HP 9000 Networking

HP-UX SNAplus2 Installation Guide

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Preface

This manual describes how to install the following Hewlett-Packard SNAplus2 products for the HP-UX operating system:

- SNAplus2 Link for Series 700 and 800
- SNAplus2 3270/3179G for Series 700 and 800
- SNAplus2 API for Series 700 and 800
- SNAplus2 RJE for Series 700 and 800

The information in this manual covers the hardware and software requirements for installing and using these products, the product files that should be installed, how to start the SAM SNAplus2 Installation program, and how to verify your system after installation.

The SAM SNAplus2 Installation program replaces the INSTALL_SNAP installation script used in previous releases and makes documenting the step-by-step instructions on installing SNAplus2 and the link components no longer necessary.

The SNA concepts, previously documented in this manual, is now part of the HP-UX SNAplus2 CBT (computer-based training). This training package is on CD-ROM for the PC. It is offered as an option with the SNAplus2 manuals.

Audience

This manual addresses the system administrator responsible for installing the SNAplus2 products on an HP 9000 SNA data communications system, and assumes that the system administrator has knowledge of the following:

- SNA data communications
- The HP-UX operating system environment

Refer to the section “Profile of a System Administrator Installing SNAplus2” in Chapter 1 for more information.

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Installation Requirements

Installing and using SNAplus2 products on your HP 9000 system requires certain hardware and software. This chapter describes the following:

- SNAplus2 product structure
- hardware and software requirements for each SNAplus2 product
- profile of a system administrator installing SNAplus2

SNAplus2 Product Structures

The following is a list of SNAplus2 products and their product structures.

SNAplus2 Link, which is available for Series 700 and Series 800, consists of the following product components:

- SNAplus2 Link transport software
- SDLC driver software
- SNA over X.25 classic software
- SNA over X.25 streams-based software
- SNA over Token Ring, 802.3 (Ethernet), or FDDI software

SNAplus2 APPN End Node, which is available for the Series 700 and Series 800 computers, adds End Node capabilities to the SNAplus2 Link Product.

SNAplus2 3270, which is available for Series 700 and Series 800, consists of the following product components:

- The 3270 emulation program including Native Language Support (NLS)
- The High-Level Language Application Programming Interface (HLLAPI), which is an API that allows an application to interact with a host system 3270 display application
- Motif interface software

SNAplus2 API, which is available for Series 700, and Series 800, consists of the following product components:

- The Advanced Program-to-Program Communication (APPC) software, which is the LU 6.2 API
- The LU Application Programming Interface (LUA), also known as LU0
- The Common Service Verbs (CSV) API
- The Network Management API (NM-API), which is the API that communicates with NetView

SNAplus2 RJE provides the functions of an IBM 3770 allowing communications with host Job Entry Subsystems. It is available for Series 700 and Series 800 and consists of the following product components:

- The RJE job spool commands
- The RJE workstation control and status commands
- The RJE console commands
- The RJE Style File Customization Program

SNAplus2 3179G, which is available for Series 700 and Series 800, consists of the 3179G emulation program.

The term **SNAplus2 Presentation Services** products is sometimes used when talking about all of the products that run over the SNAplus2 Link product. These products are SNAplus2 3270, SNAplus2 API, SNAplus2 RJE, and SNAplus2 3179G.

NOTE: For memory requirements for all SNAplus2 products, contact your Hewlett-Packard sales representative.

For information about the functions and features of each SNAplus2 product, see the *HP-UX SNAplus2 Administration Guide*.

SNAplus2 Link Hardware and Software Requirements

Certain hardware and software requirements must be met on the SNA remote system. This section describes the SNAplus2 Link hardware and software requirements for the remote system.

Host System Hardware

SNAplus2 Link requires the following IBM host system hardware:

- An IBM System/370-compatible mainframe (for example, Model 370, 43xx, and ES9000)
- An IBM 37xx-compatible communications controller that supports an SNA line, or an IBM 3172 Interconnect Controller.

Host System Software

SNAplus2 Link requires the following IBM host system software:

- MVS/SP, MVS/XA, MVS/ESA, DOS/VSE, or VM operating system
- ACF/VTAM telecommunications access method
- ACF/NCP network control program for 37xx or ICP for 3172

AS/400 System Hardware

SNAplus2 Link requires an SDLC or Token Ring communications controller card installed on an IBM AS/400 computer system.

AS/400 System Software

SNAplus2 Link requires an OS/400 operating system (all SNA-related software is included within the OS/400 operating system).

HP will support certain versions, releases, modifications and PTF levels of the remote system software. Your Hewlett-Packard sales representative can determine whether SNAplus2 Link and associated HP-UX SNAplus2 Presentation Services products can be supported with your particular remote system configuration.

HP 9000 Hardware

SNAplus2 Link requires the following HP 9000 hardware:

- An HP 9000 Series 700 or Series 800 computer system
- 18.8 MB of disk space for a Series 700 or 800
- A physical link to the SNA remote system, such as a pair of compatible modems, a modem eliminator, or a LAN connection.
- A Programmable Serial Interface (PSI) card and available slot if using SDLC. Note that for a Series 700, an EISA PSI upgrade kit might also be needed.

  You may also use SDLC over the ACC SDLC accessory product.

Running SNAplus2 Link in a client/server environment requires additional LAN/9000 Series 700 Link or LAN/9000 Series 800 Link hardware components, including the LAN interface card.

Running SNAplus2 Link using QLLC requires X.25 hardware including a PSI card.

Running SNAplus2 Link using Token Ring, 802.3/Ethernet, or FDDI requires hardware for each link type.

HP 9000 Software

SNAplus2 Link requires the HP-UX operating system (release B.10.10 or later).

Running SNAplus2 Link in a client/server environment requires additional LAN/9000 Series 700 Link or LAN/9000 Series 800 Link software components, including ARPA/Berkeley Sockets.

Running SNAplus2 Link using QLLC requires X.25 software.

