

Cleo® V6.0.7.19 SSL Quick Start Guide For UnixWare 7

Read this section first!

This Quick Start Guide contains information about installing the 6.0.7.16 version of the Cleo SNA Gateway and the 6.0.7.19 version of the Cleo TN3270/TN5250 software. This version also supports a TN3270 **SSL** connection to a TNSERVER.

Important!

Read this document before installing and using the Cleo software. Refer to your Cleo SNA documentation for additional usage information. If you have questions about installing and using this product, contact Cleo Communications Technical Support between the hours of 8:30 AM and 5:00 PM (EST/EDT) at: (866) 444-2536 or support-en@cleo.com.



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Quick Start Guide Organization

Instructions for installation of three basic types of connections for Cleo V6.0.7.19 are provided in this Quick Start Guide:

- ▶ TN3270 connection over TCP/IP
- ▶ SNA connection over SDLC
- ▶ Appendix A – LAN Network Driver Install
- ▶ Appendix B – DIGI Sync 2000 Install
- ▶ Appendix C – Kernel Tuning
- ▶ Appendix D – Host Configuration Information
- ▶ Appendix E – **tnconfig** Host Configuration Parameters
- ▶ Appendix F – **snaconfig** Host Configuration Parameters
- ▶ Appendix G – Default values for SNA Configuration Files
- ▶ Appendix H – Cleo Utilities

Follow the Guide that describes your network configuration.

For more information, please refer to the Cleo Installation Guide and the Cleo Administration Guide included with your product.

Appendix D contains a questionnaire for obtaining necessary host information.

It is recommended that you obtain this information before you install because some of the this information is required during the install process.

TN3270 Connection Over TCP/IP

Installation of a Cleo Enterprise Networking product requires that you obtain a License file (license.conf) and a 6 Digit Cleo Serial Number. The License file is available from Cleo Communications' Sales Department at (866) 444-2536. The Cleo Serial Number will appear on your Cleo Software shipment. If you do not have a Cleo Serial Number available, please call the Cleo Communications' Sales Department.

Software Prerequisites:

- ▶ UnixWare 7.1.0, 7.1.1 or later

Note: If you are adding or upgrading your SNA connection to a TN3270 connection, please enter the following command:

```
# /opt/sna/bin/sna stop
```

Installing Cleo TN3270

NOTE: These procedures assume you are installing from a CD. However, if you downloaded the product you only need to execute step1 and step 5 with the following change. Replace the mount point of the CD (/mnt) with the complete pathname of the downloaded product (e.g. /tmp/downloaded_file).

1. Login as *root*.
2. Create a mount-point for the CD if one does not already exist.(/mnt is used as the mount-point in these instructions, but any empty directory can be used).

```
# mkdir /mnt
```

3. Insert the CD into the CD-ROM drive.
4. Mount the CD by entering the following command:

```
# /sbin/mount -F cdfs -r /dev/cdrom/cdrom1 /mnt
```

5. Start the installation of the TN3270 Package

```
# pkgadd -d /mnt/cleotn
# pkgadd -d /mnt/cleotdoc      (optional)
# cd /mnt
# ./cleoadd
```

```
You are about to run the cleoadd script, version 6.0.7.19,
which will install utilities for creating configuration files
and installing Cleo license files.
Do you wish to continue? (y/n): y
Installing files in /opt/tn3270/bin and /etc/opt/tn3270 ...
Would you like to install the cleotn license file now? (y/n): y
Please enter the Cleo TN3270 Serial Number
xxxxxxx
Please confirm that you want to change the Cleo TN3270 Serial
Number to the value
          ==> xxxxxxxx <==
?[y/n]
y
Enter the full path name of the license file to install:
/tmp/license.conf
Contents of your license file:

*****
License type:      Temporary
Expiry date:      Thu Jul 20 00:00:00 2000
Shelf life:       <none>
Box name:         <none>
Total sessions:   500
*****

Do you wish to continue? (y/n): y
Stopping the TN3270 License Daemon
Saving old license in license.bak.
The license is now installed in /etc/opt/tn3270.
Starting the TN3270 License Daemon
```

6. After the installation has completed successfully, enter the following commands:

```
# cd /

# /sbin/umount /mnt
```

7. Remove the CD from the drive. Store the CD and the software license file (license.conf) in a safe place. They are needed should you ever re-install the software.

8. Set your path to include the new components with the following commands in your profile:

```
# PATH=$PATH:/opt/tn3270/bin:/opt/tn3270/bin/X11
# export PATH
```

9. Based on your needs, you may be required to increase your kernel resources by tuning some parameters. Please refer to **Appendix C** of this manual and the Cleo Installation Guide Chapter 4.

10. Cleo Communications supplies several optional utility scripts and programs that may be useful for automated kernel tuning, and starting and stopping TN3270 emulators. Please refer to **Appendix H** of this manual for details.

Instructions for Installing or Updating License

NOTE: Cleo Communications will supply the license.conf file to you.

Install the license file (this step can be included with the previous cleoad function)

```
# /opt/tn3270/bin/tnaddlic
```

Enter the full path name of the license file to install:

```
/tmp/license.conf
```

Contents of your license file:

```
*****  
License type:      Temporary  
Expiry date:      Thu Jul 20 00:00:00 2000  
Shelf life:       <none>  
Box name:         <none>  
Total sessions:   500  
*****
```

```
Do you wish to continue? (y/n): y  
Stopping the TN3270 License Daemon  
Saving old license in license.bak.  
The license is now installed in /etc/opt/tn3270.  
Starting the TN3270 License Daemon
```

Instructions for Installing, Displaying, or Modifying Cleo Serial Number

NOTE: Cleo Communications supplies the Cleo Serial Number with your software shipment.

