)` with SUSE.

Once the repository is set up, *OpenSS7* includes a number of virtual package definitions that eas the installation and removal of kernel modules, libraries and utilities. Downloading, configuring, building and installation for a single-kernel distribution is as easy as:

```
$> sudo yum install netperf
```

Removing the package is as easy as:

```
$> sudo yum remove netperf
```

If you have difficulty downloading the ‘`openss7.repo`’ file, edit the following information into the file and place it into the ‘`/etc/yum.repo.d/openss7.repo`’ file:


```

-| [openss7]
-| enabled = 1
-| name = OpenSS7 Repository
-| baseurl = http://www.openss7.org/repos/rpms/centos/5.2/x86_64
-| gpgcheck = 1
-| gpgkey = http://www.openss7.org/pubkey.asc

```

Note that it is also possible to point to these repositories as an additional installation source when installing CentOS, RedHat, Fedora, or others. You will have an additional *STREAMS* category from which to choose installation packages.

Some additional installation real or virtual package names and the installations they accomplish are as follows:

‘netperf’

This package can be used to install or remove the entire OpenSS7 NETPERF Utility package. When installing, kernel modules will be installed automatically for the highest version kernel on your system. When removing, all corresponding kernel modules will also be removed.

‘netperf-devel’

This package can be used to install or remove the development components of the OpenSS7 NETPERF Utility package. When installing, ‘netperf’ and appropriate kernel module and kernel module development and debug packages will also be installed. When removing, the development package and all kernel module development and debug packages will also be removed.

For assistance with specific RPMs, see [Section 7.2.3 \[Downloading the Binary RPM\]](#), page 55.

7.1.2 Repositories for APT

For assistance with specific DEBs, see [Section 7.2.4 \[Downloading the Debian DEB\]](#), page 59.

7.2 Downloading

The OpenSS7 NETPERF Utility package releases can be downloaded from the downloads page of [The OpenSS7 Project](#). The package is available as a binary RPM (for popular architectures) a source RPM, Debian binary DEB and source DSC, or as a tar ball. If you are using a browsable viewer, you can obtain the OpenSS7 release of netperf from the links in the sections that follow.

By far the easiest (most repeatable and manageable) form for installing and using *OpenSS7* packages is to download and install individual packages from binary RPM or DEB. If binary RPMs or DEBs are not available for your distribution, but your distribution supports `rpm(1)` or `dpkg(1)`, the next best method for installing and using *OpenSS7* packages is to download and rebuild the source RPMs or DSCs.

If your architecture does not support `rpm(1)` or `dpkg(1)` at all, or you have special needs (such as cross-compiling for embedded targets), the final resort method is to download, configure, build and install from tarball. In this later case, the easiest way to build and install *OpenSS7* packages from tarball is to use the tarball for the *OpenSS7 Master Package*, openss7-0.9.2.G.

7.2.1 Downloading with YUM

OpenSS7 repositories support `yum(8)` and `zypper(8)` in repomd XML format as well as YaST and YaST2 formats.

OpenSS7 includes virtual packages that ease the installation and removal of kernel modules, libraries and utilities. Downloading, configuration, building and installation for a single-kernel distribution installation is as easy as:

```
% sudo yum install netperf
```

This and additional packages for installation are detailed as follows:

‘netperf’ Install this package if you need the runtime **‘netperf’** package.

```
% sudo yum install netperf
```

This will install the **‘netperf’**, **‘netperf-lib’** and **‘netperf-KVERSION’** RPMs, where **‘KVERSION’** is the highest version number kernel on your system.

Remove this package if you need to remove all vestages of the **‘netperf’** package.

```
% sudo yum remove netperf
```

This will remove the **‘netperf’**, **‘netperf-lib’**, **‘netperf-devel’**, **‘netperf-KVERSION’** and **‘netperf-devel-KVERSION’** RPMs for all kernels on your system.

‘netperf-devel’

Install this package if you need the development **‘netperf’** package.

```
% sudo yum install netperf-devel
```

This will install the **‘netperf’**, **‘netperf-lib’**, **‘netperf-devel’**, **‘netperf-KVERSION’** and **‘netperf-devel-KVERSION’** RPMs, where **‘KVERSION’** is the highest version number kernel on your system.

Remove this package if you do not need development capabilities for the **‘netperf’** package for any kernel.

```
% sudo yum remove netperf-devel
```

This will remove the **‘netperf-devel’** and **‘netperf-devel-KVERSION’** RPMs for all kernels on your system.

‘netperf-lib’

This package is an auxillary package that should be removed and inserted automatically by `yum(8)`. In rare instances you might need to remove or install this package explicitly.

7.2.2 Downloading with APT

OpenSS7 repositories support `apt(8)` repository digests and signatures.

7.2.3 Downloading the Binary RPM

To install from binary RPM, you will need several of the RPM for a complete installation. Binary RPM fall into several categories. To download and install a complete package requires the appropriate RPM from each of the several categories below, as applicable. Some release packages do not provide RPMs in each of the several categories.

To install from Binary RPM, you will need all of the following independent packages for your architecture.

Independent RPM

Independent RPM are not dependent on the *STREAMS* package. For example, the source package ‘netperf-source-2.3.7-1.7.2.noarch.rpm’, is not dependent on kernel nor *STREAMS* package.

All of the following *STREAMS* independent RPM are required for your architecture. Binary RPMs listed here are for example only: additional binary RPMs are available from the downloads site. If your architecture is not available, you can build binary RPM from the source RPM (see see [Section 7.4.1 \[Building from the Source RPM\]](#), page 84).

Architecture Independent

netperf-dev-2.3.7-1.7.2.noarch.rpm

The ‘netperf-dev’ package contains the device definitions necessary to run applications programs developed for OpenSS7 NETPERF Utility.¹

netperf-doc-2.3.7-1.7.2.noarch.rpm

The ‘netperf-doc’ package contains this manual in plain text, postscript, ‘pdf’ and ‘html’ forms, along with the meta-information from the ‘netperf’ package. It also contains all of the manual pages necessary for developing OpenSS7 NETPERF Utility applications and OpenSS7 NETPERF Utility *STREAMS* modules or drivers.

netperf-init-2.3.7-1.7.2.noarch.rpm

The ‘netperf-init’ package contains the `init` scripts and provides the ‘postinst’ scripts necessary to create kernel module preloads and modules definitions for all kernel module ‘core’ subpackages.

netperf-source-2.3.7-1.7.2.noarch.rpm

The ‘netperf-source’ package contains the source code necessary for building the OpenSS7 NETPERF Utility release. It includes the `autoconf(1)` configuration utilities necessary to create and distribute tarballs, ‘rpm’ and ‘deb’/‘dsc’.²

Architecture Dependent

The following Architecture Dependent packages are required for your architecture. If your architecture is not on the list, you can build binary RPM from the source RPM (see see [Section 7.4.1 \[Building from the Source RPM\]](#), page 84).

netperf-devel-2.3.7-1.7.2.i686.rpm

The ‘netperf-devel’ package contains library archives for static compilation, header files to develop OpenSS7 NETPERF Utility modules and drivers. This

¹ Not all distributions support the ‘%dev’ RPM macro: a case in point is the SuSE 8.0 distribution which uses an older version of `rpm(1)`. Distributions that do not support the ‘%dev’ macro will build devices as a ‘%post’ operation. Note also that not all release packages contain devices. Only packages that provide *STREAMS* character device drivers need devices, and then only when the ‘specfs’ or ‘devfsd’ is not being used.

² Note that not all releases have source RPM packages. Release packages that do not contain kernel modules do not generate a source RPM package.

also includes the header files and static libraries required to compile OpenSS7 NETPERF Utility applications programs.

netperf-lib-2.3.7-1.7.2.i686.rpm

The ‘**netperf-lib**’ package contains the run-time shared libraries necessary to run application programs and utilities developed for the ‘**netperf**’ package.³

STREAMS-Dependent RPM

STREAMS-Dependent RPM are dependent upon the specific *STREAMS* package being used, either *Linux STREAMS* or *Linux Fast-STREAMS*. Packages dependent upon *Linux STREAMS* will have ‘**LiS**’ in the package name. Packages dependent upon *Linux Fast-STREAMS* will have ‘**streams**’ in the package name. Note that some *STREAMS*-Dependent RPM are also Kernel-Dependent RPM as described below.

One of the following *STREAMS*-Dependent packages is required for your architecture. If your architecture is not on the list, you can build binary RPM from the source RPM (see see Section 7.4.1 [Building from the Source RPM], page 84).

netperf-LiS-2.3.7-1.7.2.i686.rpm

The ‘**netperf-LiS**’ package contains the **netserver(8)** and **netperf(1)** programs compiled to work with OpenSS7 Kernel and LiS *STREAMS* release of the INET driver and SCTP.

netperf-streams-2.3.7-1.7.2.i686.rpm

The ‘**netperf-streams**’ package contains the **netserver(8)** and **netperf(1)** programs compiled to work with OpenSS7 Kernel and Linux Fast-*STREAMS* release of the INET driver and SCTP.

netperf-LiS-util-2.3.7-1.7.2.i686.rpm

The ‘**netperf-LiS-util**’ package provides administrative and configuration test utilities and commands associated with the OpenSS7 NETPERF Utility package. Because this package must link a *STREAMS*-specific library, it is a *STREAMS*-Dependent package. Use the ‘**netperf-LiS-util**’ package if you have *LiS* installed.

netperf-streams-util-2.3.7-1.7.2.i686.rpm

The ‘**netperf-streams-util**’ package provides administrative and configuration test utilities and commands associated with the OpenSS7 NETPERF Utility package. Because this package must link a *STREAMS*-specific library, it is a *STREAMS*-Dependent package. Use the ‘**netperf-streams-util**’ package if you have *streams* installed.

Dependent RPM

To be able to perform the SCTP and XTI tests supported by the release, it may be necessary to download and install some of the following packages to satisfy dependencies:

LiS-core-2.18.7-1.i686.rpm

This package provides one of the two SVR 4.2 *STREAMS* facilities for use by *netperf-2.3.7*. This (or the other) *STREAMS* package is required to support

³ Note that not all release packages contain shared libraries, and, therefore, not all release packages contain this package.

the DLPI and XTI tests. Since the *netperf* binary is directly linked with the ‘libLiS.so.0.0.0’ library for support of the `getpmsg(2)` and `putpmsg(2)` system calls, this package is tightly tied to the DLPI tests. This package is required by *netperf-LiS-2.3.7-1.7.2.i686.rpm*. Other subpackages created by *LiS-2.18.7-1.src.rpm* may be necessary to be able to recompile *netperf-2.3.7*.

streams-core-0.9.2.4-1.i686.rpm

This package provides the other of the two SVR 4.2 *STREAMS* facilities for use by *netperf-openss7-2.3.7*. This (or the other) *STREAMS* package is required to support the DLPI and XTI tests. Since the *netperf-openss7* binary is directly linked with the ‘libstreams.so.0.0.0’ library for support of the `getpmsg(2)` and `putpmsg(2)` system calls, this package is tightly tied to the DLPI tests. This package is required by *netperf-openss7-streams-2.3.7-1.i686.rpm*. Other subpackages created by *streams-0.9.2.4-1.src.rpm* may be necessary to be able to recompile *netperf-openss7-2.3.7*.

strxns-core-0.9.2.7-1.i686.rpm

This package provides the DLPI implementation for Linux Ethernet devices required by the *netperf-openss7-2.3.7* DLPI tests. Other subpackages created by *strxns-0.9.2.7-1.src.rpm* may be necessary to be able to recompile *netperf-openss7-2.3.7*.

strxnet-core-0.9.2.12-1.i686.rpm

This package provides the X/Open XNS 5.2 XTI/TLI library (*libxnet*) necessary to support the XTI tests. Other subpackages created by *strxnet-0.9.2.12-1.src.rpm* may be necessary to be able to recompile *netperf-openss7-2.3.7*. Section “Introduction” in *The OpenSS7 XNS/XTI Library Reference Manual*.

strinet-core-0.9.2.7-1.i686.rpm

This package provides the XTI interface to the Linux Socket SCTP, TCP and UDP implementations in support of XTI SCTP, XTI TCP and XTI UDP tests. This package is only required if it is desired to run XTI SCTP, XTI TCP or XTI UDP tests on Linux using the *strinet* driver. Section “Introduction” in *OpenSS7 STREAMS INET Driver*. The *strinet* driver is an XTIOs (XTI over Sockets) implementation that provides a *STREAMS* XTI interface to the native Linux Kernel socket code. Other subpackages created by *strinet-0.9.2.7-1.src.rpm* may be necessary to be able to recompile *netperf-openss7-2.3.7*.

strsctp-core-0.9.2.9-1.i686.rpm

This package provides the XTI interface to the Linux *STREAMS* implementation of SCTP in support of XTI SCTP tests. This package is only required if it is desired to run XTI SCTP tests on Linux. This is a native *STREAMS* implementation of the Stream Control Transmission Protocol (SCTP) that does not use XTIOs. Other subpackages created by *strsctp-0.9.2.9-1.src.rpm* may be necessary to be able to recompile *netperf-openss7-2.3.7*.

Configuration and Installation

To configure, build and install the binary RPM, See Section 7.3.1 [Configuring the Binary RPM], page 65.

7.2.4 Downloading the Debian DEB

To install from binary DEB, you will need several of the DEB for a complete installation. Binary DEB fall into several categories. To download and install a complete package requires the appropriate DEB from each of the several categories below, as applicable. Some release packages do not provide DEBs in each of the several categories.

To install from Binary DEB, you will need all of the following independent packages for your architecture.

Independent DEB

Independent DEB are dependent on neither the Linux kernel version, nor the *STREAMS* package. For example, the source package ‘`netperf-source_2.3.7-0_i386.deb`’, is not dependent on kernel nor *STREAMS* package.

All of the following *STREAMS* independent DEB are required for your architecture. Binary DEBs listed here are for example only: additional binary DEBs are available from the downloads site. If your architecture is not available, you can build binary DEB from the Debian DSC (see see [Section 7.4.2 \[Building from the Debian DSC\]](#), page 84).