Running SNAplus2 Link using Token Ring, 802.3/Ethernet, or FDDI requires software for each link type.

Optional - Running **`xsnapadmin`**, the configuration and management GUI, requires the following:

- Motif interface software
- bit-mapped display to run X11
- HP-HIL Mouse

SNAplus2 APPN End Node

The SNAplus2 APPN End Node requires the same hardware and software requirements as the SNAplus2 Link.

SNAplus2 3270/3179G Hardware and Software Requirements

The SNAplus2 3270/3179G hardware and software requirements for your HP 9000 are described below.

HP 9000 Hardware

SNAplus2 3270/3179G requires the following HP 9000 hardware:

- An HP 9000 Series 700 or Series 800 computer system
- 6.8 MB of disk space beyond the requirements of other applications for a Series 700 or 800

Running SNAplus2 3270/3179G in a client/server environment requires additional LAN/9000 Series 700 Link or LAN/9000 Series 800 Link hardware components, including the LAN interface card.

HP 9000 Software Requirements

SNAplus2 3270/3179G requires the HP-UX operating system (release B.10.10 or later) with NLS dependency.

Running SNAplus2 3270/3179G in a client/server environment requires the additional ARPA Services/9000 for the Series 700 or Series 800 software.

Optional:

Running SNAplus2 3270/3179G with Native Language Support (NLS) requires the following:

- Native Language Support (B1864) (part of the HP-UX operating system.) This includes NLS libraries and routines
- Native Language I/O (B2200) in order to have the proper fonts

Running **`xsnapadmin`**, the configuration and management GUI, requires the following:

- Motif interface software
- bit-mapped display to run X11
- HP-HIL Mouse

SNAplus2 API Hardware and Software Requirements

The SNAplus2 API hardware and software requirements for your HP 9000 are described below.

HP 9000 Hardware

SNAplus2 API requires the following HP 9000 hardware:

- An HP 9000 Series 700 or Series 800 computer system
- 1.5 MB of disk space beyond the requirements of other applications for a Series 700 or 800

Running SNAplus2 API in a client/server environment requires additional LAN/9000 Series 700 Link or LAN/9000 Series 800 Link hardware components, including the LAN interface card.

HP 9000 Software Requirements

SNAplus2 API requires the following HP 9000 software:

- HP-UX operating system (release B.10.10 or later)
- AT&T Signaling Library (LibV3.a)

Running SNAplus2 API in a client/server environment requires the additional ARPA Services/9000 for the Series 700 or Series 800 software.

Optional - Running **`xsnapadmin`**, the configuration and management GUI, requires the following:

- Motif interface software
- bit-mapped display to run X11
- HP-HIL mouse

SNAplus2 RJE Hardware and Software Requirements

The SNAplus2 RJE hardware and software requirements for your HP 9000 are described below.

HP 9000 Hardware Requirements

SNAplus2 RJE requires the following HP 9000 hardware:

- An HP 9000 Series 700 or Series 800 computer system
- 1.9 MB of disk space beyond the requirements of other applications for a Series 700 or 800

Running SNAplus2 RJE in a client/server environment requires additional LAN/9000 Series 700 Link or LAN/9000 Series 800 Link hardware components, including the LAN interface card.

HP 9000 Software Requirements

SNAplus2 RJE requires the following HP 9000 software:

- HP-UX operating system (release B.10.10 or later)

Running SNAplus2 RJE in a client/server environment requires the additional ARPA Services/9000 for the Series 700 or Series 800 software.

Optional - Running **`xsnapadmin`**, the configuration and management GUI, requires the following:

- Motif interface software
- bit-mapped display to run X11
- HP-HIL mouse

Profile of System Administrator Installing SNAplus2

In order to successfully install the SNAplus2 products, you need knowledge in the following areas:

SNA Networks

Installation requires the following basic SNA knowledge:

- interface nodes
- network routers
- NAUs
- PUs
- LU
- link types
- IBM hardware and software
- ability to configure interface nodes and network routers

Application Environment

You must understand the following:

- why the SNAplus2 products are being installed
- how the users are going to use SNAplus2
- how SNAplus2 fits into the network solution

Some knowledge of using 3270, RJE, and APPC and the corresponding programs on the host side such as CICS, TSO, and JES would be helpful.

Hardware Configuration

You must meet the following requirements:

- be familiar with HP 9000 Series 700 and 800 systems
- be able to install interface cards (PSI, EISA, ACC)
- be able to shutdown and restart the system
- be able to configure a modem (for X.25 and SDLC) and Token Ring (for Token Ring)
- know peripheral hardware (like terminals) capabilities
- understand client/server topologies and subnets
- know what products will be on the client or server
- understand IBM protocols to configure the following:

  LAN IP addresses

  physical link level configuration parameters (port number, MAC addresses)

  link level communications
- know internode protocols (SDLC vs. Token Ring)
- know interface protocols (3270)

HP-UX System Administrator Experience

You must have a user-level knowledge of HP-UX commands, the HP-UX file system, and be familiar with the following:

- running SAM (to add users and install SNAplus2)
- running LAN and PSI diagnostics on an HP-UX system

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Installing SNAplus2

This chapter begins the installation procedure. It describes the product files for SNAplus2, gives some migration information, briefly describes updating NFS Diskless clients, and introduces the SAM SNAplus2 Installation Program.

The following flowchart shows the process from installation to configuration.