Install the serial number(this step can be included with the previous cleoaddd function)

```
# /opt/sna/bin/cleoserial -w xxxxxx
  Where: xxxxxx is the Cleo 6 digit Serial Number
```

Please confirm that you want to change the Cleo SNA Serial Number to the value

```
      ==> xxxxxx <==
?[y/n]
y
```

Display the serial number

```
# /opt/sna/bin/cleoserial -r
```

The Cleo SNA Serial Number has a value of

```
      ==> xxxxxx <==
```

Modify the serial number

```
# /opt/sna/bin/cleoserial -w yyyyyy
  Where: yyyyyy is the new Cleo 6 digit Serial Number
```

The Current Cleo SNA Serial Number has a value of

```
      ==> xxxxxx <==
```

Do you want to change the Serial Number to the value

```
      ==> yyyyyy <==
?[y/n]
y
```

Instructions for Configuring the TN3270/TN5250

1. The program **tnconfig** must be executed to make the scripts for starting the TN3270/TN5250 sessions. Please see **Appendix E** for more details about **tnconfig**.

To use TN3270 sessions from a pool of **lus** on one host, execute **tnconfig** by entering the following command, and then **proceed to step 10**:

```
# tnconfig -h host_name[:port id] -n number of lus
```

Note: The default portid is 23.

A sample execution of tnconfig is as follows (for port 99):

```
# tnconfig -h tnsna:99 -n 24
```

To use TN3270 sessions from a pool of **lus** on one host/tserver that supports **SSL**, execute **tnconfig** by entering the following command, and then **proceed to step 10**:

```
# tnconfig -h host_name[:port id] -n number of lus -ssl 3
```

Note: The default portid is 23 and **-ssl 3** sets the connection type to SSL Version 3. The host/tserver must support **SSL**.

A sample execution of tnconfig is as follows (for port 99) to a host/tserver that supports SSL Version 3 :

```
# tnconfig -h tnsna:99 -n 24 -ssl 3
```

To use TN5250 sessions from a pool of **lus** on one host, execute **tnconfig** by entering the following command, and then **proceed to step 10**:

```
# tnconfig -h host_name[:port id] -n number of lus -p 5
```

Note: The default portid is 23 and **-p 5** sets the protocol type to TN5250.

A sample execution of tnconfig is as follows (for port 99):

```
# tnconfig -h tnsna:99 -n 24 -p 5
```

Note: In this example, the symbolic host name “tnsna” must be listed in the “/etc/hosts” file.

NOTE: Step 1 is the most common configuration method, for both TN3270 and TN5250.

2. **ONLY if it is required**, to use TN3270 and TN5250 from pools of LUs on multiple hosts, execute **tnconfig** by entering the following command, then **proceed to step 10**.

```
# tnconfig -h host32701[:port id],host52501[:port id],host32702[:portid],host52502[:port id] -n #lus for host327001,#lus for host52501,#lus for host32702,#lus for host52502 -p 3,5,3,5
```

3. **ONLY if it is required**, to use TN3270 SSL with pools of LUs on multiple hosts, execute **tnconfig** by entering the following command, then **proceed to step 10**.

```
# tnconfig -h host3270ssl1[:port id],host3270ssl2[:port id]-n #lus for host3270ssl1,#lus for host3270ssl2 -ssl 3
```

4. **ONLY if it is required**, to use TN3270 or TN3270 SSL sessions with specific LU Names on one host, execute **tnconfig** by entering the following command, and then **proceed to step 10**:

```
# tnconfig -h host_name[:port id] -n number of lus -l luname 1,luname 2,...,luname x
```

A sample execution of tnconfig without SSL is as follows:

```
# tnconfig -h tnsna -n 32 -l lu1,lu2,...,lu32
```

A sample execution of tnconfig with SSL is as follows:

```
# tnconfig -h tnsna -n 32 -l lu1,lu2,...,lu32 -ssl 3
```

5. **ONLY, if it is required**, to use TN5250 sessions with specific DEVICE NAMES, on one host, execute **tnconfig** by entering the following command, and then **proceed to step 10**.

```
# tnconfig -h host name[:port id] -n number of lus -l IBM-3180,IBM-3477-FC,...,IBM-3477FG -p 5
```

6. **ONLY, if it is required**, to use TN3270 or TN3270 SSL sessions from pools of lus on multiple hosts, execute **tnconfig** by entering the following command, and then **proceed to step 10**:

```
# tnconfig -h host_name 1[:port id],host name 2[:port id],...,host_name x[:port id] -n number of lus for host_name 1,number of lus for host_name 2,...,number of lus for host_name x
```

A sample execution of tnconfig without SSL is as follows:

```
# tnconfig -h host1,host2,host3 -n 10,12,10
```

A sample execution of tnconfig with SSL is as follows:

```
# tnconfig -h host1,host2,host3 -n 10,12,10 -ssl 3
```

7. **ONLY, if it is required**, to use TN5250 sessions from pools of lus on multiple hosts, execute **tnconfig** by entering the following command, and then **proceed to step 10**.

```
# tnconfig -h host name 1[:port id],host name 2[:port id],...,host name x[:port id] -n number of lus for host name 1,number of lus for host name 2,...,number of lus for host name x -p 5,5,...,5
```

A sample execution of tnconfig is as follows:

```
# tnconfig -h host1,host2,host3 -n 10,12,2 -p 5,5,5
```

8. **ONLY, if it is required**, to use TN3270 or TN3270 SSL sessions with specific LU Names on multiple hosts, execute **tnconfig** by entering the following command, and then **proceed to step 10**:

```
# tnconfig
  -h host_name 1[:port id],host_name 2[:port id],...,host_name
  x[:port id]

  -n number of lus for host_name 1,number of lus for host_name
  2,...,number of lus for host_name x

  -l luname 1 for host_name 1,...,luname 1 for host_name
  2,...,luname 1 for host_name x,...,luname for last lu for
  host_name x
```

A sample execution of tnconfig without SSL is as follows:

```
# tnconfig -h host1,host2,host3
  -n 2,4,2
  -l lu1h1,lu2h1,lu1h2,lu2h2,lu3h2,lu4h2,lu1h3,lu2h3
```