Architecture Independent

`netperf-dev_2.3.7-0_all.deb`

The ‘`netperf-dev`’ package contains the device definitions necessary to run applications programs developed for OpenSS7 NETPERF Utility.⁴

`netperf-doc_2.3.7-0_all.deb`

The ‘`netperf-doc`’ package contains this manual in plain text, postscript, ‘`pdf`’ and ‘`html`’ forms, along with the meta-information from the ‘`netperf`’ package. It also contains all of the manual pages necessary for developing OpenSS7 NETPERF Utility applications and OpenSS7 NETPERF Utility *STREAMS* modules or drivers.

`netperf-init_2.3.7-0_all.deb`

The ‘`netperf-init`’ package contains the `init` scripts and provides the `postinst` scripts necessary to create kernel module preloads and modules definitions for all kernel module ‘`core`’ subpackages.

`netperf-source_2.3.7-0_all.deb`

The ‘`netperf-source`’ package contains the source code necessary for building the OpenSS7 NETPERF Utility release. It includes the `autoconf(1)` configuration utilities necessary to create and distribute tarballs, rpms and `deb/dscs`.⁵

Architecture Dependent

The following Architecture Dependent packages are required for your architecture. If your architecture is not on the list, you can build binary DEB from the Debian DSC (see see [Section 7.4.2 \[Building from the Debian DSC\]](#), page 84).

⁴ Note that not all release packages contain devices. Only packages that provide *STREAMS* character device drivers need devices, and then only when the ‘`specfs`’ or ‘`devfsd`’ is not being used.

⁵ Note that not all releases have source DEB packages. Release packages that do not contain kernel modules do not generate a source DEB package.

netperf-devel_2.3.7-0_i386.deb

The ‘`netperf-devel`’ package contains library archives for static compilation, header files to develop OpenSS7 NETPERF Utility modules and drivers. This also includes the header files and static libraries required to compile OpenSS7 NETPERF Utility applications programs.

netperf-lib_2.3.7-0_i386.deb

The ‘`netperf-lib`’ package contains the run-time shared libraries necessary to run application programs and utilities developed for the ‘`netperf`’ package.⁶

STREAMS-Dependent DEB

STREAMS-Dependent DEB are dependent upon the specific *STREAMS* package being used, either *Linux STREAMS* or *Linux Fast-STREAMS*. Packages dependent upon *Linux STREAMS* will have ‘`LiS`’ in the package name. Packages dependent upon *Linux Fast-STREAMS* will have ‘`streams`’ in the package name. Note that some *STREAMS*-Dependent DEB are also Kernel-Dependent DEB as described below.

One of the following *STREAMS*-Dependent packages is required for your architecture. If your architecture is not on the list, you can build binary DEB from the Debian DSC (see see [Section 7.4.2 \[Building from the Debian DSC\]](#), page 84).

netperf-LiS-util_2.3.7-0_i386.deb

The ‘`netperf-LiS-util`’ package provides administrative and configuration test utilities and commands associated with the OpenSS7 NETPERF Utility package. Because this package must link a *STREAMS*-specific library, it is a *STREAMS*-Dependent package. Use the ‘`netperf-LiS-util`’ package if you have *LiS* installed.

netperf-streams-util_2.3.7-0_i386.deb

The ‘`netperf-streams-util`’ package provides administrative and configuration test utilities and commands associated with the OpenSS7 NETPERF Utility package. Because this package must link a *STREAMS*-specific library, it is a *STREAMS*-Dependent package. Use the ‘`netperf-streams-util`’ package if you have *streams* installed.

Configuration and Installation

To configure, build and install the Debian DEB, See [Section 7.3.2 \[Configuring the Debian DEB\]](#), page 66.

7.2.5 Downloading the Source RPM

If you cannot obtain a binary RPM for your architecture, or would like to roll your own binary RPM, download the following source RPM.

netperf-2.3.7-1.src.rpm

This is the source RPM for the package. From this source RPM it is possible to build binary RPM for any supported architecture and for any 2.4 or 2.6 kernel, for either *Linux STREAMS* or *Linux Fast-STREAMS*.

⁶ Note that not all release packages contain shared libraries, and, therefore, not all release packages contain this package.

Configuration

To configure the source RPM, See [Section 7.3.3 \[Configuring the Source RPM\]](#), page 66.

7.2.6 Downloading the Debian DSC

If you cannot obtain a binary DEB for your architecture, or would like to roll your own DEB, download the following Debian DSC.

[netperf_2.3.7-0.dsc](#)
[netperf_2.3.7-0.tar.gz](#)

This is the Debian DSC for the package. From this Debian DSC it is possible to build binary DEB for any supported architecture and for any 2.4 or 2.6 kernel, for either *Linux STREAMS* or *Linux Fast-STREAMS*.

Configuration

To configure the source RPM, See [Section 7.3.4 \[Configuring the Debian DSC\]](#), page 72.

7.2.7 Downloading the Tar Ball

For non-`rpm(1)` and non-`dpkg(1)` architectures, download the tarball as follows:

[netperf-2.3.7.tar.gz](#)
[netperf-2.3.7.tar.bz2](#)

These are the `tar(1)` balls for the release. These `tar(1)` balls contain the `autoconf(1)` distribution which includes all the source necessary for building and installing the package. These tarballs will even build Source RPM and Binary RPM on `rpm(1)` architectures and Debian DSC and DEB on `dpkg(1)` architectures.

The tar ball may be downloaded easily with `wget(1)` as follows:

```
% wget http://www.openss7.org/netperf-2.3.7.tar.bz2
```

or

```
% wget http://www.openss7.org/netperf-2.3.7.tar.gz
```

Note that you will need an *OpenSS7 Project* user name and password to download release candidates (which are only available to subscribers and sponsors of the *OpenSS7 Project*).

Unpacking the Archive

After downloading one of the tar balls, unpack the archive using one of the following commands:

```
% wget http://www.openss7.org/netperf-2.3.7.tar.gz  
% tar -xzf netperf-2.3.7.tar.gz
```

or


```
% wget http://www.openss7.org/netperf-2.3.7.tar.bz2
% tar -xjvf netperf-2.3.7.tar.bz2
```

Either will create a subdirectory name ‘netperf-2.3.7’ containing all of the files and subdirectories for the netperf package.

Configuration

To configure and install the tar ball, See [Section 7.3.5 \[Configuring the Tar Ball\]](#), page 72.

7.2.8 Downloading from CVS

If you are a subscriber or sponsor of [The OpenSS7 Project](#) with CVS archive access privileges then you can download release, mid-release or release candidate versions of the ‘netperf’ package from the project CVS archive.

The OpenSS7 NETPERF Utility package is located in the ‘netperf’ module of ‘/var/cvs’. For release tag information, see [Chapter 6 \[Releases\]](#), page 39.

To access the archive from the project CVS pserver, use the following commands to check out a version from the archive:

```
% export CVSROOT='-d:pserver:username@cvs.openss7.com:2401/var/cvs'
% cvs login
Password: *****
% cvs co -r netperf_2.3.7 netperf
% cvs logout
```

It is, of course, possible to check out by date or by other criteria. For more information, see [cvs\(1\)](#).

Preparing the CVS Working Directory

Although public releases of the ‘netperf’ package do not require reconfiguration, creating a configurable directory from the CVS archive requires tools not normally distributed with the other releases.

The build host requires the following GNU tools:

- m4 1.4.12
- autoconf 2.63
- automake 1.10.1
- libtool 2.2.4
- gettext 0.17
- flex 2.5.33
- bison 2.3

Most desktop development GNU/Linux distributions will have these tools; however, some non-development or server-style installations might not and they must be installed separately.⁷

⁷ Older version of bison (2.0) and the older version of flex (2.5.4a) are also suitable. Where possible, use the more recent bison 2.3 and flex 2.5.33.

Also, these tools can be acquired from the [FSF website](#) in the free software directory, and also at the following locations:

- [m4-1.4.12](#)
- [autoconf-2.63](#)
- [automake-1.10.1](#)
- [libtool-2.2.4](#)
- [gettext-0.17](#)
- [flex-2.5.33](#)
- [bison-2.3](#)

It should be stressed that, in particular, the `autoconf(1)`, and `automake(1)`, must be at version releases 2.63 and 1.10.1. *The versions normally distributed in some mainstream GNU/Linux distributions are, in fact, much older than these versions.*⁸ GNU version of these packages configured and installed to default directories will install in `‘/usr/local/’` allowing them to coexist with distribution installed versions.

For building documentation, the build host also requires the following documentation tools:

- `gs` 6.51 or `ghostscript` 6.51, or newer.
- `tetex` 3.0 or `texlive` 2007, or newer.
- `texinfo` 4.13a or newer.
- `transfig` 3.2.3d or newer.
- `imagemagick` 5.3.8 or `ImageMagick` 5.3.8, or newer.
- `groff` 1.17.2 or newer.
- `gnuplot` 3.7 or newer.
- `latex2html` 1.62 or newer.

Most desktop GNU/Linux distributions will have these tools; however, some server-style installations (e.g. *Ubuntu-server*, *SLES 9* or *Fedora 6 or 7*) will not and they must be installed separately.⁹

Note that `texinfo` 4.12 must not be used as it breaks the build process.

For uncooked manual pages, the entire `groff(1)` package is required on *Debian* and *Ubuntu* systems (the base package does not include `grefer(1)` which is used extensively by uncooked manual pages). The following will get what you need:

```
Debian: % apt-get install groff_ext
Ubuntu: % apt-get install groff
```

In addition, the build host requires a complete tool chain for compiling for the target host, including kernel tools such as `genksyms(8)` and others.

⁸ A notable exception is *Debian* and *Fedora 7*. Note that on *Fedora 7* the `gettext-devel` package must be installed.

⁹ In particular, for *CentOS*, *Fedora 6 or 7*, the `tetex-latex` and `gnuplot` packages must be loaded as well. Note also that the `latex2html` used to be part of the `textex` package (or subpackages) but is now often packaged on its own. Recent distributions such as *SUSE 11.0* and *Fedora 9* use the `texlive` package instead of the `textex` package.

If you wish to package ‘rpms’ on an `rpm(1)` system, or ‘debs’ on a `dpkg(1)` system, you will need the appropriate tool chain. Systems based on `rpm(1)` typically have the necessary tool chain available, however, `dpkg(1)` systems do not. The following on a *Debian* or *Ubuntu* system will get what you need:

```
% apt-get install debhelper
% apt-get install fakeroot
```

To generate a configuration script and the necessary scriptlets required by the GNU `autoconf(1)` system, execute the following commands on the working directory:

```
% autoreconf -fiv netperf
```

where, ‘netperf’ is the name of the directory to where the working copy was checked out under the previous step. This command generates the ‘configure’ script and other missing pieces that are normally distributed with the release Tar Balls, SRPMs and DSCs.

Make sure that ‘autoreconf --version’ returns ‘2.63’. Otherwise, you may need to perform something like the following:

```
% PATH="/usr/local/bin:$PATH"
% autoreconf -fiv netperf
```

After reconfiguring the directory, the package can then be configured and built using the same instructions as are used for the Tar Ball, see [Section 7.3.5 \[Configuring the Tar Ball\]](#), page 72, and [Section 7.4.3 \[Building from the Tar Ball\]](#), page 85.

Do note, however, that `make(1)` will rebuild the documentation that is normally released with the package. Additional tools may be necessary for building the documentation. To avoid building and installing the documentation, use the ‘--disable-devel’ or ‘--disable-docs’ option to configure described in [Section 7.3.5 \[Configuring the Tar Ball\]](#), page 72.

When configuring the package in a working directory and while working a change-compile-test cycle that involves configuration macros or documentation, I find it of great advantage to invoke the GNU ‘configure’ options ‘--enable-maintainer-mode’, ‘--enable-dependency-tracking’ and ‘--disable-devel’. The first of these three options will add maintainer-specific targets to any generated ‘Makefile’, the second option will invoke automatic dependency tracking within the ‘Makefile’ so rebuilds after changes to macro, source or documentation files will be automatically rebuilt; and the last option will suppress rebuilding and reinstalling documentation manual pages and header files. Header files will still be available under the ‘/usr/src’ directory.

7.3 Configuration

7.3.1 Configuring the Binary RPM

In general the binary RPM do not require any configuration, however, during installation it is possible to relocate some of the installation directories. This allows some degree of customization. Relocations that are available on the binary RPM are as follows:

```

‘netperf-dev-2.3.7-1.7.2.i686.rpm’
    (not relocatable)

‘netperf-devel-2.3.7-1.7.2.i686.rpm’
    ‘[No value for ‘‘_rootdir’’][No value for ‘‘_libdir’’]’
      This relocatable directory contains netperf libraries.
    ‘[No value for ‘‘_rootdir’’]/usr/include/netperf’
      This relocatable directory contains netperf header files.

‘netperf-doc-2.3.7-1.7.2.i686.rpm’
    ‘[No value for ‘‘_rootdir’’]/usr/share/doc’
      This relocatable directory contains all package specific documenta-
      tion (including this manual). The subdirectory in this directory is
      the ‘netperf-2.3.7’ directory.
    ‘[No value for ‘‘_rootdir’’]/usr/share/info’
      This relocatable directory contains info files (including the info ver-
      sion of this manual).
    ‘[No value for ‘‘_rootdir’’]/usr/share/man’
      This relocatable directory contains manual pages.

‘netperf-LiS-lib-2.3.7-1.7.2.i686.rpm’
‘netperf-streams-lib-2.3.7-1.7.2.i686.rpm’
    ‘[No value for ‘‘_rootdir’’][No value for ‘‘_libdir’’]’
      This relocatable directory contains the run-time shared libraries
      necessary to run applications programs and utilities developed for
      OpenSS7 NETPERF Utility.
    ‘[No value for ‘‘_rootdir’’]/usr/share/locale’
      This relocatable directory contains the locale information for shared
      library files.

‘netperf-source-2.3.7-1.7.2.i686.rpm’
    ‘[No value for ‘‘_rootdir’’]/usr/src’
      This relocatable directory contains the source code.

‘netperf-LiS-util-2.3.7-1.7.2.i686.rpm’
‘netperf-streams-util-2.3.7-1.7.2.i686.rpm’
    ‘[No value for ‘‘_rootdir’’]/usr/bin’
      This relocatable directory contains binary programs and utilities.
    ‘[No value for ‘‘_rootdir’’]/usr/sbin’
      This relocatable directory contains system binary programs and
      utilities.

