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# Series 32000®

# GENIX V.3™ Networking Support Utilities Notes

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# REVISION RECORD

| REVISION | RELEASE DATE | SUMMARY OF CHANGES |
|---|---|---|
| A | 12/86 | First Release.<br>*Series 32000®* GENIX V.3™ Networking<br>Support Utilities Notes<br>NSC Publication Number 424510771-420A. |

# PREFACE

The Networking Support Utilities (NSU) package supplements the Essential Utilities by extending system capabilities to support networking applications. The NSU package supports the following GENIX V.3™ features: Remote File Sharing, STREAMS mechanisms and tools, the Transport Interface, the enhanced Basic Networking Utilities, and the Listener.

The information contained in this manual is for reference only and is subject to change without notice.

# CONTENTS

# Chapter 1

# NETWORKING SUPPORT UTILITIES (NSU) OVERVIEW

## 1.1 INTRODUCTION

The Networking Support Utilities (NSU) package supplements the Essential Utilities by extending system capabilities to support networking applications. The product includes software support for STREAMS, the Transport Interface, and the Listener.

## 1.2 DOCUMENTATION CONVENTIONS

In this document, as in all GENIX V.3 system documentation, certain typesetting conventions are followed when command names, command line format, files, and directory names are described. There are also conventions for displays of terminal input and output.

- You must type words that are in **bold** font as they appear.
- *Italic* words are variables; you substitute the appropriate values. These values may be file names or they may be data values, as applicable.
- CRT or terminal output and examples of source code are presented in constant-width font.
- Characters or words in square brackets, [ ], are optional. (Do not type the brackets.)

A command name followed by a number, for example, **ed**(1), refers to that command's manual page, where the number refers to the section of the manual. Manual pages from Section (1) appear in the *User's Reference Manual*, unless otherwise noted. Manual pages from Sections (3) and (4) appear in the *Programmer's Reference Manual*. Manual pages from Section (1M) appear in the *System Administrator's Reference Manual*.

Examples in this document show the default system prompt for GENIX V.3, the dollar sign ($). They also show the default prompt when you login as the super-user, the pound sign (#).

## 1.3 CONTENTS OF THE RELEASE

The Network Support Utilities comes on one floppy diskette and requires approximately 440 free blocks in **/usr** and 651 free blocks in /.

NOTE: 513 of the blocks in / are for temporary space that is needed to reconfigure the system. After the package is installed, only about 140 blocks are used.

The following files are contained on the diskette:

**/boot/log.o**<br>
**/boot/clone.o**
**/boot/timod.o**
**/boot/tirdwr.o**
**/etc/master.d/clone**
**/etc/master.d/log**
**/etc/master.d/timod**
**/etc/master.d/tirdwr**
**/usr/bin/nlsadmin**
**/usr/bin/strace**
**/usr/bin/strerr**
**/usr/bin/strclean**
**/usr/include/sys/lihdr.h**
**/usr/include/sys/tiuser.h**
**/usr/include/sys/tihdr.h**
**/usr/include/sys/strlog.h**
**/usr/include/sys/log.h**
**/usr/include/listen.h**
**/usr/include/tiuser.h**
**/usr/lib/libnsl_s.a**
**/usr/lib/libnls.a**
**/usr/net/nls/listen**
**/usr/options/nsu.name**

## 1.4 INSTALLATION

### 1.4.1 Prerequisites

Before you can install the Networking Support Utilities you must complete the following prerequisites.

**Software**

You must have installed the following GENIX V.3 software before installing the Networking Support Utilities:

- Essential Utilities
- Directory and File Management Utilities

### Hardware

Networking Support Utilities can be run on all *Series 32000®* Computers. The minimum hardware configuration required is 2 megabytes of main memory.

### 1.4.2 Installation Procedures

The following describes the installation procedures for the Networking Support Utilities. The Networking Support Utilities for a *Series 32000* Computer are distributed on one floppy diskette. Most of the utilities are object code files. To begin the installation:

- Login as the superuser and be sure you are in the root ( / ) directory.
- Place your computer in system state—2 (multi-user) or 1 (single-user). To run this procedure in single-user mode, you must mount **/usr**.

**Run sysadm installpkg**

Step 1: To install the Networking Support Utilities, use the direct access method of the System Administration menu as follows:

```
# sysadm installpkg
```

This command executes the **sysadm** subcommand **installpkg.**

Step 2: Insert the Networking Support Utilities floppy diskette and, when prompted, press <CR> as instructed. Once you have hit <CR>, your *Series 32000* Computer will display the full path names of the files as they are copied from the floppy diskette to the hard disk. Be patient, this will take several minutes.