A sample execution of tnconfig with SSL is as follows:

```
# tnconfig -h host1,host2,host3
  -n 2,4,2
  -l lu1h1,lu2h1,lu1h2,lu2h2,lu3h2,lu4h2,lu1h3,lu2h3
  -ssl 3
```

- 9. ONLY, if it is required, to use TN5250 sessions with specific DEVICE NAMES on multiple hosts, execute **tnconfig** by entering the following command, and then proceed to step 10.**

```
# tnconfig
  -h host name 1[:port id],host_name 2[:port id],...,host_
  namex[:port id]

  -n number of lus for host_name 1,number of lus for host_name
  2,...,number of lus for host_name x

  -l DEVNAME for host_name 1,DEVNAME for host_name 2,...,DEVNAME
  for host_name x

  -p 5,5,...,5
```

A sample execution of tnconfig is as follows:

```
# tnconfig -h host52501,host52502,host52503 -n 2,3,2
  -l dev1h1,dev2h1,dev1h2,dev2h2,dev3h2,dev1h3,dev2h3
```

-p 5,5,5

- 10.** As a result of running **tnconfig**, a utility script **tnstart** is created in the `/opt/tn3270/bin` directory and specific configuration text files are created in the `/etc/opt/tn3270` directory. Run the **tnstart** utility if you want to start up configured tn3270 emulators in the background. If you run the Cleo utility **cleostart_tn** (described in **Appendix A.**), **tnstart** will be run automatically by the **cleostart_tn** utility.

Run the **mktncfg** utility to convert the newly created *tnconfig* text file(`com.txt`) to binary. This will create a `/etc/opt/tn3270/com.cfg` file. Run the following syntax and then **Proceed to step 11:**

```
# mktncfg
```

- 11. NOTE: If there are specific requirements, not met in steps 1-4,** then configure the TN3270 software by editing the `/etc/opt/tn3270/tn3270-1a.txt` (created by `tnconfig`) or the `com.txt` file (see below). To configure specific requirements ... (see the *TN3270 Administration Guide* for assistance on configuration): to convert the `com.txt` file to the executable binary, perform the following:

```
# cd /etc/opt/tn3270
```

```
# cp /opt/tn3270/samples/tnsample.txt com.txt
```

```
# vi com.txt
```

```
# /opt/tn3270/bin/tncfgtcp com.txt
```

NOTE:

To enable SSL, right after the line that specifies the type of TN3270 Support, for example:

```
tn3270_support = TN3270E
```

place the following line to enable SSL:

```
ssl_support = SSL3
```

12. Reboot the UNIX operating system. NOTE: only required if you tuned the kernel.

Run TN3270/TN5250

Select the appropriate style file in the `/etc/opt/tn3270` directory for the number of TN3270E sessions each user will have per each invocation of `tn3270`.

<code>tn3270-1.stu</code>	= 1	TN3270E session per invocation
<code>tn3270-2.stu</code>	= 2	TN3270E sessions per invocation
<code>tn3270-3.stu</code>	= 3	TN3270E sessions per invocation
<code>tn3270-4.stu</code>	= 4	TN3270E sessions per invocation
<code>tn3270-5.stu</code>	= 5	TN3270E sessions per invocation
<code>tn3270-6.stu</code>	= 6	TN3270E sessions per invocation
<code>tn3270-7.stu</code>	= 7	TN3270E sessions per invocation
<code>tn3270-8.stu</code>	= 8	TN3270E sessions per invocation
<code>tn3270-9.stu</code>	= 9	TN3270E sessions per invocation
<code>tn3270-0.stu</code>	= 10	TN3270E sessions per invocation

A sample execution of 1 TN3270E session per single user invocation:

```
# tn3270 -s /etc/opt/tn3270/tn3270-1.stu
```

A sample execution of 5 TN3270E sessions per single user invocation:

```
# tn3270 -s /etc/opt/tn3270/tn3270-5.stu
```

TN3270/TN5250 Removal

1. Login in as *root*.
2. Terminate any running instances of the TN3270 product by entering the following command:

```
# /opt/tn3270/bin/tnstop3270
```

3. Remove the Cleo TN3270 by entering the following commands:

```
# cleormv  
# pkgrm cleotdoc  
# pkgrm cleotn
```

SNA Connection Over SDLC

Installation of a Cleo Enterprise Networking product requires that you obtain a License file (license.conf) and a 6 Digit Cleo Serial Number. The License file is available from Cleo Communications' Sales Department at (866) 444-2536. The Cleo Serial Number will appear on your Cleo Software shipment. If you do not have a Cleo Serial Number available, please call the Cleo Communications' Sales Department.

Software Prerequisites

- ▶ UnixWare 7.1.0 and 7.1.1

Hardware Prerequisites (one of the following):

- ▶ Cleo Communications FIFO SIB SDLC Adapter and the cleofifo driver

OR

- ▶ Digi 570i PCI SDLC Adapter and the cleo570i driver

OR

- ▶ Digi DataFire SYNC 2000 PCI SDLC Adapter and the sync2000E driver

Installing the Cleo SNA Gateway Software

NOTE: These procedures assume you are installing from a CD. However, if you downloaded the product you only need to execute step1 and step 5 with the following change. Replace the mount point of the CD (/mnt) with the complete pathname of the downloaded product (e.g. /tmp/downloaded_file).