```

‘[No value for ‘‘_rootdir’’]/usr/libexec’
This relocatable directory contains test programs.

‘[No value for ‘‘_rootdir’’]/etc’
This relocatable directory contains init scripts and configuration information.

Installation

To install the binary RPM, See [Section 7.5.1 \[Installing the Binary RPM\]](#), page 86.

7.3.2 Configuring the Debian DEB

In general the binary DEB do not require any configuration.

Installation

To install the Debian DEB, See [Section 7.5.2 \[Installing the Debian DEB\]](#), page 86.

7.3.3 Configuring the Source RPM

When building from the source RPM (see [Section 7.4.1 \[Building from the Source RPM\]](#), page 84), the rebuild process uses a number of macros from the user’s ‘.rpmmacros’ file as described in [rpm\(8\)](#).

Following is an example of the ‘~/rpmmacros’ file that I use for rebuilding RPMS:

```
#
# RPM macros for building rpms
#

%vendor OpenSS7 Corporation
%distribution OpenSS7
%disturl http://www.openss7.org/
%packager Brian Bidulock <bidulock@openss7.org>
%url http://www.openss7.org/

%_signature gpg
%_gpg_path /home/brian/.gnupg
%_gpg_name openss7@openss7.org
%_gpgbin /usr/bin/gpg

%_source_payload w9.bzdio
%_binary_payload w9.bzdio

%_unpackaged_files_terminate_build 1
%_missing_doc_files_terminate_build 1
%_use_internal_dependency_generator 0
%_repackage_all_erasures 0
%_rollback_transaction_on_failure 0

%configure2_5x %configure
%make make
```

When building from the source RPM (see [Section 7.4.1 \[Building from the Source RPM\]](#), [page 84](#)), it is possible to pass a number of additional configuration options to the `rpmbuild(1)` process.

The additional configuration options are described below.

Note that distributions that use older versions of rpm do not have the ‘`--with`’ or ‘`--without`’ options defined. To achieve the same effect as:

```
--with someparm=somearg
```

do:

```
--define "_with_someparm --with-someparm=somearg"
```

This is a generic description of common `rpmbuild(1)` options. Not all `rpmbuild(1)` options are applicable to all SRPMs. Options that are kernel module specific are only applicable to SRPMs that build kernel modules. *STREAMS* options are only applicable to SRPMs that provide or require *STREAMS*.

```
--define "_kversion $PACKAGE_KVERSION"
```

Specifies the kernel version other than the running kernel for which to build. If `_kversion` is not defined when rebuilding, the environment variable `PACKAGE_KVERSION` is used. If the environment variable `PACKAGE_KVERSION` is not defined, then the version of the running kernel (i.e. discovered with ‘`uname -r`’) is used as the target version for kernel-dependent packages. This option can also be defined in an ‘`.rpmspec`’ file using the macro name ‘`_kversion`’.

```
--with checks
```

```
--without checks
```

Enable or disable preinstall checks. Each packages supports a number of preinstall checks that can be performed by invoking the ‘`check`’ target with `automake(1)`. These currently consist of checking each kernel module for unresolved kernel symbols, checking for documentation for exported kernel module symbols, checking for documentation for exported library symbols, checking for standard options for build and installable programs, checking for documentation for built and installable programs. Normally these checks are only run in maintainer mode, but can be enabled and disabled with this option.

```
--with k-optimize=HOW
```

```
--without k-optimize
```

Specify ‘`HOW`’ optimization, *normal*, *size*, *speed* or *quick*. *size* compiles kernel modules `-Os`, *speed* compiles kernel modules `-O3`, and *quick* compiles kernel modules `-O0`. The default is *normal*. Use with care.

```
--with cooked-manpages
```

```
--without cooked-manpages
```

Some systems do not like `grefer(1)` references in manual pages.¹⁰ This option will cook `soelim(1)`, `refer(1)`, `tbl(1)` and `pic(1)` commands from the man-

¹⁰ In particular, some *Debian* systems do not load the `groff(1)` extensions package and do not have `grefer(1)` installed. Although this is an oversight on the configuration of the particular *Debian* system, we accomodate such misconfiguration with this feature.

ual pages and also strip `groff(1)` comments. The default is to leave manual pages uncooked: they are actually smaller that way.

`--with public`

`--without public`

Release public packages or private packages. This option has no effect on the ‘netperf’ package. The default is to release public packages.

`--with k-debug`

`--without k-debug`

Specifies whether kernel debugging is to be performed on the build kernel modules. Mutually exclusive with `test` and `safe` below. This has the effect of removing static and inline attributes from functions and invoking all debugging macros in the code. The default is to not perform kernel debugging.

`--with k-test`

`--without k-test`

Specifies whether kernel testing is to be performed. Mutually exclusive with `debug` above and `safe` below. This has the effect of removing static and inline attributes from functions and invoking most debugging macros in the code. The default is to not perform kernel testing.

`--with k-safe`

`--without k-safe`

Specifies whether kernel safety is to be performed. Mutually exclusive with `debug` and `test` above. This has the effect of invoking some more pedantic assertion macros in the code. The default is not to apply kernel safety.

`--with k-inline`

`--without k-inline`

Specifies whether kernel `inline` functions are to be placed inline. This has the effect of adding the ‘`-finline-functions`’ flag to `CFLAGS` for compiling kernel modules. Linux 2.4 kernels are normally compiled ‘`-O2`’ which does not respect the `inline` directive. This compiles kernel modules with ‘`-finline-functions`’ to get closer to ‘`-O3`’ optimization. For better optimization controls, See [Section 7.3.5 \[Configuring the Tar Ball\]](#), page 72.

`--with k-modversions`

`--without k-modversions`

Specifies whether kernel symbol versions are to be applied to symbols exported by package kernel modules. The default is to version exported module symbols. This package does not export symbols so this option has no effect.

`--with devfs`

`--without devfs`

Specifies whether the build is for a device file system daemon enabled system with autoloading, or not. The default is to build for `devfsd(1)` autoloading when `CONFIG_DEVFS_FS` is defined in the target kernel. The ‘rebuild’ target uses this option to signal to the RPM spec file that the ‘dev’ subpackage need not be built. This option does not appear when the package has no devices.

`--with devel`

`--without devel`

Specifies whether to build development environment packages such as those that include header files, static libraries, manual pages and `texinfo(1)` documentation. The default is to build development environment packages. This option can be useful when building for an embedded target where only the runtime components are desired.

`--with docs`

`--without docs`

Specifies whether to build and install major documentation such manual pages and `texinfo(1)` documentation. The default is to build and install documentation. This option can be useful when building for an embedded target where only the runtime and static compile components are desired, but not major documentation. This option does not override the setting of `--without devel`.

`--with tools`

`--without tools`

Specifies whether user space packages are to be built. The default is to build user space packages. This option can be useful when rebuilding for multiple architectures and target kernels. The `'rebuild'` `automake(1)` target uses this feature when rebuilding for all available architectures and kernels, to rebuild user packages once per architecture instead of once per kernel.

`--with modules`

`--without modules`

Specifies whether kernel modules packages are to be built. The default is to build kernel module packages. This option can be useful when rebuilding for multiple architectures and target kernels. The `'rebuild'` `automake(1)` target uses this feature to rebuild for all available architectures and kernels.

`--with lis`

`--without lis`

Specifies that the package is to be rebuilt against *Linux STREAMS*. The default is to automatically identify whether `'LiS'` or `'streams'` is loaded on the build system and build accordingly.

`--with lfs`

`--without lfs`

Specifies that the package is to be rebuilt against *Linux Fast-STREAMS*. The default is to automatically identify whether `'LiS'` or `'streams'` is loaded on the build system and build accordingly.

In addition, the following rpm options, specific to the OpenSS7 NETPERF Utility package are available:

`--without netperf-dirty`

Disable code that dirties buffers before calls to send. This option defaults to `'enabled'`.

- `--without netperf-histogram`
Disable code to keep a histogram of request-response times or time spend in `send()`. This option defaults to 'enabled'.
- `--with netperf-old-histogram`
Enable old pre-2.2pl6 formatted histogram. This option defaults to 'disabled'.
- `--without netperf-intervals`
Disable code to allow pacing of sends in UDP, TCP or SCTP tests. This may have unexpected results on non-HPUX systems. This option defaults to 'enabled'.
- `--without netperf-do-dlpi`
Disable code to test to the DLPI implementation. This option defaults to 'enabled'.
- `--without netperf-do-sctp`
Disable code to test the SCTP implementation. This option defaults to 'enabled'.
- `--without netperf-do-select`
Disable code to do `select()` on receive. This option defaults to 'enabled'.
- `--with netperf-do-lwp`
This option defaults to 'disabled'.
- `--without netperf-do-nbrr`
Disable code to do non-blocking request-response. This option defaults to 'enabled'.
- `--without netperf-do-xti`
Disable code to test the XTI implementation. This option defaults to 'enabled'.
- `--without netperf-do-xti-sctp`
Disable code to test the XTI SCTP implementation. This option defaults to 'enabled'.
- `--without netperf-do-unix`
Disable code to test the UNIX domain implementation. This option defaults to 'enabled'.
- `--without netperf-do-1644`
Disable code to test T/TCP vs TCP transactions. This option defaults to 'enabled'.
- `--without netperf-do-first-burst`
Disable code to create an initial burst. This option defaults to 'enabled'.
- `--with netperf-use-looper`
Enable looper or soaker processes. When enabled, use looper or soaker processes to measure CPU utilization. These will be forked-off at the beginning. If you are running this way, it is important to see how much impact these have on the measurement. A loop back test on uniprocessor should be able to consume approximately 100% of the CPU, and the difference between throughput with

USE_LOOPER_CPU and *without* should be small for a real network. If it is not, then some work probably needs to be done on reducing the priority of the looper processes. This option defaults to ‘disabled’. Do not enable this option for *Linux*.

--with netperf-use-pstat

Enable code to perform HP-UX CPU utilization. If use on *HP-UX 10.0* and later, this will make CPU utilization measurements with some information returns by the *10.X pstat()* call. This is very accurate, and should have no impact on the measurement. Astute observers will notice that the *LOC_CPU* and *REM_CPU* created with this method look remarkably close to the clock rate of the machine. This option defaults to ‘disabled’. Do not enable this option for *Linux*.

--with netperf-use-kstat

Enable code to Solaris CPU utilization. If used on *Solaris 2*, this will make CPU utilization measurements using the *kstat()* interface. This option defaults to ‘disabled’. Do not enable this option for *Linux*.

--without netperf-use-proc-stat

Disable use of ‘*/proc/stat*’ interface. Enabled for *Linux* systems with CPU utilization info in ‘*/proc/stat*’. Provides a fairly accurate CPU load measurement without affecting measurement. This option defaults to ‘enabled’.

--with netperf-do-ipv6

Enables IPv6 testing. This option defaults to ‘disabled’.

--without netperf-do-dns

Disables DNS testing. This option defaults to ‘enabled’.

--with netperf-use-sysctl

Enables use of *sysctl* on BSD. When enabled, use the *sysctl()* call on FreeBSD (perhaps other BSDs) to calculate CPU utilization. This option defaults to ‘disabled’. Do not enable this option for *Linux*.

--with netperf-use-perfstat

Enable use of *perfstat* on AIX. When enabled, use the *perfstat()* call on AIX to calculate CPU utilization. This option defaults to ‘disabled’. Do not enable this option for *Linux*.

--with netperf-dont-wait

Enable *MSG_DONTWAIT* on sends. This option defaults to ‘disabled’.

--with-netperf-logfile=LOGFILE

Specify a debug log file. This option defaults to ‘*/tmp/netperf.debug*’.

In general, the default values of these options are sufficient for most purposes and no options need be provided when rebuilding the Source RPMs.

Build

To build from the source RPM, See [Section 7.4.1 \[Building from the Source RPM\]](#), page 84.

7.3.4 Configuring the Debian DSC

The Debian DSC can be configured by passing options in the environment variable *BUILD_DEBOPTIONS*. The options placed in this variable take the same form as those passed to the ‘configure’ script, See [Section 7.3.5 \[Configuring the Tar Ball\]](#), page 72. For an example, See [Section 7.4.2 \[Building from the Debian DSC\]](#), page 84.

Build

To build from the Debian DSC, See [Section 7.4.2 \[Building from the Debian DSC\]](#), page 84.

7.3.5 Configuring the Tar Ball

All of the normal GNU `autoconf(1)` configuration options and environment variables apply. Additional options and environment variables are provided to tailor or customize the build and are described below.

7.3.5.1 Configure Options

This is a generic description of common ‘configure’ options that are in addition to those provided by `autoconf(1)`, `automake(1)`, `libtool(1)` and `gettext(1)`.

Not all ‘configure’ options are applicable to all release packages. Options that are kernel module specific are only applicable to release packages that build kernel modules. *STREAMS* options are only applicable to release packages that provide or require *STREAMS*.

Following are the additional ‘configure’ options, their meaning and use:

`--enable-checks`

`--disable-checks`

Enable or disable preinstall checks. Each release package supports a number of preinstall checks that can be performed by invoking the ‘check’ target with `make(1)`. These currently consist of checking each kernel module for unresolved kernel symbols, checking for documentation for exported kernel module symbols, checking for documentation for exported library symbols, checking for standard options for build and installable programs, checking for documentation for built and installable programs. Normally these checks are only run in maintainer mode, but can be enabled and disabled with this option.

`--disable-compress-manpages`

Compress manual pages with ‘gzip -9’ or ‘bzip2 -9’ or leave them uncompressed. The default is to compress manual pages with ‘gzip -9’ or ‘bzip2 -9’ if a single compressed manual page exists in the target installation directory (‘--mandir’). This disables automatic compression.

`--disable-public`

Disable public release. This option is not usable on public releases and only has a usable effect on OpenSS7 NETPERF Utility when the package is acquired from CVS. In particular, the *STREAMS SS7/VoIP/ISDN/SIGTRAN Stacks* (`strss7-0.9a.8`) release package has a large number of non-public components. Specifying this option will cause the package to build and install all private release components in addition to the public release components. This option

affects all release packages. Most release packages do not have private release components.

`--disable-initscripts`

Disables the installation of `init` scripts. The default is to configure and install `init` scripts and their associated configuration files.