Step 3: When instructed, remove the floppy diskette and store it with your other diskettes. You must then type **q** to return to the shell.

Step 4: As instructed, you should shutdown the system and bring it back up again. This is done as follows:

```
# cd /
# shutdown -i6 -g0 -y
```

Once you receive the Console Login: prompt your system will be ready, and the Networking Support Utilities installation is complete.

For more information on configuring STREAMS for your system, see Chapter 6, "Performance Management," in the *Administrator's Guide.*

# Chapter 2

# NETWORKING APPLICATIONS

## 2.1 INTRODUCTION

The Networking Support Utilities package supports the following GENIX V.3 networking features: STREAMS, the Transport Interface, the enhanced Basic Networking Utilities, and the Listener. This chapter describes these features.

## 2.2 STREAMS

STREAMS is a general, flexible facility for developing GENIX V.3 communication services. By defining standard interfaces for character input/output within the kernel, STREAMS supports development ranging from complete networking protocol suites to individual device drivers. The standard interfaces and associated tools enable modular, portable development and easy integration of network services and their components—these were used to develop protocol modules and device drivers for GENIX V.3. STREAMS provides a broad framework that does not impose any specific network architecture. It implements a user interface consistent and compatible with the character I/O mechanism that is also available in the GENIX V.3 system.

The power of STREAMS resides in its modularity. The design reflects the layering characteristics of contemporary networking architectures. Each basic component (called a module) in a STREAMS implementation represents a set of processing functions and communicates with other modules via a standard interface. From the user level, kernel resident modules can be dynamically selected and interconnected to implement any rational processing sequence. No additional kernel programming, assembly, or link editing is required. Modularity allows for the following advantages:

- User-level programs (commands such as **uucp**) are independent of underlying protocols and communications media so the programs need not be changed when new media or protocols between systems become available.
- Network architectures and higher-level protocols are independent of underlying protocols, drivers, and media.
- Higher-level services can be created by selecting and connecting lower-level services and protocols.

In addition to the standard interfaces, STREAMS provides a set of software tools that help source customers build modules and drivers.

Several new documents have been written describing how to use STREAMS. For more information, see Chapter 4.

## 2.3 TRANSPORT INTERFACE

GENIX V.3 supports a Transport Interface based on the Transport Service Definition (Level 4) of the International Organization for Standardization (ISO) Open Systems Interconnection (OSI) reference model. The transport service supports two modes of transfer: connection mode and connectionless mode. Connection mode is circuit-oriented and supports data transfer over an established connection in a reliable, sequenced manner. The connectionless mode is message-oriented (datagrams) and supports data transfer in self-contained units with no logical relationship required among units.

The Transport Interface defines how a user accesses the services of a transport protocol, called a Transport Provider. An example of a Transport Provider is the Universal Receiver Protocol (URP). Applications programs access the Transport Provider by using the Transport Interface routines in the new Network Services Library. These routines support access to a Transport Provider in a media and protocol-independent manner. The Transport Provider uses kernel level programs to send the information to the desired physical device, such as the NPACK. By using the Transport Interface, application programs will be able to access other Transport Providers that may be available in the future.

## 2.4 LISTENER

The Listener is a program that can be used with Transport Providers on a system. The purpose of the Listener is to receive requests for services from another system, interpret which service is needed, and start a process that has been named to provide the requested service. The Listener then drops out of the communications path and continues to listen for new service requests.

For more information about the Listener, see the *Programmer's Reference Manual* and the *Networking Guide.*

# Chapter 3

# SOFTWARE NOTES

This chapter describes problems that may occur with the Networking Support Utilities and, in some cases, workarounds for these problems.

## 3.1 LISTEN

If two or more simultaneous connection requests come in at the same time, the listener can only accept one; the others will be disconnected by the transport provider.

Client side networking code should be prepared to handle the case where their connection request fails because of a disconnect arriving on the stream. In this case the code should be designed to use some retry mechanism.

The command line in the listener database file (*/usr/net/nls/net_spec*) is parsed using white space as the delimiter. Therefore, when building the argument list to pass to **exec**, quoted strings are not interpreted as one argument. This causes incorrect results when the server is the shell. For example:

```
/bin/sh -c "/bin/cat >/dev/console"
```

This problem can be worked around by using a shell script to perform the actual command:

```
/bin/sh -c /usr/net/servers/shellscript
```

Then *shellscript* would contain the following line:

```
/bin/cat filename >/dev/console
```

The listener expects its protocol messages in one message, unless the **T_MORE** bit is set. If a client process sends the protocol message to the listener in chunks (for example, byte-by-byte), then the listener will not be able to assemble the message and it will disconnect the connection.