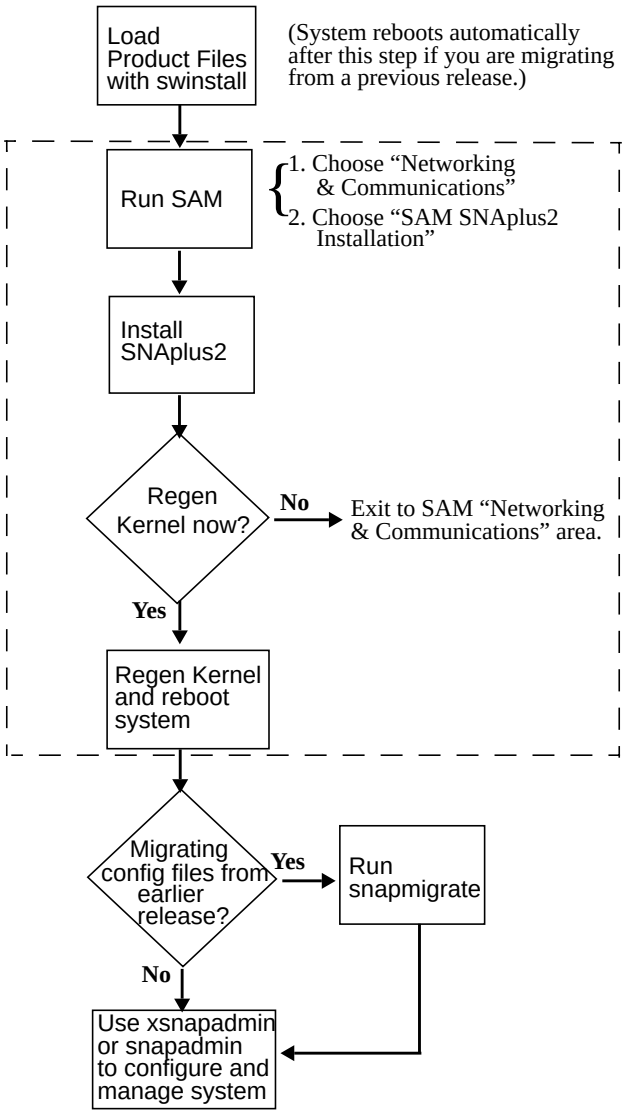

Figure 1 **The Installation Process**

Loading SNAplus2 Product Files

After you determine that you have the hardware and software required for the SNAplus2 products you are installing, you can begin loading the product files. Be sure that you have the appropriate drive—DAT, CD-ROM, magnetic tape, or cartridge—attached to your system to read the product media. This drive should be configured on your system with an entry in the **/dev** directory.

NOTE: The procedure for loading the products depends on the media containing the files. If you are loading the files from CD-ROM, you can load the files for all of your products at one time. However, if you are loading the files from magnetic tape, a cartridge, or a digital audio tape (DAT), you might have to load the files for only one product at a time.

To load the product files into the appropriate directories on your system, use the **/usr/sbin/swinstall** program. For specific instructions on loading the product files using **swinstall**, refer to the *HP Software Distribution Utilities (SD) User's Guide.*

Once you have loaded the SNAplus2 product files, you can use the SD command, **swverify**, to do the following:

- verify whether SNAplus2 is compatible with the hosts on which the software was installed.
- verify that all dependencies (prerequisites) are being met for installed software.
- report missing files, check all file attributes including permissions, file types, size, checksum, mtime, link source, and major/minor attributes.

Product File Information

You will need to load the following product files for each product you install:

Table 1

Product Files	SNAplus2 Products
SNAplus2-Link	SNAplus2 Link
SNAplus2-3270	SNAplus2 3270 and 3179G
SNAplus2-API	SNAplus2 API
SNAplus2-RJE	SNAplus2 RJE
SNAplus2-Common	Required files for all SNAplus2 products
SNAplus2-EndNode	Adds APPN End Node support to SNAplus2-Link

NOTE: Remember, if you loaded the files from CD-ROM, and you specified all of your products, you do not have to repeat the above procedure. However, if you loaded from a magnetic tape, a cartridge, or a DAT, you must repeat this procedure for each product that has not yet been loaded.

The following table describes the SNAplus2 filesets that are included in each SNAplus2 product:

Table 2

Product Files	Filesets	Description
SNAplus2-End-Node	SNAP2-EN	Adds APPN End Node support to the SNAplus2-Link product
SNAplus2-Link	SNAP2-LINK	Supports communication over SDLC, QLLC, and LAN links
	SNAP2-PC	Provides support for PC clients
SNAplus2-3270	SNAP2-3270	3270 and 3179G terminal emulators
	SNAP2-3270-MAN	Man pages for 3270 and 3179G
SNAplus2-API	SNAP2-API	APPC, CPI-C, LUA, NOF, and MS APIs
	SNAP2-API-MAN	Man pages for the SNAplus2 APIs
SNAplus2-RJE	SNAP2-RJE	RJE files
	SNAP2-RJE-MAN	Man pages for RJE
SNAplus2-Common	SNAP2-ADMIN	Administration commands
	SNAP2-ADM-MAN	Man pages for administration commands
	SNAP2-CORE	Core run-time files
	SNAP2-CORE-MAN	Man pages for core files
	SNAP2-MIGRATE	For customers migrating from a previous version of SNAplus
	SNAP2-NOTES	Release Notes
	SNAP2-NLS	Files for Japanese Language Messages

SNAP2-MIGRATE Fileset

The SNAP2-MIGRATE fileset, which is included in the SNAplus2-Common product, converts, or migrates, your systems from a previous release of SNAplus to the SNAplus2 release. This fileset performs several steps when it is installed:

1. Installs special programs that are backwards-compatible with commands that were available in SNAplus.
2. Converts the **`/etc/opt/sna/sna.net`** file to the SNAplus2 binary format.
3. Removes obsolete SNAplus files from the system.
4. Removes all SNA-related tokens from the **`/stand/system`** file.
5. Rebuilds the kernel.
6. Reboots the system.

After the SNAP2-MIGRATE fileset is installed, the kernel will not contain any SNAplus2 components. You must run SAM SNAplus2 Installation to add the SNAplus2 environment and link components to the kernel.

`Swinstall` will install the SNAP2-MIGRATE fileset *only* if your system contains a previous release of SNAplus. Systems that are installing SNAplus2 for the first time will not need this fileset. The **`checkinstall`** script determines if the fileset is actually required on the system during installation. If it is not required, the **`checkinstall`** script instructs **`swinstall`** to skip the SNAP2-MIGRATE fileset.