Although the default is to install `init` scripts, installation attempts to detect a System V `init` script configuration, and if one is not found, the `init` scripts are installed into the appropriate directories, but the symbolic links to the run level script directories are not generated and the script is not invoked. Therefore, it is safe to leave this option unchanged, even on distributions that do not support System V `init` script layout.

`--disable-32bit-libs`

Disables the build and install of 32-bit compatibility libraries and test binaries on 64-bit systems that support 32-bit compatibility. The default is to build and install 32-bit compatibility libraries and test binaries. This option can be useful when configuring for an embedded target where only native shared libraries and binaries are desired.

`--disable-devel`

Disables the installation of development environment components such as header files, static libraries, manual pages and `texinfo(1)` documentation. The default is to install development environment components. This option can be useful when configuring for an embedded target where only the runtime components are desired, or when performing a `edit-compile-test` cycle.

`--disable-docs`

Disables the build and installation of major documentation such manual pages and `texinfo(1)` documentation. The default is to build and install documentation. This option can be useful when building for an embedded target where only the runtime and static compile components are desired, but not major documentation. This option does not override the setting of `'--disable-devel'`.

`--enable-tools`

Specifies whether user space programs and libraries are to be built and installed. The default is to build and install user space programs and libraries. This option can be useful when rebuilding for multiple architectures and target kernels, particularly under `rpm(1)` or `dpkg(1)`. The `'rebuild'` `automake(1)` target uses this feature when rebuilding RPMs for all available architectures and kernels, to rebuild user packages once per architecture instead of once per kernel.

`--enable-modules`

Specifies whether kernel modules are to be built and installed. The default is to build and install kernel modules. This option can be useful when rebuilding for multiple architectures and target kernels, particularly under `rpm(1)` or `dpkg(1)`. The `'rebuild'` `automake(1)` target uses this feature to rebuild for all available architectures and kernels. This option has no effect for release packages that do not provide kernel modules.

--enable-arch

Specifies whether architectural dependent package components are to be built and installed. This option can be useful when rebuilding for multiple architectures and target kernels, particularly under `dpkg(1)`. The default is to configure, build and install architecture dependent package components. This option has no effect for release packages that do not provide architecture dependent components.

--enable-indep

Specifies whether architecture independent package components are to be built and installed. This option can be useful when rebuilding for multiple architectures and target kernels, particularly under `dpkg(1)`. The default is to configure, build and install architecture independent package components. This options has no effect for release packages that do not provide architecture independent components.

--enable-k-inline

Enable kernel inline functions. Most Linux kernels build without `'-finline-functions'`. This option adds the `'-finline-functions'` and `'-Winline'` flags to the compilation of kernel modules. Use with care. This option has no effect for release packages that do not provide kernel modules.

--enable-k-safe

Enable kernel module run-time safety checks. Specifies whether kernel safety is to be performed. This option is mutually exclusive with `'--enable-k-test'` and `'--enable-k-debug'` below. This has the effect of invoking some more pedantic assertion macros in the code. The default is not to apply kernel safety. This option has no effect for release packages that have are no kernel modules.

--enable-k-test

Enable kernel module run-time testing. Specifies whether kernel testing is to be performed. This option is mutually exclusive with `'--enable-k-safe'` above and `'--enable-k-debug'` below. This has the effect of remove `static` and `inline` attributes from functions and invoking most non-performance affecting debugging macros in the code. The default is not to perform kernel testing. This option has no effect for release packages that do not provide kernel modules.

--enable-k-debug

Enable kernel module run-time debugging. Specifies whether kernel debugging is to be performed. This option is mutually exclusive with `'--enable-k-safe'` and `'--enable-k-test'` above. This has the effect of removing `static` and `inline` attributes from functions and invoking all debugging macros in the code (including performance-affecting debug macros). The default is to not perform kernel debugging. This option has no effect for release packages that do not provide kernel modules.

--disable-k-modversions

Disable module versions on `netperf` symbols. Specifies whether kernel symbol versions are to be used on symbols exported from built `netperf` modules. The default is to provide kernel symbol versions on all exported symbols. This option has no effect for release packages that do not provide kernel modules.

`--enable-devfs`

`--disable-devfs`

Specifies whether the build is for a device file system daemon enabled system with autoloading, or not. The default is to build for `devfsd(8)` autoloading when `CONFIG_DEVFS_FS` is defined in the target kernel. The `'rebuild'` `automake(1)` target uses this option to signal to the RPM spec file that the `'dev'` subpackage need not be built. This option has no effect for release packages that do not provide devices.

`--with-gpg-user=GNUPGUSER`

Specify the `gpg(1)` `'GNUPGUSER'` for signing RPMs and tarballs. The default is the content of the environment variable `GNUPGUSER`. If unspecified, the `gpg(1)` program will normally use the user name of the account invoking the `gpg(1)` program. For building source RPMs, the RPM macro `'_gpg_name'` will override this setting.

`--with-gpg-home=GNUPGHOME`

Specify the `'GNUPGHOME'` directory for signing RPMs and tarballs. The default is the user's `'~/gpg'` directory. For building source RPMs, the RPM macro `'_gpg_path'` will override this setting.

`--with-pkg-epoch=EPOCH`

Specifies the epoch for the package. This is neither used for `rpm(1)` nor `dpkg(1)` packages, it applies to the tarball release as a whole. The default is the contents of the `'pkgepoch'` file in the release package source directory or, if that file does not exist, zero (0).

`--with-pkg-release=RELEASE`

Specifies the release for the package. This is neither used for `rpm(1)` nor `dpkg(1)` packages, it applies to the tarball release as a whole. The default is the contents of the `'pkgrelease'` file in the release package source directory or, if that file does not exist, one (1). This is the number after the last point in the package version number.

`--with-pkg-distdir=DIR`

Specifies the distribution directory for the package. This is used by the maintainer for building distributions of tarballs. This is the directory into which archives are copied for distribution. The default is the top build directory.

`--with-cooked-manpages`

Convert manual pages to remove macro dependencies and `refer(1)` references. Some systems do not like `refer(1)` references in manual pages.¹¹ This option will cook `soelim(1)`, `refer(1)`, `tbl(1)` and `pic(1)` commands from the manual pages and also strip `groff(1)` comments. The default is to leave manual pages uncooked (they are actually smaller that way).

¹¹ In particular, some *Debian* or *Ubuntu* systems do not load the `groff(1)` extensions package and do not have `refer(1)` installed. Although this is an oversight on the configuration of the particular *Debian* or *Ubuntu* system, we accomodate such misconfiguration with this feature.

- `--with-rpm-epoch=PACKAGE_EPOCH`
Specify the 'PACKAGE_EPOCH' for the RPM spec file. The default is to use the RPM epoch contained in the release package file '.rpmepoch'.
- `--with-rpm-release=PACKAGE_RPMRELEASE`
Specify the 'PACKAGE_RPMRELEASE' for the RPM 'spec' file. The default is to use the RPM release contained in the release package file '.rpmrelease'.
- `--with-rpm-extra=PACKAGE_RPMEXTRA`
Specify the 'PACKAGE_RPMEXTRA' extra release information for the RPM spec file. The default is to use the RPM extra release information contained in the release package file '.rpmextra'. Otherwise, this value will be determined from automatic detection of the RPM distribution.
- `--with-rpm-topdir=PACKAGE_RPMTOPDIR`
Specify the 'PACKAGE_RPMTOPDIR' top directory for RPMs. If specified with a null 'PACKAGE_RPMTOPDIR', the default directory for the RPM distribution will be used. If this option is not provided on the command line, the top build directory will be used as the RPM top directory as well.
- `--with-deb-epoch=EPOCH`
Specify the 'PACKAGE_DEBEPOCH' for the DEB control file. The default is to use the DEB epoch contained in the release package file '.debepoch'.
- `--with-deb-release=RELEASE`
Specify the 'PACKAGE_DEBRELEASE' for the DEB control file. The default is to use the DEB release contained in the release package file '.debrelease'.
- `--with-deb-topdir=DIR`
Specify the 'PACKAGE_DEBTOPDIR' top directory for DEBs. If specified with a null 'PACKAGE_DEBTOPDIR', the default directory for the DEB distribution will be used. If this option is not provided on the command line, the top build directory will be used as the DEB top directory as well.
- `--with-k-release=PACKAGE_KRELEASE`
Specify the 'PACKAGE_KRELEASE' release of the Linux kernel for which the build is targeted. When not cross compiling, if this option is not set, the build will be targeted at the kernel running in the build environment (e.g., 'uname -r'). When cross-compiling this option must be specified or the configure script will generate an error and terminate.
- `--with-k-linkage=PACKAGE_KLINKAGE`
Specify the 'PACKAGE_KLINKAGE' for kernel module linkage. This can be one of the following:
- 'loadable' – loadable kernel modules
 - 'linkable' – linkable kernel objects
- The default is to build loadable kernel modules.
- `--with-k-modules=K-MODULES-DIR`
Specify the 'K-MODULES-DIR' directory to which kernel modules will be installed. The default is based on the option '--with-k-release', '--with-k-prefix'

and `--with-k-rootdir`. The default is `DESTDIR/K-MODULES-DIR` which is typically `DESTDIR/lib/modules/PACKAGE_KRELEASE/`. This directory is normally located by the `configure` script and need only be provided for special cross-build environments or when requested by a `configure` script error message.

`--with-k-build=K-BUILD-DIR`

Specify the `K-BUILD-DIR` base kernel build directory in which configured kernel source resides. The default is `DESTDIR/K-MODULES-DIR/build`. This directory is normally located by the `configure` script and need only be provided for special cross-build environments or when requested by a `configure` script error message.

`--with-k-source=K-SOURCE-DIR`

Specify the `K-SOURCE-DIR` base kernel build directory in which configured kernel source resides. The default is `DESTDIR/K-MODULES-DIR/source`. This directory is normally located by the `configure` script and need only be provided for special cross-build environments or when requested by a `configure` script error message.

`--with-k-modver=K-MODVER-FILE`

Specify the `K-MODVER-FILE` kernel module versions file. The default is `K-BUILD-DIR/Module.symvers`. This file is normally located by the `configure` script and need only be provided for special cross-build environments or when requested by a `configure` script error message.

`--with-k-sysmap=K-SYSMAP-FILE`

Specify the `K-SYSMAP-FILE` kernel system map file. The default is `K-BUILD-DIR/System.map`. This file is normally located by the `configure` script and need only be provided for special cross-build environments or when requested by a `configure` script error message.

`--with-k-archdir=K-ARCHDIR`

Specify the `K-ARCHDIR` kernel source architecture specific directory. The default is `DESTDIR/K-SOURCE-DIR/arch`. This directory is normally located by the `configure` script and need only be provided for special cross-build environments or when requested by a `configure` script error message.

`--with-k-machdir=K-MACHDIR`

Specify the `K-MACHDIR` kernel source machine specific directory. The default is `DESTDIR/K-SOURCE-DIR/target_cpu`. This directory is normally located by the `configure` script and need only be provided for special cross-build environments or when requested by a `configure` script error message.

`--with-k-config=K-CONFIG`

Specify the `K-CONFIG` kernel configuration file. The default is `BOOT/config-K-RELEASE`. This configuration file is normally located by the `configure` script and need only be provided for special cross-build environments or when requested by a `configure` script error message.

`--with-k-optimize=HOW`

`--without-k-optimize`

Specify 'HOW' optimization, *normal*, *size*, *speed* or *quick*. *size* compiles kernel modules `-Os`, *speed* compiles kernel modules `-O3`, and *quick* compiles kernel modules `-O0`. The default is *normal*. Use with care. The most common use of this option is to specify `--with-k-optimize=speed --disable-k-safe` to compile for maximum performance. Nevertheless, even these setting are *ricing* and the resulting kernel modules will only be about 5% faster.

`--with-lis[=LIS-DIR]`

`--without-lis`

Specify the 'LIS-DIR' directory in which to find *LiS* headers. Also specifies that the build is to be made against Linux STREAMS. The default is `/usr/include/LiS` if it exists, 'no' otherwise. This directory is normally located by the 'configure' script and need only be provided for special cross-build environments or when requested by a 'configure' script error message. This option has no effect on release packages that do not use the *STREAMS* subsystem.

`--with-lfs[=LFS-DIR]`

`--without-lfs`

Specify the 'LFS-DIR' directory in which to find *LfS* headers. Also specifies that the build is to be made against Linux Fast-STREAMS. The default is `/usr/include/streams` if it exists, 'no' otherwise. This directory is normally located by the 'configure' script and need only be provided for special cross-build environments or when requested by a 'configure' script error message. This option has no effect on release packages that do not use the *STREAMS* subsystem.

`--with-strconf-master=STRCONF_CONFIG`

Specify the 'STRCONF_CONFIG' file name to which the configuration master file is written. The default is 'Config.master'. This option has no effect on release packages that do not use the *STREAMS* subsystem and the strconf scripts. This option should not be specified when configuring the master package as the setting for all add-on packages will conflict.

`--with-base-major=STRCONF_MAJBASE`

Start numbering for major devices at 'STRCONF_MAJBASE'. The default is '230'. This option has no effect on release packages that do not use the *STREAMS* subsystem and the strconf scripts. This option should not be specified when configuring the master package as the setting for all add-on packages will conflict.

In addition, the following `configure` options, specific to the OpenSS7 NETPERF Utility package are available:

`--disable-netperf-dirty`

Disable code that dirties buffers before calls to send. This option defaults to 'enabled'.