The client processes should always send the protocol message to the listener with one **t_snd** or one **write** call.

When the listener process encounters an unrecoverable error, it exits silently. The error can be identified by tailing the end of the listener log file, **log**, which is found in **/usr/net/nls/***net_spec*. Because the log file is truncated each time the listener is started, it must be inspected before restarting the listener.

## 3.2 NLSADMIN

The **nlsadmin** command allows the administrator to assign the same network address to the general listener service (using the **-l** option) and the login service (using the **-t** option) for the listener on a network. When that listener is subsequently started, it terminates with an error.

To avoid this problem, do not assign the same value to the listener service address and the login service address.

If you change the address the listener is listening on with the **nlsadmin -l laddr -t taddr net_spec** command, the addresses must be entered without an embedded newline between the start of the address and the terminating white space for that address. In other words, if you type:

**nlsadmin -l** *sftig.s*\
*erve* **-t** *sftig* **starlan**

then the address file for the listener will be in an invalid state and the listener will listen on names you are not expecting (namely, *sftig.s* and *erve*).

Do not break the address between two lines.

When **nlsadmin** has trouble locating a *net_spec* or a database file, two error messages are produced: *net_spec xxx invalid* or *net_spec xxx not found*. Both indicate that something is wrong (either the *net_spec* is invalid, or its corresponding file(s) are missing).

## 3.3 STRCLEAN

When **strclean** is used to remove *error.** files, there is no warning on failure. If the directory is not accessible to the user, the exit code indicates success even though it failed.

Do not rely on the exit codes of **strclean.** It may be good practice to verify that files have been removed properly after using this command.

## 3.4 STREAMS

A race condition exists in clone opens from different inodes. This problem exists when two or more disk inodes with the major of the clone device and equal minors are being opened at the same time. If the window is hit, then another open after the first open may bypass the clone device entirely, thus failing. For example, if */dev/node1* was major 63 and minor 57, and */dev/node2* was also major 63 and minor 57, and if they were two different inodes, then simultaneous opens of the two devices may result in failure of the second open.

If two or more separate files are needed on disk, they should be created as links to one disk inode, thereby closing the window. In the above example, */dev/node2* should be linked to */dev/node1* instead of being a separate inode.

### 3.5 SYSDEF

If there is not enough memory to allocate the buffers for streams, the operating system does not allocate any. However, **sysdef** reports that the number of streams buffers is the same as the amount requested in the master file, even though it is not.

In this case, the **strstat** option of **crash**(1M) can be used to accurately reflect the number of streams buffers allocated and free.

### 3.6 TIRDWR

The following problem occurs if **TIRDWR** is pushed on the stream: during the closing of a stream, the **TIRDWR** module may sometimes hang the process while waiting for a disconnect acknowledgement from the transport provider. This problem may show up when using **cu** across the network or when the server process and the client process exit at the same time.

### 3.7 T_SND

Invoking the **t_snd** routine with the **nbytes** argument set to -1 causes it to send an improperly structured message to the transport provider. More specifically, **t_snd** will call **putmsg**(2) with a data size of -1, which will cause **putmsg** to send down a Transport Interface message with only the control part and no data part. This is not a legal Transport Interface message.

Do not use a byte count of -1.

### 3.8 UUTRY

When you are using the Basic Networking Utilities over a transport provider, if a remote system listens on an address different from that in the local *Systems* file, trying to **Uutry** to it results in the following error message:

```
Called failed: NO DEVICES AVAILABLE
```

This does not imply that there are no available devices on the local system. However, this does imply that **Uutry** has failed after opening a device and before achieving a connection.

This failure could be caused by a variety of problems including no devices available on the local system or the address in the *Systems* file being incorrect. To see the local devices that are in use, type **uustat -p**.

# Chapter 4

# DOCUMENTATION

## 4.1 OVERVIEW

The following documents are provided with the Networking Support Utilities:

*GENIX V.3 Networking Support Utilities Notes*

*GENIX V.3 STREAMS Primer*

The following Network Support Utilities documents are optionally orderable:

*GENIX V.3 STREAMS Programmer's Guide*

*GENIX V.3 Networking Guide*

For further information on additional documentation for GENIX V.3, see the *Product Overview*.

## 4.2 ORDERING INFORMATION

Additional copies of any document or optional documents can be ordered by contacting your local National Semiconductor sales representative.

# INDEX

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