Therefore, if you see a message in the **`swinstall`** log that says the SNAP2-MIGRATE fileset is being skipped because it is not needed on your system, you can safely ignore the message. If the SNAP2-MIGRATE fileset is not installed, you will be able to finish the installation process without rebuilding the kernel and rebooting the system *twice*.

Updating Software on NFS Diskless Clients

The process for updating software on NFS diskless clients is accomplished by running SAM on the NFS server and selecting “Software Management”, and then selecting “Install Software to Cluster.” Clients must not be using that software while it is being updated. Therefore, if an application that you wish to update is being used on the client, that application must terminate. For some applications, it may be necessary to shut down the client.

NOTE: Neither SNAplus2 nor SNAplus supports multiple NFS diskless HP-UX S700 operating systems from the same NFS HP-UX S700 server.

For additional information on NFS diskless clients, refer to the *NFS Diskless Concepts and Administration Guide.*

For information on using **`swinstall`**, refer to the *HP Software Distribution Utilities (SD) User’s Guide*.

Introducing SAM SNAplus2 Installation

SAM SNAplus2 Installation is the program used to add the SNAplus2 environment and link components to an HP-UX 10.X system. It has a SAM-based GUI (Graphical User Interface) that is part of SAM (System Administration Manager) and works with other SAM common routines. This program allows you to add, modify and remove the SNAplus2 Environment and all of the link components using only three primary screens.

NOTE: If you are currently using QLLC with the classic X.25 software on the HP 9000 Series 800 system, and you decide to migrate to the streams-based X.25 software, you must use SNAplus2 Installation to remove QLLC, and then remove the original X.25 software before installing the streams-based software. After you install the X.25 streams-based software, you will need to use SNAplus2 Installation again to add QLLC for the new software.

The Installation Process

Before you install SNAplus2, you must have installed the following on your HP 9000:

- HP-UX operating system
- X.25 software if you are installing QLLC
- Token Ring software if you are installing SNAplus2 over Token Ring
- FDDI software if you are installing SNAplus2 over FDDI
- ACC card if you are installing SDLC over ACC.
- ASX if you are installing Native Language Support

You will also need the following:

- the name of the **Master Server** (the server that holds the master copy of the configuration file) if the machine is to be a server.
- the name of the **Connection Server** (the server in the network to which the client will connect) if the machine is to be a client.
- the name of the **Domain** where the current system resides

To install the SNAplus2 Environment:

1. Run SAM.
2. Choose “Networking and Communications”.
3. Choose “SNAplus2 Installation”

For help on the installation, use the SNAplus2 Installation online help.

After you have installed SNAplus2, verify your installation by checking that the proper libraries and product files are present. This process is described in Chapter 3.

Determine whether you need to change any information in the terminfo database (especially if non-HP terminals are used). This task is described in Chapter 4.

NOTE: Online manual entries (man pages) for all of the SNAplus2 products are in the directory **`/opt/sna/share/man`**. In order to view these man pages, you must set the following environment variable:

```
MANPATH=/opt/sna/share/man:$MANPATH
```

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Verifying SAM SNAplus2 Installation Process

This chapter lets you verify the files that should be on your system, tells you how to build the kernel manually, if necessary, and check the status of SNAplus2.

Verifying your Installation

Before you follow the steps in this chapter, check the following:

- If you are using a QLLC link, make sure that X.25 is installed and configured into your system.
- If you are using a Token Ring link, make sure that Token Ring is installed and configured into your system.
- If you are configuring SDLC links, make sure that PSI cards are installed.

Under most circumstances, the kernel is generated automatically when SNAplus2 installation is performed in SAM. If this does not happen, check the following:

1. Run **`swverify`** and investigate any errors.
2. Check that you have installed the SNAplus2-Link product:

   `swlist SNAplus2-Link`
3. Save a copy of the system file you will be modifying (usually **`/stand/system`**).
4. Verify that the following statements are included in the system file (default is **`/stand/system`**.

Table 3 System File Driver Statements

sixl	SDLC Streams driver
sixd	Common LAN driver
sixm	Common LAN driver
sixq	Streams-based and classic QLLC
sixp	Streams-based and classic QLLC
sixx	QLLC for Classic X.25 only
sixt	SNA Trace Device driver
sixr	Node/Router driver and Client driver
netisr_priority 100	QLLC, except on an S712
psi1	SDLC S700 only
psi0	SDLC S800 only
driver hw_path psi0	SDLC S800 only

Building the Kernel Manually

If all problems have been fixed, the kernel can be built manually or you can rerun SAM SNAplus2 Installation (recommended). To build the kernel manually, do the following:

1. Type **`cd /stand/build`**
2. Execute the following command:

   `/usr/sbin/mk_kernel -s` ***`system filename`***
3. Save the current kernel as **`/stand/vmunix.prev`** and move the new kernel to **`/stand/vmunix:`**

   `mv /stand/vmunix /stand/vmunix.prev`

   `mv /stand/build/vmunix_test /stand/vmunix`
4. Use **`/usr/sbin/reboot`** to reboot the system. If the system does not boot with the new kernel, reboot using **`/stand/vmunix.prev`** and fix the problem. Refer to the *HP-UX System Administrator Manual* for procedures on rebooting, or the *Solving the HP-UX Problems Manual* for more problem solving information.

Checking SNAplus2 Status

If the new kernel boots successfully, then the SNAplus2 software is probably running. Use the following command to check for the status of SNAplus2 on your system.