- `--disable-netperf-histogram`
Disable code to keep a histogram of request-response times or time spend in `send()`. This option defaults to `'enabled'`.
- `--enable-netperf-old-histogram`
Enable old pre-2.2pl6 formatted histogram. This option defaults to `'disabled'`.
- `--disable-netperf-intervals`
Disable code to allow pacing of sends in UDP, TCP or SCTP tests. This may have unexpected results on non-HPUX systems. This option defaults to `'enabled'`.
- `--disable-netperf-do-dlpi`
Disable code to test to the DLPI implementation. This option defaults to `'enabled'`.
- `--disable-netperf-do-sctp`
Disable code to test the SCTP implementation. This option defaults to `'enabled'`.
- `--disable-netperf-do-select`
Disable code to do `select()` on receive. This option defaults to `'enabled'`.
- `--enable-netperf-do-lwp`
This option defaults to `'disabled'`.
- `--disable-netperf-do-nbr`
Disable code to do non-blocking request-response. This option defaults to `'enabled'`.
- `--disable-netperf-do-xti`
Disable code to test the XTI implementation. This option defaults to `'enabled'`.
- `--disable-netperf-do-xti-sctp`
Disable code to test the XTI SCTP implementation. This option defaults to `'enabled'`.
- `--disable-netperf-do-unix`
Disable code to test the UNIX domain implementation. This option defaults to `'enabled'`.
- `--disable-netperf-do-1644`
Disable code to test T/TCP vs TCP transactions. This option defaults to `'enabled'`.
- `--disable-netperf-do-first-burst`
Disable code to create an initial burst. This option defaults to `'enabled'`.
- `--enable-netperf-use-looper`
Enable looper or soaker processes. When enabled, use looper or soaker processes to measure CPU utilization. These will be forked-off at the beginning. If you are running this way, it is important to see how much impact these have on the measurement. A loop back test on uniprocessor should be able to consume approximately 100% of the CPU, and the difference between throughput with

USE_LOOPER_CPU and without should be small for a real network. If it is not, then some work probably needs to be done on reducing the priority of the looper processes. This option defaults to ‘disabled’. Do not enable this option for *Linux*.

--enable-netperf-use-pstat

Enable code to perform HP-UX CPU utilization. If use on *HP-UX 10.0* and later, this will make CPU utilization measurements with some information returns by the *10.X pstat()* call. This is very accurate, and should have no impact on the measurement. Astute observers will notice that the *LOC_CPU* and *REM_CPU* created with this method look remarkably close to the clock-rate of the machine. This option defaults to ‘disabled’. Do not enable this option for *Linux*.

--enable-netperf-use-kstat

Enable code to Solaris CPU utilization. If used on *Solaris 2*, this will make CPU utilization measurements using the *kstat()* interface. This option defaults to ‘disabled’. Do not enable this option for *Linux*.

--disable-netperf-use-proc-stat

Disable use of ‘/proc/stat’ interface. Enabled for *Linux* systems with CPU utilization info in ‘/proc/stat’. Provides a fairly accurate CPU load measurement without affecting measurement. This option defaults to ‘enabled’.

--enable-netperf-do-ipv6

Enables IPv6 testing. This option defaults to ‘disabled’.

--disable-netperf-do-dns

Disables DNS testing. This option defaults to ‘enabled’.

--enable-netperf-use-sysctl

Enables use of *sysctl* on BSD. When enabled, use the *sysctl()* call on FreeBSD (perhaps other BSDs) to calculate CPU utilization. This option defaults to ‘disabled’. Do not enable this option for *Linux*.

--enable-netperf-use-perfstat

Enable use of *perfstat* on AIX. When enabled, use the *perfstat()* call on AIX to calculate CPU utilization. This option defaults to ‘disabled’. Do not enable this option for *Linux*.

--enable-netperf-dont-wait

Enable *MSG_DONTWAIT* on sends. This option defaults to ‘disabled’.

--with-netperf-logfile=LOGFILE

Specify a debug log file. This option defaults to ‘/tmp/netperf.debug’.

7.3.5.2 Environment Variables

Following are additional environment variables to ‘configure’, their meaning and use:

GPG GPG signature command. This is used for signing distributions by the maintainer. By default, ‘configure’ will search for this tool.

GNUPGUSER

GPG user name. This is used for signing distributions by the maintainer.

GNUPGHOME

GPG home directory. This is used for signing distributions by the maintainer.

GPGPASSWD

GPG password for signing. This is used for signing distributions by the maintainer. This environment variable is not maintained by the `'configure'` script and should only be used on an isolated system.

SOELIM Roff source elimination command, `soelim(1)`. This is only necessary when the option `'--with-cooked-manpages'` has been specified and `'configure'` cannot find the proper `soelim(1)` command. By default, `'configure'` will search for this tool.

REFER Roff references command, `refer(1)`. This is only necessary when the option `'--with-cooked-manpages'` has been specified and `'configure'` cannot find the proper `refer(1)` command. By default, `'configure'` will search for this tool.

TBL Roff table command, `tbl(1)`. This is only necessary when the option `'--with-cooked-manpages'` has been specified and `'configure'` cannot find the proper `tbl(1)` command. By default, `'configure'` will search for this tool.

PIC Roff picture command, `pic(1)`. This is only necessary when the option `'--with-cooked-manpages'` has been specified and `'configure'` cannot find the proper `pic(1)` command. By default, `'configure'` will search for this tool.

GZIP Default compression options provided to `GZIP_CMD`.

GZIP_CMD

Manpages (and kernel modules) compression commands, `gzip(1)`. This is only necessary when the option `'--without-compressed-manpages'` has *not* been specified and `'configure'` cannot find the proper `gzip(1)` command. By default, `'configure'` will search for this tool.

BZIP2 Default compression options provided to `BZIP2_CMD`

BZIP2_CMD

Manpages compression commands, `bzip2(1)`. This is only necessary when the option `'--without-compressed-manpages'` has *not* been specified and `'configure'` cannot find the proper `bzip2(1)` command. By default, `'configure'` will search for this tool.

MAKEWHATIS

Manpages apropos database rebuild command, `makewhatis(8)`. By default, `'configure'` will search for this tool. By default, `'configure'` will search for this tool.

CHKCONFIG

Chkconfig command, `chkconfig(8)`. This was used for installation of `init` scripts. All packages now come with `init_install(8)` and `init_remove(8)` scripts used to install and remove `init` scripts on both RPM and Debian systems.

RPM

Rpm command, `rpm(1)`. This is only necessary for RPM builds. By default, `'configure'` will search for this tool.

RPMBUILD

Build RPM command, `rpmbuild(1)`. This is only necessary for RPM builds. By default, 'configure' will search for this tool. `rpm(1)` will be used instead of `rpmbuild(1)` only if `rpmbuild(1)` cannot be found.

DPKG Dpkg comand, `dpkg(1)`. This command is used for building Debian packages. By default, 'configure' will search for this tool.

DPKG_SOURCE

Dpkg-source command, `dpkg-source(1)`. This command is used for building Debian dsc packages. By default, 'configure' will search for this tool.

DPKG_BUILDPACKAGE

Dpkg-buildpackage command, `dpkg-buildpackage(1)`. This command is used for building Debian deb packages. By default, 'configure' will search for this tool.

DEB_BUILD_ARCH

Debian build architecture. This variable is used for building Debian packages. The default is the autoconf build architecture.

DEB_BUILD_GNU_CPU

Debian build cpu. This variable is used for building Debian packages. The default is the autoconf build cpu.

DEB_BUILD_GNU_SYSTEM

Debian build os. This variable is used for building Debian packages. The default is the autoconf build os.

DEB_BUILD_GNU_TYPE

Debian build alias. This variable is used for building Debian packages. The default is the autoconf build alias.

DEB_HOST_ARCH

Debian host architecture. This variable is used for building Debian packages. The default is the autoconf host architecture.

DEB_HOST_GNU_CPU

Debian host cpu. This variable is used for building Debian packages. The default is the autoconf host cpu.

DEB_HOST_GNU_SYSTEM

Debian host os. This variable is used for building Debian packages. The default is the autoconf host os.

DEB_HOST_GNU_TYPE

Debian host alias. This variable is used for building Debian packages. The default is the autoconf host alias.

LDCONFIG

Configure loader command, `ldconfig(8)`. Command used to configure the loader when libraries are installed. By default, 'configure' will search for this tool.

DESTDIR Cross build root directory. Specifies the root directory for build and installation.

DEPMOD

Build kernel module dependencies command, `depmod(8)`. This is used during installation of kernel modules to a running kernel to rebuild the modules dependency database. By default, ‘`configure`’ will search for this tool.

MODPROBE

Probe kernel module dependencies command, `modprobe(8)`. This is used during installation of kernel modules to a running kernel to remove old modules. By default, ‘`configure`’ will search for this tool.

LSMOD

List kernel modules command, `lsmod(8)`. This is used during installation of kernel modules to a running kernel to detect old modules for removal. By default, ‘`configure`’ will search for this tool.

LSOF

List open files command, `lsof(1)`. This is used during installation of kernel modules to a running kernel to detect old modules for removal. Processes owning the old kernel modules will be killed and the module removed. If the process restarts, the new module will be demand loaded. By default, ‘`configure`’ will search for this tool.

GENKSYMS

Generate kernel symbols command, `genksyms(8)`. This is used for generating module symbol versions during build. By default, ‘`configure`’ will search for this tool.

KGENKSYMS

Linux 2.6 generate kernel symbols command, `genksyms(8)`. This is used for generating module symbol version during build. By default, ‘`configure`’ will search for this tool.

OBJDUMP

Object dumping command, `objdump(1)`. This is used for listing information about object files. By default, ‘`configure`’ will search for this tool.

NM

Object symbol listing command, `nm(1)`. This is used for listing information about object files. By default, ‘`configure`’ will search for this tool.

MODPOST_CACHE

Cache file for `modpost(1)`. The version of the `modpost.sh` script that ships with each package can cache information to a cache file to speed multiple builds. This environment variable is used to specify a cache file.

AUTOM4TE

Autom4te command, `autom4te(1)`. This is the executable used by `autotest` for pre- and post-installation checks. By default, ‘`configure`’ will search for this tool.

AUTOTEST

Autotest macro build command, `autom4te(1)`. This is the executable used by `autotest` for pre- and post-installation checks. By default, ‘`configure`’ will search for this tool.

7.3.5.3 Build

To build from the tar ball, See [Section 7.4.3 \[Building from the Tar Ball\]](#), page 85.

7.4 Building

7.4.1 Building from the Source RPM

If you have downloaded the necessary source RPM (see [Section 7.2.5 \[Downloading the Source RPM\]](#), page 60), then the following instructions will rebuild the binary RPMs on your system. Once the binary RPMs are rebuilt, you may install them as described above (see [Section 7.5.1 \[Installing the Binary RPM\]](#), page 86).

The source RPM is rebuilt to binary RPMs as follows:

```
% wget http://www.openss7.org/rpms/SRPMS/netperf-2.3.7-1.src.rpm
% rpmbuild --rebuild -vv netperf-2.3.7-1.src.rpm
```

The rebuild process can also recognize a number of options that can be used to tweak the resulting binaries, See [Section 7.3.3 \[Configuring the Source RPM\]](#), page 66. These options are provided on the `rpm(1)` command line. For example:

```
% rpmbuild --rebuild -vv --target athlon-redhat-linux \
--with lis -- netperf-2.3.7-1.src.rpm
```

will rebuild binary RPM for the ‘athlon’ architecture against the *LiS STREAMS* package.

Installation

To install the resulting binary RPM, See [Section 7.5.1 \[Installing the Binary RPM\]](#), page 86.

7.4.2 Building from the Debian DSC

If you have downloaded the necessary Debian DSC (see [Section 7.2.6 \[Downloading the Debian DSC\]](#), page 61), then the following instructions will rebuild the binary DEBs on your system. Once the binary DEBs are rebuilt, you may install them as described above (see [Section 7.5.2 \[Installing the Debian DEB\]](#), page 86).

The Debian DSC is rebuilt to binary DEBs as follows:

```
% wget http://www.openss7.org/debian/netperf_2.3.7-0.dsc
% wget http://www.openss7.org/debian/netperf_2.3.7-0.tar.gz
% dpkg-buildpackage -v netperf_2.3.7-0.dsc
```

The rebuild process can also recognize a number of options that can be used to tweak the resulting binaries, See [Section 7.3.4 \[Configuring the Debian DSC\]](#), page 72. These options are provided in the environment variable `BUILD_DPKG_OPTIONS` and have the same form as the options to ‘configure’, See [Section 7.3.5 \[Configuring the Tar Ball\]](#), page 72. For example:

```
% BUILD_DEBOPTIONS='
    --with-lis
    --host=athlon-debian-linux-gnu'
dpkg-buildpackage -v \
netperf_2.3.7-0.dsc
```

will rebuild binary DEB for the ‘athlon’ architecture against the *LiS STREAMS* package.

Installation

To install the resulting binary DEB, See [Section 7.5.2 \[Installing the Debian DEB\]](#), page 86.

7.4.3 Building from the Tar Ball

If you have downloaded the tar ball (see [Section 7.2.7 \[Downloading the Tar Ball\]](#), page 61), then the following instructions will rebuild the package on your system. (Note that the build process does not required `root` privilege.)

7.4.3.1 Native Build

Following is an example of a native build against the running kernel:

```
% wget http://www.openss7.org/netperf-2.3.7.tar.bz2
% tar -xjvf netperf-2.3.7.tar.bz2
% pushd netperf-2.3.7
% ./configure
% make
% popd
```

7.4.3.2 Cross-Build

Following is an example for a cross-build. The kernel release version must always be specified for a cross-build.¹² If you are cross-building, specify the root for the build with environment variable `DESTDIR`. The cross-compile host must also be specified if different from the build host. Either the compiler and other tools must be in the usual places where GNU `autoconf(1)` can find them, or they must be specified with declarations such as ‘`CC=/usr/lib/ppc-linux/gcc`’ on the ‘`configure`’ command line.

```
% wget http://www.openss7.org/netperf-2.3.7.tar.bz2
% tar -xjvf netperf-2.3.7.tar.bz2
% pushd netperf-2.3.7
% ./configure DESTDIR="/some/other/root" \
--with-k-release=2.4.18 --host sparc-linux
% make
% popd
```

¹² Because it *is* a cross-build, the kernel version on the build machine is unlikely to be the kernel version of the target machine, except by coincidence.

7.5 Installing

7.5.1 Installing the Binary RPM

If you have downloaded the necessary binary RPMs (see [Section 7.2.3 \[Downloading the Binary RPM\]](#), page 55), or have rebuilt binary RPMs using the source RPM (see [Section 7.4.1 \[Building from the Source RPM\]](#), page 84), then the following instructions will install the RPMs on your system. For additional information on `rpm(1)`, see `rpm(8)`.

```
% pushd RPMS/i686
% rpm -ihv netperf-*-2.3.7-1.7.2.i686.rpm
```

You must have the correct binary RPMs downloaded or built for this to be successful.