1. Log in as *root*.
2. Create a mount-point for the CD, if one does not already exist.(/mnt is used as the mount-point in these instructions, but any empty directory can be used).

```
# mkdir /mnt
```

3. Insert the CD into the CD-ROM drive.
4. Mount the CD by entering the following command:

```
# /sbin/mount -F cdfs -r /dev/cdrom/cdrom1 /mnt
```

5. Start the installation of the Cleo SNA Package

```
# pkgadd -d /mnt/cleosna
# pkgadd -d /mnt/cleodocs      (optional)
# cd /mnt
# ./cleoadd
```

```
You are about to run the cleoadd script, version 6.0.7.19,
which will install utilities for creating configuration files
and installing Cleo license files.
```

```
Do you wish to continue? (y/n): y
```

```
Installing files in /opt/sna/bin and /etc/opt/sna ...
```

```
Would you like to install the cleosna license file now? (y/n): y
```

```
Please enter the Cleo SNA Serial Number
```

```
xxxxxxx
```

```
Please confirm that you want to change the Cleo SNA Serial Number
to the value
```

```
==> xxxxxx <==
```

```
?[y/n]
```

```
y
```

```

Enter the full path name of the license file to install:
/tmp/license.conf
Contents of your license file:
*****
License type:      Temporary
Expiry date:      Thu Jul 20 00:00:00 2000
Shelf life:       <none>
Box name:         <none>
PU concentration: Not licensed
TN Server:        Not licensed
HPR:              Not licensed
LU 0-3 sessions: 32
APPC sessions:   32
Total sessions:  64
Users:            unlimited
*****

Do you wish to continue? (y/n): y
Saving old license in license.bak.
The license is now installed in /etc/opt/sna.
You must stop and restart the SNA software for
the new license to become active.

```

6. After the installation has completed successfully, enter the following commands:

```

# cd /
# /sbin/umount /mnt

```

7. Remove the CD from the drive. Store the CD with the Software License file in a safe place. They are needed should you ever re-install the software.
8. Set your path to include the new components with the following commands in your profile:

```

# PATH=$PATH:/opt/sna/bin:/opt/sna/bin/X11
# export PATH

```

9. Based on your needs, you may be required to increase your kernel resources by tuning some parameters. Please refer to **Appendix C** of this manual and the Cleo Installation Guide Chapter 4.

10. Cleo Communications supplies several optional utility scripts and programs that may be useful for automated kernel tuning, starting and stopping SNA 3270 emulators, and obtaining SNA protocol traces. Please refer to **Appendix H** of this manual for details.

Instructions for Installing or Updating License

NOTE: Cleo Communications will supply the license.conf file to you.

Install the license file (this step can be included with the previous **cleoad** function)

```
# /opt/sna/bin/snaaddlic
```

Enter the full path name of the license file to install:

```
/tmp/license.conf
```

Contents of your license file:

```
*****
License type:      Temporary
Expiry date:      Thu Jul 20 00:00:00 2000
Shelf life:       <none>
Box name:         <none>
PU concentration: Not licensed
TN Server:        Not licensed
HPR:              Not licensed
LU 0-3 sessions: 32
APPC sessions:   32
Total sessions:  64
Users:            unlimited
*****
```

Do you wish to continue? (y/n): y

Saving old license in license.bak.

The license is now installed in /etc/opt/sna.

You must stop and restart the SNA software for the new license to become active.

Instructions for Installing, Displaying, or Modifying Cleo Serial Number

NOTE: Cleo Communications supplies the Cleo Serial Number with your software shipment.

Install the serial number(this step can be included with the previous cleoad function)

```
# /opt/sna/bin/cleoserial -w xxxxxx
  Where: xxxxxx is the Cleo 6 digit Serial Number

Please confirm that you want to change the Cleo SNA Serial Number
to the value
      ==> xxxxxx <==
?[y/n]
y
```

Display the serial number

```
# /opt/sna/bin/cleoserial -r

The Cleo SNA Serial Number has a value of
      ==> xxxxxx <==
```

Modify the serial number

```
# /opt/sna/bin/cleoserial -w yyyyyy
  Where: yyyyyy is the new Cleo 6 digit Serial Number

The Current Cleo SNA Serial Number has a value of
      ==> xxxxxx <==
Do you want to change the Serial Number
to the value
      ==> yyyyyy <==
?[y/n]
y
```

Installing the SDLC UNIX Network Driver

Follow the instructions included with your adapter for the DIGI 570i for the hardware installation instructions. For the driver installation instructions, refer to **Appendix B**.

Note: It is important that you install your SDLC Driver components after you install the Cleo SNA Gateway software and hardware.

Configuring Cleo SNA Gateway

Installation of the Cleo SNA Gateway software and Unix Driver is now complete. Utilize the "*xnaadmin*" GUI utility for configuring the SNA Gateway. (see the Cleo Administration Guide...section *Administration Tools*)

OR

You can configure the Cleo SNA Gateway software for 3270 sessions, using the "*snaconfig*" command line program. To configure, Edit the **SNA SDLC CONFIGURATION TEXT** file (*/etc/opt/sna/snasdcl.txt*) and then running the "*snaconfig*" program to update the Cleo SNA Software's configuration.

Running "*snaconfig*" AFTER editing the SNA SDLC CONFIGURATION TEXT file

1. If the SNA Software is running, then Stop the SNA Software by entering the following command:

```
# /opt/sna/bin/sna stop
```

2. Edit the default SNA SDLC CONFIGURATION TEXT file (***/etc/opt/sna/snasdcl.txt***) supplying your Host system's specific parameters. Note: See Appendix C. for a definition of the Host Configuration Parameters in the

SNA SDLC CONFIGURATION TEXT file. See **Appendix D**. for the file's default values.

3. Update the Cleo SNA Software's configuration using the following command:

```
# /opt/sna/bin/snaconfig -S          (where -S = SDLC)
```

4. As a result of running **snaconfig -S**, a utility script **snastart** is created in the `/opt/sna/bin` directory. Run the **snastart** utility, after starting the SNA Server, if you want to start up configured sna3270 emulators in the background. If you run the Cleo utility **cleostart_sna**, (described in **Appendix H.**), **snastart** will be run automatically by the **cleostart_sna** utility.
5. If this is a new installation, then go to the "**Starting Cleo SNA Server**" section.
6. If you are modifying an existing System configuration and need to restart the SNA Software, then enter the following command:

```
# /opt/sna/bin/sna start
```

7. If this is a new installation, then go to the "**Starting Cleo SNA Server**" section.
8. If you are modifying an existing System's configuration, and need to restart the SNA Software, then enter the following command:

```
# /opt/sna/bin/sna start
```

Starting Cleo SNA Server

The quickest way of starting Cleo SNA is to issue the following commands (assumes correct PATH... PATH=\$PATH:/opt/sna/bin:/opt/sna/bin/X11):

```
# sna start
# xsnaadmin
```

The xsnaadmin program is a Motif-based administrative program. It contains extensive on-line help which will guide you through setting up a configuration from scratch.