`/opt/sna/bin/X11/xsnapadmin`

If the SNAplus2 software is not running, issue the following command to manually start SNAplus2:

`/opt/sna/bin/snap start`

If this command fails, do the following:

1 Check the device files to make sure they exist as shown below:

```
crw-rw-rw- 1 root sna  72 0xOOOO6b Aug 13 15:43 /dev/sna_v5access
crw-rw-rw- 1 root sna 107 0xOOOOOO Aug 13 15:43 /dev/sna_v5router
crw-rw-rw- 1 root sna 110 0xOOOOOO Aug 13 15:43 /dev/sna_trace
crw-rw-rw- 1 root sna  72 0xOOOO6d Aug 13 15:43 /dev/sna_SDLC
crw-rw-rw- 1 root sna  72 0xOOO075 Aug 13 15:43 /dev/sna_QLLC,
crw-rw-rw- 1 root sna  72 0xOOOO6c Aug 13 15:43 /dev/sna_NDG
crw-rw-rw- 1 root sna  72 0xOOO076 Aug 13 15:43 /dev/sna_NMA
```

These device files are created by **`/sbin/init.d/snaplus2`** when the system is booted. In addition, you need the following device files for SDLC:

PSI device files for S800:

```
crw-rw-rw- 1 bin sna 47 0xOIO2Oi Aug 13 15:43 /dev/psi0_index#
```

PSI device files for S700:

```
crw-rw-rw- 1 bin sna 59 0xOIO2Oi Aug 13 15:43 /dev/psi1_index#
```

`i` starts at 1 and is increased incrementally according to the number of device files.

`Index#` starts at 0 and is increased incrementally according to the number of device files.

I is the instance number for the driver and is associated with a specific hardware path. It is obtained from executing **`/sbin/ioscan`**.

2 Check that the following files are on your system. These files should have been installed with **`swinstall`**:

`/sbin/init.d/snaplus2`

`/etc/rc.config.d/snaplus2`

`/sbin/rc2.d/S680snaplus`

`/sbin/init.d/snaplus2` is the startup script which is executed at boot time to create SNAplus2 device files. It has the ability to start the SNAplus2 daemon, local node and **`snapinetd`** process. *Do not change this script.*

/etc/rc.config.d/snaplus2 contains the following environment variables that control the startup script. START_SNAPLUS and START_SNANODE are set when the SNAplus2 components are installed with SAM.

- START_SNAPLUS

  When this environment variable is set to 1, the startup script will start the SNAplus2 daemon. The default value is 0.

- START_SNANODE

  When this variable is set to 1, the startup script will start the SNAplus2 local node. This variable should only be set to 1 on systems that have SNAplus2-Link installed. The default value is 0.

- START_SNAINETD

  When this variable is set to 1, the startup script will stop the Internet Services daemon, start the **snapinetd** process, then restart the Internet Services daemon. This variable should only be set to 1 on systems that have SNAplus2-Link installed and have TN3270 Server configured to use port 23. The default value is 0.

/sbin/rc2.d/S680snaplus is a soft link to **/sbin/init.d/snaplus2**. HP-UX uses this link for executing the SNAplus2 startup script.

3 Check the **/etc/opt/sna/sna.ini** file using any text editor to see if the following entries are present:

SLIM BSD *broadcast netmask* (for back-level support)
DOWNLOAD /dev/psi(0/1)_*index* path=*hw_path* (for SDLC)

4

The terminfo Database

After you have completed the installation, you need to determine whether you must change any information in the **`terminfo`** database (especially if non-HP terminals will be used with the SNAplus2 products).

Altering Terminfo Database

The SNAplus2 products will run on many terminal types, and the **/opt/sna/terminfo** database tells SNAplus2 how to communicate with them. This is done by using the information in the terminfo entry for each terminal type.

NOTE: Most terminfo entries provided for HP terminals should need very little altering. However, the entries provided for non-HP terminals may require altering. If you need to alter terminfo, do it after all the products are installed. See the HP-UX Reference for more information about altering terminfo.

Input and Output Handling

To handle all input and output correctly, the SNAplus2 products use the terminfo entry named **hpSNAplus**. This entry is the only one provided with the SNAplus2 products; all other terminfo entries are provided as part of HP-UX operating system. The **hpSNAplus** entry is for all HP terminals that have softkey labels and support the line-drawing character set.

If you need to alter the terminfo entry for an HP terminal or a non-HP terminal that supports line-drawing characters, a lookup table, **/etc/opt/sna/snaptermfile**, provides a mechanism to change the default $TERM value to another value that supports the line-drawing characters. When SNAplus2 is started on an ASCII terminal interface, SNAplus2 searches for an entry in **/etc/opt/sna/snaptermfile** based on the current $TERM value. If an entry is found that matches, the line-drawing characters are used on the interface. If an entry is not found that matches, the "_" (underbar) is used to represent horizontal lines and the "|" (vertical bar) is used to represent vertical lines on the screen.

If you find that your $TERM value does not support the line-drawing character set, edit the **snaptermfile** file and redirect the $TERM value to **hpSNAplus**. (For example, **hpterm=hpSNAplus**:). Use an editor to change the **/etc/opt/sna/snaptermfile** default values. These are shown on the following pages.

snaptermfile

The **snaptermfile** has the following format:

Current TERM=New TERM:*Keyword=Setting*:*Keyword=Setting*:.....

Where:

Current TERM is the $TERM value you want to change. *Current TERM* must begin on a new line.

New TERM is the $TERM value that you want the SNAplus2 products to use. This is usually **hpSNAplus** for HP terminals.

If *New TERM* does not exist, then $TERM will not be changed.

Keyword is one of the following:

Table 4 **snaptermfile Default Values**

UL = Upper Left Box Character	default = _
UR = Upper Right Box Character	default = -
BL = Bottom Left Box Character	default = |
BR = Bottom Right Box Character	default = |
HB = Horizontal Bar Character	default = _
VB = Vertical Bar Character	default = |
LT = Left Tee Character	default = |
RT = Right Tee Character	default = |
UA = Up Arrow Character	default = ^
DA = Down Arrow Character	default = v
SB = Scroll Box Character	default = #
EL = Scroll Box Elevator Character	default = Dim/Inverse

If a Keyword is missing then the defaults are used.

