OpenSS7 Master Package
Installation and Reference Manual

Version 0.9.2 Edition G
Updated 2008-10-31
Package openss7-0.9.2.G

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This is texinfo edition G of the OpenSS7 Master Package manual, and is consistent with OpenSS7 0.9.2. This manual was developed under the OpenSS7 Project and was funded in part by OpenSS7 Corporation.

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Preface

Notice

This package is released and distributed under the *AGPL* (see [GNU Affero General Public License], page 137). Please note, however, that there are different licensing terms for some of the sub-packages included in this master package. Consult the permission notices contained in the documentation of each sub-package for more information.

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Abstract

This manual provides a *Installation and Reference Manual* for *OpenSS7 Master Package*.

Objective

The objective of this manual is to provide a guide for the *OpenSS7 Master Package* developer when downloading, building, installing and using the *OpenSS7 Master Package* package.

This guide provides information to developers on the downloading, building, installation and use of the *OpenSS7 Master Package* package.

Intent

The intent of this manual is to act as an installation guide and reference manual to the *OpenSS7 Master Package* developer. It is intended to be read alone and is not intended to replace or supplement the *OpenSS7 Master Package* 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 Master Package* 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, administration, kernel dumps, crashes, oops logs, package managers, the autoconf packaging system, etc.

The guide is intended for installers and maintainers of *OpenSS7 Master Package* software.

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 Master Package* package, `openss7-0.9.2.G`.[1]

Version Control

```
openss7.texi,v
Revision 0.9.2.24  2008-09-20 11:04:23  brian
- added package patchlevel

Revision 0.9.2.23  2008-08-03 06:03:26  brian
- protected agains texinfo commands in log entries

Revision 0.9.2.22  2008/07/27 08:48:42  brian
- no invariant sections, more libtool ignores

Revision 0.9.2.21  2008-05-03 21:22:25  brian
- updates for release

Revision 0.9.2.20  2008-05-03 13:23:24  brian
- added strx25 sub-package and package updates

Revision 0.9.2.19  2008-04-25 11:50:39  brian
- updates to AGPLv3

Revision 0.9.2.18  2008/01/01 14:40:24  brian
- updated release files

Revision 0.9.2.17  2007/08/12 06:43:30  brian
- updated licenses in manuals

Revision 0.9.2.16  2007/08/03 13:33:57  brian
- manual updates, put ss7 modules in public release

Revision 0.9.2.15  2007/06/22 00:18:20  brian
- mostly documentation updates for release, some netconfig workaround

Revision 0.9.2.14  2007/03/17 08:31:22  brian
- corrected formatting problems

Revision 0.9.2.13  2007/02/28 06:30:07  brian
- updates and corrections, #ifdef instead of #if

Revision 0.9.2.12  2007/01/08 11:10:06  brian
- updated documentation for release

Revision 0.9.2.11  2006/12/29 12:17:54  brian
- old rpms hate nested ifs, release updates

Revision 0.9.2.10  2006/12/29 05:50:40  brian
- changes for successful master build

Revision 0.9.2.9  2006/10/21 10:30:43  brian
- updated LiS release number

Revision 0.9.2.8  2006/10/02 11:31:16  brian
- changes to get master builds working for RPM and DEB
- added outside licenses to package documentation
```

[1] http://www.openss7.org/tarballs/openss7-0.9.2.G.tar.bz2

```
- added LICENSE automated release file
- copy MANUAL to source directory
- add and remove devices in -dev debian subpackages
- get debian rules working better
- release library version files
- added notes to debian changelog
- corrections for cooked manual pages in spec files
- added release documentation to spec and rules files
- copyright header updates
- moved controlling tty checks in stream head
- missing some defines for LiS build in various source files
- added OSI headers to striso package
- added includes and manual page paths to acincludes for various packages
- added sunrpc, uidlpi, uinpi and uitpi licenses to documentation and release
  files
- moved pragma weak statements ahead of declarations
- changes for master build of RPMS and DEBS with LiS

Revision 0.9.2.7  2006/09/18 01:06:16  brian
- updated manuals and release texi docs

Revision 0.9.2.6  2006/08/28 10:46:48  brian
- correction

Revision 0.9.2.5  2006/08/28 10:32:40  brian
- updated references

Revision 0.9.2.4  2006/08/27 12:26:28  brian
- finalizing auto release files

Revision 0.9.2.3  2006/08/26 09:15:47  brian
- better release file generation

Revision 1.1.2.2  2006/08/23 11:00:17  brian
- added preface, corrections and updates for release

Revision 1.1.2.1  2006/08/22 12:40:13  brian
- added doc tree for master package
```

ISO 9000 Compliance

Only the TEX, texinfo, or roff source for this manual is controlled. An opaque (printed, postscript or portable document format) version of this manual is an **UNCONTROLLED VERSION**.

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Acknowledgements

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- OpenSS7 Corporation

Thanks to the subscribers to and sponsors of The OpenSS7 Project. Without their support, open software like this would not be possible.

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*.

Sponsors

Funding for completion of the *OpenSS7 OpenSS7 Master Package* package was provided in part by:

- OpenSS7 Corporation

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- OpenSS7 Corporation
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- TECORE
- Tumsan Oy
- Vodare Ltd.
- Excel Telecommunications

Contributors

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

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- Chuck Winters
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- Tom Chandler
- Gurol Ackman
- Kutluk Testicioglu
- John Wenker
- Others

Authors

The authors of the *OpenSS7 OpenSS7 Master Package* package include:

- Brian Bidulock

See [Index of Authors], page 180, for a complete listing and cross-index of authors to sections of this manual.

Maintainer

The maintainer of the *OpenSS7 OpenSS7 Master Package* 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 7.2 [Problem Reports], page 123.

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 Master Package* package, only after reading the '`BUGS`' file in the release, or See

Section 7.2 [Problem Reports], page 123. 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 Master Package* package as well as other packages released by The OpenSS7 Project.

These are `mailman` mailing lists and so have convenient web interfaces for subscribers to control their settings. See `http://www.openss7.org/mailinglist.html`.

The mailing lists are as follows:

'`openss7`'
: The '`openss7`' mailing list is for general enquiries, information exchange and announcements regarding the OpenSS7 Project. This is our original mailing list and takes the highest amount of traffic.

'`openss7-announce`'
: The '`openss7-announce`' mailing list is for announcements related to the OpenSS7 Project. This list will accept announcements posted by subscribers. Subscribe to this list if you are interested in announcements from the OpenSS7 Project, subscribers and sponsors, related to the OpenSS7 Project or STREAMS, SS7, SIGTRAN or SCTP in general.

'`openss7-cvs`'
: The '`openss7-cvs`' mailing list is for automatic CVS log reporting. You must get permission of the owner to subscribe to this list. Subscribers are not allowed to post to this list, this is merely for distributing notification of changes to the CVS repository.h

'`openss7-develop`'
: The '`openss7-develop`' mailing list is for email exchange related to the development projects under the OpenSS7 Project. This includes development requests, proposals, requests for comment or proposal. Subscribe to this list if you are interested in ongoing development details regarding the OpenSS7 Project.

'`openss7-test`'
: The '`openss7-test`' mailing list is for email exchange related to the testing of code under the OpenSS7 Project. This specifically relates to conformance testing, verification testing, interoperability testing and beta testing. Subscribe to this list if you are interested in participating in and receiving ongoing details of test activities under the OpenSS7 Project.

'`openss7-bugs`'
: The '`openss7-bugs`' mailing list is specifically tailored to bug tracking. The mailing list takes a feed from the OpenSS7 GNATS bug tracking system and accepts posting of responses to bug reports, tracking and resolution. Subscribe to this list if you are interested in receiving detailed *OpenSS7* release code bug tracking information. This list is not archived; for historical information on problem reports, see our GNATS databases.

‘openss7-updates’
: The ‘openss7-updates’ mailing list provides updates on OpenSS7 Project code releases and ongoing activities. Subscribers are not allowed to post to this list; this list is for official OpenSS7 Project announcements only. Subscribe to this list if you are interested in receiving updates concerning official releases and activities of the OpenSS7 Project.

‘openss7-streams’
: The ‘openss7-streams’ mailing list is for email exchange related to the *STREAMS* development projects under the OpenSS7 Project. This includes development requests, proposals, requests for comment or proposal. Subscribe to this list if you are interested in ongoing development details regarding the OpenSS7 Project *STREAMS* components.

‘linux-streams’
: The ‘linux-streams’ mailing list is for mail exchange related to *Linux Fast-STREAMS* or *Linux STREAMS*. This includes patches, development requests, proposals, requests for comment or proposal. Subscribe to this list if you are interested in ongoing development details regarding the *STREAMS* for Linux components. This is the the new (September 2006) home of the ‘linux-streams’ list formerly of gsyc.escet.urjc.es.

Spam

To avoid spam being sent to the members of the *OpenSS7* mailing list(s), we have blocked mail from non-subscribers. Please subscribe to the mailing list before attempting to post to them. (Attempts to post when not subscribed get bounced.)

As an additional measure against spam, subscriber lists for all *OpenSS7* mailing lists are not accessible to non-subscribers; for most lists subscriber lists are only accessible to the list administrator. This keeps your mailing address from being picked off our website by bulk mailers.

Acceptable Use Policy

It is acceptable to post professional and courteous messages regarding the *OpenSS7* package or any general information or questions concerning *STREAMS*, *SS7*, *SIGTRAN*, *SCTP* or telecommunications applications in general.

Large Attachments

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 Master Package

Package openss7-0.9.2.G was released under AGPLv3 2008-10-31.

This is the *OpenSS7 Master Package* package. It consists of a master package that contains all other OpenSS7 Project package releases. Use this package if you are interested in ease of installation of a wide range of OpenSS7 Project packages.

The *OpenSS7 Master Package* package contains:

`sctp-0.2.27` (*Linux Native Sockets SCTP*),
`iperf-2.0.8` (*Internet Performance*),
`streams-0.9.2.4` (*Linux Fast-STREAMS*),
`strcompat-0.9.2.7` (*STREAMS Compatibility Modules*),
`strutil-0.9.2.7` (*STREAMS Utilities*),
`strbcm-0.9.2.5` (*STREAMS Binary Compatibility Module*),
`strtty-0.9.2.4` (*STREAMS Terminals*),
`strxns-0.9.2.7` (*STREAMS X/Open Networking Services*),
`strxnet-0.9.2.12` (*STREAMS X/Open Networking*),
`strsock-0.9.2.4` (*STREAMS Sockets*),
`strinet-0.9.2.7` (*STREAMS Internet*),
`strsctp-0.9.2.9` (*STREAMS SCTP*),
`strchan-0.9.2.4` (*STREAMS Channels*),
`strx25-0.9.2.1` (*STREAMS X.25*),
`striso-0.9.2.4` (*STREAMS Open Systems Interconnect*),
`netperf-2.3.7` (*Network Performance*),
`strisdn-0.9.2.4` (*STREAMS ISDN Stack*),
`strss7-0.9a.8` (*STREAMS SS7 Stacks*),
`sigtran-0.9.2.4` (*STREAMS SIGTRAN Stack*),
`strvoip-0.9.2.4` (*STREAMS VoIP Stacks*),
`osr61-0.9.2.3` (*Dialogic Open System Release 6.1*) and
`LiS-2.18.7` (*Linux STREAMS*).

If you need to build an install a significant number of these packages, the *OpenSS7 Master Package* package is the easiest way to do so.

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 `openss7-0.9.2.G` package, released 2008-10-31. This '`0.9.2.G`' 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/openss7-0.9.2.G.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 `openss7` 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-openss7`' and '`README-make`', files (or see Chapter 6 [Installation], page 83) for installation instructions.

When working from `cvs(1)` or `git(1)`, please see the '`README-cvs`', file (or see Section 6.2.8 [Downloading from CVS], page 88). 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 the *OpenSS7 Master Package*, `openss7-0.9.2.G`.

Prerequisites for the OpenSS7 Master Package 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 5.2 [Compatibility], page 67.
   - 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).
   - GNU bison and flex (for config programs).
   - net-snmp (for SNMP agents).[3]

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:

---

[1] See Section 5.2.1 [GNU/Linux Distributions], page 67, 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] A wide range of net-snmp releases are supported, from UCD-SNMP 4.2.5 through net-snmp 5.4.

```
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:

```
$> ../openss7-0.9.2.G/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/openss7-0.9.2.G.tar.bz2
$> tar -xjvf openss7-0.9.2.G.tar.bz2
$> mkdir build
$> pushd build
$> ../openss7-0.9.2.G/configure --enable-autotest
$> make
$> make check
$> sudo make install
$> sudo make installcheck
$> sudo make uninstall
$> popd
$> sudo rm -rf build
$> rm -rf openss7-0.9.2.G
$> rm -f openss7-0.9.2.G.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:

```
$> wget http://www.openss7.org/tarballs/openss7-0.9.2.G.tar.bz2
$> tar -xjvf openss7-0.9.2.G.tar.bz2
$> mkdir build
$> pushd build
$> ../openss7-0.9.2.G/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 openss7-0.9.2.G
$> rm -f openss7-0.9.2.G.tar.bz2
```

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

[4] Please see Section 7.2 [Problem Reports], page 123, or the file 'PROBLEMS' in the release directory for more information on filing a proper *Problem Report*.

For custom applications, see the 'INSTALL' and 'INSTALL-openss7' files or the see Chapter 6 [Installation], page 83, as listed below. If you encounter troubles, see Chapter 7 [Troubleshooting], page 119, before issuing a bug report.

Brief Installation Instructions

The OpenSS7 Master Package package is available from the downloads area of The OpenSS7 Project website using a command such as:

```
$> wget http://www.openss7.org/tarballs/openss7-0.9.2.G.tar.bz2
```

Unpack the tarball using a command such as:

```
$> tar -xjvf openss7-0.9.2.G.tar.bz2
```

The tarball will unpack into the relative subdirectory named after the package name: openss7-0.9.2.G.

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
$> ../openss7-0.9.2.G/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 ../openss7-0.9.2.G/INSTALL
```

For specific options to the '`configure`' script, see the 'INSTALL-openss7' file in the distribution, or simply execute the configure script with the '`--help`' option like so:

```
$> ../openss7-0.9.2.G/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 openss7-0.9.2.G
$> rm -f openss7-0.9.2.G.tar.bz2
```

Detailed Installation Instructions

More detailed installation instructions can be found in the Chapter 6 [Installation], page 83, contained in the distribution in '`text`', '`info`', '`html`' and '`pdf`' formats:

```
$> cd ../openss7-0.9.2.G
$> less doc/manual/openss7.txt
$> lynx doc/manual/openss7.html
$> info doc/manual/openss7.info
$> xpdf doc/manual/openss7.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/openss7_manual.html
```

1 Introduction

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

1.1 Objective

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

1.2 Organization of this Manual

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

1.3 Conventions and Definitions

This manual uses *texinfo* typographic conventions.

2 Overview

2.1 Background

The OpenSS7 Project was started in 1996 an made it Web debut in 2000. The initial objectives of the OpenSS7 Project were to provide an SS7 stack implementation for Linux. Initial work on development of the SS7 stack attempted to integrate the SS7 protocol elements into Linux's BSD-like Sockets based networking system. Early on this approach became problematic. Although the true BSD sockets networking system is somewhat ameniable to a wider range of protocols that just the TCP/IP protocol suite, as evidenced by the early adoption of OSI protocols into BSD 4.3 , the incarnation of the system present in Linux deviates largely from the BSD module in that there is no clean separation between the socket layer and the protocol layer, and that the protocol layer cannot actually be stacked in the same fashion as is possible in BSD. Thes and other difficulties led the project, in 2001, to persue the STREAMS approach to networking.

At the time (in 2000), there was an implemetnation for STREAMS for Linux, called Linux STREAMS, or *LiS* for short. The OpenSS7 Project worked extensively with enhancing the *LiS* package for use with SS7 and SIGTRAN protocols. The versions of *LiS* that were available for the Linux 2.2 series kernels available at the time were quite stable.[1] The versions of *LiS* that were available for the Linux 2.4 series kernels attempted to support SMP using the same SVR 4.0-like STREAMS model. These versions of *LiS* were incredibly difficult to stabilize on Linux 2.4 series kernels. Much of the problems with *LiS* appeared to be related to a poor coding style, and the attempt to maintain portablity to systems other than Linux, (even though it appears that ports were not even popular).

Therefore, in 2003, the OpenSS7 Project decided to replace *LiS* with a completely new implementation of STREAMS for Linux based, on SVR 4.2 documentation, called *Linux Fast-STREAMS*, or *LfS*. The OpenSS7 Project also decided to support a fork of *LiS* in the meantime to developing *Linux Fast-STREAMS* to production grade. The project maintained a fork of *LiS-2.16* for the Linux 2.4 kernel series, and later a fork of *LiS-2.18* for the Linux 2.6 kernel series. The development of *Linux Fast-STREAMS* culminated with the first production grade release for Linux 2.4 and 2.6 kernel services at the beginning of 2006, after which the OpenSS7 forks of *LiS* were completely deprecated.

Beginning in 2001, the OpenSS7 Project has developed STREAMS components over a wide range of applications, not just SS7. These components are divided into groups of components that are released within separate sub-packages of the OpenSS7 Master Package.

2.2 Package Contents

The *OpenSS7 Master Package* package is intended as a common build and installation package for all other packages available from The OpenSS7 Project. The master package began as a slim framework for development of the other packages and blossomed into a combined build and development environment for all OpenSS7 packages. The master package is currently very mature and provides a simple way for users of the OpenSS7 packages to download, build and install all available OpenSS7 Project packages without concern or consideration for intricate dependencies between packages.

[1] Linux 2.2 series kernels did *not* support symmetrical multi-processing (SMP) making it similar to SVR 4.0.

2.2.1 STREAMS Packages

Because OpenSS7 packages first built with *Linux STREAMS (LiS)* but now build with the superior *Linux Fast-STREAMS (LfS)*, the master package had the objective from the onset of being able to build all OpenSS7 packages against either *LiS* or *LfS* or both. This was the case from *LiS* version *2.18.1* through *2.18.3* and *streams* version *0.7a.3* through *0.7a.5*, or master package releases *0.9.2.A* through *0.9.2.C*. With the release of master package *0.9.2.D* containing *streams 0.9.2.1*, *LiS* is no longer supported in the master package. *LiS 2.18.3* was the final public release of *LiS* from the OpenSS7 Project.

2.2.2 Other Packages

The other packages in the OpenSS7 Master Package normally depend upon one of the *STREAMS* packages and zero or more of the other sub-packages in the master package. The OpenSS7 Master Package, by default, builds *Linux Fast-STREAMS* (`streams-0.9.2.4`) and all other packages against *Linux Fast-STREAMS*. It was formerly possible; however, to direct the package to build against *Linux STREAMS* (`LiS-2.18.7`), or both *LiS* and *LfS* (such as is done to release the master package).

3 Reference

3.1 Packages

Following is a list of the sub-packages contained in the *OpenSS7 Master Package* package:

These sub-packages are described in sections following.

3.1.1 sctp-0.2.27

sctp-0.2.27 is the *Linux* native (Sockets) version of OpenSS7 Stream Control Transmission Protocol (SCTP). This is an implementation of SCTP built on the same protocol engine core as the *STREAMS* implementation: `strsctp-0.9.2.9`. This sub-package currently only builds for *Linux* kernels in the 2.4 series; however, the *STREAMS* implementation (`strsctp-0.9.2.9`) runs on both 2.4 and 2.6 kernel series.

This package does not rely upon any other package, but will only form part of the build for a 2.4 series *Linux* kernel.

This package is contained in the '`sctp`' subdirectory in the OpenSS7 Master Package source distribution. See the installation and reference manual in the '`sctp/doc`' directory for more information on this sub-package.

3.1.2 iperf-2.0.8

iperf-2.0.8 is an OpenSS7 Project modified version of the University of Illinois IPERF package. The packages is modified to work with the OpenSS7 Linux Native Sockets version of SCTP (`sctp-0.2.27`) and is used for performance testing of that package.

This package relies upon the `sctp-0.2.27` package only.

This package is contained in the '`iperf`' subdirectory in the OpenSS7 Master Package source distribution. See the installation and reference manual in the '`iperf/doc`' directory for more information on this sub-package.

3.1.3 streams-0.9.2.4

The *Linux Fast-STREAMS* (`streams-0.9.2.4`) package is *POSIX/SuSv3* conforming, high-performance, SVR 4.2 *STREAMS* compatible, production replacement for the buggy, non-conforming, SVR 4 *STREAMS LiS* package.

This package relies upon no other package and is compatible with a wide range of *Linux* kernels in both the 2.4 and 2.6 kernels.

This package is contained in the '`streams`' subdirectory in the OpenSS7 Master Package source distribution. See the installation and reference manual in the '`streams/doc`' directory for more information on this sub-package.

3.1.4 strcompat-0.9.2.7

The *STREAMS Compatibility Modules* (`strcompat-0.9.2.7`) package is an SVR 4.2 *STREAMS* compatibility package that provides *STREAMS* compatibility for the following mainstream *STREAMS* implementations:

- UNIX System V Release 3.2
- UNIX System V Release 4 MP
- UNIX System V Release 4.0 MP
- UNIX System V Release 4.2 MP
- Mentat Portable STREAMS (MPS)
- Linux STREAMS LiS 2.16
- Linux STREAMS LiS 2.18
- Linux Fast-STREAMS 0.7a
- AIX 5L Version 5.2 Portable STREAMS Environment (PSE)
- HP-UX 11.0i v2 STREAMS/UX
- OSF/1.2 - Digital UNIX STREAMS
- UnixWare 7.1.3 (OpenUnix 8) STREAMS
- Solaris 8/SunOS 5.9 (OpenSolaris) STREAMS
- Mac OS 9 OpenTransport 1.5r2
- IRIX 6.5.17 STREAMS
- SUPER-UX Release 9.2
- UXP/V V10L10 STREAMS V10

This package was originally part of the *Linux Fast-STREAMS* release, but was split off to temporarily provide compatibility for both *Linux Fast-STREAMS* and *Linux STREAMS*, and, thus, provide a transition path for *STREAMS* drivers and modules using other major *UNIX* implementations, and even *LiS*, to *Linux Fast-STREAMS*.

This package relies upon the presence of the following packages also included in the OpenSS7 Master Package:

1. *Linux Fast-STREAMS* (`streams-0.9.2.4`).

This package is contained in the '`strcompat`' subdirectory in the OpenSS7 Master Package source distribution. See the installation and reference manual in the '`strcompat/doc`' directory for more information on this sub-package.

3.1.5 strutil-0.9.2.7

The *STREAMS Utilities* package (`strutil-0.9.2.7`) provides a set of utility programs normally only contained in the *Linux Fast-STREAMS* release, such as the `scls` program. It was the intention of this package to split of some of the more useful utilities to allow them to work with *LiS* as well as *Linux Fast-STREAMS*. Currently, these utilities are present in the `streams-0.9.2.4` package, and, as *LiS* is now completely deprecated, there is no longer a use for this package. It is currently not part of the build or the distribution of the OpenSS7 Master Package.

This package relies upon the presence of the following packages also included in the OpenSS7 Master Package:

1. *Linux STREAMS* (`LiS-2.18.7`)
2. *STREAMS Compatibility Modules* (`strcompat-0.9.2.7`)

This package is contained in the '`strutil`' subdirectory in the OpenSS7 Master Package source distribution. See the installation and reference manual in the '`strutil/doc`' directory for more information on this sub-package.

3.1.6 strbcm-0.9.2.5

The *STREAMS Binary Compatibility Module* (`strbcm-0.9.2.5`) package was intended to provide the ability to take a pre-compiled binary object, pre-compiled either for *Linux STREAMS* or *Linux Fast-STREAMS* and install it onto a system running *Linux Fast-STREAMS*. This package would provide the ability to run older, deprecated, *Lis* pre-compiled binaries and run them under a new production *Linux Fast-STREAMS* installation.

This package is currently incomplete and neither forms part of the build, nor part of the distribution. This package relies upon the presence of the following packages also included in the OpenSS7 Master Package:

1. *Linux Fast-STREAMS* (`streams-0.9.2.4`)
2. *STREAMS Compatibility Modules* (`strcompat-0.9.2.7`)

This package is contained in the '`strbcm`' subdirectory in the OpenSS7 Master Package source distribution. See the installation and reference manual in the '`strbcm/doc`' directory for more information on this sub-package.

3.1.7 strtty-0.9.2.4

The *STREAMS Terminal* (`strtty-0.9.2.4`) package

It was the intention of this package to provide Terminal interface capability for *Linux STREAMS*. Unfortunately, *Linux STREAMS* does not support the necessary capability for supporting Terminal input/output controls directly from the *Stream head* as is necessary for proper implementation of this package.

Currently, *Linux Fast-STREAMS* (`streams-0.9.2.4`) contains direct support for Sockets and Terminals from the *Stream head*. Master terminals are formed by sending a *M_SETOPTS* message to the *Stream head* at open in the normal fashion for *STREAMS*-based terminals. However, this capability is to some degree incomplete and only partially tested.

Nevertheless, *LiS* is now completely deprecated, and this package can contain only the necessary modules (‘`streams-ldterm`’) and drivers (‘`streams-ptem`’) and depend upon *Linux Fast-STREAMS*.

This package is incomplete and untested and neither forms part of the build, nor part of the distribution. This package relies upon the presence of the following packages also included in the OpenSS7 Master Package:

1. *Linux Fast-STREAMS* (`streams-0.9.2.4`), and
2. *STREAMS Compatibility Modules* (`strcompat-0.9.2.7`).

This package is contained in the ‘`strtty`’ subdirectory in the OpenSS7 Master Package source distribution. See the installation and reference manual in the ‘`strtty/doc`’ directory for more information on this sub-package.

3.1.8 strxns-0.9.2.7

The *STREAMS XNS* (`strxns-0.9.2.7`) package provides Communications Data Link Interface (CDI), Data Link Provider Interface (DLPI) and Network Provider Interface (NPI) drivers, modules, header files, documentation and specification reprints.

This package contains drivers, modules and header files that were split off from the *Linux STREAMS* release so that they could be corrected and used with *Linux Fast-STREAMS*. In particular, the standard headers files (‘`sys/cdi.h`’, ‘`sys/dlpi.h`’ and ‘`sys/npi.h`’) that formed part of the original *LiS* releases from GCOM releases of *LiS* contained errors.

This package also provides additional DLPI and NPI drivers that were not present in any *LiS* release.

This package is complete but not completely tested. This package relies upon the presence of the following packages also included in the OpenSS7 Master Package:

1. *Linux Fast-STREAMS* (`streams-0.9.2.4`), and
2. *STREAMS Compatibility Modules* (`strcompat-0.9.2.7`).

This package is contained in the ‘`strxns`’ subdirectory in the OpenSS7 Master Package source distribution. See the installation and reference manual in the ‘`strxns/doc`’ directory for more information on this sub-package.

3.1.9 strxnet-0.9.2.12

The *STREAMS XTI/TLI Library* (`strxnet-0.9.2.12`) package

This package contains drivers, modules and header files that were split off from the *Linux STREAMS* release so that they could be corrected and used with *Linux Fast-STREAMS*. In particular, the standard header files ('`sys/tihdr.h`' and '`sys/tiuser.h`') that formed part of the original *LiS* releases from GCOM release of *LiS* contained errors.

This package provides the X/Open Transport Inteface/Transport Layer Interface (XTI/TLI) library described in the X/Open Networking Services (XNS) 5.2 specification available from the OpenGroup. This library and cooperating *STREAMS* modules ('`streams-timod`') provide XTI/TLI library functionality to any driver providing the Transport Provider Interface (TPI) Revision 2.0.0 interface. It also provides header files conforming to the TPI specification.

This package is complete and completely tested. This package relies upon the presence of the following packages also included in the OpenSS7 Master Package:

1. *Linux Fast-STREAMS* (`streams-0.9.2.4`),
2. *STREAMS Compatibility Modules* (`strcompat-0.9.2.7`), and
3. *STREAMS XNS* (`strxns-0.9.2.7`).

This package is contained in the '`strxnet`' subdirectory in the OpenSS7 Master Package source distribution. See the installation and reference manual in the '`strxnet/doc`' directory for more information on this sub-package.

3.1.10 strnsl-0.9.2.4

The *STREAMS NSL Library* (`strnsl-0.9.2.4`) package

3.1.11 strsock-0.9.2.4

The *STREAMS Socket Library* (`strsock-0.9.2.4`) package provides a library ('`libsocket`') and cooperating *STREAMS* module ('`streams-sockmod`') that provides X/Open Network Services (XNS) 5.2 Sockets interface to any driver or module supporting a Transport Provider Interface (TPI) Revision 2.0.0 service interface at its upper boundary in a similar fashion to the XTI/TLI library package above.

It was the intention of this package to provide Sockets interface capability for *Linux STREAMS*. Unfortunately, *Linux STREAMS* does not provide the necessary capabilities for supporting Socket and Terminal input/output controls directly from the *Stream head* as is necessary for proper implementation of this package.

Currently, *Linux Fast-STREAMS* (`streams-0.9.2.4`) contains direct support for Sockets and Terminals in the *Stream head*. Sockets are formed by declaring the *Stream* to be of type *IFSOCK*; however, this capability is incomplete and untested.

Nevertheless, as *LiS* is now completely deprecated, and there is no longer a use for this package. It is currently not part of the build no the distribution of OpenSS7 Master Package.

This package is incomplete and untested and neither forms part of the build, nor part of the distribution. This package relies upon the presence of the following packages also included in the OpenSS7 Master Package:

1. *Linux Fast-STREAMS* (`streams-0.9.2.4`),

2. *STREAMS Compatibility Modules* (`strcompat-0.9.2.7`),
3. *STREAMS XNS* (`strxns-0.9.2.7`), and
4. *STREAMS XNET* (`strxnet-0.9.2.12`).

This package is contained in the '`strsock`' subdirectory in the OpenSS7 Master Package source distribution. See the installation and reference manual in the '`strsock/doc`' directory for more information on this sub-package.

3.1.12 strinet-0.9.2.7

The *STREAMS INET* (`strinet-0.9.2.7`) package provides a pseudo-device driver sporting a Transport Provider Interface (TPI) Revision 2.0.0 service interface providing to *SCTP*, *TCP*, *UDP*, *RAWIP*, and *UNIX* sockets within the *Linux* kernel. Also provided are second generation implementations of *UDP* and *RAWIP* that are completely implemented using *STREAMS*.

This package is complete and tested. This package relies upon the presence of the following packages also included in the OpenSS7 Master Package:

1. *Linux Fast-STREAMS* (`streams-0.9.2.4`),
2. *STREAMS Compatibility Modules* (`strcompat-0.9.2.7`),
3. *STREAMS XNS* (`strxns-0.9.2.7`),
4. *STREAMS XNET* (`strxnet-0.9.2.12`), and
5. optional *Sockets SCTP* (`sctp-0.2.27`).

This package is contained in the '`strinet`' subdirectory in the OpenSS7 Master Package source distribution. See the installation and reference manual in the '`strinet/doc`' directory for more information on this sub-package.

3.1.13 strsctp-0.9.2.9

The *STREAMS SCTP* (`strsctp-0.9.2.9`) package provides a pseudo-device driver sporting a Network Provider Interface (NPI) Revision 2.0.0 and Transport Provider Interface (TPI) Revision 2.0.0 service interfaces to an full *STREAMS* implementation of SCTP (*Stream Control Transmission Protocol*).

This package is complete and tested. This package relies upon the presence of the following packages also included in the OpenSS7 Master Package:

1. *Linux Fast-STREAMS* (`streams-0.9.2.4`),
2. *STREAMS Compatibility Modules* (`strcompat-0.9.2.7`),
3. *STREAMS XNS* (`strxns-0.9.2.7`), and
4. *STREAMS XNET* (`strxnet-0.9.2.12`).

This package is contained in the '`strsctp`' subdirectory in the OpenSS7 Master Package source distribution. See the installation and reference manual in the '`strsctp/doc`' directory for more information on this sub-package.

3.1.14 strchan-0.9.2.4

The *STREAMS Channels* (`strchan-0.9.2.4`) package provides real device drivers and pseudo-device drivers support a Channel Interface (CHI) or Multiplex Interface (MXI) for

data and media bearer connections. It also provides several lower level modules for HDLC and SS7 DAED functions providing the Communications Device Interface (CDI) from the `strxns-0.9.2.7` package. The package also provides documentation for the Channel Interface (CHI), Multiplex Interface (MXI) and Media Gateway Interface (MGI).

The HDLC component is a base component for the `striso` and `strisdn` packages, whereas the SS7 DAEDR is a base component for the `strss7` package.

The device drivers provided by this package are more generic and have wider applicability than the device drivers for the same hardware present in the `strss7` package. Also included in this package is the beginning of a `zaptel` integrated driver for Asterisk integration support.

This package is incomplete and untested and neither forms part of the build, nor part of the distribution. This package relies upon the presence of the following packages also included in the OpenSS7 Master Package:

1. *Linux Fast-STREAMS* (`streams-0.9.2.4`),
2. *STREAMS Compatibility Modules* (`strcompat-0.9.2.7`), and
3. *STREAMS XNS* (`strxns-0.9.2.7`).

This package is contained in the '`strchan`' subdirectory in the OpenSS7 Master Package source distribution. See the installation and reference manual in the '`strchan/doc`' directory for more information on this sub-package.

3.1.15 strx25-0.9.2.1

The *STREAMS X.25* (`strx25-0.9.2.1`) package provides pseudo-device drivers providing the Communications Datalink Interface (CDI) for X.21 PAD, Data Link Provider Interface (DLPI) for X.25 LP, Network Layer Interface (NLI) for X.25 PLP, Network Provider Interface (NPI) for X.25 OSI CONS, and Transport Provider Interface (TPI) for X.25. It also supports Ethernet LAP over LLC2. It is intended that this package support XOT and XOS.

This package is incomplete and untested and neither forms part of the build, nor part of the distribution. This package relies upon the presence of the following packages also included in the OpenSS7 Master Package:

1. *Linux Fast-STREAMS* (`streams-0.9.2.4`),
2. *STREAMS Compatibility Modules* (`strcompat-0.9.2.7`),
3. *STREAMS XNS* (`strxns-0.9.2.7`),
4. *STREAMS XNET* (`strxnet-0.9.2.12`), and
5. *STREAMS Channels* (`strchan-0.9.2.4`).

This package is contained in the '`strx25`' subdirectory in the OpenSS7 Master Package source distribution.

3.1.16 striso-0.9.2.4

The *STREAMS ISO* (`striso-0.9.2.4`) package provides pseudo-device drivers providing the Communications Datalink Interface (CDI) for X.21 PAD, Data Link Provider Interface (DLPI) for X.25 LP, Network Provider Interface (NPI) for X.25 PLP CONS and ISO CLNS, and Transport Provider Interface (TPI) for ISO TP0, TP1, TP2, TP3, TP4. It also

supports Ethernet LAP over LLC2. It is intended that this package support ISOT, CMOT, CMISE/CMIP for TMN management.

This package is incomplete and untested and neither forms part of the build, nor part of the distribution. This package relies upon the presence of the following packages also included in the OpenSS7 Master Package:

1. *Linux Fast-STREAMS* (`streams-0.9.2.4`),
2. *STREAMS Compatibility Modules* (`strcompat-0.9.2.7`),
3. *STREAMS XNS* (`strxns-0.9.2.7`),
4. *STREAMS XNET* (`strxnet-0.9.2.12`), and
5. *STREAMS Channels* (`strchan-0.9.2.4`).
6. *STREAMS X.25* (`strx25-0.9.2.1`).

This package is contained in the '`striso`' subdirectory in the OpenSS7 Master Package source distribution.

3.1.17 netperf-2.3.7

The *Netperf* (`netperf-2.3.7`) package is a OpenSS7 modified version of the Hewlett-Packard network performance testing tool, *Netperf*, modified for use with *Linux Fast-STREAMS* XTI/TLI, INET and SCTP stack components. It is used for performance testing and measurement on these packages by the OpenSS7 Project.

This package is complete and tested. This package relies upon the presence of the following packages also included in the OpenSS7 Master Package:

1. *Linux Fast-STREAMS* (`streams-0.9.2.4`),
2. *STREAMS Compatibility Modules* (`strcompat-0.9.2.7`),
3. *STREAMS XNS* (`strxns-0.9.2.7`),
4. *STREAMS XNET* (`strxnet-0.9.2.12`),
5. *STREAMS INET* (`strinet-0.9.2.7`),
6. *STREAMS SCTP* (`strsctp-0.9.2.9`),
7. *STREAMS Channels* (`strchan-0.9.2.4`),
8. *STREAMS X.25* (`strx25-0.9.2.1`).
9. *STREAMS ISO* (`striso-0.9.2.4`).

This package is contained in the '`netperf`' subdirectory in the OpenSS7 Master Package source distribution.

3.1.18 strisdn-0.9.2.4

The *STREAMS ISDN* (`strisdn-0.9.2.4`) package contains a wide array of signalling and call control packages for use in development of switching platforms and VoIP networks.

The components in this subpackage are the ISDN components that were originally part of the `strss7` package.[1]

This package is a work in progress and partially tested. This package relies upon the presence of the following packages also included, in the OpenSS7 Master Package:

[1] The `strss7` package was getting much too large and was split into `strchan`, `striso`, `strisdn`, `strss7`, `sigtran` and `strvoip` sub-packages.

1. *Linux Fast-STREAMS* (`streams-0.9.2.4`),
2. *STREAMS Compatibility Modules* (`strcompat-0.9.2.7`),
3. *STREAMS XNS* (`strxns-0.9.2.7`),
4. *STREAMS XNET* (`strxnet-0.9.2.12`),
5. *STREAMS INET* (`strinet-0.9.2.7`),
6. *STREAMS SCTP* (`strsctp-0.9.2.9`),
7. *STREAMS Channels* (`strchan-0.9.2.4`), and
8. *STREAMS X.25* (`strx25-0.9.2.1`).
9. *STREAMS ISO* (`striso-0.9.2.4`).

This package is contained in the '`strisdn`' subdirectory in the OpenSS7 Master Package source distribution. See the installation and reference manual in the '`strisdn/doc/manual`' subdirectory for more information on this subpackage.

3.1.19 strss7-0.9a.8

The *STREAMS SS7/VoIP/ISDN/SIGTRAN* (`strss7-0.9a.8`) package contains a wide array of signalling and call control packages for use in development of switching platforms for legacy and VoIP networks.

The components in this subpackage are the SS7 components that were originally part of the `strss7` package.[2]

This package is a work in progress and partially tested. This package relies upon the presence of the following packages also included in the OpenSS7 Master Package:

1. *Linux Fast-STREAMS* (`streams-0.9.2.4`),
2. *STREAMS Compatibility Modules* (`strcompat-0.9.2.7`),
3. *STREAMS XNS* (`strxns-0.9.2.7`),
4. *STREAMS XNET* (`strxnet-0.9.2.12`),
5. *STREAMS INET* (`strinet-0.9.2.7`),
6. *STREAMS SCTP* (`strsctp-0.9.2.9`),
7. *STREAMS Channels* (`strchan-0.9.2.4`),
8. *STREAMS X.25* (`strx25-0.9.2.1`),
9. *STREAMS ISO* (`striso-0.9.2.4`), and
10. *STREAMS ISDN* (`strisdn-0.9.2.4`).

This package is contained in the '`stacks`' subdirectory in the OpenSS7 Master Package source distribution.

3.1.20 sigtran-0.9.2.4

The *STREAMS SIGTRAN* (`sigtran-0.9.2.4`) package contains a wide array of Signalling Transport components used for telephony signalling over SCTP/IP.

The components in this subpackage are the SIGTRAN components that were originally part of the `strss7` package.[3]

[2] The `strss7` package was getting much too large and was split into `strchan`, `striso`, `strisdn`, `strss7`, `sigtran` and `strvoip` sub-packages.

[3] The `strss7` package was getting much too large and was split into `strchan`, `striso`, `strisdn`, `strss7`, `sigtran` and `strvoip` sub-packages.

This package is a work in progress and partially tested. This package relies upon the presence of the following packages also included in the OpenSS7 Master Package:

1. *Linux Fast-STREAMS* (`streams-0.9.2.4`),
2. *STREAMS Compatibility Modules* (`strcompat-0.9.2.7`),
3. *STREAMS XNS* (`strxns-0.9.2.7`),
4. *STREAMS XNET* (`strxnet-0.9.2.12`),
5. *STREAMS INET* (`strinet-0.9.2.7`),
6. *STREAMS SCTP* (`strsctp-0.9.2.9`),
7. *STREAMS Channels* (`strchan-0.9.2.4`),
8. *STREAMS X.25* (`strx25-0.9.2.1`),
9. *STREAMS ISO* (`striso-0.9.2.4`),
10. *STREAMS ISDN* (`strisdn-0.9.2.4`), and
11. *STREAMS SS7* (`strisdn-0.9a.8`).

3.1.21 strvoip-0.9.2.4

The components in this subpackage are the VoIP components that were originally part of the `strss7` package.[4]

This package is a work in progress and partially tested. This package relies upon the presence of the following packages also included in the OpenSS7 Master Package:

1. *Linux Fast-STREAMS* (`streams-0.9.2.4`),
2. *STREAMS Compatibility Modules* (`strcompat-0.9.2.7`),
3. *STREAMS XNS* (`strxns-0.9.2.7`),
4. *STREAMS XNET* (`strxnet-0.9.2.12`),
5. *STREAMS INET* (`strinet-0.9.2.7`),
6. *STREAMS SCTP* (`strsctp-0.9.2.9`),
7. *STREAMS Channels* (`strchan-0.9.2.4`),
8. *STREAMS X.25* (`strx25-0.9.2.1`),
9. *STREAMS ISO* (`striso-0.9.2.4`),
10. *STREAMS ISDN* (`strisdn-0.9.2.4`),
11. *STREAMS SS7* (`strisdn-0.9a.8`), and
12. *STREAMS SIGTRAN* (`sigtran-0.9.2.4`).

The *STREAMS VoIP* (`strvoip-0.9.2.4`) package contains

3.1.22 osr61-0.9.2.3

The components in this subpackage are the Dialogic Open System Release 6.1 components that were originally in the Dialogic Open System Release 6.1 version 239 GPL drivers release package from Dialogic.

This package is a work in progress and is untested. This package relies upon the presence of the following packages also included in the OpenSS7 Master Package:

[4] The `strss7` package was getting much too large and was split into `strchan`, `striso`, `strisdn`, `strss7`, `sigtran` and `strvoip` sub-packages.

1. *Linux Fast-STREAMS* (`streams-0.9.2.4`),
2. *STREAMS Compatibility Modules* (`strcompat-0.9.2.7`),
3. *STREAMS XNS* (`strxns-0.9.2.7`),
4. *STREAMS XNET* (`strxnet-0.9.2.12`),

3.1.23 LiS-2.18.7

The *Linux STREAMS* (`LiS-2.18.7`) package is the deprecated *Linux STREAMS* package first available from GCOM and later supported by The OpenSS7 Project for a number of years. *Do not use this package.*[5] *LiS* has always been buggy and impossible to fix. Use *Linux Fast-STREAMS* (`streams-0.9.2.4`) instead. By default, this master package will build *Linux Fast-STREAMS* and will build all other sub-packages for *Linux Fast-STREAMS*.

This package is contained in the '`LiS`' subdirectory in the OpenSS7 Master Package source distribution.

3.2 Files

The OpenSS7 Master Package does not install and files of it own and is simply a master package for the coordinated build and installation of the contained sub-packages.

3.2.1 Kernel Modules

The OpenSS7 Master Package package does directly build or install any of its own kernel modules. The kernel modules built and installed belong to subtending add-on packages. The following sections describe some of the kernel modules installed by add-on packages in the OpenSS7 Master Package.

3.2.1.1 sctp

The `sctp-0.2.27` add-on package is a Linux Native Sockets implementation of Stream Control Transmission Protocol (SCTP), and does not use *STREAMS*. This package installs one module that implements the SCTP socket functionality:

'`sctp`'

This kernel module provides the Stream Control Transmission Protocol (SCTP) sockets and the *OpenSS7* implementation of SCTP for sockets. See `sctp(7)` for more information.

3.2.1.2 streams

The `streams-0.9.2.4` add-on package provides a number of kernel modules used to implement the *STREAMS* Shadow Special Filesystem, the *STREAMS* executive, and various base and standard *STREAMS* drivers and modules.

Kernel modules installed by `streams-0.9.2.4` are as follows:

'`specfs`'

This kernel module contains the *STREAMS* Special Shadow Filesystem. See `specfs(5)` for more information.

[5] *LiS* is only included in this release for those that are so impossibly behind on the development evolutionary scale that they simply do not have the genetic material to evolve to the superior *Linux Fast-STREAMS*. We pity you (as we pity pond scum).

‘`streams`’

This kernel module contains the *STREAMS* scheduler, utility functions, and *STREAMS* Device Driver Interface/Driver Kernel Interface (DDI/DKI). See `STREAMS(9)` for more information.

‘`streams-bufmod`’

This kernel module contains the ‘`bufmod`’ *STREAMS* module. The ‘`bufmod`’ *STREAMS* module is a simple buffer module (a module that always defers to its service procedure and then passes any message along). This module is used for performance testing of the *STREAMS* package. See `bufmod(4)` for more information.

‘`streams-connld`’

This kernel module contains the ‘`connld`’ *STREAMS* module. This is a standard *STREAMS* module. See `connld(4)` for more information.

‘`streams-echo`’

This kernel module contains the ‘`echo`’ *STREAMS* driver. This is a standard *STREAMS* driver, but is also used by the conformance and validation test suite. See `echo(4)` for more information.

‘`streams-fifo`’

This kernel module contains the ‘`fifo`’ *STREAMS* driver. This is a standard *STREAMS* driver, but is also used by the conformance and validation test suite. See `fifo(4)` for more information.

‘`streams-log`’

This kernel module contains the ‘`log`’ *STREAMS* driver. This is a standard *STREAMS* driver. See `log(4)` for more information.

‘`streams-loop`’

This kernel module contains the ‘`loop`’ *STREAMS* driver. This is a standard *STREAMS* driver, but is also used by the conformance and validation test suite. See `loop(4)` for more information.

‘`streams-mux`’

This kernel module contains the ‘`mux`’ *STREAMS* driver. This is a standard *STREAMS* driver< but is also used by the conformance and validation test suite. See `mux(4)` for more information.

‘`streams-nsdev`’

This kernel module contains the ‘`nsdev`’ *STREAMS* driver. This is a *Linux Fast-STREAMS* specific driver. See `nsdev(4)` for more information.

‘`streams-nullmod`’

This kernel module contains the ‘`nullmod`’ *STREAMS* module. The ‘`nullmod`’ *STREAMS* module is a simple null module (a module that always passes messages to the next module in along the Stream). This module is used for performance testing of the *STREAMS* package and is also used by the conformance and validation test suite. See `nullmod(4)` for more information.

‘`streams-nuls`’
: This kernel module contains the ‘`nuls`’ *STREAMS* driver. This is a standard *STREAMS* module. See `nuls(4)` for more information.

‘`streams-pipemod`’
: This kernel module contains the ‘`pipemod`’ *STREAMS* module. This is a standard *STREAMS* module used with pipes. See `pipemod(4)` for more information.

‘`streams-pipe`’
: This kernel module contains the ‘`pipe`’ *STREAMS* driver. This is a standard *STREAMS* driver. See `pipe(4)` for more information.

‘`streams-sad`’
: This kernel module contains the ‘`sad`’ *STREAMS* driver. This is the standard *STREAMS* Administrative Driver. See `sad(4)` for more information.