Some of the packages are relocatable and can have final installation directories altered with the ‘`--relocate`’ option to `rpm(1)`, see `rpm(8)`. For example, the following will relocate the documentation and info directories:

```
% pushd RPMS/i686
% rpm -ihv \
    --relocate '/usr/share/doc=/usr/local/share/doc' \
    --relocate '/usr/share/info=/usr/local/share/info' \
    -- netperf-doc-2.3.7-1.7.2.i686.rpm
```

The previous example will install the ‘`netperf-doc`’ package by will relocate the documentation an info directory contents to the ‘`/usr/local`’ version.

7.5.2 Installing the Debian DEB

If you have downloaded the necessary Debian DEBs (see [Section 7.2.4 \[Downloading the Debian DEB\]](#), page 59), or have rebuild binary DEBs using the Debian DSC (see [Section 7.4.2 \[Building from the Debian DSC\]](#), page 84), then the following instructions will install the DEBs on your system. For additional information see `dpkg(8)`.

```
% pushd debian
% dpkg -iv netperf-*_2.3.7-0_*.deb
```

You must have the correct ‘`.deb`’ files downloaded or build for this to be successful.

7.5.3 Installing the Tar Ball

After the build process (see [Section 7.4.3 \[Building from the Tar Ball\]](#), page 85), installation only requires execution of one of two `automake(1)` targets:

```
‘make install’
```

The ‘`install`’ `automake(1)` target will install all the components of the package. Root privilege is required to successfully invoke this target.

```
'make install-strip'
```

The `'install-strip'` [automake\(1\)](#) target will install all the components of the package, but will strip unnecessary information out of the objects and compress manual pages. Root privilege is required to successfully invoke this target.

7.6 Removing

7.6.1 Removing the Binary RPM

To remove an installed version of the binary RPMs (whether obtained from the OpenSS7 binary RPM releases, or whether created by the source RPM), execute the following command:

```
% rpm -evv 'rpm -qa | grep '^netperf-'
```

For more information see [rpm\(1\)](#).

7.6.2 Removing the Debian DEB

To remove and installed version of the Debian DEB (whether obtained from the OpenSS7 binary DEB releases, or whether created by the Debian DSC), execute the following command:

```
% dpkg -ev 'dpkg -l | grep '^netperf-'
```

For more information see [dpkg\(8\)](#).

7.6.3 Removing the Source RPM

To remove all the installed binary RPM build from the source RPM, see [Section 7.6.1 \[Removing the Binary RPM\], page 87](#). Then simply remove the binary RPM package files and source RPM file. A command such as:

```
% find / -name 'netperf-*.rpm' -type f -print0 | xargs --null rm -f
```

should remove all `'netperf'` RPMs from your system.

7.6.4 Removing the Debian DSC

To remove all the installed binary DEB build from the Debian DSC, see [Section 7.6.2 \[Removing the Debian DEB\], page 87](#). Then simply remove the binary DEB package files and Debian DSC file. A command such as:

```
% find / \( -name 'netperf-*.deb' \  
    -o -name 'netperf-*.dsc' \  
    -o -name 'netperf-*.tar.*' \  
    \) -type f -print0 | xargs --null rm -f
```

should remove all `'netperf'` DEBs, DSCs and TARs from your system.

7.6.5 Removing the Tar Ball

To remove a version installed from tar ball, change to the build directory where the package was built and use the ‘uninstall’ `automake(1)` target as follows:

```
% cd /usr/src/netperf
% make uninstall
% cd ..
% rm -fr netperf-2.3.7
% rm -f netperf-2.3.7.tar.gz
% rm -f netperf-2.3.7.tar.bz2
```

If you have inadvertently removed the build directory and, therefore, no longer have a configured directory from which to execute ‘make uninstall’, then perform all of the steps for configuration and installation (see [Section 7.5.3 \[Installing the Tar Ball\], page 86](#)) except the final installation and then perform the steps above.

7.6.5.1 Linux STREAMS Module Loading

LiS is deprecated and this section has been deleted.

7.7 Maintenance

7.7.1 Makefile Targets

`automake(1)` has many targets, not all of which are obvious to the casual user. In addition, *OpenSS7 automake(1)* files have additional rules added to make maintaining and releasing a package somewhat easier. This list of targets provides some help with what targets can be invoked, what they do, and what they hope to achieve. The available targets are as follows:

7.7.1.1 User Targets

The following are normal targets intended to be invoked by installers of the package. They are concerned with compiling, checking the compile, installing, checking the installation, and removing the package.

‘[all]’ This is also the default target. It compiles the package and all release packages selected by ‘configure’. This is performed after configuring the source with ‘configure’. A ‘Makefile’ stub is provided so that if the package has not had `autoreconf(1)` run (such as when checked out from CVS, the package will attempt to run ‘autoreconf -fiv’.

All *OpenSS7 Project* packages are configured without maintainer mode and without dependency tracking by default. This speeds compilation of the package for one-time builds. This also means that if you are developing using the source package (edit-compile-test cycle), changes made to source files will not cause the automatic rebuilding due to dependencies. There are two ways to enable dependency tracking: specify ‘--enable-maintainer-mode’ to ‘configure’; or, specify ‘--enable-dependency-tracking’ to ‘configure’. I use the former during my edit-compile-test cycle.

This is a standard *GNU automake(1)* makefile target. This target does not require root privilege.

‘check’ All *OpenSS7 Project* release packages provide check scripts for the check target. This step is performed after compiling the package and will run all of the **‘check’** programs against the compiled binaries. Which checks are performed depends on whether **‘--enable-maintainer-mode’** was specified to **‘configure’**. If in maintainer mode, checks that assist with the release of the package will be run (such as checking that all manual pages load properly and that they have required sections.) We recommend running the check stage before installing, because it catches problems that might keep the installed package from functioning properly.

Another way to enable the greater set of checks, without invoking maintainer mode, is to specify **‘--enable-checks’** to **‘configure’**. For more information, see [Section 8.1.1 \[Pre-installation Checks\], page 99](#).

This is a standard *GNU automake(1)* makefile target, although the functions performed are customized for the *OpenSS7 Project*. This target does not require root privilege.

‘install’

‘install-strip’

The **‘install’** target installs the package by installing each release package. This target also performs some actions similar to the pre- and post-install scripts used by packaging tools such as *rpm(1)* or *dpkg(1)*. The **‘install-strip’** target strips unnecessary symbols from executables and kernel modules before installing.

This is a standard *GNU automake(1)* makefile target. This target requires root privilege.

‘installcheck’

All *OpenSS7 Project* packages provide test scripts for the **‘installcheck’** target. Test scripts are created and run using *autotest* (part of the *autoconf(1)* package). Which test suites are run and how extensive they are depends on whether **‘--enable-maintainer-mode’** was specified to **‘configure’**. When in maintainer mode, all test suites will be run. When not in maintainer mode, only a few post-install checks will be performed, but the test suites themselves will be installed in `‘/usr/libexec/[No value for ‘‘PACKAGE_LCNAME’’]’`¹³ for later use.

This is a standard *GNU automake(1)* makefile target. This target might require root privilege. Tests requiring root privilege will be skipped when run as a regular user. Tests requiring regular account privileges will be skipped when run as root.

‘retest’ To complement the **‘installcheck’** target above, all *OpenSS7 Project* packages provide the **‘retest’** target as a means to rerun failed conformance test

¹³ `‘/usr/libexec/[No value for ‘‘PACKAGE_LCNAME’’]’` is just an example, the actual location is `‘${libexecdir}/${PACKAGE}’`, which varies from distribution to distribution (as some distributions such as Mandriva do not have a libexec directory).

suite test cases. The `'retest'` target is provided because some test cases in the test suites have delicate timing considerations that allow them to fail sporadically. Invoking this target will retest the failed cases until no cases that are not expected failures remain.

This is an *OpenSS7 Project* specific makefile target. As with `'installcheck'`, this target might require root privilege. Tests requiring root privilege will be skipped when run as a regular user. Tests requiring regular account privileges will be skipped when run as root.

`'uninstall'`

This target will reverse the steps taken to install the package. This target also performs pre- and post- erase scripts used by packaging tools such as *rpm* or *dpkg*. You need to have a configured build directory from which to execute this target, however, you do not need to have compiled any of the files in that build directory.¹⁴

The `'uninstall'` target unfortunately removes add-on packages in the same order in which they were installed. This is not good for the *OpenSS7 Master Package*, where the `'remove'` target should be used instead.

This is a standard GNU `automake(1)` makefile target. This target requires root privilege.

`'remove'` This target is like `'uninstall'` with the exception that it removes add-on packages in the reverse order that installation was performed.¹⁵

This is an *OpenSS7 Project* specific makefile target. This target requires root privilege.

7.7.1.2 Maintainer Targets

The following targets are targets intended for use by maintainers of the package, or those responsible for release and packaging of a derivative work of the package. Some of these targets are only effective when maintainer mode has been invoked (`'--enable-maintainer-mode'` specified to `'configure'`.)

`'dist'` Creates a distribution package (tarball) in the top level build directory. *OpenSS7 Project* packages distribute two archives: a `'gzip tar'` archive and a `'bzip tar'` archive. These archives will have the name `'netperf-2.3.7.tar.gz'` and `'netperf-2.3.7.tar.bz2'`.

This is a standard GNU `automake(1)` makefile target. This target does not require root privilege.

`'distcheck'`

This target is intended for use when releasing the package. It creates the `tar(1)` archives above and then unpacks the tarball in a source directory, configures in a separate build directory, compiles the package, installs the package in a separate install directory, tests the install package to ensure that some components work,

¹⁴ Therefore, it is possible to download the package, configure it, and then uninstall it. This is handy if you do not have the sources used to build and install the package immediately available.

¹⁵ This is useful from the *OpenSS7 Master Package*.

and, finally, uses the unpacked source tree to build another tarball. If you have added or removed files from the package, this is a good way to ensure that everything is still stable for release.

This is a standard *GNU automake(1)* makefile target. This target does not require root privilege.

7.7.1.3 Clean Targets

`'mostlyclean'`

Cleans out most of the files from the compile stage. This target is helpful if you have not enabled dependency tracking and need to recompile with changes.

This is a standard *GNU automake(1)* makefile target. This target does not require root privilege.

`'clean'`

Cleans all the files from the build directory generated during the `'make [all]'` phase. It does not, however, remove files from the directory left there from the `'configure'` run. Use the `'distclean'` target to remove those too.

This is a standard *GNU automake(1)* makefile target. This target might require root privilege if the `'installcheck'` target or the `testsuite` was invoked with root privilege (leaving files belonging to root).

`'distclean'`

This target cleans out the directories left behind by `'distcheck'` and removes all the `'configure'` and generated files from the build directory. This will effectively remove all the files in the build directory, with the except of files that belong to you or some other process.

This is a standard *GNU automake(1)* makefile target. This target might require root privilege if the `'installcheck'` target or the `testsuite` was invoked with root privilege (leaving files belonging to root).

`'maintainer-clean'`

This target not only removes files from the build directory, it removes generated files from the source directory as well. Care should be taken when invoking this target, because it removes files generated by the maintainer and distributed with the archive that might require special tools to regenerate. These special tools might only be available to the maintainer.¹⁶ It also means that you probably need a full blown Linux system to rebuild the package. For more information, see [Section 7.2.8 \[Downloading from CVS\], page 62](#).

This is a standard *GNU automake(1)* makefile target. This target might require root privilege if the `'installcheck'` target or the `testsuite` was invoked with root privilege (leaving files belonging to root).

`'check-clean'`

This target removes log files left behind by the `'check'` target. By default, the check scripts append to log files in the top level build directory. This target can be used to clean out those log files before the next run.

¹⁶ Theoretically this is true, however, the *OpenSS7 Project* does not use any maintainer programs that are not generally available (i.e. open source).

This is an *OpenSS7 Project* specific makefile target. This target does not require root privilege.

7.7.1.4 Manual Page Targets

The following targets are used to build, install and uninstall just the manual pages from the distribution. These targets are good for creating a distribution of just the manual pages. When building atop multiple packages, these targets recurse down through each package.

'mans' Build all of the manual pages. This involves performing parameter substitution on manual pages and optionally cooking the manual pages if `'--with-cooked-manpages'` was requested during configuration.

'install-mans' Installs the manual pages under *DESTDIR*. Specify *DESTDIR* to place the manual pages wherever you see fit. If *DESTDIR* is not specified on the command line, the manual pages will be installed in the normal installation directory.

'uninstall-mans' Uninstalls the manual pages from *DESTDIR*. Specify *DESTDIR* to indicate where to remove the manual pages from. If *DESTDIR* is not specified on the command line, the manual pages will be removed from the normal installation directory.

7.7.1.5 Release Targets

The following are targets used to generate complete releases into the package distribution directory. These are good for unattended and NFS builds, which is what I use them for. Also, when building from atop multiple packages, these targets also recurse down through each package.

'release' Build all of the things necessary to generate a release. On an `rpm(1)` system this is the distribution archives, the source rpm, and the architecture dependent and architecture independent binary rpms. All items are placed in the package distribution directory that can be specified with the `'--with-pkg-distdir=DIR'` option to `'configure'`.

This is an *OpenSS7 Project* specific makefile target. This target does not require root privilege.

'forced-release' The `'release'` target will not regenerate any files that already exist in the package distribution directory. This forced target will.

This is an *OpenSS7 Project* specific makefile target. This target does not require root privilege.

'release-sign' You will be prompted for a password, unless to specify it to make with the *GNUPGPASS* variable. For unattended or non-interactive builds with signing, you can do that as: `'make GNUPGPASS=myspasswd release-sign'`

This is an *OpenSS7 Project* specific makefile target. This target does not require root privilege.

‘forced-release-sign’

The ‘release-sign’ target will not regenerate any files that already exist in the package distribution directory. This forced target will.

This is an *OpenSS7 Project* specific makefile target. This target does not require root privilege.

‘release-clean’

This target will remove all distribution files for the current package from the package distribution directory.

This is an *OpenSS7 Project* specific makefile target. This target does not require root privilege.