Setting is the *single character* to set the box characters defined by the previous keyword. The following modifiers are supported:

\A = Select Alternate Character Set (if supported by term)
\B = Bold Character (if terminal supports Bold)
\D = Dim Character (if terminal supports Dim)
\I = Inverse Character (if terminal supports Inverse)
\S = Standout Character (Curses determines bold or inverse)
\\ = The "\" character
\: = The ":" character when ":" is last in the line

NOTE: All Keywords after "\:" are ignored, therefore if "\:" is necessary in an entry, then they must be the last characters in the line.

The maximum line length is 500 characters.

All lines beginning with "#" are considered comments.

Lines must not be broken; however, multiple entries are supported.

Examples

The following are hp2392 terminals with thin-line drawing character set. The first entry is an example of how multiple entries can be used to shorten the line length.

```
2392=hpSNAplus:UR=\At:UL=\Ar:BL\Af:BR=\Ag:HB=\A,
2392=hpSNAplus:LT=\A5:RT=\A6:S=\A):EL=\D\I:VB=\A.
2392a=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HB=\A,:LT=\A5:RT=\
A6:SB=\A):EL=\D\I:VB=\A.
2392A=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HB=\A,:LT=\A5:RT=\
A6:SB=\A):EL=\D\I:VB=\A
hp2392=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HB=\A,:LT=\A5:RT=
\A6:SB=\A):EL=\D\I:VB=\A
hp2392A=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HB=\A,:LT=\A5:RT
=\A6:SB=\A):EL=\D\I:VB=\A
```

The following are hp700/92 terminals with thick line-drawing character set (notice "\:" is last)

```
70092=hpSNAplus:UR=\Aw:UL=\Aq:BL=\Aa:BR=\As:HB=\A;:LT=\A1:RT=\
A2:SB=\A):EL=D\I:VB=\A\:
```

```
70092a=hpSNAplus:UR=\Aw:UL=\Aq:BL=\Aa:BR=\As:HB=\A;:LT=\A1:RT=
\A2:SB=\A):EL=D\I:VB=\A\:
```

```
70092A=hpSNAplus:UR=\Aw:UL=\Aq:BL=\Aa:BR=\As:HB=\A;:LT=\A1:RT=
\A2:SB=\A):EL=D\I:VB=\A\:
```

The following terminals have the HP line-drawing character set and have been tested. (Thin lines used below).

```
2393=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HP=\A,:LT=\A5:RT=\A
6:SB=\A):EL=\D\I:VB=\A.
```

```
2393a=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HP=\A,:LT=\A5:RT=\
A6:SB=\A):EL=\D\I:VB=\A.
```

```
2393A=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HP=\A,:LT=\A5:RT=\
A6:SB=\A):EL=\D\I:VB=\A.
```

```
hp2393=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HP=\A,:LT=\A5:RT=
\A6:SB=\A):EL=\D\I:VB=\A.
```

```
hp2393a=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HP=\A,:LT=\A5:RT
=\A6:SB=\A):EL=\D\I:VB=\A.
```

```
hp2393A=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HP=\A,:LT=\A5:RT
=\A6:SB=\A):EL=\D\I:VB=\A.
```

```
2397=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HP=\A,:LT=\A5:RT=\A
6:SB=\A):EL=\D\I:VB=\A.
```

```
2397a=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HP=\A,:LT=\A5:RT=\
A6:SB=\A):EL=\D\I:VB=\A.
```

```
2397A=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HP=\A,:LT=\A5:RT=\
A6:SB=\A):EL=\D\I:VB=\A.
```

```
hp2397=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HP=\A,:LT=\A5:RT=
\A6:SB=\A):EL=\D\I:VB=\A.
```

```
hp2397a=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HP=\A,:LT=\A5:RT
=\A6:SB=\A):EL=\D\I:VB=\A.
```

```
hp2397A=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HP=\A,:LT=\A5:RT
=\A6:SB=\A):EL=\D\I:VB=\A.
```

The following terminals appear to have the HP line-drawing character set but have not been tested. (Thin line used below).

```
2394=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HB=\A,:LT=\A5:RT=\A
6:SB=\A):EL=\D\I:VB=\A.

2394a=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HB=\A,:LT=\A5:RT=\
A6:SB=\A):EL=\D\I:VB=\A.

2394A=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HB=\A,:LT=\A5:RT=\
A6:SB=\A):EL=\D\I:VB=\A.

hp2394=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HB=\A,:LT=\A5:RT=
\A6:SB=\A):EL=\D\I:VB=\A.

hp2394a=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HB=\A,:LT=\A5:RT
=\A6:SB=\A):EL=\D\I:VB=\A.

hp2394A=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HB=\A,:LT=\A5:RT
=\A6:SB=\A):EL=\D\I:VB=\A.

hp2624=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HB=\A,:LT=\A5:RT=
\A6:SB=\A):EL=\D\I:VB=\A.

2624a=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HB=\A,:LT=\A5:RT=\
A6:SB=\A):EL=\D\I:VB=\A.

hp2624a=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HB=\A,:LT=\A5:RT
=\A6:SB=\A):EL=\D\I:VB=\A.

2624p=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HB=\A,:LT=\A5:RT=\
A6:SB=\A):EL=\D\I:VB=\A.

hp2624p=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HB=\A,:LT=\A5:RT
=\A6:SB=\A):EL=\D\I:VB=\A.

150=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HB=\A,:LT=\A5:RT=\A6
:SB=\A):EL=\D\I:VB=\A.

150a=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HB=\A,:LT=\A5:RT=\A
6:SB=\A):EL=\D\I:VB=\A.

150A=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HB=\A,:LT=\A5:RT=\A
6:SB=\A):EL=\D\I:VB=\A.

hp150=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HB=\A,:LT=\A5:RT=\
A6:SB=\A):EL=\D\I:VB=\A.

hp150a=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HB=\A,:LT=\A5:RT=
\A6:SB=\A):EL=\D\I:VB=\A.

hp150A=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HB=\A,:LT=\A5:RT=
\A6:SB=\A):EL=\D\I:VB=\A.

70094=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HB=\A,:LT=\A5:RT=\
A6:SB=\A):EL=\D\I:VB=\A

70094A=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HB=\A,:LT=\A5:RT=
\A6:SB=\A):EL=\D\I:VB=\A.

70094A=hpSNAplus:UR=\At:UL=\Ar:BL=\Af:BR=\Ag:HB=\A,:LT=\A5:RT=
\A6:SB=\A):EL=\D\I:VB=\A.
```