‘`streams-sc`’
: This kernel module contains the *sc STREAMS* module. This is a common *STREAMS* Configuration module. See `sc(4)` for more information.

‘`streams-sfx`’
: This kernel module contains the *sfx STREAMS* driver. This is a common character device driver for implementing *STREAMS* FIFOs. See `sfx(4)` for more information.

‘`streams-spx`’
: This kernel module contains the *spx STREAMS* driver. This is a common character device driver for implementing *STREAMS* pipes. See `spx(4)` for more information.

‘`streams-testmod`’
: This kernel module contains the ‘`testmod`’ *STREAMS* module. This is a OpenSS7 Master Package specific test module that is used for conformance and validation testing of *STREAMS*. See `testmod(4)` for more information.

3.2.1.3 strcompat

The `strcompat-0.9.2.7` add-on package provides a number of kernel modules that implement enhanced *STREAMS* and *DDI/DKI* functions in support of compatibility for *STREAMS* driver and modules written for other implementations of *STREAMS*.

Kernel modules installed by `strcompat-0.9.2.7` are as follows:

‘`streams-aixcompat`’
: This kernel module provides compatibility to *STREAMS* modules and drivers written for *AIX 5L Version 5.1*. See `aixcompat(9)` for more information.

‘`streams-hpuxcompat`’
: This kernel module provides compatibility to *STREAMS* modules and drivers written for *HP-UX 11.0i v2*. See `hpuxcomat(9)` for more information.

‘`streams-irixcompat`’
: This kernel module provides compatibility to *STREAMS* modules and drivers written for *IRIX 6.5.17*. See `irixcompat(9)` for more information.

‘`streams-liscompat`’
: This kernel module provides compatibility to *STREAMS* modules and drivers written for *LiS-2.18.7*. See `liscompat(9)` for more information.

‘`streams-maccompat`’
: This kernel module provides compatibility to *STREAMS* modules and drivers written for *MacOT 1.5r2*. See `maccompat(9)` for more information.

‘`streams-mpscompat`’
: This kernel module provides compatibility to *STREAMS* modules and drivers written for *Mentat Portable STREAMS*. See `mpscompat(9)` for more information.

‘`streams-os7compat`’
: This kernel module provides compatibility to *STREAMS* modules and drivers written for *OpenSS7*. See `os7compat(9)` for more information.

‘`streams-osfcompat`’
: This kernel module provides compatibility to *STREAMS* modules and drivers written for *OSF1 1.2–Digital UNIX*. See `osfcompat(9)` for more information.

‘`streams-suncompat`’
: This kernel module provides compatibility to *STREAMS* modules and drivers written for *Solaris 9/SunOS 5.9*. See `suncompat(9)` for more information.

‘`streams-svr3compat`’
: This kernel module provides compatibility to *STREAMS* modules and drivers written for *UNIX System V Release 3.2*. See `svr3compat(9)` for more information.

‘`streams-svr4compat`’
: This kernel module provides compatibility to *STREAMS* modules and drivers written for *UNIX System V Release 4.2 MP*. See `svr4compat(9)` for more information.

‘`streams-uw7compat`’
: This kernel module provides compatibility to *STREAMS* modules and drivers written for *UnixWare 7.1.3 (OpenUnix 8)*. See `uw7compat(9)` for more information.

3.2.1.4 strutil

The `strutil-0.9.2.7` package is not currently contained in the release and the kernel modules it installs are, therefore, not listed here.

3.2.1.5 strbcm

The `strbcm-0.9.2.5` package is not currently contained in the release and the kernel modules it installs are, therefore, not listed here.

3.2.1.6 strtty

The `strtty-0.9.2.4` add-on package provides kernel modules for core *STREAMS* drivers and modules written to the specifications for the *SVR 4 Terminal Subsystem*. These *STREAMS* modules and drivers are provided as kernel modules by the add-on package.

Kernel modules installed by `strtty-0.9.2.4` are as follows:

'`streams-pckt`'
: This kernel module provides the classical '`pckt`' *STREAMS* module. This is a standard *STREAMS* module that is part of the *SVR 4 Terminal Subsystem*. When pushed on a master pseudo-terminal *Stream* it provides packetization of the messages received from the master pseudo-terminal. For more information, see `pckt(4)`.

'`streams-ptem`'
: This kernel module provides the classical '`ptem`' *STREAMS* module. This is a standard *STREAMS* module that is part of the *SVR 4 Terminal Subsystem*. When pushed on a slave pseudo-terminal *Stream* it provides terminal emulation for the pseudo-terminal. For more information, see `ptem(4)`.

'`streams-ttcompat`'
: This kernel module provides the classical '`ttcompat`' *STREAMS* module. This is a standard *STREAMS* module that is part of the *SVR 4 Terminal Subsystem*. When pushed on a slave pseudo-terminal or real terminal *Stream* it provides input-output control compatibility all the way back to UNIX Version 7. For more information, see `ttcompat(4)`.

'`streams-ldterm`'
: This kernel module provides the classical '`ldterm`' *STREAMS* module. This is a standard *STREAMS* module that is part of the *SVR 4 Terminal Subsystem*. When pushed on a terminal *Stream* it provides the line discipline for terminals. For more information, see `ldterm(4)`.

'`streams-pty`'
: This kernel module provides the classical '`pty`' *STREAMS* driver. This is a standard *STREAMS* driver that is part of the *SVR 4 Terminal Subsystem*. The driver provides both slave and master pseudo-terminals. For more information, see `pty(4)`.

3.2.1.7 strxns

The `strxns-0.9.2.7` add-on packages provides kernel modules for sundry *STREAMS* drivers and modules written to the specifications for *X/Open Networking Services* and the *CDI*, *DLPI* and *NPI* levels. Many of these modules come from the deprecated *LiS* package and were ported to *Linux Fast-STREAMS* to aid migration.

Kernel modules installed by `strxns-0.9.2.7` are as follows:

'`streams-ip_strm_mod`'
: This *STREAMS* module was originally part of the *LiS* distribution.

'`streams-ip_to_dlpi`'
: This *STREAMS* driver was originally part of the *LiS* distribution.

'`streams-ldl`'
: This *STREAMS* driver was originally part of the *LiS* distribution.

'`streams-np_ip`'
: This *STREAMS* driver was originally part of the *Linux Fast-STREAMS* distribution.

3.2.1.8 strxnet

The `strxnet-0.9.2.12` add-on package provides several *STREAMS* modules that provide capabilities first found in *UNIX System V Release 4* that form part of the *Transport Provider Interface (TPI)* networking capabilities. These *STREAMS* modules are provided as kernel modules in the add-on package.

Kernel modules installed by `strxnet-0.9.2.12` are as follows:

'`streams-timod`'
: This kernel module provides the '`timod`' *STREAMS* module. This is a standard *STREAMS* module that is part of the *X/Open Transport Interface (XTI)* library capability. When pushed on a *Stream* it provides a set of input-output controls that are used by the *X/Open Transport Interface (XTI)* library ('`libxnet`') to provide its functions. See `timod(4)` for more information.

'`streams-tirdwr`'
: This kernel module provides the '`tirdwr`' *STREAMS* module. This is a standard *STREAMS* module that is part of the *X/Open Transport Interface (XTI)* library capability. When pushed on a *Stream* it provides the ability to `read(2)` from and `write(2)` to a *Stream* supporting the *Transport Provider Interface (TPI)*. See `tirdwr(4)` for more information.

3.2.1.9 strsock

The `strsock-0.9.2.4` add-on package provides a number of *STREAMS* drivers and modules as kernel modules. These drivers and modules provide capabilities first found in *UNIX System V Release 4* the form part of the *POSIX Sockets* networking capabilities.

Kernel modules installed by `strsock-0.9.2.4` are as follows:

'`streams-sockmod`'
: This kernel modules provides the '`sockmod`' *STREAMS* module. This is a standard *STREAMS* module that is part of the *POSIX Sockets* library capability. When pushed on a *Stream* it provides a set of input-output controls that are used by the *POSIX Sockets* library ('`libsocket`') to provide its functions. For more information, see `sockmod(4)`.

'`streams-socksys`'
: This kernel module provides the '`socksys`' *STREAMS* driver. This is a standard *STREAMS* driver that is part of the *POSIX Sockets* capability. When a *Stream* is opened on this driver, it directly provides a system call Socket interface to the *Stream* using native system calls (that is, the '`libsocket`' library is not required). For more information, see `socksys(4)`.

3.2.1.10 strinet

The `strinet-0.9.2.7` add-on package provides a number of *STREAMS* drivers and kernel modules. The original package provided only the *XTIOS (XTI over Sockets)* approach '`inet`' driver, however, the current package also provides implementations of these drivers written directly in *STREAMS*.

Kernel modules installed by `strinet-0.9.2.7` are as follows:

‘`streams-inet`’
: This kernel module provides the first-generation ‘`inet`’ *STREAMS* driver. This driver provides *STREAMS* access to *TCP/IP* and *UNIX* domain sockets based on the *Transport Provider Interface (TPI)* and supporting the *X/Open Transport Interface/Transport Layer Interface (XTI/TLI)* library. See `inet(4)` for more information.

‘`streams-rawip`’
: This kernel module provides the second-generation ‘`rawip`’ *STREAMS* driver. This driver provides a second-generation ‘`rawip`’ driver. This difference between this ‘`rawip`’ driver and that provided by the ‘`inet`’ module is that this driver does not open a socket internal to the kernel and implements the driver as a full *STREAMS* driver. See `rawip(4)` for more information.

‘`streams-tcp`’
: This kernel module provides the second-generation ‘`tcp`’ *STREAMS* driver. This driver provides a second-generation ‘`tcp`’ driver. This difference between this ‘`tcp`’ driver and that provided by the ‘`inet`’ module is that this driver does not open a socket internal to the kernel and implements the driver as a full *STREAMS* driver. See `tcp(4)` for more information.

‘`streams-udp`’
: This kernel module provides the second-generation ‘`udp`’ *STREAMS* driver. This driver provides a second-generation ‘`udp`’ driver. This difference between this ‘`udp`’ driver and that provided by the ‘`inet`’ module is that this driver does not open a socket internal to the kernel and implements the driver as a full *STREAMS* driver. See `udp(4)` for more information.

3.2.1.11 strsctp

The `strsctp-0.9.2.9` add-on package provides a number of *STREAMS* drivers in kernel modules. This is the *STREAMS* implementation of Stream Control Transmission Protocol (SCTP).

Kernel modules installed by `strsctp-0.9.2.9` are as follows:

‘`streams-sctp`’
: This kernel module provides the *STREAMS* implementation of Stream Control Transmission Protocol (SCTP). See `sctp(4)` for more information.

‘`streams-tpiperf`’
: This kernel module provides a capability to perform in-kernel performance testing of drivers based on the *Transport Provider Interface (TPI)*. It will eventually be moved to the `strxnet-0.9.2.12` add-on package. See `tpiperf(4)` for more information.

3.2.1.12 strchan

The `strchan-0.9.2.4` add-on package provides a range of *STREAMS* drivers and modules as kernel modules. The drivers and modules implement various protocol components for *Isochronous Channels* and related devices. A number of these drivers and modules were formerly part of the commercial `strss7` package releases.

Kernel modules installed by `strchan-0.9.2.4` are as follows:

This add-on package currently installs no kernel modules. Modules will be added from the commercial release of `strss7` as they are re-validated on *Linux Fast-STREAMS*.

3.2.1.13 strx25

The `strx25-0.9.2.1` add-on package provides a range of *STREAMS* drivers and modules as kernel modules. The drivers and modules implement various protocol components in the *International Standards Organization (ISO) X.25* model, and a number of *Internet Enginerring Task Force* related protocols. A number of these drivers and modules were formerly part of the commercial `strss7` package releases.

Kernel modules installed by `strx25-0.9.2.1` are as follows:

'`streams-xot`'
: This kernel modules provides the *STREAMS* '`xot`' module. This module provides a pushable module that implements *RFC 1613* to provide *X.25 over TCP (XOT)*. It provides a *Network Provider Interface (NPI)*, `npi(7)`, for connectionless or connection-oriented service suitable for use with the *OSI Transport* drivers. For more information, see `xot(4)`.

'`streams-x25-lapb`'
: This kernel modules provides the *STREAMS* '`lapb`' driver. This driver provides *X.25 Link Access Protocol – Balanced (LAPB)* data links. It provides the *Data Link Provider Interface (DLPI)*, `dlpi(7)`. For more information, see `x25-lapb(4)`.

'`streams-x25-plp`'
: This kernel modules provides the *STREAMS* '`plp`' driver. This driver provides *X.25 Pakcet Layer Protocol (PLP)*. It is able to link Streams that provide the *Data Link Provider Interface (DLPI)*, `dlpi(7)` for LAPB and LLC2. It provides the *Network Provider Interface (NPI)*, `npi(7)`, for connection-oriented network service. For more information, see `x25-plp(4)`.

3.2.1.14 striso

The `striso-0.9.2.4` add-on package provides a range of *STREAMS* drivers and modules as kernel modules. The drivers and modules implement various protocol components in the *International Standards Organization (ISO) Open Systems Interconnect* model, and a number of *Internet Enginerring Task Force* related protocols. A number of these drivers and modules were formerly part of the commercial `strss7` package releases.

Kernel modules installed by `striso-0.9.2.4` are as follows:

'`streams-cmot`'
: This kernel modules provides the *STREAMS* '`cmot`' module. This module provides a pushable module that implements *RFC 1189 CMISE/CMIP over TCP*. It provides a *Transport Provider Interface (TPI)*, `tpi(7)`, providing the mOSI interface. For more information, see `cmot(4)`.

‘streams-isot’
: This kernel modules provides the *STREAMS* ‘isot’ module. This module provides a pushable module that implements *RFC 1006* to provide *OSI Transport Class 0* over TCP. For more information, see isot(4).

‘streams-itot’
: This kernel modules provides the *STREAMS* ‘itot’ module. This module provides a pushable module that implements *RFC 2126* to provide *OSI Transport Class 0 and 2* over TCP.

  For more information, see itot(4).

‘streams-lpp’
: This kernel modules provides the *STREAMS* ‘lpp’ module. This module provides a pushable module that implemented *RFC 1189* to provide *Lightweigth Presentation Protocol*. It provides a *Transport Provider Interface (TPI)*, tpi(7), mOSI interface. For more information, see lpp(4).

‘streams-tcpns’
: This kernel modules provides the *STREAMS* ‘tcpns’ module. This module provides a pushable modules that implements *ISO CONS* over *TCP*. It provides a *Network Provider Interface (NPI)*, npi(7), for connectionless network service. For more information, see tcpns(4).

‘streams-clns’
: This kernel modules provides the *STREAMS* ‘clns’ driver. This driver provides *X.213 Connectionless Network Service (CLNS)*. It is able to link Streams that provide the *Network Provider Interface (NPI)*, npi(7), for connectionless service. For more information, see clns(4).

3.2.1.15 strisdn

The strisdn-0.9.2.4 add-on package provides a range of *STREAMS* drivers and modules as kernel modules. The drivers and modules implement various protocol components in, or related to, the *Integrated Services Digital Network*. A number of these drivers and modules were formerly part of the commercial strss7 package releases.

Kernel modules installed by strisdn-0.9.2.4 are as follows:

This add-on package currently installs no kernel modules. Modules will be added from the commercial release of strss7 as they are re-validated on *Linux Fast-STREAMS*.

3.2.1.16 strss7

The strss7-0.9a.8 add-on package provides a wide range of *STREAMS* drivers and modules as kernel modules. The package comes in public and subscriber versions. The public version has far fewer modules than the subscriber version. Listed below are only the current public modules.

Kernel modules installed by strss7-0.9a.8 are as follows:

‘`streams-sdlm`’
: This kernel modules provides the *STREAMS* ‘`sdlm`’ multiplexing driver. This driver provide a multiplexer for *Signalling Data Links*. See `sdlm(4)` for more information.

‘`streams-sdl`’
: This kernel module provides the *STREAMS* ‘`sdl`’ module. This module provides a *Signalling Data Link* interface to any modules providing a *Multiplex Interface (MX)*. See `sdl(4)` for more information.

‘`streams-sdt`’
: This kernel module provides the *STREAMS* ‘`sdt`’ module. This module provide a *Signalling Data Terminal* interface to any modules providing the *Signalling Data Link* interface. See `sdt(4)` for more information.

‘`streams-sl_mux`’
: This kernel modules provides the *STREAMS* ‘`sl_mux`’ multiplexing driver. This module provides a multiplexer for *Streams* supporting the *Signalling Data Link*, *Signalling Data Terminal* or *Signalling Link* interfaces. See `sl_mux(4)` for more information.

‘`streams-sl`’
: This kernel module provides the *STREAMS* ‘`sl`’ module. This module provides a *Signalling Link* interface to any modules providing a *Signalling Data Terminal* interface. This module implements a *Signalling System No. 7 (SS7) Message Transfer Part (MTP) Level 2* state machine. See `sl(4)` for more information.

‘`streams-sm_mod`’
: This kernel module provides the *STREAMS* ‘`sm_mod`’ module. This module provides a simplistic *SS7 MTP Level 3* capability using the *Message Transfer Part Inteface (MTPI)* service interface. See `sm_mod(4)` for more information.

‘`streams-spm`’
: This kernel module provides the *STREAMS* ‘`spm`’ module. See `spm(4)` for more information.

‘`streams-x100p-ss7`’
: This kernel module provides the *STREAMS* ‘`x100p-ss7`’ driver. This driver provides SS7 signalling link support for the *T100P* and *E100P* cards. See `x100p-ss7(4)` for more information.

‘`streams-x400p-ss7`’
: This kernel module provides the *STREAMS* ‘`x400p-ss7`’ driver. This driver provides SS7 signalling link support for the *E400P*, *T400P*, *V400P* and *V401P* cards. See `x400p-ss7(4)` for more information.

3.2.1.17 sigtran

The `sigtran-0.9.2.4` add-on package provides a range of *STREAMS* drivers and modules as kernel modules. The drivers and modules implement various protocol components of *Signalling Transport (SIGTRAN)* and related SS7 over IP protocols. A number of these drivers and modules were formerly part of the commercial `strss7` package releases.

Kernel modules installed by `sigtran-0.9.2.4` are as follows:

‘`streams-m2pa_sl`’
: This kernel module provides the *STREAMS* ‘`m2pa_sl`’ module. This module provide an implementation of *MTP2 Peer-to-Peer Adaptation Layer*. See `m2pa_sl(4)` for more information.

‘`streams-m2ua_as`’
: This kernel modules provides the *STREAM* ‘`m2ua_as`’ module. This module provides an implementation of *MTP2 User Adaptaion Layer*. See `m2ua_as(4)` for more information.

‘`streams-m3ua_as`’
: This kernel modules provides the *STREAM* ‘`m3ua_as`’ module. This module provides an implementation of *MTP3 User Adaptaion Layer*. See `m3ua_as(4)` for more information.

‘`streams-sdl_sctp`’
: This kernel module provides the *STREAMS* ‘`sdl_sctp`’ module. This module provides *SS7 over IP* by directly passing *Signalling Data Link* messages on the *Stream Control Transmission Protocol (SCTP)*. See `sdl_sctp(4)` for more information.

‘`streams-sdt_sctp`’
: This kernel module provides the *STREAMS* ‘`sdt_sctp`’ module. This module provides *SS7 over IP* by directly passing *Signalling Data Terminal* message on the *Stream Control Transmission Protocol (SCTP)*. See `sdt_sctp(4)` for more information.

‘`streams-sdt_tpi`’
: This kernel module provides the *STREAMS* ‘`sdt_tpi`’ module. This module provides *SS7 over IP* by directly passing *Signalling Data Terminal* messages on any *Stream* supporting the *Transport Provider Interface* (such as *UDP* or *SCTP*). See `sdt_tpi(4)` for more information.

‘`streams-sl_tpi`’
: This kernel module provides the *STREAMS* ‘`sl_tpi`’ module. This module provides *SS7 over IP* by directly passing *Signalling Link* messages on any *Stream* supporting the *Transport Provider Interface* (such as *UDP* or *SCTP*). See `sl_tpi(4)` for more information.

3.2.1.18 strvoip

The `strvoip-0.9.2.4` add-on package provides a range of *STREAMS* drivers and modules as kernel modules. The drivers and modules implement various protocol components for *Voice over IP* and related protocols. A number of these drivers and modules were formerly part of the commercial `strss7` package releases.

Kernel modules installed by `strvoip-0.9.2.4` are as follows:

: This add-on package currently installs no kernel modules. Modules will be added from the commercial release of `strss7` as they are re-validated on *Linux Fast-STREAMS*.

3.2.1.19 osr61

The `osr61-0.9.2.3` add-on package provides a range of *STREAMS* drivers and modules as kernel modules. The drivers and modules implement various device drivers and components for the *Dialogic Open System Release 6.1* supported devices. All of these drivers and modules cam from the Dialogic Open System Release 6.1 version 239 GPL drivers release.

Kernel modules installed by `osr61-0.9.2.3` are as follows:

streams-dlgn
: This kernel module contains the '`dlgn`' *STREAMS* driver. This driver supports the Dialogic® Springware boards and the Antares boards. See `dlgn(4)` for more information.

streams-dvbm
: This kernel module contains the '`dvbm`' *STREAMS* module. This driver supports the Dialogic® Springware boards and the Antares boards. See `dvbm(4)` for more information.

streams-gncfd
: This kernel module contains the '`gncfd`' *STREAMS* driver. This driver supports the Dialogic® Springware boards and the Antares boards. See `gncfd(4)` for more information.

streams-gpio
: This kernel module contains the '`gpio`' *STREAMS* driver. This driver supports the Dialogic® Springware boards and the Antares boards. See `gpio(4)` for more information.

streams-sctmr
: This kernel module contains the '`sctmr`' *STREAMS* module. This driver supports the Dialogic® Springware boards and the Antares boards. See `sctmr(4)` for more information.

streams-mercd
: This kernel module contains the '`mercd`' *STREAMS* driver. This driver supports the Dialogic® DM3 boards. See `mercd(4)` for more information.

pmacd
: This kernel module contains the '`pmacd`' driver. This driver supports the Dialogic® IPT boards. See `pmacd(4)` for more information.

ctimod
: This kernel module contains the '`ctimod`' kernel module. This kernel module supports the `pmacd(4)` driver. See `ctimod(4)` for more information.

3.2.1.20 LiS

The `LiS-2.18.7` package is deprecated and this section is deleted.

3.3 Drivers

The OpenSS7 Master Package does not install any drivers of its own and is simply a master package for the coordinated build and installation of the contained sub-packages.

STREAMS drivers contained in sub-packages consist of the following:

'streams_clone.ko'	For more information, see clone(4).
'streams_echo.ko'	For more information, see echo(4).
'streams_fifo.ko'	For more information, see fifo(4).
'streams_log.ko'	For more information, see log(4).
'streams_loop.ko'	For more information, see loop(4).
'streams_mux.ko'	For more information, see mux(4).
'streams_nsdev.ko'	For more information, see nsdev(4).
'streams_nuls.ko'	For more information, see nuls(4).
'streams_pipe.ko'	For more information, see pipe(4).
'streams_sad.ko'	For more information, see sad(4).
'streams_sfx.ko'	For more information, see sfx(4).
'streams_spx.ko'	For more information, see spx(4).
'streams_ip_to_dlpi.ko'	For more information, see ip_to_dlpi(4).
'streams_ldl.ko'	For more information, see ldl(4).
'streams_np_ip.ko'	For more information, see np_ip(4).
'streams_inet.ko'	For more information, see inet(4).
'streams_rawip.ko'	For more information, see rawip(4).
'streams_tcp.ko'	For more information, see tcp(4).
'streams_udp.ko'	For more information, see udp(4).
'streams_sctp.ko'	For more information, see sctp(4).
'streams_sdlm.ko'	For more information, see sdlm(4).
'streams_sl_mux.ko'	For more information, see sl_mux(4).
'streams_x100p-ss7.ko'	For more information, see x100p-ss7(4).
'streams_x400p-ss7.ko'	For more information, see x400p-ss7(4).
'streams_dlgn.ko'	For more information, see dlgn(4).
'streams_gncfd.ko'	For more information, see gncfd(4).
'streams_gpio.ko'	For more information, see gpio(4).
'streams_mercd.ko'	For more information, see mercd(4).
'pmacd.ko'	For more information, see pmacd(4).

3.4 Modules

The OpenSS7 Master Package does not install any drivers of its own and is simply a master package for the coordinated build and installation of the contained sub-packages.

STREAMS modules contained in sub-packages consist of the following:

'streams_sth.ko'	For more information, see sth(4).
'streams_bufmod.ko'	For more information, see bufmod(4).
'streams_connld.ko'	For more information, see connld(4).
'streams_nullmod.ko'	For more information, see nullmod(4).
'streams_pipemod.ko'	For more information, see pipemod(4).
'streams_sc.ko'	For more information, see sc(4).
'streams_testmod.ko'	For more information, see testmod(4).
'streams_ip_strm_mod.ko'	For more information, see ip_strm_mod(4).
'streams_timod.ko'	For more information, see timod(4).
'streams_tirdwr.ko'	For more information, see tirdwr(4).
'streams_tpiperf.ko'	For more information, see tpiperf(4).

‘streams_m2pa_sl.ko’	For more information, see m2pa_sl(4).
‘streams_sdl.ko’	For more information, see sdl(4).
‘streams_sdl_sctp.ko’	For more information, see sdl_sctp(4).
‘streams_sdt.ko’	For more information, see sdt(4).
‘streams_sdt_sctp.ko’	For more information, see sdt_sctp(4).
‘streams_sl.ko’	For more information, see sl(4).
‘streams_sl_tpi.ko’	For more information, see sl_tpi(4).
‘streams_sm_mod.ko’	For more information, see sm_mod(4).
‘streams_spm.ko’	For more information, see spm(4).
‘streams_dvbm.ko’	For more information, see dvbm(4).
‘streams_sctmr.ko’	For more information, see sctmr(4).
‘ctimod.ko’	For more information, see ctimod(4).

3.5 Libraries

The OpenSS7 Master Package does not install any libraries of its own and is simply a master package for the coordinated build and installation of the contained sub-packages.

During the installation process of the sub-packages, subroutine libraries are built and installed on the system. For 64-bit systems that support 32-bit compatibility, two version of each library are built and installed: one 64-bit native library and one 32-bit compatibility library. 64-bit native libraries are installed to the ‘/usr/lib64/’ subdirectory; 32-bit native and 32-bit compatibility libraries are installed to the ‘/usr/lib/’ subdirectory.

Libraries contained in sub-packages consist of the following:

‘libstreams’
: This is a *STREAMS* library installed by the streams-0.9.2.4 package providing usable getmsg(2), getpmsg(2), putmsg(2), putpmsg(2) and isastream(2) system call emulation.

‘libtty’
: This is a *TTY* library installed by the strtty-0.9.2.4 package providing a set of Pseudo-Terminal device functions described in Section 3 of the manual pages, starting with tty(3).

‘libxnet’
: This is an *XTI/TLI* library installed by the strxnet-0.9.2.12 package providing a set of XTI/TLI functions described in Section 3 of the manual pages, starting with xti(3).

‘libxnsl’
: This is an *NSL* library installed by the strnsl-0.9.2.4 package providing a set of NSL functions described in Section 3 of the manual pages, starting with nsl(3).

‘libsocket’
: This ia a *Sockets* library installed by the strsock-0.9.2.4 package providing a set of Socket functions described in Section 3 of the manual pages, starting with libsocket(3).

'libsockpath'
: This ia a *Sockets* library installed by the strsock-0.9.2.4 package providing a set of Socket functions described in Section 3 of the manual pages, starting with libsockpath(3).

'libLiS'
'libpLiS'
: These are *STREAMS* libraries formerly installed by the LiS-2.18.7 package providing usable getmsg(2), getpmsg(2), putmsg(2), putpmsg(2) and isastream(2) system call emulation.

  These libraries are also installed by the streams-0.9.2.4 package for backward compatibility with *LiS*.

3.5.1 iperf

3.5.2 streams

3.5.2.1 libstreams Library Routines

The following subroutines are present in the 'libstreams' libraries. The routines in these libraries are standard *STREAMS* interface system calls documented in the *UNIX® System V Release 4.2 Programmer's Manual – STREAMS*. Refer to the associated manual pages for detailed information on these subroutines.

fattach(2) –
: Name a *STREAMS* special file. For more information, see fattach(2).

fdetach(2) –
: Unname a *STREAMS* special file. For more information, see fdetach(2).

getmsg(2) –
: Get next message off a Stream. For more information, see getmsg(2).

getpmsg(2s) –
: Get next message off a Stream. For more information, see getpmsg(2s).

isastream(2) –
: Test for a *STREAMS* special file. For more information, see isastream(2).

pipe(2s) –
: Create a *STREAMS* pipe. For more information, see pipe(2s).

putmsg(2) –
: Put a message to a *STREAMS* special device. For more information, see putmsg(2).

putpmsg(2s) –
: Put a band message to a *STREAMS* special device. For more information, see putpmsg(2s).

pstrlog(3) –
: Print a *STREAMS* log buffer. For more information, see pstrlog(3).

strlog(3) –
: Print a *STREAMS* log buffer. For more information, see strlog(3).

vstrlog(3) –
: Print a *STREAMS* log buffer. For more information, see vstrlog(3).

3.5.2.2 libLiS Library Routines

For more information on this compatibility library, see See Section 3.5.10 [LiS], page 47.

3.5.2.3 libpLiS Library Routines

For more information on this compatibility library, see See Section 3.5.10 [LiS], page 47.

3.5.3 strtty

3.5.3.1 libtty Library Routines

The following subroutines are present in the '`libtty`' libraries. The routines in these libraries are standard *STREAMS* interface system calls documented in the *UNIX® System V Release 4.2 Programmer's Manual – STREAMS*. Refer to the associated manual pages for detailed information on these subroutines.

`openpt(3tty)` – Open a master pseudo-terminal. For more information, see `openpt(3tty)`.

`ptsname(3tty)` – Obtain name for slave device. For more information, see `ptsname(3tty)`.

`grantpt(3tty)` – Grant access to slave device. For more information, see `granpt(3tty)`.

`unlockpt(3tty)` – Unlock the pseudo-terminal. For more information, see `unlockpt(3tty)`.

3.5.4 strxnet

3.5.4.1 libxnet Library Routines

3.5.5 strnsl

3.5.5.1 libxnsl Library Routines

The following subroutines are present in the '`libxnsl`' libraries. The routines in these libraries are standard *STREAMS* interface system calls documented in the *UNIX® System V Release 4.2 Programmer's Manual – STREAMS*. Refer to the associated manual pages for detailed information on these subroutines.

`endnetconfig(3)` – Unbind from the network selection database. For more information, see `endnetconfig(3)`.

`endnetpath(3)` – Unbind from the `NETPATH` database. For more information, see `endnetpath(3)`.

`freenetconfigent(3)` – Free a network selection database entry. For more information, see `freenetconfigent(3)`.

`getnetconfig(3)` – get an entry from the network selection database. For more information, see `getnetconfig(3)`.

`getnetconfigent(3)` – get an entry from the network selection database by network id. For more information, see `getnetconfigent(3)`.

`getnetpath(3)` – get entry from `NETPATH` database. For more information, see `getnetpath(3)`.

`nc_perror(3)` – Print a network selection error message. For more information, see `nc_perror(3)`.

`nc_sperror(3)` – Obtain a network selection error message. For more information, see `nc_sperror(3)`.

`_nderror(3)` – Network selection error number. For more information, see `_nderror(3)`.

`netdir_free(3)` – Free network selection database data structures. For more information, see `netdir_free(3)`.

`netdir_getbyaddr(3)` – Look up host and service names in directory service by address. For more information, see `netdir_getbyaddr(3)`.

`netdir_getbyname(3)` – Look up address in directory service by name. For more information, see `netdir_getbyname(3)`.

`netdir_options(3)` – Perform options management on a transport endpoint. For more information, see `netdir_options(3)`.

`netdir_perror(3)` – Print network directory error message. For more information, see `netdir_perror(3)`.

`netdir_sperror(3)` – Obtain network directory error message. For more information, see `netdir_sperror(3)`.

`setnetconfig(3)` – Bind to or rewind the network selection database. For more information, see `setnetconfig(3)`.

`setnetpath(3)` – Bind to or rewind the `NETPATH` database. For more information, see `setnetpath(3)`.

`taddr2uaddr(3)` – Convert a transport address to a universal address. For more information, see `taddr2uaddr(3)`.

`uaddr2taddr(3)` – Convert a universal address to a transport address. For more information, see `uaddr2taddr(3)`.