7.7.1.6 Logging Targets

For convenience, to log the output of a number of targets to a file, log targets are defined. The log file itself is used as the target to make, but make invokes the target minus a ‘.log’ suffix. So, for example, to log the results of target ‘foo’, invoke the target ‘foo.log’. The only target that this does not apply to is ‘compile.log’. When you invoke the target ‘compile.log’ a simple `automake(1)` is invoked and logged to the file ‘compile.log’. The ‘foo.log’ rule applies to all other targets. This does not work for all targets, just a selected few.¹⁷ Following are the logging targets:

Common Logging Targets

Common logging targets correspond to normal user `automake(1)` makefile targets as follows:

‘compile.log’

This is an *OpenSS7 Project* specific makefile target, but it invokes the standard GNU `automake(1)` makefile target ‘[all]’.

‘check.log’

This is an *OpenSS7 Project* specific makefile target, but it invokes the standard GNU `automake(1)` makefile target ‘check’.

‘install.log’

This is an *OpenSS7 Project* specific makefile target, but it invokes the standard GNU `automake(1)` makefile target ‘install’.

‘installcheck.log’

This is an *OpenSS7 Project* specific makefile target, but it invokes the standard GNU `automake(1)` makefile target ‘installcheck’.

‘uninstall.log’

This is an *OpenSS7 Project* specific makefile target, but it invokes the standard GNU `automake(1)` makefile target ‘uninstall’.

‘remove.log’

This is an *OpenSS7 Project* specific makefile target, that invokes the *OpenSS7 Project* ‘remove’ target.

¹⁷ Note that because logging targets invoke a pipe, `automake(1)` does not return the correct return status (always returns success if the `tee(1)` operation is successful). Therefore, these targets should not be invoked by scripts that need to use the return value from `automake(1)`.

Maintainer Logging Targets

Maintainer logging targets correspond to maintainer mode `automake(1)` makefile targets as follows:

`dist.log`

This is an *OpenSS7 Project* specific makefile target, but it invokes the standard GNU `automake(1)` makefile target `dist`.

`distcheck.log`

This is an *OpenSS7 Project* specific makefile target, but it invokes the standard GNU `automake(1)` makefile target `distcheck`.

`srpm.log`

This is an *OpenSS7 Project* specific makefile target, that invokes the *OpenSS7 Project* `srpm` target.

`rebuild.log`

This is an *OpenSS7 Project* specific makefile target, that invokes the *OpenSS7 Project* `rebuild` target.

`resign.log`

This is an *OpenSS7 Project* specific makefile target, that invokes the *OpenSS7 Project* `resign` target.

`release.log`

This is an *OpenSS7 Project* specific makefile target, that invokes the *OpenSS7 Project* `release` target.

`release-sign.log`

This is an *OpenSS7 Project* specific makefile target, that invokes the *OpenSS7 Project* `release-sign` target.

If you want to add one, simply add it to `LOGGING_TARGETS` in `Makefile.am`.

7.7.1.7 Problem Report Targets

To ease problem report generation, all logging targets will automatically generate a problem report suitable for mailing in the file `target.pr` for target `target.log`. This problem report file is in the form of an email and can be sent using the included `send-pr` script or by invoking the `send-pr` makefile target.

There are two additional problem report targets:

`pr`

The `pr` target is for independently generating a problem report outside of the build or installation process. The target will automatically generate a problem report skeleton suitable for editing and mailing in the file `problem.pr`. This problem report file is in the form of an email and can be edited and sent directly, or sent using the included `send-pr` script or by invoking the `send-pr` target. This is an *OpenSS7 Project* specific makefile target. This target does not require root privilege.

`send-pr`

The `send-pr` target is for finalizing and mailing a problem report generated either inside or outside the build and installation process. The target will automatically finalize and mail the `problem.pr` problem report if it has changed since the last time that `send-pr` was invoked.

This is an *OpenSS7 Project* specific makefile target. This target does not require root privilege (unless the problem report file was generated as root).

7.7.1.8 Release Archive Targets

The following targets are used to generate and clean distribution archive and signature files. Whereas the `dist` target affects archives in the top build directory, the `release-archive` targets affects archives in the package distribution directory (either the top build directory or that specified with `--with-pkg-distdir=DIR` to `configure`).

You can change the directory to which packages are distributed by using the `--with-pkg-distdir=DIR` option to `configure`. The default directory is the top build directory.

`release-archives`

This target creates the distribution archive files if they have not already been created. This not only runs the `dist` target, but also copies the files to the distribution directory, which, by default is the top build directory.

The files generated are named:

`netperf-2.3.7.tar.gz` and `netperf-2.3.7.tar.bz2`

You can change this distribution directory with the `--with-pkg-distdir` option to `configure`. See `./configure --help` for more details on options.

This is an *OpenSS7 Project* specific makefile target. This target does not require root privilege.

`release-sign-archives`

This target is like `release-archives`, except that it also signs the archives using a *GPG* detached signature. You will be prompted for a password unless you pass the *GNUPGPASS* variable to make. For automated or unattended builds, pass the *GNUPGPASS* variable like so:

```
make GNUPGPASS=myspasswd release-sign-archives
```

Signature files will be named:

`netperf-2.3.7.tar.gz.asc` and `netperf-2.3.7.tar.bz2.asc`

These files will be moved to the package distribution directory with the plain text archives.

This is an *OpenSS7 Project* specific makefile target. This target does not require root privilege.

`release-clean-archives`

This target will clean the release archives and signature files from the package distribution directory.

This is an *OpenSS7 Project* specific makefile target. This target does not require root privilege.

7.7.1.9 RPM Build Targets

On `rpm(1)` systems, or systems sporting rpm packaging tools, the following targets are used to generate `rpm(1)` release packages. The epoch and release number can be controlled by the contents of the `.rpmepoch` and `.rpmrelease` files, or with the `--with-rpm-epoch=EPOCH`

and ‘`--with-rpm-release=RELEASE`’ options to ‘`configure`’. See ‘`configure --help`’ for more information on options. We always use release number ‘1’. You can use release numbers above ‘1’.

‘`srpm`’ This target generates the source rpm for the package (without signing the source rpm). The source rpm will be named: ‘`netperf-2.3.7-1.srpm`’.

This is an *OpenSS7 Project* specific makefile target. This target does not require root privilege.

‘`rpms`’ This target is responsible for generating all of the package binary rpms for the architecture. The binary rpms will be named:

‘`netperf-*-2.3.7-1.*.rpm`’

where the stars indicate the subpackage and the architecture. Both the architecture specific subpackages (binary objects) and the architecture independent (‘`.noarch`’) subpackages will be built unless the former was disabled with the option ‘`--disable-arch`’, or the later with the option ‘`--disable-indep`’, passed to ‘`configure`’.

This is an *OpenSS7 Project* specific makefile target. This target does not require root privilege.

‘`sign`’

‘`srpm-sign`’

These two targets are the same. When invoked, they will add a signature to the source rpm file, provided that the file does not already have a signature. You will be prompted for a password if a signature is required. Automated or unattended builds can be achieved by using the `emake` expect script, included in ‘`${srcdir}/scripts/emake`’.

This is an *OpenSS7 Project* specific makefile target. This target does not require root privilege.

‘`rebuild`’ This target searches out a list of kernel names from the ‘`${DESTDIR}/lib/modules`’ directory and builds rpms for those kernels and for each of a set of architectures given in the `AM_RPMTARGETS` variable to make. This is convenience target for building a group of rpms on a given build machine.

This is an *OpenSS7 Project* specific makefile target. This target does not require root privilege.

‘`resign`’ This target will search out and sign, with a *GPG* signature, the source rpm, and all of the binary rpms for this package that can be found in the package distribution directory. This target will prompt for a *GPG* password. Automated or unattended builds can be achieved with the `emake` expect script located here: ‘`${srcdir}/scripts/emake`’.

This is an *OpenSS7 Project* specific makefile target. This target does not require root privilege.

7.7.1.10 Debian Build Targets

On Debian systems, or systems sporting Debian packaging tools, the following targets are used to generate Debian release packages. The release number can be controlled by the

contents of the `.debrelease` file, or with the `--with-debrelease=RELEASENUMBER` option to `configure`. See `configure --help` for more information on options.

`dsc` This target will build the Debian source change package (`.dsc` file). We use release number `0` so that the entire tarball is included in the `dsc` file. You can use release number `1` for the same purposes. Release numbers above `1` will not include the entire tarball. The `.dsc` file will be named: `netperf_2.3.7-0.dsc`.

This is an *OpenSS7 Project* specific makefile target. This target does not require root privilege.

`sigs` This target signs the `.deb` files. You will be prompted for a password, unless to specify it to make with the `GNUPGPASS` variable.

This is an *OpenSS7 Project* specific makefile target. This target does not require root privilege.

`debs` This target will build the Debian binary package (`.deb` file) from the `.dsc` created above. (This target will also create the `.dsc` if it has not been created already.) The subpackage `.deb` files will be named: `netperf-*_2.3.7-0_*.deb`, where the stars indicate the subpackage and the architecture.

This is an *OpenSS7 Project* specific makefile target. This target does not require root privilege.

`csig` This target signs the `.dsc` file. You will be prompted for a password, unless to specify it to make with the `GNUPGPASS` variable.

This is an *OpenSS7 Project* specific makefile target. This target does not require root privilege.

7.7.1.11 Documentation Targets

On systems that have `doxygen(1)` documentation tool, the following targets are used to generate doxygen html documentation:

`doxy` This target generates `doxygen(1)` documetnation from suitably marked sources. File containing the necessary documentation marks are discovered automatically by `configure`. Doxygen documentation can be generated bus is not distributed. Documentation is cerated in the subdirectory `doc/html`.

8 Troubleshooting

8.1 Test Suites

8.1.1 Pre-installation Checks

Most *OpenSS7* packages, including the *OpenSS7 NETPERF Utility* package, ship with pre-installation checks integral to the build system. Pre-installation checks include check scripts that are shipped in the ‘scripts’ subdirectory as well as specialized `make` targets that perform the checks.

When building and installing the package from *RPM* or *DEB* source packages (see [Section 7.4.1 \[Building from the Source RPM\]](#), page 84; and [Section 7.4.2 \[Building from the Debian DSC\]](#), page 84), a fundamental set of post-compile, pre-installation checks are performed prior to building binary packages. This is performed automatically and does not require any special actions on the part of the user creating binary packages from source packages.

When building and installing the package from *tarball* (see [Section 7.4.3 \[Building from the Tar Ball\]](#), page 85; and [Section 7.5.3 \[Installing the Tar Ball\]](#), page 86), however, pre-installation checks are only performed if specifically invoked by the builder of the package. Pre-installation checks are invoked after building the package and before installing the package. Pre-installation checks are performed by invoking the ‘check’ or ‘check.log’ target to `make` when building the package, as shown in [Example 8.1](#).

```
% wget http://www.openss7.org/netperf-2.3.7.tar.bz2
% tar -xjvf netperf-2.3.7.tar.bz2
% pushd netperf-2.3.7
% ./configure
% make
% make check # <----- invoke pre-installation checks
% popd
```

Example 8.1: *Invoking Pre-Installation Checks*

Pre-installation checks fall into two categories: *System Checks* and *Maintenance Checks*.

8.1.1.1 Pre-Installation System Checks

System Checks are post-compilation checks that can be performed before installing the package that check to ensure that the compiled objects function and will be successfully installed. When the ‘--enable-maintainer-mode’ option has not been passed to `configure`, only *System Checks* will be performed.

For example, the steps shown in [Example 8.2](#) will perform *System* checks.

```
% wget http://www.openss7.org/netperf-2.3.7.tar.bz2
% tar -xjvf netperf-2.3.7.tar.bz2
% pushd netperf-2.3.7
% ./configure
% make
% make check # <----- invokes System pre-installation checks
% popd
```

Example 8.2: *Invoking System Checks*

8.1.1.2 Pre-Installation Maintenance Checks

Maintenance Checks include all *System Checks*, but also checks to ensure that the kernel modules, applications programs, header files, development tools, test programs, documentation, and manual pages conform to *OpenSS7* standards. When the ‘`--enable-maintainer-mode`’ option has been passed to `configure`, *Maintenance Checks* will be performed.

For example, the steps shown in [Example 8.3](#) will perform *Maintenance* checks.

```
% wget http://www.openss7.org/netperf-2.3.7.tar.bz2
% tar -xjvf netperf-2.3.7.tar.bz2
% pushd netperf-2.3.7
% ./configure --enable-maintainer-mode
% make
% make check # <----- invokes Maintenance pre-installation checks
% popd
```

Example 8.3: *Invoking Maintenance Checks*

8.1.1.3 Specific Pre-Installation Checks

A number of check scripts are provided in the ‘`scripts`’ subdirectory of the distribution that perform both *System* and *Maintenance* checks. These are as follows:

`check_commands`

This check performs both *System* and *Maintenance* checks.

When performing *System* tests, the following tests are performed:

Unless cross-compiling, or unless a program is included in `AM_INSTALLCHECK_STD_OPTIONS_EXEMPT` every program in `bin_PROGRAMS`, `sbin_PROGRAMS`, and `libexec_PROGRAMS` is tested to ensure that the ‘`--help`’, ‘`--version`’, and ‘`--copying`’ options are accepted. When cross-compiling is not possible to execute cross-compiled binaries, and these checks are skipped in that case.

Script executables, on the other hand, can be executed on the build host, so, unless listed in `AM_INSTALLCHECK_STD_OPTIONS_EXEMPT`, every program in `dist_bit_SCRIPTS`, `dist_sbin_SCRIPTS`, and `pkglibexec_SCRIPTS` are tested to ensure that the ‘`--help`’, ‘`--version`’, and ‘`--copying`’ options are accepted.

When performing *Maintenance* tests, `check_commands` also checks to ensure that a manual page exists in section 1 for every executable binary or script

that will be installed from `bin_PROGRAMS` and `dist_bin_SCRIPTS`. It also checks to ensure that a manual page exists in section 8 for every executable binary or script that will be installed from `sbin_PROGRAMS`, `dist_sbin_SCRIPTS`, `libexec_PROGRAMS`, and `pkglibexec_SCRIPTS`.

`check_decls`

This check only performs *Maintenance* checks.

It collects the results from the `check_libs`, `check_modules` and `check_headers` check scripts and tests to ensure every declaration of a function prototype or external variable contained in installed header files has a corresponding exported symbol from either a to be installed shared object library or a to be installed kernel module. Declarations are exempted from this requirement if their identifiers have been explicitly added to the `EXPOSED_SYMBOL` variable. If `WARN_EXCESS` is set to 'yes', then the check script will only warn when excess declarations exist (without a corresponding exported symbol); otherwise, the check script will generate an error and the check will fail.