Or

Start Cleo SNA Server from the command line

```
# sna start
# snaadmin init_node
# snaadmin start_port,port_name=xxxx      (where xxxx is the name of the
                                           port... i.e.  SDLCPO)
# snaadmin start_ls,ls_name=xxxx         (where xxxx is the name of the
                                           link station... i.e.  SDLCLO)
```

Run SNA3270

select the appropriate style file in the `/etc/opt/sna` directory for the number of SNA3270 sessions each user will use per each invocation of `sna3270`.

```
s3270-1.stu    = 1  sna3270 session per invocation
s3270-2.stu    = 2  sna3270 sessions per invocation
s3270-3.stu    = 3  sna3270 sessions per invocation
s3270-4.stu    = 4  sna3270 sessions per invocation
s3270-5.stu    = 5  sna3270 sessions per invocation
s3270-6.stu    = 6  sna3270 sessions per invocation
s3270-7.stu    = 7  sna3270 sessions per invocation
s3270-8.stu    = 8  sna3270 sessions per invocation
s3270-9.stu    = 9  sna3270 sessions per invocation
s3270-0.stu    = 10 sna3270 sessions per invocation
```

A sample execution of 1 SNA3270 session per single user invocation:

```
# sna3270 -s /etc/opt/sna/s3270-1.stu
```

A sample execution of 5 SNA3270 sessions per single user invocation:

```
# sna3270 -s /etc/opt/sna/s3270-5.stu
```

Cleo SNA Gateway Removal

1. Login in as *root*.
2. Terminate any running instances of the product by entering the following command:

```
# /opt/sna/bin/sna stop
```

3. Remove the Cleo SNA Gateway by entering the following commands: *Note: if you need to remove the “cleofifo”, the “cleo570i” or the sync2000E package, you MUST also remove the “cleosna” package.*

```
# cleormv  
# pkgrm cleofifo (optional)  
# pkgrm cleo570i (optional)  
# pkgrm sync2000E (optional)  
# re-boot the system  
# pkgrm cleodocs  
# pkgrm cleosna
```

4. Perform an orderly shutdown(eg. **/etc/shutdown**) and reboot the system.

SNA Connection Over LAN (Ethernet)

Installation of a Cleo Enterprise Networking product requires that you obtain a License file (license.conf). The License file is available from Cleo Communications' Sales Department at (866) 444-2536.

Software Prerequisites

- ▶ Unix Ware 7.1.0 and 7.1.1

Hardware Prerequisites

- ▶ Any Ethernet board supported by the Operating System

Installing the LAN UNIX Network Driver

For instructions to help install you LAN network driver refer to the operating system administration guide.

Note: It is important that you install your hardware components before you install the Cleo SNA Gateway software.

Installing the Cleo SNA Gateway Software

NOTE: These procedures assume you are installing from a CD. However, if you downloaded the product you only need to execute step1 and step 5 with the following change. Replace the mount point of the CD (/mnt) with the complete pathname of the downloaded product (e.g. /tmp/downloaded_file).

1. Log in as *root*.
2. Create a mount-point for the CD, if one does not already exist.(/mnt is used as the mount-point in these instructions, but any empty directory can be used).

```
# mkdir /mnt
```

3. Insert the CD into the CD-ROM drive.
4. Mount the CD by entering the following command:

```
# /sbin/mount -F cdfs -r /dev/cdrom/cdrom1 /mnt
```

5. Start the installation of the Cleo SNA Package

```
# pkgadd -d /mnt/cleosna
# pkgadd -d /mnt/cleodocs      (optional)
# cd /mnt
# ./cleoadd
```

```
You are about to run the cleoadd script, version 6.0.7.19,
which will install utilities for creating configuration files
and installing Cleo license files.
```

```
Do you wish to continue? (y/n): y
```

```
Installing files in /opt/sna/bin and /etc/opt/sna ...
```

```
Would you like to install the cleosna license file now? (y/n): y
```

```
Please enter the Cleo SNA Serial Number
```

```
xxxxxx
```

```
Please confirm that you want to change the Cleo SNA Serial Number
to the value
```

```
==> xxxxxx <==
```

```
?[y/n]
```

```
y
```

```

Enter the full path name of the license file to install:
/tmp/license.conf
Contents of your license file:
*****
License type:      Temporary
Expiry date:      Thu Jul 20 00:00:00 2000
Shelf life:       <none>
Box name:         <none>
PU concentration: Not licensed
TN Server:        Not licensed
HPR:              Not licensed
LU 0-3 sessions: 32
APPC sessions:   32
Total sessions:  64
Users:           unlimited
*****

Do you wish to continue? (y/n): y
Saving old license in license.bak.
The license is now installed in /etc/opt/sna.
You must stop and restart the SNA software for
the new license to become active.

```

6. After the installation has completed successfully, enter the following commands:

```

# cd /

# /sbin/umount /mnt

```

7. Remove the CD from the drive. Store the CD with the Software License file in a safe place. They are needed should you ever re-install the software.

8. Set your path to include the new components with the following commands in your profile:

```

# PATH=$PATH:/opt/sna/bin:/opt/sna/bin/X11
# export PATH

```

9. Based on your needs, you may be required to increase your kernel resources by tuning some parameters. Please refer to **Appendix C** of this manual and the Cleo Installation Guide Chapter 4.

10. You must reboot the system to allow the new kernel to take effect.
11. Cleo Communications supplies several optional utility scripts and programs that may be useful for automated kernel tuning, starting and stopping SNA 3270 emulators, and obtaining SNA protocol traces. Please refer to **Appendix H** of this manual for details.

Instructions for Installing or Updating License

NOTE: Cleo Communications will supply the license.conf file to you.