3.5.6 strsock

3.5.6.1 libsocket Library Routines

The following subroutines are present in the '`libsocket`' libraries. The routines in these libraries are standard *STREAMS* interface system calls documented in the *UNIX® System V Release 4.2 Programmer's Manual – STREAMS*. Refer to the associated manual pages for detailed information on these subroutines.

3.5.6.2 libsockpath Library Routines

`accept(3)` – Accept a transport connection. For more information, see `accept(3)`.

`bind(3)` – Bind a transport endpoint. For more information, see `bind(3)`.

`connect(3)` – Establish a transport connection. For more information, see `connect(3)`.

`getpeername(3)` – Get name of remote transport endpoint. For more information, see `getpeername(3)`.

`getsockname(3)` – Get name of local transport endpoint. For more information, see `getsockname(3)`.

`getsockopt(3)` – Get a socket option. For more information, see `getsockopt(3)`.

`listen(3)` – Listen for connections on a transport endpoint. For more information, see `listen(3)`.

`recv(3)` – Receive data on a transport endpoint. For more information, see `recv(3)`.

`recvfrom(3)` – Receive data from a transport endpoint. For more information, see `recvfrom(3)`.

`recvmsg(3)` – Receive a message on a transport endpoint. For more information, see `recvmsg(3)`.

`send(3)` – Send data on a transport endpoint. For more information, see `send(3)`.

`sendmsg(3)` – Send a message on a transport endpoint. For more information, see `sendmsg(3)`.

`sendto(3)` – Send data to a transport endpoint. For more information, see `sendto(3)`.

`setsockopt(3)` – Set a socket option. For more information, see `setsockopt(3)`.

`shutdown(3)` – Shut down a transport connection. For more information, see `shutdown(3)`.

`socket(3)` – Create a socket. For more information, see `socket(3)`.

`socketpair(3)` – Create a connected pair of sockets. For more information, see `socketpair(3)`.

The following subroutines are present in the '`libsockpath`' libraries. The routines in these libraries are standard *STREAMS* interface system calls documented in the *UNIX® System V Release 4.2 Programmer's Manual – STREAMS*. Refer to the associated manual pages for detailed information on these subroutines.

`setsockpath(3)` – Access the sock2path database. For more information, see `setsockpath(3)`.

`getsockpath(3)` – Get next sock2path database entry. For more information, see `getsockpath(3)`.

`endsockpath(3)` – Close sock2path database. For more information, see `endsockpath(3)`.

`getsockpathent(3)` – Get a sock2path database entry. For more information, see `getsockpathent(3)`.

`freesockpathent(3)` – Free a sock2path database entry. For more information, see `freesockpathent(3)`.

3.5.7 strx25

3.5.7.1 libsx25 Library Routines

In the future the '`libsx25`' libraries will provide the Solstice X.25 interface routines.

3.5.8 striso

3.5.8.1 libosi Library Routines

In the future the '`libosi`' libraries will provide the Solstice OSI interface routines.

3.5.9 osr61

Although the Dialogic® Open System Release 6.1 contains quite a few runtime libraries, these libraries currently have licensing too restrictive for an open source release. Check the Dialogic® Open System Release website for how to obtain the runtime libraries.

3.5.10 LiS

3.5.10.1 libLiS Library Routines

The following subroutines are present in the '`libLiS`' libraries. The routines in these libraries are standard *STREAMS* interface system calls documented in the *UNIX® System V Release 4.2 Programmer's Manual – STREAMS*. Refer to the associated manual pages for detailed information on these subroutines.

See also See Section 3.5.2 [streams], page 43.

`fattach(2)` – Name a *STREAMS* special file. For more information, see `fattach(2)`.

`fdetach(2)` – Unname a *STREAMS* special file. For more information, see `fdetach(2)`.

`getmsg(2)` – Get next message off a Stream. For more information, see `getmsg(2)`.

`getpmsg(2s)` – Get next message off a Stream. For more information, see `getpmsg(2s)`.

`isastream(2)` – Test for a *STREAMS* special file. For more information, see `isastream(2)`.

`pipe(2s)` – Create a *STREAMS* pipe. For more information, see `pipe(2s)`.

`putmsg(2)` – Put a message to a *STREAMS* special device. For more information, see `putmsg(2)`.

`putpmsg(2s)` – Put a band message to a *STREAMS* special device. For more information, see `putpmsg(2s)`.

3.5.10.2 libpLiS Library Routines

The following subroutines are present in the '`libpLiS`' libraries. The routines in these libraries are standard *STREAMS* interface system calls documented in the *UNIX® System V Release 4.2 Programmer's Manual – STREAMS*. Refer to the associated manual pages for detailed information on these subroutines.

See also See Section 3.5.2 [streams], page 43.

`fattach(2)` – Name a *STREAMS* special file. For more information, see `fattach(2)`.

`fdetach(2)` – Unname a *STREAMS* special file. For more information, see `fdetach(2)`.

`getmsg(2)` – Get next message off a Stream. For more information, see `getmsg(2)`.

`getpmsg(2s)` – Get next message off a Stream. For more information, see `getpmsg(2s)`.

`isastream(2)` – Test for a *STREAMS* special file. For more information, see `isastream(2)`.

`putmsg(2)` – Put a message to a *STREAMS* special device. For more information, see `putmsg(2)`.

`putpmsg(2s)` – Put a band message to a *STREAMS* special device. For more information, see `putpmsg(2s)`.

3.6 Utilities

The OpenSS7 Master Package does not install any drivers of its own and is simply a master package for the coordinated build and installation of the contained sub-packages.

Utilities contained in sub-packages consist of the following:

This section is incomplete.

3.7 Development

The OpenSS7 Master Package sub-packages install info manuals, manual pages, header files, static and shared libraries, and kernel modules in a structured manner.

3.7.1 Header Files

Header files are installed, typically, in the '`/usr/include/`*`name`*`/`' subdirectory, where *name* is the name of the package.[6] To use the header files from one of the packages, '`-I/usr/include/`*`name`*`/`' must be included as a `gcc` compile option. This is true regardless of whether user space or kernel programs are being compiled.

In general, '`-I`' include directives on the `gcc` command line should be ordered in the reverse order of the dependencies between packages. So, for example, if include files for all add-on packages are required, the order of these directives should be:

1. '`-I/usr/include/strvoip`'
2. '`-I/usr/include/sigtran`'
3. '`-I/usr/include/strss7`'
4. '`-I/usr/include/strisdn`'
5. '`-I/usr/include/striso`'
6. '`-I/usr/include/strx25`'
7. '`-I/usr/include/strchan`'
8. '`-I/usr/include/strsctp`'
9. '`-I/usr/include/strinet`'
10. '`-I/usr/include/strxnet`'
11. '`-I/usr/include/strnsl`'
12. '`-I/usr/include/strxns`'
13. '`-I/usr/include/strtty`'
14. '`-I/usr/include/strbcm`'
15. '`-I/usr/include/strutil`'
16. '`-I/usr/include/strcompat`'

[6] That is, where *name* is one of '`sctp`', '`iperf`', '`streams`', '`strcompat`', '`strutil`', '`strbcm`', '`strtty`', '`strxns`', '`strxnet`', '`strnsl`', '`strinet`', '`strchan`', '`strx25`', '`striso`', '`strsctp`', '`netperf`', or '`LiS`'.

17. ‘`-I/usr/include/streams`’

See the sections that follow for a list of the user-visible header files provided by each of the add-on packages:

3.7.1.1 sctp

The `sctp-0.2.27` add-on package provides the following user-visible header files in ‘`/usr/include`’:

‘`netinet/sctp.h`’ primary header file for `sctp(7)`.

3.7.1.2 iperf

The `iperf-2.0.8` add-on package installs no header files.

3.7.1.3 streams

The `streams-0.9.2.4` add-on package provides the following user-visible header files in ‘`/usr/include/streams`’:

‘`strlog.h`’ primary header file for the `strlog(4)` driver.
‘`stropts.h`’ primary user header file for the *Stream head*.
‘`log.h`’ primary header file for the `log(4)` driver.
‘`loop.h`’ primary header file for the `loop(4)` driver.
‘`sad.h`’ primary header file for the `sad(4)` driver.
‘`sys/sad.h`’ system specific header file for the `sad(4)` driver.
‘`sys/cmn_err.h`’ system specific kernel header file for the `cmn_err(9)` utility.
‘`sys/ddi.h`’ system specific kernel header file for various *STREAMS* `DDI(9)` utilities.
‘`sys/debug.h`’
‘`sys/dki.h`’ system specific kernel header file for various *STREAMS* `DKI(9)` utilities.
‘`sys/kmem.h`’ system specific kernel header file for `kmem_alloc(9)` and related utilities.
‘`sys/strconf.h`’ system specific kernel header file for *STREAMS* driver and module configuration.
‘`sys/strdebug.h`’ system specific kernel header file for *STREAMS* driver and module debugging macros.
‘`sys/stream.h`’ system specific kernel header file for *STREAMS* drivers and modules.
‘`sys/strlog.h`’ system specific header file for the `strlog(4)` and `strlog(9)` facilities.
‘`sys/stropts.h`’ system specific user header file for the *Stream head*.
‘`sys/stropts32.h`’ system specific user 32/64-bit header file for the *Stream head*.
‘`sys/strsubr.h`’ system specific kernel header file for *STREAMS* private definitions.
‘`sys/log.h`’ system specific header file for the `log(4)` driver.
‘`sys/loop.h`’ system specific header file for the `loop(4)` driver.
‘`sys/sad.h`’ system specific header file for the `sad(4)` driver.
‘`sys/sc.h`’ system specific header file for the `sc(4)` module.

‘sys/testmod.h’	system specific header file for the testmod(4) module.

3.7.1.4 strcompat

The strcompat-0.9.2.7 add-on package provides the following user-visible header files in ‘/usr/include/strcompat’:

‘sys/ddi.h’	system specific kernel header file for various *STREAMS* DDI(9) utilities.
‘sys/strconf.h’	system specific kernel header file for *STREAMS* driver and module configuration.
‘sys/stream.h’	system specific kernel header file for *STREAMS* drivers and modules.
‘sys/strsun.h’	*Solaris/SunOS* system specific kernel header file.
‘sys/sunddi.h’	*Solaris/SunOS* system specific kernel header file.
‘sys/os7/compat.h’	*OpenSS7* system specific kernel header file.

The ‘sys/ddi.h’, ‘ssy/strconf.h’ and ‘sys/stream.h’ header files installed by this package are intended to override those from the streams-0.9.2.4 add-on package. To accomplish this, ‘-I/usr/include/strcompat’ must appear on the gcc command line ahead of ‘-I/usr/include/streams’.

3.7.1.5 strutil

The strutil-0.9.2.7 add-on package was deprecated with LiS and this section has been deleted.

3.7.1.6 strbcm

The strbcm-0.9.2.5 add-on package was deprecated with LiS and this section has been deleted.

3.7.1.7 strtty

The strtty-0.9.2.4 add-on package provides the following user-visible header files in ‘/usr/include/strtty/’:

‘sys/ttydev.h’	replacement for the standard *SVR 4* header file.
‘sys/ttyio.h’	replacement for the standard *SVR 4* header file.
‘sys/strtty.h’	replacement for the standard *SVR 4* header file.
‘sys/pty.h’	See pty(4) for more information.
‘ttychars.h’, ‘sys/ttychars.h’	replacement for the standard *SVR 4* header file.
‘ttcompat.h’	See ttcompat(4) for more information.
‘sgtty.h’, ‘sys/sgtty.h’	replacement for the standard *SVR 4* header file.
‘termios.h’, ‘sys/termios.h’	replacement for the standard *SVR 4* header file.
‘termio.h’, ‘sys/termio.h’	replacement for the standard *SVR 4* header file.

3.7.1.8 strxnet

The `strxnet-0.9.2.12` add-on package provides the following user-visible header files in '`/usr/include/strxnet`':

'`ticlts.h`'	header file for the `ticlts(4)` device.
'`ticots.h`'	header file for the `ticots(4)` device.
'`ticotsord.h`'	header file for the `ticotsord(4)` device.
'`tihdr.h`'	kernel header file for the *Transport Provider Interface (TPI)*.
'`tiuser.h`'	user header file for the *Transport Provider Interface (TPI)*.
'`timod.h`'	header file for the `timod(4)` module.
'`tirdwr.h`'	header file for the `tirdwr(4)` module.
'`xti.h`'	header file for the *X/Open Transport Interface (XTI)*.
'`xti_inet.h`'	header file for the *X/Open Transport Interface (XTI)*, Internet Protocol specific declarations.
'`sys/ticlts.h`'	system specific header file for the `ticlts(4)` device.
'`sys/ticots.h`'	system specific header file for the `ticots(4)` device.
'`sys/ticotsord.h`'	system specific header file for the `ticotsord(4)` device.
'`sys/tihdr.h`'	system specific kernel header file for the *Transport Provider Interface (TPI)*.
'`sys/tiuser.h`'	system specific user header file for the *Transport Provider Interface (TPI)*.
'`sys/timod.h`'	system specific header file for the `timod(4)` module.
'`sys/tirdwr.h`'	system specific header file for the `tirdwr(4)` module.
'`sys/tli.h`'	system specific header file for the *Transport Layer Interface (TLI)*.
'`sys/tpi.h`'	system specific header file for the *Transport Provider Interface (TPI)*.
'`sys/xti.h`'	system specific header file for the *X/Open Transport Interface (XTI)*.
'`sys/xti_atm.h`'	system specific header file for the *X/Open Transport Interface (XTI)*, ATM specific declarations.
'`sys/xti_inet.h`'	system specific header file for the *X/Open Transport Interface (XTI)*, Internet Protocol specific declarations.
'`sys/xti_ip.h`'	system specific header file for the *X/Open Transport Interface (XTI)*, Internet Protocol specific declarations.
'`sys/xti_local.h`'	system specific header file for the *X/Open Transport Interface (XTI)*, local declarations.
'`sys/xti_mosi.h`'	system specific header file for the *X/Open Transport Interface (XTI)*, Minimal OSI specific declarations.
'`sys/xti_osi.h`'	system specific header file for the *X/Open Transport Interface (XTI)*, OSI specific declarations.
'`sys/xti_sctp.h`'	system specific header file for the *X/Open Transport Interface (XTI)*, SCTP specific declarations.
'`sys/xti_tcp.h`'	system specific header file for the *X/Open Transport Interface (XTI)*, TCP specific declarations.
'`sys/xti_udp.h`'	system specific header file for the *X/Open Transport Interface (XTI)*, UDP specific declarations.

‘sys/xti_xti.h’	system specific header file for the *X/Open Transport Interface (XTI)*, XTI generic declarations.

3.7.1.9 strnsl

The strnsl-0.9.2.4 add-on package provides the following user-visible header files in ‘/usr/include/strnsl’:

‘netdir.h’	primary header file for the Name-to-Address translation facility.
‘netconfig.h’, ‘sys/netconfig.h’	primary header file for the Network Selection facility.

3.7.1.10 strsock

The strsock-0.9.2.4 add-on package provides the following user-visible header files in ‘/usr/include/strsock’:

‘sockio.h’, ‘sys/sockio.h’	primary header files defining input-output controls for sockets.
‘sockmod.h’, ‘sys/sockmod.h’	primary header files defining input-output controls for the sockmod(4) cooperating module.
‘sockdb.h’, ‘sys/sockpath.h’, ‘sys/socklib.h’	primary header files for the sock2path(5) database.
‘socksys.h’, ‘sys/socksys.h’	primary header files defining input-output controls for the socksys(4) driver.

3.7.1.11 strinet

The strinet-0.9.2.7 add-on package provides the following user-visible header files in ‘/usr/include/strinet’:[7]

‘ticlts.h’	header file for the ticlts(4) device.
‘ticots.h’	header file for the ticots(4) device.
‘ticotsord.h’	header file for the ticotsord(4) device.
‘sys/ticlts.h’	system specific header file for the ticlts(4) device.
‘sys/ticots.h’	system specific header file for the ticots(4) device.
‘sys/ticotsord.h’	system specific header file for the ticots(4) device.
‘sys/ticotsord.h’	system specific header file for the ticotsord(4) device.
‘xti.h’	header file for the *X/Open Transport Interface (XTI)*.
‘xti_inet.h’	header file for the *X/Open Transport Interface (XTI)*, Internet Protocol specific declarations.
‘sys/xti_inet.h’	system specific header file for the *X/Open Transport Interface (XTI)*, Internet Protocol specific declarations.
‘sys/xti_ip.h’	system specific header file for the *X/Open Transport Interface (XTI)*, Internet Protocol specific declarations.
‘sys/xti_udp.h’	system specific header file for the *X/Open Transport Interface (XTI)*, UDP specific declarations.

[7] Note that some of these header files are repeats of those found in the strxnet-0.9.2.12 package: the reason for this is that the strinet add-on package was also meant to be used in a stand-alone fashion with non-*OpenSS7 LiS*, even though this use is deprecated.

‘sys/xti_tcp.h’ system specific header file for the *X/Open Transport Interface (XTI)*, XTI generic declarations.

3.7.1.12 strsctp

The strsctp-0.9.2.9 add-on package provides the following user-visible header files in ‘/usr/include/strsctp’:

‘sys/npi_sctp.h’ system specific header file for the *Network Provider Interface (NPI)*, *Stream Control Transmission Protocol (SCTP)* specifics.

‘sys/tpi_sctp.h’ system specific header file for the *Transport Provider Interface (TPI)*, *Stream Control Transmission Protocol (SCTP)* specifics.

‘sys/xti_sctp.h’ system specific header file for the *X/Open Transport Interface (XTI)*, *Stream Control Transmission Protocol (SCTP)* specifics.

3.7.1.13 strchan

The strchan-0.9.2.4 add-on package provides the following user-visible header files in ‘/usr/include/strchan’:

3.7.1.14 strxns

The strxns-0.9.2.7 add-on package provides the following user-visible header files in ‘/usr/include/strxns’:

‘sys/cdi.h’ system specific *Communications Device Interface (CDI)* header file.

‘sys/dlpi.h’ system specific *Data Link Provider Interface (DLPI)* header file.

‘sys/ldl.h’ system specific header file for the ldl(4) driver.

‘sys/npi.h’ system specific *Network Provider Interface (NPI)* header file.

‘sys/npi_ip.h’ system specific *NPI for Internet Protocol (IP)* header file.

3.7.1.15 strx25

‘xti_xx25.h’ header for for the *X/Open Transport Interface (XTI)*.

‘x25_proto.h’, ‘x25_control.h’ headers for the *Network Layer Interface (NLI)*.

‘xnetdb.h’ headers for the *X.25 Support Library (SX.25)*.

3.7.1.16 striso

‘xti.h’ header file for the *X/Open Transport Interface (XTI)*.

‘xti_osi.h’, ‘sys/xti_osi.h’ system specific header file for the *X/Open Transport Interface (XTI)*, *Open Systems Interconnect (OSI)* specifics.

‘xti_mosi.h’, ‘sys/xti_mosi.h’ system specific header file for the *X/Open Transport Interface (XTI)*, *Minimal OSI (mOSI)* specifics.

3.7.1.17 netperf

The netperf-2.3.7 add-on package does not provide any user-visible header files.

3.7.1.18 strisdn

The strisdn-0.9.2.4 add-on package provides the following user-visible header files in ‘/usr/include/strisdn’:

‘sys/capi.h’	header file for *ISDN Common API (CAPI)*.
‘sys/capi_ioctl.h’	header file for *ISDN Common API (CAPI)* input-output controls.
‘sys/cci.h’	header file for *Call Control Interface (CCI)*.
‘sys/dlpi_gr303.h’	system specific header file for the *Data Link Provider Interface (DLPI)*, *GR-303* specifics.
‘sys/dlpi_isdn.h’	system specific header file for the *Data Link Provider Interface (DLPI)*, *ISDN* specifics.
‘sys/dlpi_lapd.h’	system specific header file for the *Data Link Provider Interface (DLPI)*, *Link Access Protocol (D-Channel)* specifics.
‘sys/dlpi_v52.h’	system specific header file for the *Data Link Provider Interface (DLPI)*, *V5.2* specifics.
‘sys/dua_ioctl.h’	header file for the dua(4) driver, input-output controls.
‘sys/gr303_ioctl.h’	header file for the gr303(4) driver, input-output controls.
‘sys/isdni.h’	header file for *Integrated Services Digital Network Interface (ISDNI)*.
‘sys/isdni_ioctl.h’	header file for *Integrated Services Digital Network Interface (ISDNI)*, input-output controls.
‘sys/lapd_ioctl.h’	header file for the labd(4) driver, input-output controls.
‘sys/lapf_ioctl.h’	header file for the labf(4) driver, input-output controls.
‘sys/ph.h’	header file for *Physical Interface (PH)*.
‘sys/q920.h’	header file for the q920(4) driver.
‘sys/v52_ioctl.h’	header file for the v52(4) driver, input-output controls.

3.7.1.19 strss7

The strss7-0.9a.8 add-on package provides the following user-visible header files in ‘/usr/include/strss7’:

‘sys/cdi.h’	system specific header file for the *Communications Device Interface (CDI)*.
‘sys/cdi_daed.h’	system specific header file for the *Communications Device Interface (CDI)*, *Delimination, Alignment and Error Detection* specifics.
‘sys/cdi_hdlc.h’	system specific header file for the *Communications Device Interface (CDI)*, *High-Level Data link Control* specifics.
‘sys/dlpi.h’	system specific header file for the *Data Link Provider Interface (DLPI)*.
‘sys/dlpi_dua.h’	system specific header file for the *Data Link Provider Interface (DLPI)*, *DASS/DPNSS User Adaptation Layer* specifics.
‘sys/dlpi_gr303.h’	system specific header file for the *Data Link Provider Interface (DLPI)*, *GR-303* specifics.
‘sys/dlpi_gr303ua.h’	system specific header file for the *Data Link Provider Interface (DLPI)*, *GR-303 User Adaptation Layer* specifics.
‘sys/dlpi_gsma.h’	system specific header file for the *Data Link Provider Interface (DLPI)*, *GSM-A Inteface* specifics.
‘sys/dlpi_h225.h’	system specific header file for the *Data Link Provider Interface (DLPI)*, *H.225* specifics.

‘`sys/dlpi_isdn.h`’ system specific header file for the *Data Link Provider Interface (DLPI)*, *ISDN* specifics.

‘`sys/dlpi_iua.h`’ system specific header file for the *Data Link Provider Interface (DLPI)*, *ISDN User Adaptation Layer* specifics.

‘`sys/dlpi_lapb.h`’ system specific header file for the *Data Link Provider Interface (DLPI)*, *Link Access Protocol (Balanced)* specifics.

‘`sys/dlpi_lapd.h`’ system specific header file for the *Data Link Provider Interface (DLPI)*, *Link Access Protocol (D-Channel)* specifics.

‘`sys/dlpi_lapf.h`’ system specific header file for the *Data Link Provider Interface (DLPI)*, *Link Access Protocol (Frame Relay)* specifics.

‘`sys/dlpi_m2ua.h`’ system specific header file for the *Data Link Provider Interface (DLPI)*, *MTP2 User Adaptation Layer* specifics.

‘`sys/dlpi_mtp2.h`’ system specific header file for the *Data Link Provider Interface (DLPI)*, *Message Transfer Part (MTP) Level 2* specifics.

‘`sys/dlpi_v52.h`’ system specific header file for the *Data Link Provider Interface (DLPI)*, *V5.2* specifics.

‘`sys/dlpi_v5ua.h`’ system specific header file for the *Data Link Provider Interface (DLPI)*, *V5.2 User Adaptation Layer* specifics.

‘`sys/npi.h`’ system specific header file for the *Network Provider Interface (NPI)*.

‘`sys/npi_ip.h`’ system specific header file for the *Network Provider Interface (NPI)*, *Internet Protocol* specifics.

‘`sys/npi_mtp.h`’ system specific header file for the *Network Provider Interface (NPI)*,

‘`sys/npi_sccp.h`’ system specific header file for the *Network Provider Interface (NPI)*, *Signalling Connection Control Part (SCCP)* specifics.

‘`sys/npi_sctp.h`’ system specific header file for the *Network Provider Interface (NPI)*, *Stream Control Transmission Protocol (SCTP)* specifics.

‘`sys/npi_ss7.h`’ system specific header file for the *Network Provider Interface (NPI)*, *Signalling System Number 7 (SS7)* specifics.

‘`sys/npi_sscop.h`’ system specific header file for the *Network Provider Interface (NPI)*, *Service-Specific Connection Oriented Protocol (SSCOP)* specifics.

‘`sys/npi_tcp.h`’ system specific header file for the *Network Provider Interface (NPI)*, *Transmission Control Protocol (TCP)* specifics.

‘`sys/npi_udp.h`’ system specific header file for the *Network Provider Interface (NPI)*, *User Datagram Protocol (UDP)* specifics.

‘`sys/tpi.h`’ system specific header file for the *Transport Provider Interface (TPI)*.

‘`sys/tpi_inet.h`’ system specific header file for the *Transport Provider Interface (TPI)*, *Internet Protocol* suite specifics.

‘`sys/tpi_ip.h`’ system specific header file for the *Transport Provider Interface (TPI)*, *Internet Protocol* specifics.

‘sys/tpi_mtp.h’	system specific header file for the *Transport Provider Interface (TPI)*, *Message Transfer Part (MTP)* specifics.
‘sys/tpi_sccp.h’	system specific header file for the *Transport Provider Interface (TPI)*, *Signalling Connection Control Part (SCCP)* specifics.
‘sys/tpi_sctp.h’	system specific header file for the *Transport Provider Interface (TPI)*, *Stream Control Transmission Protocol (SCTP)* specifics.
‘sys/tpi_sl.h’	system specific header file for the *Transport Provider Interface (TPI)*, *Signalling Link (SL)* specifics.
‘sys/tpi_ss7.h’	system specific header file for the *Transport Provider Interface (TPI)*, *Signalling System Number 7 (SS7)* specifics.
‘sys/tpi_sscop.h’	system specific header file for the *Transport Provider Interface (TPI)*, *Service-Specific Connection Oriented Protocol (SSCOP)* specifics.
‘sys/tpi_tcap.h’	system specific header file for the *Transport Provider Interface (TPI)*, *Transaction Capabilities Application Part (TCAP)* specifics.
‘sys/tpi_tcp.h’	system specific header file for the *Transport Provider Interface (TPI)*, *Transmission Control Protocol (TCP)* specifics.
‘sys/tpi_udp.h’	system specific header file for the *Transport Provider Interface (TPI)*, *User Datagram Protocol (UDP)* specifics.
‘ticlts.h’	header file for the `ticlts(4)` device.
‘ticots.h’	header file for the `ticots(4)` device.
‘ticotsord.h’	header file for the `ticotsord(4)` device.
‘tihdr.h’	kernel header file for the *Transport Provider Interface (TPI)*.
‘tiuser.h’	user header file for the *Transport Provider Interface (TPI)*.
‘timod.h’	header file for the `timod(4)` module.
‘tirdwr.h’	header file for the `tirdwr(4)` module.
‘sys/ticlts.h’	system specific header file for the `ticlts(4)` device.
‘sys/ticots.h’	system specific header file for the `ticots(4)` device.
‘sys/ticotsord.h’	system specific header file for the `ticotsord(4)` device.
‘sys/tihdr.h’	system specific kernel header file for the *Transport Provider Interface (TPI)*.
‘sys/tiuser.h’	system specific user header file for the *Transport Provider Interface (TPI)*.
‘sys/timod.h’	system specific header file for the `timod(4)` module.
‘sys/tirdwr.h’	system specific header file for the `tirdwr(4)` module.
‘sys/tli.h’	system specific header file for the *Transport Layer Interface (TLI)*.
‘xti.h’	header file for the *X/Open Transport Interface (XTI)*.
‘xti_inet.h’	header file for the *X/Open Transport Interface (XTI)*, *Internet Protocol Suite (INET)* specifics.
‘sys/xti.h’	system specific header file for the *X/Open Transport Interface (XTI)*.
‘sys/xti_atm.h’	system specific header file for the *X/Open Transport Interface (XTI)*, *Asynchronous Transfer Mode (ATM)* specifics.

‘sys/xti_inet.h’	system specific header file for the *X/Open Transport Interface (XTI)*, *Internet Protocol Suite (INET)* specifics.
‘sys/xti_ip.h’	system specific header file for the *X/Open Transport Interface (XTI)*, *Internet Protocol (IP)* specifics.
‘sys/xti_local.h’	system specific header file for the *X/Open Transport Interface (XTI)*, *XTI Generic* specifics.
‘sys/xti_mosi.h’	system specific header file for the *X/Open Transport Interface (XTI)*, *Minimal OSI (mOSI)* specifics.
‘sys/xti_mtp.h’	system specific header file for the *X/Open Transport Interface (XTI)*, *Message Transfer Part (MTP)* specifics.
‘sys/xti_osi.h’	system specific header file for the *X/Open Transport Interface (XTI)*, *Open Systems Interconnect (OSI)* specifics.
‘sys/xti_sccp.h’	system specific header file for the *X/Open Transport Interface (XTI)*, *Signalling Connection Control Part (SCCP)* specifics.
‘sys/xti_sctp.h’	system specific header file for the *X/Open Transport Interface (XTI)*, *Stream Control Transmission Protocol (SCTP)* specifics.
‘sys/xti_sl.h’	system specific header file for the *X/Open Transport Interface (XTI)*, *Signalling Link (SL)* specifics.
‘sys/xti_ss7.h’	system specific header file for the *X/Open Transport Interface (XTI)*, *Signalling System Number 7 (SS7)* specifics.
‘sys/xti_sscop.h’	system specific header file for the *X/Open Transport Interface (XTI)*, *Service-Specific Connection Oriented Protocol (SSCOP)* specifics.
‘sys/xti_tcap.h’	system specific header file for the *X/Open Transport Interface (XTI)*, *Transaction Capabilities Application Part (TCAP)* specifics.
‘sys/xti_tcp.h’	system specific header file for the *X/Open Transport Interface (XTI)*, *Transmission Control Protocol (TCP)* specifics.
‘sys/xti_udp.h’	system specific header file for the *X/Open Transport Interface (XTI)*, *User Datagram Protocol (UDP)* specifics.
‘sys/xti_xti.h’	system specific header file for the *X/Open Transport Interface (XTI)*, *XTI Generic* specifics.
‘sys/sockmod.h’	
‘ss7/capi.h’	header file for *ISDN Common API (CAPI)*.
‘ss7/capi_ioctl.h’	header file for *ISDN Common API (CAPI)* input-output controls.
‘ss7/cci.h’	header file for *Call Control Interface (CCI)*.
‘ss7/cdi.h’	header file for *Communications Device Interface (CDI)*.
‘ss7/chi.h’	header file for *Channel Inteface (CHI)*.
‘ss7/chi_ioctl.h’	header file for *Channel Inteface (CHI)* input-output controls.
‘ss7/devi.h’	header file for *Device Inteface (DEVI)*.
‘ss7/devi_ioctl.h’	header file for *Device Inteface (DEVI)* input-output controls.
‘ss7/dl.h’	header file for the dl(4) driver.
‘ss7/dl_ioctl.h’	header file for the dl(4) driver, input-output controls.
‘ss7/dlpi_ioctl.h’	header file for the *Data Link Provider Interface (DLPI)*, input-output controls.

‘ss7/dua_ioctl.h’	header file for the dua(4) driver, input-output controls.
‘ss7/gr303_ioctl.h’	header file for the gr303(4) driver, input-output controls.
‘ss7/gr303ua_ioctl.h’	header file for the gr303ua(4) driver, input-output controls.
‘ss7/gsma_ioctl.h’	header file for the gsma(4) driver, input-output controls.
‘ss7/h225_ioctl.h’	header file for the h225(4) driver, input-output controls.
‘ss7/hdlc_ioctl.h’	header file for the hdlc(4) driver, input-output controls.
‘ss7/isdni.h’	header file for *Integrated Services Digital Network Interface (ISDNI)*.
‘ss7/isdni_ioctl.h’	header file for *Integrated Services Digital Network Interface (ISDNI)*, input-output controls.
‘ss7/isupi.h’	header file for *ISDN User Part Interface (ISUPI)*.
‘ss7/isupi_ioctl.h’	header file for *ISDN User Part Interface (ISUPI)*, input-output controls.
‘ss7/iua_ioctl.h’	header file for the iua(4) driver, input-output controls.
‘ss7/lapb_ioctl.h’	header file for the labp(4) driver, input-output controls.
‘ss7/lapd_ioctl.h’	header file for the labd(4) driver, input-output controls.
‘ss7/lapf_ioctl.h’	header file for the labf(4) driver, input-output controls.
‘ss7/lki.h’	header file for *Link Interface (LKI)*.
‘ss7/lki_ioctl.h’	header file for *Link Interface (LKI)*, input-output controls.
‘ss7/lmi.h’	header file for *Local Management Interface (LMI)*.
‘ss7/lmi_ioctl.h’	header file for *Local Management Interface (LMI)*, input-output controls.
‘ss7/m2pa_ioctl.h’	header file for the m2pa(4) driver, input-output controls.
‘ss7/m2ua_ioctl.h’	header file for the m2ua(4) driver, input-output controls.
‘ss7/m3ua.h’	header file for the m3ua(4) driver.
‘ss7/m3ua_ioctl.h’	header file for the m3ua(4) driver, input-output controls.
‘ss7/mgcp.h’	header file for the mgcp(4) driver.
‘ss7/mgi.h’	header file for *Media Gateway Interface (MGI)*.
‘ss7/mgi_ioctl.h’	header file for *Media Gateway Interface (MGI)*, input-output controls.
‘ss7/mtp2_ioctl.h’	header file for the mtp2(4) driver, input-output controls.
‘ss7/mtp3b.h’	header file for the mtp3b(4) driver.
‘ss7/mtp.h’	header file for the mtp(4) driver.
‘ss7/mtpi.h’	header file for *Message Transfer Part Interface (MTPI)*.
‘ss7/mtpi_ioctl.h’	header file for *Message Transfer Part Interface (MTPI)*, input-output controls.
‘ss7/mtp_ioctl.h’	header file for the mtp(4) driver, input-output controls.
‘ss7/mxi.h’	header file for *Multiplex Interface (MXI)*.
‘ss7/mxi_ioctl.h’	header file for *Multiplex Interface (MXI)*, input-output controls.
‘ss7/ph.h’	header file for *Physical Interface (PH)*.
‘ss7/q920.h’	header file for the q920(4) driver.
‘ss7/sccp.h’	header file for the sccp(4) driver.
‘ss7/sccpi.h’	header file for *Signalling Connection Control Part Interface (SCCPI)*.
‘ss7/sccpi_ioctl.h’	header file for *Signalling Connection Control Part Interface (SCCPI)*, input-output controls.

‘ss7/sccp_ioctl.h’	header file for the sccp(4) driver, input-output controls.
‘ss7/sctp.h’	header file for the sctp(4) driver.
‘ss7/sctpi.h’	header file for *Stream Control Transmission Protocol Inteface (SCTPI)*.
‘ss7/sctpi_ioctl.h’	header file for *Stream Control Transmission Protocol Inteface (SCTPI)*, input-output controls.
‘ss7/sdli.h’	header file for *Signalling Data Link Interface (SDLI)*.
‘ss7/sdli_ioctl.h’	header file for *Signalling Data Link Interface (SDLI)*, input-output controls.
‘ss7/sdti.h’	header file for *Signalling Data Terminal Interface (SDTI)*.
‘ss7/sdti_ioctl.h’	header file for *Signalling Data Terminal Interface (SDTI)*, input-output controls.
‘ss7/sl.h’	header file fro the sl(4) module.
‘ss7/sli.h’	header file for *Signalling Link Interface (SLI)*.
‘ss7/sli_ioctl.h’	header file for *Signalling Link Interface (SLI)*, input-output controls.
‘ss7/slmi.h’	
‘ss7/slsi.h’	header file for *Signalling Link Set Inteface (SLSI)*.
‘ss7/slsi_ioctl.h’	header file for *Signalling Link Set Inteface (SLSI)*, input-output controls.
‘ss7/smi.h’	header file for *Signalling Management Interface (SMI)*.
‘ss7/smi_ioctl.h’	header file for *Signalling Management Interface (SMI)*, input-output controls.