These **terminfo** entries may not always have line-drawing characters. Use the defaults.

hp=hpSNAplus:
hpex=hpSNAplus:
hpterm=hpSNAplus:
X-hpterm=hpSNAplus:
300h=hpSNAplus:
hp300h=hpSNAplus:

vt100 terminals with line-drawing character set loaded into GO:

```
vt100=:UR=\Ak:UL=\A1:BR=\Aj:BL=\Am:HB=\Aq:LT=\At:RT=\Au:SB=\Aa
:EL=\I:VB=\Ax
```

```
vt100-am=:UR=\Ak:UL=\A1:BR=\Aj:BL=\Am:HB=\Aq:LT=\At:RT=\Au:SB=
\Aa:EL=\I:VB=\Ax
```

Unsupported Term Types

The following **terminfo** files are included in the SNAP2-CORE fileset but are *unsupported*. Note that the following **terminfo** files will be generated by the tic command (see the *HP-UX Reference* for more information on the **tic** command).

/usr/share/lib/terminfo/h/hpsna

/usr/share/lib/terminfo/h/hpsnaplus

/usr/share/lib/terminfo/h/hpSNAplus

/usr/share/lib/terminfo/h/hp2392sna

/usr/share/lib/terminfo/2/2392sna

These **terminfo** entries specify the same **terminfo** file. They are best used with the SNAplus2 ASCII interface on Term0 defined terminals (which include most HP terminals). If an HP terminal has programmable softkeys, it is likely to meet the Term0 definition.

Creating a Non-HP Terminal Entry

You may need to create entries for some non-HP terminals that are used with the SNAplus2 products. For example, the sequence of codes generated when f1 is pressed on a VT100 terminal may differ slightly, depending on which company manufactured the terminal. If you are using VT100s from different manufacturers, you may need to create a new VT100 **terminfo** entry for each manufacturer.

For one manufacturer's VT100, you might create a **terminfo** entry named vt100-A, which contains the capabilities available on that manufacturer's terminal. For the second manufacturer's VT100, you might create a **terminfo** entry named vt100-B, and that entry would contain the capabilities available on the second manufacturer's terminal.

To create a **terminfo** entry, do the following:

1. First, use the **untic** program to create a file that can be modified with an editor.
2. Using the information in tables 8-1 and 8-2, determine which capabilities must be defined in the entry. (For a non-HP terminal, you probably will also have to use information from the manufacturer's documentation for the terminal.)
3. Using the editor of your choice, edit the file you created with **untic** to ensure that it contains the correct information.
4. When the information is complete, use the **tic** program to compile the new terminfo entry from the edited file (see the HP-UX Reference for more information about **terminfo**, **tic**, and **untic**).

To complete the above example of the entries vt100-A and vt100-B, you would specify the following for first manufacturer's VT100 terminal when logging in,

```
set TERM=vt100-A
```

and specify the following for the second manufacturer's VT100 terminal when logging in:

```
set TERM=vt100-B
```

Required and Recommended Functions

In order to use the ASCII interface, your terminal must have certain requirements defined in the HP-UX computer's **`terminfo`** database. The two types of functions to be defined in the **`terminfo`** database are **required** and **recommended**.

Terminals without the required functions cannot be used with the menu interface. (However, they can be used for application programs using the APIs provided with SNAplus2.) Terminals without the recommended functions can be used with the menu interface, but these functions make the screen interface easier to use.

The 3270 emulation program's default keyboard mapping (the mapping between keystrokes on your terminal and the 3270 keys they represent) assumes that your terminal's keyboard has all the required and recommended keys. However, you can always remap a 3270 key to a different keystroke if your terminal does not have the default key.

Any additional keys on your terminal should be included in the **`terminfo`** database if you want to use them in the 3270 emulation program to represent 3270 keys. For example, if you have the function keys f9 - f24, you will probably want to ensure that those keys are defined in the terminfo database for your terminal.

Required Functions

The following table contains the functions that must be defined in the terminfo database. Also included are the capabilities SNAplus2 uses to define each function:

Table 5 **Required Terminal Functions**

Function	Capabilities
Screen size Note: The defined screen size must be at least 80 columns by 24 rows	cols and lines
Cursor addressability	cup (for example)
f1 function key Note: This key is used to invoke the online help facility	kf1 (the last character is the number “1”)
up arrow key	kcuu1 (the last character is the number “1”)
down arrow key	kcud1 (the last character is the number “1”)
PageUp key Note: This key is required only for the snapbrowse program (but is recommended for other programs (see “Recommended Functions” below).	kpp or ka3
PageDown key Note: This key is required only for the snapbrowse program (but is recommended for other programs (see “Recommended Functions” below).	knp or kc3

Recommended Functions

The following table contains the functions that, when defined in the terminfo database, make the screen interfaces easier to use. Also included are the capabilities SNAplus2 uses to define each function. Note that these functions are not required, but recommended: The screen interfaces can still be used even if these functions are not defined in terminfo.