Install the license file (this step can be included with the previous cleoad function)

```
# /opt/sna/bin/snaaddlic
```

Enter the full path name of the license file to install:

```
/tmp/license.conf
```

Contents of your license file:

```
*****  
License type:      Temporary  
Expiry date:      Thu Jul 20 00:00:00 2000  
Shelf life:       <none>  
Box name:         <none>  
PU concentration: Not licensed  
TN Server:        Not licensed  
HPR:              Not licensed  
LU 0-3 sessions: 32  
APPC sessions:   32  
Total sessions:  64  
Users:           unlimited  
*****
```

Do you wish to continue? (y/n): y

Saving old license in license.bak.

The license is now installed in /etc/opt/sna.

You must stop and restart the SNA software for
the new license to become active.

Instructions for Installing, Displaying, or Modifying Cleo Serial Number

NOTE: Cleo Communications supplies the Cleo Serial Number with your software shipment.

Install the serial number(this step can be included with the previous cleoaddd function)

```
# /opt/sna/bin/cleoserial -w xxxxxx
  Where: xxxxxx is the Cleo 6 digit Serial Number
```

Please confirm that you want to change the Cleo SNA Serial Number
To the value

==> xxxxxx <==

?[y/n]

y

Display the serial number

```
# /opt/sna/bin/cleoserial -r
```

The Cleo SNA Serial Number has a value of

==> xxxxxx <==

Modify the serial number

```
# /opt/sna/bin/cleoserial -w yyyyyy
  Where: yyyyyy is the new Cleo 6 digit Serial Number
```

The Current Cleo SNA Serial Number has a value of

==> xxxxxx <==

Do you want to change the Serial Number
to the value

==> yyyyyy <==

?[y/n]

y

Configuring Cleo SNA Gateway - Ethernet

Installation of the Cleo SNA Gateway software and Unix Driver is now complete. You can utilize the ***x snaadmin*** GUI utility for configuring the SNA Gateway. (see the Cleo Administration Guide...section *Administration Tools*)

OR

You can configure the Cleo SNA Gateway software for 3270 sessions, using the "***snaconfig***" command line program. To configure, Edit the **SNA Ethernet CONFIGURATION TEXT** file (/etc/opt/sna/snaeth.txt) and then running the "***snaconfig***" program to update the Cleo SNA Software's configuration.

Running "***snaconfig***" after editing the SNA ETHERNET CONFIGURATION TEXT file

1. If the SNA Software is running, then Stop the SNA Software by entering the following command:

```
# /opt/sna/bin/sna stop
```

2. Edit the default SNA Ethernet configuration text file (/etc/opt/sna/snaeth.txt) supplying your Host system's specific parameters. Note: See **Appendix F**. for a definition of the **snaconfig** Host Configuration Parameters in the **SNA ETHERNET CONFIGURATION TEXT** file. See **Appendix G**. for the file's default values.
3. Update the Cleo SNA Software's configuration using the following command:

```
# /opt/sna/bin/snaconfig -E
```

 (where -E = ETHERNET)
4. As a result of running **snaconfig -E**, a utility script **snastart** is created in the /opt/sna/bin/directory. Run the **snastart** utility, after starting the SNA Server, if you want to start up configured sna3270 emulators in the background. If you run the Cleo utility **cleostart_sna**, (described in **Appendix H**, **snastart** will be run automatically by the **cleosna_start** utility.
5. If this is a new installation, then go to the "**Starting Cleo SNA Server**" section.

6. If you are modifying an existing System configuration and need to restart the SNA Software, then enter the following command:

```
# /opt/sna/bin/sna start
```

7. If this is a new installation, then go to the "**Starting Cleo SNA Server**" section.

8. If you are modifying an existing System's configuration, and need to restart the SNA Software, then enter the following command:

```
# /opt/sna/bin/sna start
```

Starting Cleo SNA Server

The quickest way of starting Cleo SNA is to issue the following commands (assumes correct PATH... PATH=\$PATH:/opt/sna/bin:/opt/sna/bin/X11):

```
# sna start
# xsnaadmin
```

The *xsnaadmin* program is a Motif-based administrative program. It contains extensive on-line help which will guide you through setting up a configuration from scratch. (see the Cleo Administration Guide...section *Administration Tools*)

Or

Start Cleo SNA Server from the command line

```
# sna start
# snaadmin init_node
# snaadmin start_port,port_name=xxxx      (where xxxx is the name of the
                                           port... i.e.  SDLCP0)
# snaadmin start_ls,ls_name=xxxx         (where xxxx is the name of the
                                           link station... i.e.  SDLCL0)
```

Run SNA3270

select the appropriate style file in the /etc/opt/sna directory for the number of SNA3270 sessions each user will use per each invocation of sna3270.

```
s3270-1.stu    = 1  sna3270 session per invocation
s3270-2.stu    = 2  sna3270 sessions per invocation
s3270-3.stu    = 3  sna3270 sessions per invocation
s3270-4.stu    = 4  sna3270 sessions per invocation
s3270-5.stu    = 5  sna3270 sessions per invocation
s3270-6.stu    = 6  sna3270 sessions per invocation
s3270-7.stu    = 7  sna3270 sessions per invocation
s3270-8.stu    = 8  sna3270 sessions per invocation
s3270-9.stu    = 9  sna3270 sessions per invocation
s3270-0.stu    = 10 sna3270 sessions per invocation
```

A sample execution of 1 SNA3270 session per single user invocation:

```
# sna3270 -s /etc/opt/sna/s3270-1.stu
```

A sample execution of 5 SNA3270 sessions per single user invocation:

```
# sna3270 -s /etc/opt/sna/s3270-5.stu
```

Cleo SNA Gateway Removal

1. Login in as *root*.
2. Terminate any running instances of the product by entering the following command:

```
# /opt/sna/bin/sna stop
```

3. Remove the Cleo SNA Gateway by entering the following commands:

```
# cleormv
```

```
# pkgrm cleodocs
```

```
# pkgrm cleosna
```

4. Perform an orderly shutdown(eg. **/etc/shutdown**) and reboot the system.

Appendix A – LAN Network Driver Install

Installing the Ethernet UNIX Network Driver

1. Login as *root*.
2. At the command prompt, type:

```
# ifconfig -a
```
3. Look for an entry of your Ethernet adapter followed by the Ethernet adapter's 12 digit MAC address. If this entry is present, then the Ethernet UNIX network driver has been installed. Proceed to *Installing the Cleo SNA Gateway Software*.