‘ss7/tcap.h’	header file for the tcap(4) driver.
‘ss7/tcapi.h’	header file for *Transaction Capabilities Application Part Interface (TCAPI)*.
‘ss7/tcap_ioctl.h’	header file for *Transaction Capabilities Application Part Interface (TCAPI)*, input-output controls.
‘ss7/tc.h’	header file for the tc(4) driver.
‘ss7/tr.h’	header file for the tr(4) driver.
‘ss7/ua_lm.h’	header file for *User Adaptation Layer Management (UA-LM)*.
‘ss7/ua_lm_ioctl.h’	header file for *User Adaptation Layer Management (UA-LM)*, input-output controls.
‘ss7/v52_ioctl.h’	header file for the v52(4) driver, input-output controls.
‘ss7/v5ua_ioctl.h’	header file for the v5ua(4) driver, input-output controls.

3.7.1.20 sigtran

The sigtran-0.9.2.4 add-on package provides the following user-visible header files in ‘/usr/include/sigtran’:

‘sys/dlpi_dua.h’	system specific header file for the *Data Link Provider Interface (DLPI)*, *DASS/DPNSS User Adaptation Layer* specifics.
‘sys/dlpi_gr303ua.h’	system specific header file for the *Data Link Provider Interface (DLPI)*, *GR-303 User Adaptation Layer* specifics.
‘sys/dlpi_iua.h’	system specific header file for the *Data Link Provider Interface (DLPI)*, *ISDN User Adaptation Layer* specifics.

‘sys/dlpi_m2ua.h’	system specific header file for the *Data Link Provider Interface (DLPI)*, *MTP2 User Adaptation Layer* specifics.
‘sys/dlpi_v5ua.h’	system specific header file for the *Data Link Provider Interface (DLPI)*, *V5.2 User Adaptation Layer* specifics.
‘sys/dua_ioctl.h’	header file for the dua(4) driver, input-output controls.
‘sys/gr303ua_ioctl.h’	header file for the gr303ua(4) driver, input-output controls.
‘sys/iua_ioctl.h’	header file for the iua(4) driver, input-output controls.
‘sys/m2pa_ioctl.h’	header file for the m2pa(4) driver, input-output controls.
‘sys/m2ua_ioctl.h’	header file for the m2ua(4) driver, input-output controls.
‘sys/m3ua.h’	header file for the m3ua(4) driver.
‘sys/m3ua_ioctl.h’	header file for the m3ua(4) driver, input-output controls.
‘sys/ua_ioctl.h’	header file for *User Adaptation Layer Management (UA-LM)*.
‘sys/ua_lm.h’	header file for *User Adaptation Layer Management (UA-LM)*.
‘sys/ua_lm_ioctl.h’	header file for *User Adaptation Layer Management (UA-LM)*, input-output controls.
‘sys/v5ua_ioctl.h’	header file for the v5ua(4) driver, input-output controls.

3.7.1.21 strvoip

The strvoip-0.9.2.4 add-on package provides the following user-visible header files in ‘/usr/include/strvoip’:

‘sys/dlpi_h225.h’	system specific header file for the *Data Link Provider Interface (DLPI)*, *H.225* specifics.
‘sys/h225.h’	header file for the h225(4) driver.
‘sys/h225_ioctl.h’	header file for the h225(4) driver, input-output controls.

3.7.1.22 osr61

The osr61-0.9.2.3 add-on package provides the following user-visible header files in ‘/usr/include/osr61’:

‘sys/dlgn.h’	system specific header file including declarations for the exported symbols from the dlgn(4) driver.
‘sys/ctimod.h’	system specific header file including declarations for the exported symbols from the ctimod(4) kernel module.

3.7.1.23 LiS

The strvoip-2.18.7 package provides user-visible header files in ‘/usr/include/LiS/’. The mess of header files provided by LiS is convoluted and overly complex and will not be outlined here. LiS is deprecated. Please do not use it.

3.7.2 Libraries

Shared or static libraries must be linked when using the streams-0.9.2.4 (‘libstreams’), strtty-0.9.2.4 (‘libtty’), strxnet-0.9.2.12 (‘libxnet’), strnsl-0.9.2.4 (‘libxnsl’), strsock-0.9.2.4 (‘libsocket’ and ‘libsockpath’) or LiS-2.18.7 packages (‘libLiS’ or ‘libpLiS’). These libraries must either be specified on the gcc command line as shared libraries (e.g. ‘-lstreams -lxnet -lsocket’) or as static libraries (e.g. ‘/usr/lib/libstreams.a /usr/lib/libxnet.a /usr/lib/libsocket.a’).

If all shared libraries are linked, include the following options on the `gcc` command line:

'`-lstreams`'	Link to the '`/usr/lib/libstreams.so`' shared library.
'`-ltty`'	Link to the '`/usr/lib/libtty.so`' shared library.
'`-lxnet`'	Link to the '`/usr/lib/libxnet.so`' shared library.
'`-lxnsl`'	Link to the '`/usr/lib/libxnsl.so`' shared library.
'`-lsocket`'	Link to the '`/usr/lib/libsocket.so`' shared library.
'`-lsockpath`'	Link to the '`/usr/lib/libsockpath.so`' shared library.
'`-lLiS`'	Link to the '`/usr/lib/libLiS.so`' shared library.
'`-lpLiS`'	Link to the '`/usr/lib/libpLiS`' shared library.

If all static libraries are linked, include the following options on the `gcc` command line:

'`/usr/lib/libstreams.a`'	Link with the '`/usr/lib/libstreams.a`' static library.
'`/usr/lib/libtty.a`'	Link with the '`/usr/lib/libtty.a`' static library.
'`/usr/lib/libxnet.a`'	Link with the '`/usr/lib/libxnet.a`' static library.
'`/usr/lib/libxnsl.a`'	Link with the '`/usr/lib/libxnsl.a`' static library.
'`/usr/lib/libsocket.a`'	Link with the '`/usr/lib/libsocket.a`' static library.
'`/usr/lib/libsockpath.a`'	Link with the '`/usr/lib/libsockpath.a`' static library.
'`/usr/lib/libLiS.a`'	Link with the '`/usr/lib/libLiS.a`' static library.
'`/usr/lib/libpLiS.a`'	Link with the '`/usr/lib/libpLiS.a`' static library.

3.7.3 Kernel Modules

Developing *STREAMS* kernel modules is similar to user space programs with regard to header files. '`/usr/include/`*`name`*' should be placed in the `gcc` command line. The rules for compiling *Linux* kernel modules should be followed. In particular, several important intricacies should be considered:

- The `gcc` compiler used to compile the kernel modules must be the same version of compiler that was used to compile the kernel.
- The `gcc` command line must have the same compile flags that were used to compile the kernel.
- The `gcc` command line must define several important kernel defines including '`-DLINUX`', '`-D__KERNEL__`', as well as the base name of the module.
- The `gcc` command line must include several important include files directly on the command line such as '`--include /lib/modules/`‘`uname -r`‘`/build/include/linux/autoconf.h`' and maybe even '`--include /lib/modules/`‘`uname -r`‘`/build/include/linux/modversions.h`'.

3.7.4 Manual Pages

Sub-packages install a number of manual pages. All sub-packages combined install over 1000 manual packages for use by developers and administrators.

4 Conformance

Each add-on package to the OpenSS7 Master Package has its own set of conformances to *ipso facto* or *standards* specifications. In general, however, most of the add-on packages can only to either *ipso facto* nor *standards* specifications when used with *Linux Fast-STREAMS*.

LiS, on the other hand, is so buggy and non-conformant to *POSIX/SuSv3* specifications, that it is impossible to expect add-on packages built against *LiS* to conform in many respects. Do not use *LiS*, use the superior *Linux Fast-STREAMS* instead.

4.1 STREAMS Compatibility

OpenSS7 Master Package provides some degree of compatibility with other *STREAMS* implementation as follows:

— *SVR 4.2 ES/MP*
: *OpenSS7 Master Package* provides some degree of operational compatibility with *SVR 4.2 ES/MP* to ease portability and common comprehension, see Section "SVR 4.2 Compatibility" in *STREAMS Programmer's Guide*.

— *AIX 5L Version 5.1*
: *OpenSS7 Master Package* provides some degree of operational compatibility with *AIX 5L Version 5.1* to ease portability and common comprehension, see Section "AIX Compatibility" in *STREAMS Programmer's Guide*.

— *HP-UX 11.0i v2*
: *OpenSS7 Master Package* provides some degree of operational compatibility with *HP-UX 11.0i v2* to ease portability and common comprehension, see Section "HP-UX Compatibility" in *STREAMS Programmer's Guide*.

— *OSF/1 1.2/Digital UNIX/True 64*
: *OpenSS7 Master Package* provides some degree of operational compatibility with *OSF/1 1.2/Digital UNIX* to ease portability and common comprehension, see Section "OSF/1 Compatibility" in *STREAMS Programmer's Guide*.

— *UnixWare 7.1.3 (OpenUnix 8)*
: *OpenSS7 Master Package* provides some degree of operational compatibility with *UnixWare 7.1.3 (OpenUnix 8)* to ease portability and common comprehension, see Section "UnixWare Compatibility" in *STREAMS Programmer's Guide*.

— *Solaris 9/SunOS 5.9*
: *OpenSS7 Master Package* provides some degree of operational compatibility with *Solaris 9/SunOS 5.9* to ease portability and common comprehension, see Section "Solaris Compatibility" in *STREAMS Programmer's Guide*.

— *SUPER-UX*
: *OpenSS7 Master Package* provides some degree of operational compatibility with *SUPER-UX* to ease portability and common comprehension, see Section "SUX Compatibility" in *STREAMS Programmer's Guide*.

— *UXP/V*
: *OpenSS7 Master Package* provides some degree of operational compatibility with *UXP/V* to ease portability and common comprehension, see Section "UXP Compatibility" in *STREAMS Programmer's Guide*.

— *LiS-2.16.18*
: *OpenSS7 Master Package* provides some degree of operational compatibility with *LiS 2.16* to ease portability and common comprehension, see Section "LiS Compatibility" in *STREAMS Programmer's Guide*.

For additional details, see Section "About This Manual" in *STREAMS Programmer's Guide*.

4.2 Porting

— *SVR 4.2 ES/MP*
: *OpenSS7 Master Package* provides compatibility functions for source level compatibility with *SVR 4.2 ES/MP* and to ease porting of modules and drivers to *OpenSS7 Master Package*. Portability considerations are maintained in a separate manual: see Section "Porting from SVR 4.2 MP" in *Linux Fast-STREAMS Porting Guide*.

— *AIX 5L Version 5.1*
: *OpenSS7 Master Package* provides compatibility functions for source level compatibility with *AIX 5L Version 5.1* and to ease porting of modules and drivers to *OpenSS7 Master Package*. Portability considerations are maintained in a separate manual: see Section "Porting from AIX 5L Version 5.1" in *Linux Fast-STREAMS Porting Guide*.

— *HP-UX 11.0i v2*
: *OpenSS7 Master Package* provides compatibility functions for source level compatibility with *HP-UX 11.0i v2* and to ease porting of modules and drivers to *OpenSS7 Master Package*. Portability considerations are maintained in a separate manual: see Section "Porting from HP-UX 11.0i v2" in *Linux Fast-STREAMS Porting Guide*.

— *OSF/1 1.2/Digital UNIX/True 64*
: *OpenSS7 Master Package* provides compatibility functions for source level compatibility with *OSF/1 1.2/Digital UNIX/True 64* and to ease porting of modules and drivers to *OpenSS7 Master Package*. Portability considerations are maintained in a separate manual: see Section "Porting from OSF/1 1.2/Digital UNIX" in *Linux Fast-STREAMS Porting Guide*.

— *UnixWare 7.1.3 (OpenUnix 8)*
: *OpenSS7 Master Package* provides compatibility functions for source level compatibility with *UnixWare 7.1.3 (OpenUnix 8)* and to ease porting of modules and drivers to *OpenSS7 Master Package*. Portability considerations are maintained in a separate manual: see Section "Porting from UnixWare 7.1.3 (OpenUnix 8)" in *Linux Fast-STREAMS Porting Guide*.

— *Solaris 9/SunOS 5.9*

OpenSS7 Master Package provides compatibility functions for source level compatibility with *Solaris 9/SunOS 5.9* and to ease porting of modules and drivers to *OpenSS7 Master Package*. Portability considerations are maintained in a separate manual: see Section "Porting from Solaris 9/SunOS 5.9" in *Linux Fast-STREAMS Porting Guide*.

— *SUPER-UX*

OpenSS7 Master Package provides compatibility functions for source level compatibility with *SUPER-UX* and to ease porting of modules and drivers to *OpenSS7 Master Package*. Portability considerations are maintained in a separate manual: see Section "Porting from SUPER-UX" in *Linux Fast-STREAMS Porting Guide*.

— *UXP/V*

OpenSS7 Master Package provides compatibility functions for source level compatibility with *UXP/V* and to ease porting of modules and drivers to *OpenSS7 Master Package*. Portability considerations are maintained in a separate manual: see Section "Porting from UXP/V" in *Linux Fast-STREAMS Porting Guide*.

— *LiS-2.16.18*

OpenSS7 Master Package provides compatibility functions for source level compatibility with *LiS-2.16.18* and to ease porting of modules and drivers to *OpenSS7 Master Package*. Portability considerations are maintained in a separate manual: see Section "Porting from Linux STREAMS (LiS) 2.16.18" in *Linux Fast-STREAMS Porting Guide*.

For additional details, see Section "About This Manual" in *Linux Fast-STREAMS Porting Guide*.

5 Releases

This is the OpenSS7 Release of the OpenSS7 Master Package core, tools, drivers and modules that implement the *OpenSS7 Master Package* SVR 4.2 MP STREAMS utility for Linux. This package is intended as a replacement package for *Linux STREAMS (LiS)*.

The following sections provide information on OpenSS7 Master Package releases as well as compatibility information of OpenSS7 release to mainstream UNIX releases of the core, modules and drivers, as well as Linux kernel compatibility.

5.1 Prerequisites

The quickest and easiest way to ensure that all prerequisites are met is to download and install the *OpenSS7 Master Package*, `openss7-0.9.2.G`.

Prerequisites for the OpenSS7 Master Package 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 5.2 [Compatibility], page 67.
   - 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).
   - GNU bison and flex (for config programs).
   - net-snmp (for SNMP agents).[3]

If you need to rebuild the package from sources with modifications, you will need a larger GNU tool chain as described in See Section 6.2.8 [Downloading from CVS], page 88.

5.2 Compatibility

This section discusses compatibility with major prerequisites.

5.2.1 GNU/Linux Distributions

OpenSS7 Master Package is compatible with the following *Linux* distributions:[4]

- 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)

[1] See Section 5.2.1 [GNU/Linux Distributions], page 67, 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] A wide range of net-snmp releases are supported, from UCD-SNMP 4.2.5 through net-snmp 5.4.

[4] 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.

- 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)
- 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 6.5.3 [Installing the Tar Ball], page 107), 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.

5.2.2 Kernel

The *OpenSS7 Master Package* package compiles as a *Linux* kernel module. It is not necessary to patch the *Linux* kernel to build or use the package.[5] 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 Master Package* 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.

[5] 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.

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.

5.2.3 Architectures

The *OpenSS7 Master Package* 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.

5.2.4 Linux STREAMS

OpenSS7 Master Package provides a suitable replacement for the (now deprecated) *Linux STREAMS (LiS) 2.18.0* package formerly maintained by Dave Goethe of GCOM.

The *OpenSS7 Master Package* package is currently compatible with *Linux STREAMS*,[6] however, to use the *OpenSS7 Master Package* package with *LiS* requires use of the OpenSS7 release packages of *LiS*. The *OpenSS7 Master Package* 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.

5.2.5 Linux Fast-STREAMS

The *OpenSS7 Master Package* package is no longer receiving active development or support. The *OpenSS7 Master Package* package is so fraught with bugs that it is unusable as far as The OpenSS7 Project is concerned. *Linux Fast-STREAMS* is the preferred replacement for *OpenSS7 Master Package*.

The *OpenSS7 Master Package* package is currently compatible with *Linux Fast-STREAMS (LfS)*. The *OpenSS7 Master Package* package is compatible with the OpenSS7 **streams-0.9.2.4** release that is available from the The OpenSS7 Project Downloads Page.

5.3 Release Notes

The sections that follow provide information on OpenSS7 releases of the *OpenSS7 Master Package* package.

[6] *Linux STREAMS* is buggy, unsupported and deprecated. Do not use it.

Major changes for release openss7-0.9.2.G

This is the sixth public release of the OpenSS7 Master Package. See '`README`' in the release for a sub-package listing. Most of the sub-packages in the release are production grade for *Linux Fast-STREAMS*. All existing validation test suites run clean on supported distributions and architectures.

The *OpenSS7 Master Package* is not released as often as the sub-packages. As sub-packages are released more often, to rebuild the master package with a new sub-package release, simply replace the directory to which the sub-package belongs with the unpacked sub-package release and then rebuild the master package. This release provides support for recent distributions and tool chains.

Major features since the last public release are as follows:

- License upgrade to *AGPL Version 3*.
- Modifications to build under *Fedora* '`2.6.22.5-49`' kernel. These changes also support '`2.6.22.9-91.fc7`' kernel. Modifications to build under *Fedora* '`2.6.25-45.fc9`' and '`2.6.26.5-45.fc9`' kernels. Documented '`lib32gcc1`' problem on Ubuntu. Noted problem running under XEN kernels. XEN kernels are not yet supported. Added `MODULE_VERSION` to all modules and drivers.
- Ability to strap out major documentation build and installation primarily for embedded targets. Improvements to common build process for embedded and cross-compile targets. Cross-compile fixes (strap out `AC_FUNC_REALLOC` macro when cross-compiling). Conversion of RPM spec files to common approach for major subpackages.

  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.
- Higher performance and updated performance papers.
- Updated tool chain to '`m4-1.4.12`', '`autoconf-2.63`' and '`texinfo-4.13`'. Support for '`flex 2.5.33`' in maintainer mode.
- Updated references database for manual pages and roff documents.
- Added the following major sub-packages to the master build (and release):
  - '`strx25-0.9.2.1`'
- All of the major subpackages that are at production release have maintenance upgrades for new production kernels, distributions and tool chains. Many of the major subpackages have greatly expanded documentation and provide additional modules and drivers not previously available in public releases. Significant feature updates were made to:
  - '`strxns-0.9.2.7`'
  - '`strinet-0.9.2.7`'
  - '`strchan-0.9.2.4`'
  - '`strx25-0.9.2.1`'
  - '`striso-0.9.2.4`'
  - '`strss7-0.9a.8`'
  - '`sigtran-0.9.2.4`'

  Please see the individual '`NEWS`' files in each of the subpackages for more information.

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*. 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 openss7 package page.

See `http://www.openss7.org/codefiles/openss7-0.9.2.G/ChangeLog` and `http://www.openss7.org/codefiles/openss7-0.9.2.G/NEWS` in the release for more information. Also, see the '`openss7.pdf`' manual in the release (also in html `http://www.openss7.org/openss7_manual.html`).

For the news release, see `http://www.openss7.org/rel20081029_L.html`.

Major changes for release openss7-0.9.2.F

This is the fifth public release of the OpenSS7 Master Package. See '`README`' in the release for a sub-package listing. Most of the sub-packages in the release are production grade for *Linux Fast-STREAMS*. All existing validation test suites run clean on supported distributions and architectures.

The *OpenSS7 Master Package* is not released as often as the sub-packages. As sub-packages are released more often, to rebuild the master package with a new sub-package release, simply replace the directory to which the sub-package belongs with the unpacked sub-package release and then rebuild the master package. This release provides support for recent distributions and tool chains.

Major features since the last public release are as follows:

- Support build on openSUSE 10.2.
- Support build on Fedora 7 and 2.6.21 kernel.
- Support build on CentOS 5.0 (RHEL5).
- Support build on Ubuntu 7.04.
- Updated to gettext 0.16.1.
- Changes to support build on 2.6.20-1.2307.fc5 and 2.6.20-1.2933.fc6 kernel.
- Supports build on Fedora Core 6.
- Support for recent distributions and tool chains.

Major changes for release openss7-0.9.2.E

This is the fourth public release of the OpenSS7 Master Package. See '`README`' in the release for a sub-package listing. Most of the sub-packages in the release are production grade for *Linux Fast-STREAMS*. All existing validation test suites run clean on supported distributions and architectures.

It is unlikely that the *OpenSS7 Master Package* will be released as frequently as before. Sub-packages will be released more often. To rebuild the master package with a new sub-package release, simply replace the directory to which the sub-package belongs with the unpacked sub-package release and then rebuild the master package. This release provides support for recent distributions and tool chains.

Major features since the last public release are as follows:

- Addition of the `osr61` sub-package that contains Dialogic® Open System Release 6.1 version 239 GPL drivers.
- A few minor corrections to the common build process.
- 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 subpackages with a version number as unpacked by separate tarball.

Major changes for release openss7-0.9.2.D

This is the fourth public release of the OpenSS7 Master Package. The sub-packages have been reorganized for this release. See '`README`' in the release for a sub-package listing. Aside from sub-package reorganization, the major difference from previous release is that this release no longer contains *LiS*. Too many of the sub-packages will not even build against *LiS* because of its Stream head deficiencies.

Most of the sub-packages in the release are production grade for *Linux Fast-STREAMS*. All existing validation test suites run clean on supported distributions and architectures. The packages build better Debian/Ubuntu .deb files.

It is unlikely that the *OpenSS7 Master Package* will be released as frequently as before. Sub-packages will be released more often. To rebuild the master package with a new sub-package release, simply replace the directory to which the sub-package belongs with the unpacked sub-package release and then rebuild the master package.

The release provides the following enhancements and fixes:

- Added the following sub-packages to the master build (and release):
  - '`strnsl-0.9.2.4`'
  - '`strbcm-0.9.2.5`'
  - '`striso-0.9.2.4`'
  - '`strsock-0.9.2.4`'
  - '`strtty-0.9.2.4`'
  - '`strutil-0.9.2.7`'
- Automated release file generation making for vastly improved and timely text documentation present in the release directory.
- This release candidate 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.
- Better support for Ubuntu and recent `gcc` compilers, including debian script corrections.
- Support for most recent 2.6.18 kernels (including Fedora Core 5 with inode diet patch-set).
- 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.
- Added versions to all library symbols.
- Many documentation updates for all OpenSS7 packages.

- Dropped support for *LiS*.
- Start assigning majors at major device number 231 instead of major device number 230. Assign major device number 230 explicitly to the clone device. Package will now support extended ranges of minor devices on 2.6 kernels under Linux Fast-STREAMS only. '`streams`' now supports expanded addressable minor device numbers, permitting 2^16 addressable minor devices per major device number on 2.6 kernels: LiS cannot support this change.
- 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.
- Improvide compiler flag generation and optimizations for recent `gcc` compilers and some idiosyncratic beahviour 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.
- 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).
- Added `send-pr` script for automatic problem report generation.
- Each package will not build `doxygen(1)` html documentation with the '`make doxy`' target. See '`make help`' or '`README-make`' in the distribution for more information.

Major changes for release openss7-0.9.2.D.rc3

Third release candidate.

- The package will now build doxygen(1) html documentation with the 'doxy' make target. See 'make help' or README-make in the distribution for more information.
- 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.
- Added complete documentation and *Installation and Reference Manual* for the *OpenSS7 Master Package* (this manual).
- Added the following sub-packages to the master build (and release):
  - '`strbcm-0.9.2.5`'
  - '`striso-0.9.2.4`'
  - '`strsock-0.9.2.4`'
  - '`strtty-0.9.2.4`'
  - '`strutil-0.9.2.7`'
- Automated release file generation making for vastly improved and timely text documentation present in the release directory.
- Dropped support for *LiS*.
- Sub-packages will now support extended ranges of minor devices on 2.6 kernels under *Linux Fast-STREAMS* only.
- This release candidate 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.

- This release candidate 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.

This was an subscriber release.

Major changes for release openss7-0.9.2.D.rc2

Second release candidate.

This release candidate also contains the results of performance testing of the new second generation UDP driver (implemented completely in STREAMS instead of using an internal socket).

This release candidate also contains support for SuSE 10.1.

This was an subscriber release.

Major changes for release openss7-0.9.2.Drc1

First release candidate.

- Release candidate for Mark Fugate.
- Added –enable-devel configure option for embedded targets.
- Added send-pr script for automatic problem report generation.

This was an subscriber release.

Major changes for release openss7-0.9.2.C

Distribution check for entire master package. Trying to get master package into form where it can be released as a complete package.

This was a public release.

Major changes for release openss7-0.9.2.B

Minor changes for wider release, better master packaging and bug fixes.

This was a public release.

Major changes for release openss7-0.9.2.A

With this release version numbers were changed to reflect an upstream version only to be consistent with other OpenSS7 package releases. All RPM release numbers will be -1$(PACKAGE_RPMEXTRA) and all Debian release numbers will be '_0'. If you wish to apply patches and release the package, please bump up the release number and apply a suitable release suffix for your organization. We leave Debian release number _1 reserved for your use, so you can still bundle the source in the .dsc file.

Major changes for this release include build against Linux 2.6 kernels and popular distributions based on the 2.6 kernel as well as wider distribution support.

This was a public release.

Initial release openss7-0.9.2-1

Initial autoconf/RPM release of the OpenSS7 master package.

This master package contains all other OpenSS7 releases.

5.4 Maturity

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

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

5.4.1 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.

5.4.2 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.

5.4.3 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.

5.4.4 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.

5.4.5 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.

5.4.6 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.

5.5 Bugs

5.5.1 Defect Notices

OpenSS7 Master Package 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**.[7]

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.

[7] See sections **Disclaimer of Warranty** and **Limitation of Liability** under [GNU Affero General Public License], page 137.

5.5.2 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 Master Package* had no known bugs at the time of release.

5.5.3 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

`002. 2007-07-21T17:26:01-0600`

It was reported that validation test suites for XEN kernels are failing. XEN kernels are, therefore, not supported. (Thanks to Bryan Shupe at Flying J for reporting this bug.)

noted in `openss7-0.9.2.G`

`001. 2007-06-27T08:53:51+0000`

A report was made by Chris from Sandia that the build process choked on building 32-bit libraries and applications on an x86_64 system under Ubuntu Fiesty (7.04). While most other distributions include the `gcc` 32-bit compatibility libraries for 64-bit architectures with a 32-bit emulation mode, Ubuntu (and maybe Debian too) does not. The Ubuntu 7.04 package that is missing is the '`lib32gcc1`' package. There are two workarounds to this difficulty: add the '`lib32gcc1`' package (with apt), or add the '`--disable-32bit-libs`' flag to '`configure`'.

noted in `openss7-0.9.2.G`

For a history of defects for each of the individual subpackages, see the *Defect History* section of the *Installation and Reference Manual* for the appropriate subpackage.

5.6 Schedule

Current Plan

The OpenSS7 master package is a mature collection of all of the OpenSS7 STREAMS and protocol modules that builds all packages on a wide range of supported Linux distributions and kernels. The master package is a good way to build and validate all packages against a given distribution.

Therefore, the current plan for the OpenSS7 Master Package is largely a maintenance plan. The OpenSS7 Project intends to release regularly new versions of the Master Package that build and validate against upcoming releases of the supported Linux Distributions available from major distributors and upcoming releases of the Linux kernel, both mainline and as

patched by major distributions. This release schedule is approximately every 3 to 6 months. More recent corrections and support for new distributions and kernels can be obtained by sponsoring the OpenSS7 Project and obtaining access to the live CVS repository (also available as a git repository).

Two significant plans for the master package include providing cross-compiling support for more cross-platform development distributions, such as the Denx ELDK. Also, support for real-time distributions such as Montavista Linux and upcoming RT releases of SuSE and RedHat are within the scope of the development plan.

No additional subpackages are currently planned although development within the existing subpackages are planned. See the TODO files in the subpackage for a current development plan for a specific subpackage.

Things to Do

– Packaging.

  Get master build package working better. Currently the master build package does not build a master tarball or RPM distribution, which would be nice, only individual RPMs for subpackages.

– Cross-testing framework.

  We have nice autotest test suites that are fine for native builds, but for cross-compile builds, it would also be nice to cross-test. We can accomplish this nicely within the autoconf framework using DejaGNU. DejaGNU configured under the LiS, but we need a more general autoconf .m4 fragement check for the existence of DejaGNU, and automake and DejaGNU expect wrappers for the existing test programs (and integration into the make check-DEJAGNU target). Then we could cross-build the package and then execute the test scripts on the result on a remote board using DEJAGNU.

– Distributed testing framework.

  Because these are mostly communications protocols implemented using STREAMS, it is important to be able to do consistent distributed testing and validation of the protocol implementations. We can perform much validation using Ferry-Clip approaches (linking or pushing STREAMS-based pipes beneath drivers or modules), however, acceptance and performance testing would benefit from a distributed framework. Perhaps the most direct yet general approach to this is TETware from OpenGroup and is used for POSIX (and XNS 5.2, by the way) test suites from OpenGroup. Although netperf incorporates its own client-server subsystem, TETware provides these mechanisms separately. TETware also provides mechanisms for test case synchronization points between distributed systems that makes distributed conformance test cases quite possible. Note that TETware does not really require any external tools but does require network access and installation on the target systems (unlike DejaGNU that can execute test cases over a serial port if necessary).

– Documentation generation.

  I have all these ‘`/**`’ comments that use either kerneldoc or doxygen format sprinkled throughout the code. I would like to get doxygen running, or kerneldoc, or write a script of my own. This documentation would be useful for developers and troubleshooters, particularly if the code was included with the documentation. Doxygen does this nicely, but only in html, but does not generate manual pages or other things very nicely. Well,

I have to do something with that. A start would be just providing the autoconf .m4 and automake .am fragments necessary to generate doxygen or kerneldoc documentation.

done (for doxygen)

I added .m4 and .am files to search out doxygen source files. It looks for source files in the package with the string 'doxygen(1)' in them. What I really put in there was