Table 6 Recommended Terminal Functions

Function	Capabilities
Alternate character mode Note: This function is used to draw the menus and dialog boxes. If it is not supported, the menu interface programs can still be used, but the menus and dialog boxes will be drawn with characters such as - and + instead of solid lines.	smacs and rmacs
f2 through f8 or higher (for example, f20) function keys Note: Most HP terminals provide only eight function keys. However, some HP terminals and non-HP terminals provide more than eight. These extra function keys are used as accelerator keys in the snapconfig program and the 3270 Control menu, to provide a “short-cut” to certain dialogs or functions. If the user's terminal does not have these keys, the IBM 3270 keys can be remapped to different keystrokes. However, note that the accelerator keys cannot be remapped, but the same dialogs or functions can be reached by using the main screen menus.	kf2 through kf8
left arrow key Note: This key is used for moving within edit boxes and for selecting buttons from radio groups.	kcub1 (the last character is the number “1”)
right arrow key Note: This key is used for moving within edit boxes and for selecting buttons from radio groups.	kcuf1 (the last character is the number “1”)
Home key Note: This key can be used to move quickly to the first or last entry in a list box, or to the first or last page of a file in the snapbrowse program. The up arrow key and down arrow key, or the [PageUp] key and [PageDown] key, can be used instead, but they will be slower.	khome

Table 6 **Recommended Terminal Functions**

Function	Capabilities
End key Note: This key can be used to move quickly to the first or last entry in a list box, or to the first or last page of a file in the snapbrowse program. The up arrow key and down arrow key, or the PageUp key and PageDown key, can be used instead, but they will be slower.	kl1 (the second character is the letter "l" and the last character is the number "1")
Backtab key Note: This key can be used to move backwards through the sequence of items in a dialog box, and it is also the default keystroke for the IBM 3270 Backtab key. Within the menu interface, the keystroke CTRL-B can be used as an alternative to this key. The IBM 3270 Backtab key can be remapped to a different keystroke if this key (Backtab) is not available.	cbt
Insert key Note: This key is used in the 3270 emulation program as the default for the IBM 3270 Insert key. If it is not available, the IBM 3270 key can be remapped to a different keystroke.	kich1 (the last character is the number "1")
Delete key Note: This key is used in the 3270 emulation program as the default for the IBM 3270 Delete key. If it is not available, the IBM 3270 key can be remapped to a different keystroke. The Delete key can also be useful for modifying information in an edit box.	kdch1 (the last character is the number "1")
Backspace key Note: This key can be useful for modifying information in an edit box.	kbs
Clear screen key Note: This key can be used and remapped in the 3270 emulation program.	ked
Clear line key Note: This key can be used and remapped in the 3270 emulation program.	kel (the last character is the letter "l")

A

Tunable System Parameters

This appendix describes the HP-UX tunable system parameters that affect the function of SNAplus2.

System Parameter Defaults

The default values of the tunable system parameters are usually adequate; however, changing the value of one or more of the parameters may be necessary, particularly if many users are using the SNAplus2 products at the same time. Changing the parameters' values should be done only after SNAplus2 has been successfully installed and started using the defaults. The table on the following page shows either the SNAplus2 default value or the SNAplus2 required value of each tunable system parameter that affects SNAplus2.

If you need to change any of the parameters' values, you can use the **`/usr/sbin/sam`** program. This procedure is discussed in the *System Administration Tasks* manual for your HP 9000 system. Generally, you should only increase a parameter's value in order to avoid affecting other applications.

Table 7 **Tunable System Parameter Default Values**

Parameter	Type of Parameter	SNAplus2 Default or Required Value
netisr_priority	Networking	100
semmni	Semaphore related	Increase by (2 x number of concurrent copies of the 3270 emulation program) + (number of sessions configured for HLLAPI).
semmns	Semaphore related	Increase by (2 x number of concurrent copies of the 3270 emulation program) + (2 x number of sessions configured by HLLAPI).
semmnu	Semaphore related	Increase by (number of sessions configured for HLLAPI and CPI-C).
semume	Semaphore related	Recommend value = 10.
shmmni	Shared memory related	Increase by 1 + (number of concurrent copies of the 3270 emulation program) + (number of sessions configured by HLLAPI).
shmseg	Shared memory related	Must be at least 2 + (number of sessions configured for HLLAPI per copy of the 3270 emulation program).

B

Restricting User Access

After the SNAplus2 software has been installed, determine whether user access to the SNAplus2 functions needs to be restricted. This appendix discusses how to restrict access to SNAplus2 functions.

Restricting Access to SNAplus2 Functions

SNAplus2 functions can be divided into two categories: system administrator functions, such as the **xsnapadmin** program, and user functions, such as the 3270 emulation program and the API libraries.

The default setup for SNAplus2 is that the user functions are accessible to all users of the HP-UX system, and that the system administrator functions are accessible only to a restricted group of users. The SNAplus2 installation procedure requires that the system is initially set up in this way. If you need to create a more restricted setup, do this after the software has been installed. See the following section “Restricting Access to SNAplus2 Functions” for more information.

The configure script invoked by the SD program automatically creates a group (in the file **/etc/group**) named **sna**, and within that group, a login named **sna** is also created. All users with the system administrator privilege should be members of the **sna** group, but users who are not required to have the system administrator privilege should not be members.

The default access to SNAplus2 functions can be restricted in two ways:

1 Restrict all functions to a specific group of users.

- Make all SNAplus2 users members of the **sna** group.
- Change the permissions on all files to allow access by only owner and group, and not by others; for example, the 3270 emulation program should have permissions r-xr-x--- and not r-xr-xr-x.

2 Restrict system administrator functions to a single user.

- Set up a single login (for example, sna), in the **sna** group, as the administrator login.
- Make all files associated with system administrator functions (see the list below) owned by this login and not accessible by group or others.

In the following directories, these listed files should be restricted:

/opt/sna/bin	snapconfig snapmigrate snapmigrate2 snapadmin snap snaprunbck snapstopbck **snapconn** **snapstart** **snapstop** **snaplu** **snapman**
/opt/sna/bin/X11	xsnapconfig xsnapadmin

Note that the commands in **bold** are not installed on every system.

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