If the driver is not present, go to step 4 below.

4. Install the "Ethernet Driver" software, using "netcfg". At the command prompt, type:

```
# netcfg
```

netcfg will display "**Network Configuration Manager**". For navigating around the screens use **TAB** and **ARROW KEYS**.

5. The *netcfg* window displays 3 buttons: **Hardware, Protocol, and View**, on the top on the left-hand side. Use the **TAB** key. It will place the cursor on the Hardware menu item. Use the **DOWN ARROW** key to see the following menu:

```
Add new LAN adapter
(Remove network device)
(Modify hardware configuration)
(View hardware configuration)
(Test Network Connectivity)
(Switch to backup)
(Revert to Primary)
Exit
```

6. Use the **DOWN ARROW** key and choose **ADD NEW LAN adapter**. A screen will appear with a list of adapters :

```
*Ethernet- xxx - PCI Slot x Bus x...
```

Use the **DOWN ARROW** key and choose the correct entry. Use the **TAB KEY** to position the cursor on the **CONTINUE** button and press **ENTER**.

7. The "***Add Protocol***" screen will appear.
8. Use the **DOWN ARROW** key and choose **TCP/IP** and then use the **TAB** key to move onto the **ADD** button and press **ENTER**. The "***Internet Protocol Configuration***" screen will appear. It will have the following fields:

```
Host name
DHCP client <> Yes  <> No
Domain Name
IP address
Netmask
Broadcast address
Default router
[Advanced Options]
```

9. The ***Host name*** entry should be filled automatically with the value used in the ***uname*** command
 - ▶ Ignore the ***DHCP client*** and ***Domain Name*** entries.
 - ▶ Fill out the ***IP address***
 - ▶ Fill out the ***Netmask***
 - ▶ Fill out the ***Broadcast address***
 - ▶ Fill out the ***Default Router***

10. Fill in all fields and use the **TAB** key to move to **OK** and press **ENTER**.

11. The "***Network Configuration Manager***" screen will appear with:

```
The following product was successfully modified
TCP/IP
Ethernet-xxx - PCI Slot x Bus x...
```

With the cursor on the **OK** button, press **ENTER**. The first window will reappear with the display:

```
HW Ethernet-xxx - PCI Slot x Bus x...
* - TCP/IP
```

12. The cursor will be on the ***HARDWARE*** button. Use the **DOWN ARROW** key. A menu window will appear. Choose ***EXIT***

Appendix B – SDLC Driver Installation

DIGI 570i SYNC Adapter Driver Installation

1. Make sure the Cleo CD ROM is inserted in the CD ROM drive and mounted in /mnt
2. Install the Digi 570i SYNC Adapter Driver by entering the following command:

```
# pkgadd -d /mnt/cleo570i
```
3. After successful completion, unmount and remove CD.

Appendix C – Kernel Tuning

The kernel tuning values(both Semaphores and Shared memory values) for 256 HLLAPI LUs are listed below:

SEMMNI	Increase by 200
SEMMNS	Increase by 200
SEMUME	Increase by 400
SHMMNI	Increase by 200
SHMSEG	Increase by 400

These are the values for 256 sessions if you require different numbers refer to the Cleo Installation Guide Chapter 4 for more information.

Appendix D – Host Configuration Information

Required Configuration Information:

Before you begin the installation and configuration process, contact your host personnel and get the following critical information about your connection.

Much of this information can be found in the NCP Gen on your mainframe host.

Line Type: (leased / dial up) _____

XID Type: (Format 0 / Format 3) _____

NRZ or NRZI _____

PU Address = _____

LOCADDR(s) or LU Number(s) = _____

MAXDATA = (265 – 4105) _____

IDBLK = _____

IDNUM = _____

TN3270 Connection

If you are Planning to establish a TN3270(E) (TCP/IP) connection to your mainframe host please provide the following information:

IP address of the Mainframe host or TNSERVER
_____ - _____ - _____ and Port Number _____

Does the TNSERVER support TN3270 or TN3270E? _____

SNA Over LAN Connection (Ethernet)

If you are planning to access your host over an Ethernet connection please get the following information from your Network Administrator.

Remote MAC Address _____

System Information

What Operating System will you be running your Cleo software on?

AIX SCO SOLARIS UnixWare

What is the version of the operating system? _____

What hardware platform will the Cleo software be running on? _____

What version of Cleo Software will you be loading? _____

Is this a new install or an Upgrade? _____

What type of connection will you be using for communicating with the remote system?
(Ethernet / SDLC) _____

What is the model and manufacturer of the modem, modem eliminator or modem sharing device that will be used for this connection?

Please provide diagram of the connection from the mainframe host to your network. Include as much detail as possible.

APPENDIX E – *tnconfig* HOST CONFIGURATION PARAMETERS

The *tnconfig* command has the following options:

[-T TERMTYPE]

Optional parameter to specify a TN3270 Terminal Type to use. This sets the Environment Variable `OVERVERRIDE_TN3270_TERM` to the value of **TERMTYPE**.

[-NE]

Optional parameter to override the default of using TN3270 Extentions Mode.

If **-NE** is specified, then negotiations with TN SERVERS will not use TN3270 Extentions.

-h hostname1,hostname2,...,hostnamen

Mandatory parameter.

Each comma separated argument is an /etc/hosts entry or DNS name entry that points to a TNSERVER.

There must be a corresponding **-n** argument for each **-h** Argument.