```
/* This file can be processed with doxygen(1). */
```

Then html documentation is automatically generated in the doc/html or html directory. I still need to do the same for kerneldoc.

– Dynamic configuration.

Automake files (Makefile.am) are too static. The strbcm package needs the list of sources and objects to be rather dynamic. It would be nice to convert all packages to the same approach. We could perhaps use strconf-sh to generate Makefile.in fragments at configuration time and then include them in a far more general main Makefile.am file.

– Merge sub-packages.

I really want to put all these packages back together, it is too time consuming maintaining the various administrative files for each of seven or so packages. Once some more testing has been done on Linux Fast-STREAMS, I will drop LiS altogether and wrap the following packages together:

- streams-0.7a.5
- strcompat-0.9.2.4
- strutil-0.9.2.4
- strxns-0.9.2.4
- strxnet-0.9.2.9
- strinet-0.9.2.4
- strsctp-0.9.2.6
- netperf-2.3.2

The result will be just a streams-0.9.4 release. The only two (STREAMS) packages left will be strbcm and strss7.

– STREAMS Terminals

I want to someday write an ldterm for Linux Fast-STREAMS and provide truly STREAMS-based pseudo terminals.

done

Added package `strtty-0.9.2.1` for *STREAMS*-based terminals. Pick up the todo list there...

– Bug reporting.

We have these nice autotest test suites that generate a lot of information when a test case fails in testsuite.log. What I would like to do is integrate that to our GNATS problem report system so that testsuite will generate the template for a new problem report upon test case failure. Unfortunately autotest does not provide an m4 diversion point at which to hook into the failure branch of the test script. Several choices:

  – distribute a modified set of autotest macros. uggh.
  – submit a change to autoconf (2.59 is not going away soon).

Perhaps a better alternative is to provide a make target for problem reports that will collect the testsuite.log and any other pertinent information and generate a problem report template as a mail text file that can then be edited by the user and mailed to the bugs address. I like that. That will work better.

Better still, it might be a good idea to modify the logging targets to automatically generate a problem report when they fail. That would be better.

done

– Embedded install.

Provide an option for not installing documentation and development headers, etc. Just the runtime. This is mostly for embedded targets. Make it a '`--without-devel`' configure flag that defaults to including documentation and development environment.

done

5.7 History

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

6 Installation

6.1 Repositories

The OpenSS7 Master Package 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`.

6.1.1 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 openss7
```