`check_headers`

This check only performs *Maintenance* checks.

When performing *Maintenance* tests, it identifies all of the declarations included in to be installed header files. It then checks to ensure that a manual page exists in sections 2, 3, 7 or 9, as appropriate, for the type of declaration. It also checks to see if a manual page source file exists in the source directory for a declaration that has not been included in the distribution. Function or prototype declarations that do not have a manual page in sections 2, 3, or 9 will cause the check to fail. Other declarations ('variable', 'externvar', 'macro', 'enumerate', 'enum', 'struct', 'union', 'typedef', 'member', etc.) will only warn if a manual page does not exist, but will not fail the check.

`check_libs`

This check only performs *Maintenance* checks.

When performing *Maintenance* tests, it checks that each exported symbol in each to be installed shared object library has a manual page in section 3. It also checks that each exported symbol has a 'function', 'prototype' or 'externvar' declaration in the to be installed header files. A missing declaration or manual page will cause this check to fail.

`check_mans`

This check only performs *Maintenance* checks.

When performing *Maintenance* tests, it checks that to be install manual pages can be formatted for display without any errors or warnings from the build host `man` program. It also checks that required headings exist for manual pages according to the section in which the manual page will be installed. It warns if recommended headings are not included in the manual pages. Because some *RPM* distributions have manual pages that might conflict with the package manual pages, this check script also checks for conflicts with installed manual pages on the build host. This check script also checks to ensure that all to be

installed manual pages are used in some fashion, that is, they have a declaration, or exported symbol, or are the name of a kernel module or STREAMS module or driver, possibly capitalized.

Note that checking for conflicts with the build host should probably be included in the *System* checks (because *System* checks are performed before the source *RPM %install* scriptlet).

check_modules

This check performs both *System* and *Maintenance* checks.

When performing *System* tests, it checks each to be installed kernel module to ensure that all undefined symbols can be resolved to either the kernel or another module. It also checks whether an exported or externally declared symbol conflicts with an exported or externally declared symbol present in the kernel or another module.¹

When performing *Maintenance* tests, this check script tests that each to be installed kernel module has a manual page in section 9 and that each exported symbol that does not begin with an underscore, and that belongs to an exported function or exported variable, has a manual page in section 9. It also checks to ensure that each exported symbol that does not begin with an underscore, and that belongs to an exported function or exported variable, has a ‘function’, ‘prototype’ or ‘externvar’ declaration in the to be installed header files.

check_streams

This check performs only *Maintenance* checks.

When performing *Maintenance* tests, it checks that for each configured *STREAMS* module or driver, or device node, that a manual page exists in section 4 or section 7 as appropriate.

The output of the pre-installation tests are fairly self explanatory. Each check script saves some output to ‘*name.log*’, where *name* is the name of the check script as listed above. A summary of the results of the test are display to standard output and can also be captured to the ‘*check.log*’ file if the ‘*check.log*’ target is used instead of the ‘*check*’ target to *make*.

Because the check scripts proliferate ‘*name.log*’ files throughout the build directory, a ‘*make check-clean*’ *make* target has be provided to clean them out. ‘*make check-clean*’ should be run before each successive run of ‘*make check*’.

8.1.2 Post-installation Checks

Most OpenSS7 packages ship with a compatibility and conformance test suite built using the ‘*autotest*’ capabilities of ‘*autoconf*’. These test suites act as a wrapper for the compatibility and conformance test programs that are shipped with the package.

Unlike the pre-installation checks, the post-installation checks are always run complete. The only check that post-installation test scripts perform is to test whether they have been invoked with root privileges or not. When invoked as root, or as a plain user, some tests might be skipped that require root privileges, or that require plain user privileges, to complete successfully.

¹ This particular check has caught some name space pollution that has occurred in the 2.6.11 kernel.

8.1.2.1 Running Test Suites

There are several ways of invoking the conformance test suites:

1. The test suites can be run after installation of the package by invoking the ‘`make installcheck`’ or ‘`make installcheck.log`’ target. Some packages require that root privileges be acquired before invoking the package.
2. The test suites can be run from the distribution subdirectory after installation of the package by invoking the `testsuite` shell script directly.
3. The test suites can be run standalone from the ‘`libexec`’ (‘`/usr/libexec`’) installation directory by invoking the `testsuite` shell script directly.

Typical steps for invoking the test suites directly from `make` are shown in [Example 8.4](#).

```
% wget http://www.openss7.org/netperf-2.3.7.tar.bz2
% tar -xjvf netperf-2.3.7.tar.bz2
% pushd netperf-2.3.7
% ./configure
% make
% make check # <----- invokes System pre-installation checks
% make install
% sudo make installcheck # <----- invokes post-installation tests
% popd
```

Example 8.4: *Invoking System Checks*

When performing post-installation checks for the purposes of generating a problem report, the checks should always be performed from the build directory, either with ‘`make installcheck`’ or by invoking `testsuite` directly from the ‘`tests`’ subdirectory of the build directory. This ensures that all of the information known to `configure` and pertinent to the configuration of the system for which a test case failed, will be collected in the resulting ‘`testsuite.log`’ file deposited upon test suite failure in the ‘`tests`’ directory. This ‘`testsuite.log`’ file can then be attached as part of the problem report and provides rich details to maintainers of the package. See also [Section 8.2 \[Problem Reports\]](#), page 103, below.

Typical steps for invoking and installed `testsuite` standalone are shown in [Example 8.5](#).

```
% [sudo] /usr/libexec/netperf/testsuite
```

Example 8.5: *Invoking testsuite Directly*

When invoked directly, `testsuite` will generate a ‘`testsuite.log`’ file in the current directory, and a ‘`testsuite.dir`’ directory of failed tests cases and debugging scripts. For generating a problem report for failed test cases, see [Section 8.2.4 \[Stand Alone Problem Reports\]](#), page 106.

8.2 Problem Reports

8.2.1 Problem Report Guidelines

Problem reports in the following categories should include a log file as indicated in the table below:

`./configure`

A problem with the configuration process occurs that causes the `./configure` command to fail. The problem report must include the `config.log` file that was generated by `configure`.

`make compile.log`

A problem with the build process occurs that causes the `make` command to fail. Perform `make clean` and then `make compile.log` and attach the `config.log` and `compile.log` files to the problem report.

`make check.log`

A problem occurs with the `make check` target that causes it to fail. Perform `make check-clean check.log` and attach the `config.log`, `compile.log` and `check.log` files to the problem report.

`sudo make install.log`

A problem occurs with `sudo make install` that causes it to fail. Perform `sudo make uninstall` and `sudo make install.log` and attach the `config.log`, `compile.log`, `check.log`, and `install.log` files to the problem report.

`[sudo] make installcheck.log`

A problem occurs with the `make installcheck` target that causes the test suite to fail. Attach the resulting `tests/testsuite.log` and `installcheck.log` file to the problem report. There is no need to attach the other files as they are included in `tests/testsuite.log`.

`[sudo] make uninstall.log`

A problem occurs with the `make uninstall` target that causes the test suite to fail. Perform `sudo make uninstall.log` and attach the `config.log`, `compile.log`, `check.log`, `install.log`, `installcheck.log`, `tests/testsuite.log` and `uninstall.log` file to the problem report.

`[sudo] make remove.log`

A problem occurs with the `make remove` target that causes the test suite to fail. Perform `sudo make remove.log` and attach the `config.log`, `compile.log`, `check.log`, `install.log`, `installcheck.log`, `tests/testsuite.log` and `remove.log` file to the problem report.

For other problems that occur during the use of the *OpenSS7 NETPERF Utility* package, please write a test case for the test suite that recreates the problem if one does not yet exist and provide a test program patch with the problem report. Also include whatever log files are generated by the kernel (`cmn_err(9)`) or by the `strerr(8)` or `strace(1)` facilities (`strlog(9)`).

8.2.2 Generating Problem Reports

The *OpenSS7 Project* uses the *GNU GNATS* system for problem reporting. Although the `send-pr` tool from the *GNU GNATS* package can be used for bug reporting to the project's

GNATS database using electronic mail, it is not always convenient to download and install the *GNATS* system to gain access to the ‘send-pr’ tool.

Therefore, the *OpenSS7 NETPERF Utility* package provides the ‘send-pr’ shell script that can be used for problem reporting. The ‘send-pr’ shell script can be invoked directly and is a work-alike for the *GNU* ‘send-pr’ tool.

The ‘send-pr’ tool takes the same flags and can be used in the same fashion, however, whereas ‘send-pr’ is an interactive tool², ‘send-pr’ is also able to perform batch processing. Whereas ‘send-pr’ takes its field information from local databases or from using the ‘query-pr’ C-language program to query a remote database, the ‘send-pr’ tool has the field database internal to the tool.

Problem reports can be generated using *make*, See [Section 7.7.1.7 \[Problem Report Targets\]](#), page 94. An example of how simple it is to generate a problem report is illustrated in [Example 8.6](#).

```
% make pr
SEND-PR:
SEND-PR: send-pr: send-pr was invoked to generate an external report. An
SEND-PR: automated problem report has been created in the file named
SEND-PR: 'problem.pr' in the current directory. This problem report can
SEND-PR: be sent to bugs@openss7.org by calling this script as
SEND-PR: '/home/brian/os7/scripts/send-pr --file="problem.pr"'.
SEND-PR:
SEND-PR: It is possible to edit some of the fields before sending on the
SEND-PR: problem report. Please remember that there is NO WARRANTY. See
SEND-PR: the file 'COPYING' in the top level directory.
SEND-PR:
SEND-PR: Please do not send confidential information to the bug report
SEND-PR: address. Inspect the file 'problem.pr' for confidential
SEND-PR: information before mailing.
SEND-PR:
% vim problem.pr # <--- follow instructions at head of file
% make send-pr
```

Example 8.6: *Invoking Problem Report Generation*

Using the ‘make pr’ target to generate a problem report has the advantages that it will assemble any available ‘*.log’ files in the build directory and attach them to the problem report.

8.2.3 Automatic Problem Reports

The *OpenSS7 NETPERF Utility* package also provides a feature for automatic problem report generation that meets the problem report submission guidelines detailed in the preceding sections.

Whenever a logging makefile target (see [Section 7.7.1.6 \[Logging Targets\]](#), page 93) is invoked, if the primary target fails, the *send-pr* shell script is invoked to automatically

² ‘send-pr’ launches the user’s *EDITOR* to edit the problem report before submitting it.

generate a problem report file suitable for the corresponding target (as described above under see [Section 8.2.1 \[Problem Report Guidelines\]](#), page 104). An example is shown in [Example 8.7](#).

```
% make compile.log
...
...
make[5]: *** [libXNSdrvs_a-ip.o] Error 1
make[5]: Leaving directory '/u6/buildel4/strxns'
make[4]: *** [all-recursive] Error 1
make[4]: Leaving directory '/u6/buildel4/strxns'
make[3]: *** [all] Error 2
make[3]: Leaving directory '/u6/buildel4/strxns'
make[2]: *** [all-recursive] Error 1
make[2]: Leaving directory '/u6/buildel4'
make[1]: *** [all] Error 2
make[1]: Leaving directory '/u6/buildel4'
SEND-PR:
SEND-PR: send-pr: Make target compile.log failed in the compile stage. An
SEND-PR: automated problem report has been created in the file named
SEND-PR: 'problem.pr' in the current directory. This problem report can
SEND-PR: be sent to bugs@openss7.org by calling 'make send-pr'.
SEND-PR:
SEND-PR: It is possible to edit some of the fields before sending on the
SEND-PR: problem report. Please remember that there is NO WARRANTY. See
SEND-PR: the file 'COPYING' in the top level directory.
SEND-PR:
SEND-PR: Please do not send confidential information to the bug report
SEND-PR: address. Inspect the file 'problem.pr' for confidential
SEND-PR: information before mailing.
SEND-PR:
% vim problem.pr # <--- follow instructions at head of file
% make send-pr
```

Example 8.7: *Problem Report from Failed Logging Target*

8.2.4 Stand Alone Problem Reports

The *OpenSS7 NETPERF Utility* package installs the `send-pr` script and its configuration file `send-pr.config` in ``${libexecdir}/netperf` along with the validation `testsuite`, see [Section 8.1 \[Test Suites\]](#), page 99. As with the `testsuite`, this allows the `send-pr` script to be used for problem report generation on an installed system that does not have a build directory.

An example of invoking the package `testsuite` and then generating a problem report for failed cases is shown in [Example 8.8](#).

```

% [sudo] /usr/libexec/netperf/testsuite
% # test cases failed...
% /usr/libexec/netperf/send-pr
SEND-PR:
SEND-PR: send-pr: send-pr was invoked to generate an external report. An
SEND-PR: automated problem report has been created in the file named
SEND-PR: 'problem.pr' in the current directory. This problem report can
SEND-PR: be sent to bugs@openss7.org by calling this script as
SEND-PR: '/usr/libexec/netperf/send-pr --file problem.pr'.
SEND-PR:
SEND-PR: It is possible to edit some of the fields before sending on the
SEND-PR: problem report. Please remember that there is NO WARRANTY. See
SEND-PR: the file 'COPYING' in the top level directory.
SEND-PR:
SEND-PR: Please do not send confidential information to the bug report
SEND-PR: address. Inspect the file 'problem.pr' for confidential
SEND-PR: information before mailing.
SEND-PR:
% vim problem.pr # <--- follow instructions at head of file
% /usr/libexec/netperf/send-pr --file problem.pr

```

Example 8.8: *Invoking send-pr Directly*

The advantage of the approach shown in the example is that the `send-pr` script is capable of collecting the `testsuite.log` file and the failed test cases and debugging scripts from the `testsuite.dir` directory and including them in the problem report, as well as all package pertinent information from the installed `send-pr.config`.

8.3 Known Problems

The OpenSS7 Project does not ship software with known bugs. All bugs are unknown.

Verified behaviour is that behaviour that has been verified by conformance test suites that are shipped with the *OpenSS7 NETPERF Utility* package.

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See also [Section 6.5 \[Bugs\]](#), page 49, or file `BUGS` in the release directory.

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