Removing the package is as easy as:

```
$> sudo yum remove openss7
```

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:

‘`openss7`’
: This package can be used to install or remove the entire OpenSS7 Master Package 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.

‘`openss7-devel`’
: This package can be used to install or remove the development components of the OpenSS7 Master Package package. When installing, ‘`openss7`’ 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.

‘`openss7-2.4.20-28.7`’
: This package can be used to install or remove the package for a specific kernel version. When installing, the ‘`openss7`’ package will also be installed if necessary. When removing the last kernel module package, the ‘`openss7`’ package will also be removed.

  Note that the version ‘`2.4.20-28.7`’ is just an example. Use the version returned by ‘`$(uname -r)`’ for the kernel for which you wish to install or remove the packages.

‘`openss7-2.4.20-28.7-devel`’
: This package can be used to install or remove the development and debug packages for a specific kernel version. When installing, the ‘`openss7`’ and ‘`openss7-devel`’ packages will also be installed if necessary. When removing the development and debug for kernel modules for the last kernel, the ‘`openss7-devel`’ package will also be removed.

  Note that the version ‘`2.4.20-28.7`’ is just an example. Use the version returned by ‘`$(uname -r)`’ for the kernel for which you wish to install or remove the packages.

For assistance with specific RPMs, see Section 6.2.3 [Downloading the Binary RPM], page 87.

6.1.2 Repositories for APT

For assistance with specific DEBs, see Section 6.2.4 [Downloading the Debian DEB], page 87.

6.2 Downloading

The OpenSS7 Master Package package releases can be downloaded from the downloads page of The OpenSS7 Project. The master package is currently only available as a tar ball.[1] If you are using a browsable viewer, you can obtain the OpenSS7 release of `OpenSS7` 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`.

6.2.1 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 signle-kernel distribution installation is as easy as:

```
% sudo yum install openss7
```

This and additional packages for installation are detailed as follows:

‘`openss7`’ Install this package if you need the runtime ‘`openss7`’ package.

```
% sudo yum install openss7
```

This will install the ‘`openss7`’, ‘`openss7-lib`’ and ‘`openss7-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 ‘`openss7`’ package.

```
% sudo yum remove openss7
```

This will remove the ‘`openss7`’, ‘`openss7-lib`’, ‘`openss7-devel`’, ‘`openss7-KVERSION`’ and ‘`openss7-devel-KVERSION`’ RPMs for all kernels on your system.

‘`openss7-devel`’

Install this package if you need the development ‘`openss7`’ package.

```
% sudo yum install openss7-devel
```

This will install the ‘`openss7`’, ‘`openss7-lib`’, ‘`openss7-devel`’, ‘`openss7-KVERSION`’ and ‘`openss7-devel-KVERSION`’ RPMs, where ‘`KVERSION`’ is the highest version number kernel on your system.

[1] At a later date this OpenSS7 Master Package might be enhanced to build separate master package RPMs and DEBs, but as the objective of the OpenSS7 Master Package was for development purposes, this is on the back-burner.

Remove this package if you do not need development capabilities for the ‘openss7’ package for any kernel.

```
% sudo yum remove openss7-devel
```

This will remove the ‘openss7-devel’ and ‘openss7-devel-KVERSION’ RPMs for all kernels on your system.

‘openss7-2.4.20-28.7’

Install this package if you need the runtime ‘openss7’ for kernel version ‘2.4.20-28.7’. The value ‘2.4.20-28.7’ is just an example. For the running kernel, you can install the runtime ‘openss7’ components with:

```
% sudo yum install openss7-$(uname -r)
```

This will install the ‘openss7’, ‘openss7-lib’ and ‘openss7-2.4.20-28.7’ RPMs, where ‘2.4.20-28.7’ is the kernel version specified.

Remove this package if you no longer need the runtime ‘openss7’ for kernel version ‘2.4.20-28.7’. The value ‘2.4.20-28.7’ is just an example. For the running kernel, you can remove the runtime ‘openss7’ components with:

```
% sudo yum remove openss7-$(uname -r)
```

This will remove the ‘openss7-2.4.20-28.7’ and ‘openss7-devel-2.4.20-28.7’ RPMs, where ‘2.4.20-28.7’ is the kernel version specified. Also, if this is the last kernel for which ‘openss7’ was installed, the ‘openss7’ ‘openss7-lib’ and ‘openss7-devel’ RPMs will also be removed.

Note that this is a virtual package name: the actual RPMs installed or removed from the system is a kernel module package whose precise name will depend upon the system being used.

‘openss7-devel-2.4.20-28.7’

Install this package if you need the development ‘openss7’ package for kernel version ‘2.4.20-28.7’. The value ‘2.4.20-28.7’ is just an example. For the running kernel, you can install the kernel development ‘openss7’ components with:

```
% sudo yum install openss7-devel-$(uname -r)
```

This will install the ‘openss7’, ‘openss7-lib’, ‘openss7-devel’, ‘openss7-2.4.20-28.7’ and ‘openss7-devel-2.4.20-28.7’ RPMs, where ‘2.4.20-28.7’ is the kernel version specified.

Remove this package if you no longer need the development capabilities for the ‘openss7’ package for kernel version ‘2.4.20-28.7’. The value ‘2.4.20-28.7’ is just an example. For the running kernel, you can remove the kernel development ‘openss7’ components with:

```
% sudo yum remove openss7-devel-$(uname -r)
```

This will remove the ‘openss7-devel-2.4.20-28.7’ RPMs, where ‘2.4.20-28.7’ is the kernel version specified. Also, if this is the last kernel for which ‘openss7’ was installed, the ‘openss7-devel’ RPMs will also be removed.

Note that this is a virtual package name: the actual RPMs installed or removed from the system is a kernel module package whose precise name will depend upon the system being used.

‘openss7-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.

6.2.2 Downloading with APT

OpenSS7 repositries support apt(8) repositorie digests and signatures.

6.2.3 Downloading the Binary RPM

The *OpenSS7 Master Package* does not provide any binary RPMs directly. Downloading binary RPMs consists of downloading the binary RPMs for the individual release packages contained in the *OpenSS7 Master Package*. For instructions on downloading the binary RPMs for each individual release package, see the *Downloading the Binary RPM* section of the *Installation and Reference Manual* for the appropriate release package.

6.2.4 Downloading the Debian DEB

The *OpenSS7 Master Package* does not provide any binary DEBs directly. Downloading binary DEBs consists of downloading the binary DEBs for the individual release packages contained in the *OpenSS7 Master Package*. For instructions on downloading the binary DEBs for each individual release package, see the *Downloading the Binary DEB* section of the *Installation and Reference Manual* for the appropriate release package.

6.2.5 Downloading the Source RPM

The *OpenSS7 Master Package* does not provide any source RPMs directly. Downloading source RPMs consists of downloading the source RPMs for the individual release packages contained in the *OpenSS7 Master Package*. For instructions on downloading the source RPMs for each individual release package, see the *Downloading the Source RPM* section of the *Installation and Reference Manual* for the appropriate release package.

6.2.6 Downloading the Debian DSC

The *OpenSS7 Master Package* does not provide any source DSCs directly. Downloading source DSCs consists of downloading the source DSCs for the individual release packages contained in the *OpenSS7 Master Package*. For instructions on downloading the source DSCs for each individual release package, see the *Downloading the Debian DSC* section of the *Installation and Reference Manual* for the appropriate release package.

6.2.7 Downloading the Tar Ball

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

openss7-0.9.2.G.tar.gz
openss7-0.9.2.G.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, for each of the individual release packages.

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

```
% wget http://www.openss7.org/openss7-0.9.2.G.tar.bz2
```

or

```
% wget http://www.openss7.org/openss7-0.9.2.G.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/openss7-0.9.2.G.tar.gz
% tar -xzvf openss7-0.9.2.G.tar.gz
```

or

```
% wget http://www.openss7.org/openss7-0.9.2.G.tar.bz2
% tar -xjvf openss7-0.9.2.G.tar.bz2
```

Either will create a subdirectory name '`openss7-0.9.2.G`' containing all of the files and subdirectories for the `OpenSS7` package.

Configuration

To configure and install the tar ball, See Section 6.3.5 [Configuring the Tar Ball], page 91.

6.2.8 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 '`OpenSS7`' package from the project CVS archive.

The OpenSS7 Master Package package is located in the '`openss7`' module of '`/var/cvs`'. For release tag information, see Chapter 5 [Releases], page 67.

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 openss7_0.9.2.G openss7
% 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 '`OpenSS7`' 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 wil have these tools; however, some non-development or server-style installations might not and they must be installed separately.[2]

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.*[3] 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.

[2] 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.

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

- `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.[4]

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.

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 openss7
```

where, '`openss7`' 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 openss7
```

[4] 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 `tetex` package.

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 6.3.5 [Configuring the Tar Ball], page 91, and Section 6.4.3 [Building from the Tar Ball], page 106.

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 6.3.5 [Configuring the Tar Ball], page 91.

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.

6.3 Configuration

6.3.1 Configuring the Binary RPM

OpenSS7 Master Package is not currently distributed as binary RPM. For configuring the binary RPMs of the included release packages, see the *Configuring the Binary RPM* section of the *Installation and Reference Manual* for the individual release package.

6.3.2 Configuring the Debian DEB

OpenSS7 Master Package is not currently distributed as binary DEB. For configuring the binary DEBs of the included release packages, see the *Configuring the Binary DEB* section of the *Installation and Reference Manual* for the individual release package.

6.3.3 Configuring the Source RPM

OpenSS7 Master Package is not currently distributed as source RPM. For configuring the source RPMs of the included release packages, see the *Configuring the Source RPM* section of the *Installation and Reference Manual* for the individual release package.

6.3.4 Configuring the Debian DSC

OpenSS7 Master Package is not currently distributed as Debian DSC. For configuring the Debian DSCs of the included release packages, see the *Configuring the Debian DSC* section of the *Installation and Reference Manual* for the individual release package.

6.3.5 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.

6.3.5.1 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.

`--enable-autotest`
`--disable-autotest`
: Enable or disable pre- and post-installation testing. Each release package supports a number of `autotest` test suites that can be performed by invoking the '`installcheck`' target with `make(1)`. These currently consist of running installed modules, commands and binaries against a number of specific test cases. 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 Master Package 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 usefule 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 `OpenSS7` symbols. Specifies whether kernel symbol versions are to be used on symbols exported from built `OpenSS7` 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 '`reuild`' `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 `grefer(1)` references. Some systems do not like `grefer(1)` references in manual pages.[5] 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).

`--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`'.

[5] In particular, some *Debian* or *Ubuntu* 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* or *Ubuntu* system, we accomodate such misconfiguration with this feature.

`--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.

Options specific to the OpenSS7 Master Package control primarily whether add-on packages are included or excluded from the build, install or RPM or DEB packaging. The following `configure` options, specific to the OpenSS7 Master Package, are available:

`--without-SCTP`
: When disabled, excludes the `sctp-0.2.27` add-on package from the build. This function is useful only for disabling build of the `sctp` add-on package on a 2.4 series *Linux* kernel. This option defaults differently depending upon for which kernel the add-on package is being built. For 2.4 kernels, this option defaults to include the `sctp` add-on package; 2.6 kernels, defaults to exclude the `sctp` add-on package.

`--without-IPERF`
: When disabled, excludes the `iperf-2.0.8` add-on package from the build. This function is useful only for disabling build of the `sctp` add-on package on a 2.4

series *Linux* kernel. This option defaults differently depending upon for which kernel the add-on package is being built. For 2.4 kernels, this option defaults to include the `sctp` add-on package; 2.6 kernels, defaults to exclude the `sctp` add-on package.

`--without-STREAMS`
: When disabled, excludes the `streams-0.9.2.4` add-on package from the build. When the `streams` add-on package is excluded, none of the packages which depend upon it can be built unless the `streams` package was otherwise installed on the build system. The default is to include the *Linux Fast-STREAMS* (`streams-0.9.2.4`) add-on package in the build.

`--without-STRCOMPAT`
: When disabled, excludes the `strcompat-0.9.2.7` add-on package from the build. When the `strcompat` add-on package is excluded, none of the packages which depend upon it can be built unless the `strcompat` package was otherwise installed on the build system. The default is to include the *STREAMS Compatibility Modules* (`strcompat-0.9.2.7`) add-on package in the build.

`--with-STRUTIL`
: When enabled, includes the `strutil-0.9.2.7` add-on package in the build. Because the `strutil` add-on package is not distributed by default, this option only has a use on development copies and CVS checkouts. The default is to exclude the *STREAMS Utilities* (`strutil-0.9.2.7`) add-on package from the build.

`--with-STRTTY`
: When enabled, includes the `strtty-0.9.2.4` add-on package in the build. Because the `strtty` add-on package is not distributed by default, this option only has a use on development copies and CVS checkouts. The default is to exclude the *STREAMS Terminals* (`strtty-0.9.2.4`) add-on package from the build.

`--without-STRXNS`
: When disabled, excludes the `strxns-0.9.2.7` add-on package from the build. When the `strxns` add-on package is excluded, none of the packages which depend upon it can be built unless the `strxns` package was otherwise installed on the build system. The default is to include the *STREAMS X/Open Networking Services (XNS)* (`strxns-0.9.2.7`) add-on package in the build.

`--without-STRXNET`
: When disabled, excludes the `strxnet-0.9.2.12` add-on package from the build. When the `strxnet` add-on package is excluded, none of the packages which depend upon it can be built unless the `strxnet` package was otherwise installed on the build system. The default is to include the *STREAMS X/Open Transport Interface (XTI)* (`strxnet-0.9.2.12`) add-on package in the build.

`--with-STRSOCK`
: When enabled, includes the `strsock-0.9.2.4` add-on package in the build. Because the `strsock` add-on package is not distributed by default, this option only has a use on development copies and CVS checkouts. The default is to

exclude the *STREAMS Sockets* (`strsock-0.9.2.4`) add-on package from the build.

`--without-STRINET`
: When disabled, excludes the `strinet-0.9.2.7` add-on package from the build. When the `strinet` add-on package is excluded, none of the packages which depend upon it can be built unless the `strinet` package was otherwise installed on the build system. The default is to include the *STREAMS Internet Protocol (INET)* (`strinet-0.9.2.7`) add-on package in the build.

`--without-STRSCTP`
: When disabled, excludes the `strsctp-0.9.2.9` add-on package from the build. When the `strsctp` add-on package is excluded, none of the packages which depend upon it can be built unless the `strsctp` package was otherwise installed on the build system. The default is to include the *STREAMS Stream Control Transmission Protocol (SCTP)* (`strsctp-0.9.2.9`) add-on package in the build.

`--without-STRCHAN`
: When disabled, excludes the `strchan-0.9.2.4` add-on package from the build. When the `strchan` add-on package is excluded, none of the packages which depend upon it can be built unless the `strchan` package was otherwise installed on the build system. The default is to include the *STREAMS Channels* (`strchan-0.9.2.4`) add-on package in the build.

`--with-STRX25`
: When enabled, includes the `strx25-0.9.2.1` add-on package in the build. Because the `strx25` add-on package is not distributed by default, this option only has a use on development copies and CVS checkouts. The default is to exclude the *STREAMS X.25* (`strx25-0.9.2.1`) add-on package from the build.

`--with-STRISO`
: When enabled, includes the `striso-0.9.2.4` add-on package in the build. Because the `striso` add-on package is not distributed by default, this option only has a use on development copies and CVS checkouts. The default is to exclude the *STREAMS Open Standards Interconnect (ISO/OSI)* (`striso-0.9.2.4`) add-on package from the build.

`--without-NETPERF`
: When disabled, excludes the `netperf-2.3.7` add-on package from the build. The default is to include the *Netperf* (`netperf-2.3.7`) add-on package in the build.

`--without-STRISDN`
: When disabled, excludes the `strisdn-0.9.2.4` add-on package from the build. When the `strisdn` add-on package is excluded, none of the packages which depend upon it can be built unless the `strisdn` package was otherwise installed on the build system. The default is to include the *STREAMS ISDN Stacks* (`strisdn-0.9.2.4`) add-on package in the build.

`--without-STACKS`
: When disabled, excludes the `strss7-0.9a.8` add-on package from the build. When the `strss7` add-on package is excluded, none of the packages which depend upon it can be built unless the `strss7` package was otherwise installed on the build system. The default is to include the *STREAMS SS7 Stacks* (`strss7-0.9a.8`) add-on package in the build.

`--without-SIGTRAN`
: When disabled, excludes the `sigtran-0.9.2.4` add-on package from the build. When the `sigtran` add-on package is excluded, none of the packages which depend upon it can be built unless the `sigtran` package was otherwise installed on the build system. The default is to include the *STREAMS SIGTRAN Stacks* (`sigtran-0.9.2.4`) add-on package in the build.

`--without-STRVOIP`
: When disabled, excludes the `strvoip-0.9.2.4` add-on package from the build. When the `strvoip` add-on package is excluded, none of the packages which depend upon it can be built unless the `strvoip` package was otherwise installed on the build system. The default is to include the *STREAMS VoIP Stacks* (`strvoip-0.9.2.4`) add-on package in the build.

`--without-OSR61`
: When disabled, excludes the `osr61-0.9.2.3` add-on package from the build. When the `osr61` add-on package is excluded, none of the packages which depend upon it can be built unless the `osr61` package was otherwise installed on the build system. The default is to include the *Dialogic Open System Release 6.1* (`osr61-0.9.2.3`) add-on package in the build.

`--with-LIS`
: When enabled, includes the `LiS-2.18.7` add-on package in the build. Because the `LiS` add-on package is no longer distributed by default, this option only has a use on development copies and CVS checkouts. The default is to exclude the *Linux STREAMS* (`LiS-2.18.7`) add-on package from the build.

`--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 the include directory of the add-on *LiS* package, or the directory '`/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 add-on packages that do not use the *STREAMS* subsystem.

  When enabled, *STREAMS* add-on packages will also have RedHat RPMs or Debian DEBs built for the *Linux STREAMS* (`LiS-2.18.7`) *STREAMS* package. '`--with-LIS`' must also be specified. The default is to not build RPMs nor DEBs for *LiS* version of the add-on *STREAMS* packages. As *LiS* is deprecated and no longer included in the distribution, this option is only useful for CVS downloads.

`--without-lfs`
`--with-lfs[=LFS-DIR]`
: 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 the include directory of the add-on *LfS* package, or the directory '`/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 add-on packages that do not use the *STREAMS* subsystem.

  When disabled, *STREAMS* add-on packages will not have RedHat RPMS nor Debian DEBs built for the *Linux Fast-STREAMS* (`streams-0.9.2.4`) package. '`--without-STREAMS`' may also be specified. The default is to build RPMs nor DEBs for *Linux Fast-STREAMS* version of the add-on *STREAMS* packages. As *LiS* is deprecated and no longer included in the distribution, and this option is only useful for suppressing *Linux Fast-STREAMS* builds in favour of *LiS*, this option is only useful for CVS downloads or where the `streams` package has otherwise already been installed on the target system.

Additional options specified to an add-on package may also be specified on the `configure` command line and they will be passed to all sub-packages. Therefore, any of the add-on package specific options described by the *Installation and Reference Manual* for the add-on package may also be specified on the command line.

6.3.5.2 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 apropros 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.

6.3.5.3 Build

To build from the tar ball, See Section 6.4.3 [Building from the Tar Ball], page 106.

6.4 Building

6.4.1 Building from the Source RPM

OpenSS7 Master Package does not directly provide Source RPMs. For building from the source RPMs of the individual release packages, see the *Building from the Source RPM* section of the *Installation and Reference Manual* for the individual release package.

6.4.2 Building from the Debian DSC

OpenSS7 Master Package does not directly provide Debian DSCs. For building from the Debian DSCs of the individual release packages, see the *Building from the Debian DSC* section of the *Installation and Reference Manual* for the individual release package.

6.4.3 Building from the Tar Ball

If you have downloaded the tar ball (see Section 6.2.7 [Downloading the Tar Ball], page 87), then the following instructions will rebuild the package on your system. (Note that the build process does not required `root` privilege.)

6.4.3.1 Native Build

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

```
% wget http://www.openss7.org/openss7-0.9.2.G.tar.bz2
% tar -xjvf openss7-0.9.2.G.tar.bz2
% pushd openss7-0.9.2.G
% ./configure
% make
% popd
```

6.4.3.2 Cross-Build

Following is an example for a cross-build. The kernel release version must always be specified for a cross-build.[6] 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/openss7-0.9.2.G.tar.bz2
% tar -xjvf openss7-0.9.2.G.tar.bz2
% pushd openss7-0.9.2.G
% ./configure DESTDIR="/some/other/root" \
--with-k-release=2.4.18 --host sparc-linux
% make
% popd
```

6.5 Installing

6.5.1 Installing the Binary RPM

OpenSS7 Master Package does not directly provide binary RPMs. For installation of the binary RPMs for any of the release packages, see the *Installing the Binary RPM* section of the *Installation and Reference Manual* for the particular release package.

[6] 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.

6.5.2 Installing the Debian DEB

OpenSS7 Master Package does not directly provide binary DEBs. For installation of the binary DEBs for any of the release packages, see the *Installing the Binary DEB* section of the *Installation and Reference Manual* for the particular release package.

6.5.3 Installing the Tar Ball

After the build process (see Section 6.4.3 [Building from the Tar Ball], page 106), 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.

6.6 Removing

6.6.1 Removing the Binary RPM

OpenSS7 Master Package does not directly provide Binary RPMs. For removing the binary RPMs of a given release package, see the *Removing the Binary RPM* section of the *Installation and Reference Manual* for the individual release package.

6.6.2 Removing the Debian DEB

OpenSS7 Master Package does not directly provide Debian DEBs. For removing the Debian DEBs of a given release package, see the *Removing the Debian DEB* section of the *Installation and Reference Manual* for the individual release package.

6.6.3 Removing the Source RPM

OpenSS7 Master Package does not directly provide Source RPMs. For removing the source RPM of a given release package, see the *Removing the Source RPM* section of the *Installation and Reference Manual* for the individual release package.

6.6.4 Removing the Debian DSC

OpenSS7 Master Package does not directly provide Debian DSCs. For removing the Debian DSC of a given release package, see the *Removing the Debian DSC* section of the *Installation and Reference Manual* for the individual release package.

6.6.5 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/openss7
% make uninstall
% cd ..
% rm -fr openss7-0.9.2.G
% rm -f openss7-0.9.2.G.tar.gz
% rm -f openss7-0.9.2.G.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 6.5.3 [Installing the Tar Ball], page 107) except the final installation and then perform the steps above.

6.7 Loading

6.7.1 Normal Module Loading

When OpenSS7 Master Package installs, modules and drivers belonging to release packages are normally configured for demand loading. The '`install`' and '`install-strip`' `automake(1)` targets will make the necessary changes to the '`/etc/modules.conf`' file and place the modules in an appropriate place in '`/lib/modules/2.4.20-28.7/openss7`'. The '`make install`' process should have copied the kernel module files '`streams-*.o`' to the directory '`/lib/modules/2.4.20-28.7/openss7`'. This means that to load any of these modules, you can simply execute, for example, '`modprobe stream-`*`somedriver`*'.[7]

6.7.1.1 Linux Fast-STREAMS Module Loading

The '`openss7`' demand load system supports both the old `kerneld` and the new `kmod` mechanisms for demand loading kernel modules.

The convention for '`openss7`' kernel loadable object files is:

- Their name start with "streams-".
- They are placed in '`/lib/modules/2.4.20-28.7/streams/`', where '`2.4.20-28.7`' is an example kernel version.

If your kernel has been built using the '`kerneld`' daemon, then '`OpenSS7`' kernel modules will automatically load as soon as the *STREAMS* module is pushed or the driver is opened. The '`make install`' process makes the necessary changes to the '`/etc/modules.conf`' file. After the install, you will see lines like the following added to your '`/etc/modules.conf`' file:

```
prune modules.openss7
if -f /lib/modules/‘uname -r‘/modules.openss7
include /lib/modules/‘uname -r‘/modules.openss7
endif
```

which will provide for demand loading of the modules if they have been built and installed for the running kernel. The '`/lib/modules/‘uname -r‘/modules.openss7`' file looks like this:

[7] Note that the '`_kversion`' of '`2.4.20-28.7`' is only an example.

```
alias char-major-245  streams-some_driver
alias char-major-246  streams-other_driver
```

Note that *STREAMS* modules are not listed in this file, but will be loaded by name using '`kerneld`' if available.

Linux Fast-STREAMS has a wider range of kernel module loading mechanisms than is provided by the deprecated *LiS*. For mechanisms used for kernel module loading under *Linux Fast-STREAMS*, See Section "Top" in *Linux Fast-STREAMS Reference Manual*.

6.7.1.2 Linux STREAMS Module Loading

LiS is deprecated and this section has been deleted.

6.8 Maintenance

6.8.1 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:

6.8.1.1 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 7.1.1 [Pre-installation Checks], page 119.

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/openss7`'[8] 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 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

[8] '`/usr/libexec/openss7`' 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).

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.[9]

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.[10]

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

6.8.1.2 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 '`openss7-0.9.2.G.tar.gz`' and '`openss7-0.9.2.G.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, 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.

6.8.1.3 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.

---

[9] 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.

[10] This is useful from the *OpenSS7 Master Package*.

'`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.[11] It also means that you probably need a full blown Linux system to rebuild the package. For more information, see Section 6.2.8 [Downloading from CVS], page 88.

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.

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

6.8.1.4 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 com-

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

mand 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.

6.8.1.5 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=mypasswd 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.

6.8.1.6 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.[12] 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.

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`'.

[12] 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)`.

‘`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`’.

6.8.1.7 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).

6.8.1.8 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:

  '`openss7-0.9.2.G.tar.gz`' and '`openss7-0.9.2.G.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=mypasswd release-sign-archives`'

  Signature files will be named:

  '`openss7-0.9.2.G.tar.gz.asc`' and '`openss7-0.9.2.G.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.

6.8.1.9 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: '`openss7-0.9.2.G-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:

‘openss7-*-0.9.2.G-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 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 accepts 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.

6.8.1.10 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: ‘openss7_0.9.2.G-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: '`openss7-*_0.9.2.G-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.

6.8.1.11 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`'.

7 Troubleshooting

7.1 Test Suites

7.1.1 Pre-installation Checks

Most *OpenSS7* packages, including the *OpenSS7 Master Package* 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 6.4.1 [Building from the Source RPM], page 105; and Section 6.4.2 [Building from the Debian DSC], page 105), 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 6.4.3 [Building from the Tar Ball], page 106; and Section 6.5.3 [Installing the Tar Ball], page 107), 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 7.1.

```
% wget http://www.openss7.org/openss7-0.9.2.G.tar.bz2
% tar -xjvf openss7-0.9.2.G.tar.bz2
% pushd openss7-0.9.2.G
% ./configure
% make
% make check  # <------- invoke pre-installation checks
% popd
```

Example 7.1: *Invoking Pre-Installation Checks*

Pre-installation checks fall into two categories: *System Checks* and *Maintenance Checks*.

7.1.1.1 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 7.2 will perform *System* checks.

```
% wget http://www.openss7.org/openss7-0.9.2.G.tar.bz2
% tar -xjvf openss7-0.9.2.G.tar.bz2
% pushd openss7-0.9.2.G
% ./configure
% make
% make check  # <------ invokes System pre-installation checks
% popd
```

Example 7.2: *Invoking System Checks*

7.1.1.2 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 7.3 will perform *Maintenance* checks.

```
% wget http://www.openss7.org/openss7-0.9.2.G.tar.bz2
% tar -xjvf openss7-0.9.2.G.tar.bz2
% pushd openss7-0.9.2.G
% ./configure --enable-maintainer-mode
% make
% make check  # <------ invokes Maintenance pre-installation checks
% popd
```

Example 7.3: *Invoking Maintenance Checks*

7.1.1.3 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 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`'.

7.1.2 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.

7.1.2.1 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 7.4.

```
% wget http://www.openss7.org/openss7-0.9.2.G.tar.bz2
% tar -xjvf openss7-0.9.2.G.tar.bz2
% pushd openss7-0.9.2.G
% ./configure
% make
% make check  # <------ invokes System pre-installation checks
% make install
% sudo make installcheck # <------- invokes post-installation tests
% popd
```

Example 7.4: *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 See Section 7.2 [Problem Reports], page 123, below.

Typical steps for invoking and installed `testsuite` standalone are shown in Example 7.5.

```
% [sudo] /usr/libexec/openss7/testsuite
```

Example 7.5: *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 7.2.4 [Stand Alone Problem Reports], page 126.

7.2 Problem Reports

7.2.1 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 Master Package* 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)`).

7.2.2 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 Master Package* package provides the '`send-pr`' shell script that can be used for problem reporting. The '`send-pr`' shell script can 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 tool[2], '`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 generate using `make`, See Section 6.8.1.7 [Problem Report Targets], page 115. An example of how simple it is to generate a problem report is illustrated in Example 7.6.

```
% 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 7.6: *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.

7.2.3 Automatic Problem Reports

The *OpenSS7 Master Package* 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 6.8.1.6 [Logging Targets], page 114) 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 7.2.1 [Problem Report Guidelines], page 124). An example is shown in Example 7.7.

```
% 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 7.7: *Problem Report from Failed Logging Target*

7.2.4 Stand Alone Problem Reports

The *OpenSS7 Master Package* package installs the `send-pr` script and its configuration file '`send-pr.config`' in '`${libexecdir}/openss7`' along with the validation `testsuite`, see See Section 7.1 [Test Suites], page 119. 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 7.8.

```
% [sudo] /usr/libexec/openss7/testsuite
% # test cases failed...
% /usr/libexec/openss7/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/openss7/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/openss7/send-pr --file problem.pr
```

Example 7.8: *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`'.

7.3 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 Master Package* package.

Unverified behaviour may contain unknown bugs.

Please remember that there is **NO WARRANTY**.

See also Section 5.5 [Bugs], page 77, or file '`BUGS`' in the release directory.

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