-n number lus for hostname1,number lus for hostname2,...,number of lus for hostnamen

Mandatory parameter.

Each comma separated argument is the number of LUs to use for the corresponding **-h** argument.

[-l 3270specificLUname1,3270specificLUname2,..., 3270specificLUnamen]

Optional parameter.

Each comma separated argument is a specific LU name for TN3270. There will be an entry for every LU on every host/TNSERVER connection.

[-t seconds]

WHERE: *seconds* is the number of seconds to delay before trying to re-connect an LU, when a host connection fails.

The environment variable

SNA3270_RETRY_TIME

is set to the value of the *seconds* argument.

Optional parameter. 5 seconds is the default value.

The environment variable

SNA3270_RETRY_TIME

is set to the value of the *seconds* argument.

[-a seconds]

WHERE: *seconds* is the number of seconds to use for DIP HLLAPI no-response from emulator failure value

Optional parameter. 1 second is the default value.

[-ssl 3|2]

Optional parameter.

Where 3 specifies to use Version 3.0 of SSL to negotiate the SSL connection to the TNSERVER.

Where 2 specifies to use Version 2.0 of SSL to negotiate the SSL connection to the TNSERVER.

If the **-ssl** parameter is **NOT SPECIFIED**, then SSL will not be used to connect to the TNSERVER.

[-cm RLE|ZLIB]**Optional parameter.**

Where **RLE** specifies to use RLE type SSL compression.

Where **ZLIB** specifies to use ZLIB type SSL compression.

[-cc PATHTOCLIENTCERTIFICATEFILE]**Optional parameter.**

The specific path and file name of the Client SSL Certificate File must be specified. The File must be in "**Privacy Enhanced Mail**" format. This certificate file will be used when negotiating a SSL connection to the TNSERVER.

[-ck PATHTOCLIENTKEYFILE]**Optional parameter.**

The specific path and file name of the File that contains the KEY to the Client SSL Certificate.

The KEY File must be in "**Privacy Enhanced Mail**" format.

This KEY File will be used when the SSL Certificate is accessed, during the negotiation of a SSL connection to the TNSERVER.

[-cp PATHTOKEYFILEPASSWORDFILE]**Optional parameter.**

The specific path and file name of the File that contains the password needed to access the SSL KEY file.

The password in the KEY File Password File is used when the KEY File is accessed, during the negotiation of a SSL connection to the TNSERVER.

APPENDIX F – *snaconfig* HOST CONFIGURATION PARAMETERS

The PARAMETERS defined in the "/etc/opt/sna/snasdlc.txt and /etc/opt/sna/snaeth.txt" file are:

SNA_TYPE = S | E

Where **S** = SNA over SDLC
E = SNA over ETHERNET

PORT_NUM = 1 | 2 | 3 | 4

Where **1** corresponds to

SDLCP0 for SDLC (note the Link Station will be **SDLCL0**)
ETSAP0 for Ethernet (note the Link Station will be **ETHL0**)

2 corresponds to

SDLCP1 for SDLC (note the Link Station will be **SDLCL1**)
ETSAP1 for Ethernet (note the Link Station will be **ETHL1**)

3 corresponds to

SDLCP2 for SDLC (note the Link Station will be **SDLCL2**)
ETSAP2 for Ethernet (note the Link Station will be **ETHL2**)

4 corresponds to

SDLCP3 for SDLC (note the Link Station will be **SDLCL3**)
ETSAP3 for Ethernet (note the Link Station will be **ETHL3**)

MAXDATA = dddd

Where **dddd** is the decimal value for MAXDATA

XIDS = 0xnxxxxxxxx

Where **xxxxxxxx** is the 3 digit Hexadecimal **IDBLK** and 5 digit Hexadecimal **IDNUM** to send to the Host

XIDR = 0xnnnnnnnn

Where **nnnnnnnn** is the 3 digit Hexadecimal **IDBLK** and 5 digit Hexadecimal **IDNUM** to send to receive from the Host

LINE_TYPE = LEASED | SWITCHED (SDLC ONLY)

DUPLEX = HALF | FULL (SDLC ONLY)

ENCODING = NRZ | NRZI (SDLC ONLY)

CONSTANT_RTS = Y | N (SDLC ONLY)

POLL_ADDR = hh (SDLC ONLY)

Where **hh** is the 2 digit Hexadecimal Polling Address(eg. C1)

LOCAL_SAP = 0xhh (Ethernet ONLY)

REMOTE_SAP = 0xhh (Ethernet ONLY)

Where **hh** is the 2 digit Hexadecimal Remote **SAP**(Service Access Pt.)

MAC_ADDR = xxxxxxxxxxxx (Ethernet ONLY)

Where **xxxxxxxxxxxx** is the 12 digit Hexadecimal Remote Mac Address

SESS = d

Where **d** is the total number of LUs to use.

APPENDIX G - DEFAULT VALUES for SNA CONFIGURATION files

There is a Cleo CONFIGURATION text file supplied for each type of SNA connectivity.

The file `/etc/opt/sna/snasdcl.txt` contains the following default entries for **SNA over SDLC**:

```
SNA_TYPE = S
PORT_NUM = 1
MAXDATA = 265
XIDS = 0x05DFFFFFF
XIDR =
LINE_TYPE = LEASED
ENCODING = NRZ
CONSTANT_RTS = N
POLL_ADDR = C1
N = 128
```

The file `/etc/opt/sna/snaeth.txt` contains the following default entries for **SNA over ETHERNET**:

```
SNA_TYPE = E
PORT_NUM = 1
MAXDATA = 1929
XIDS = 0x05DFFFFFF
XIDR =
LOCAL_SAP = 04
REMOTE_SAP = 04
MAC_ADDR = 400000000000
FLIP = TRUE
SESS = 128
```

APPENDIX H – CLEO UTILITIES

The following utility scripts and programs are provided by Cleo Communications. They may be useful for automated kernel tuning, starting and stopping SNA and SNA3270 emulators, starting and stopping TN3270 emulators, and obtaining SNA protocol traces. All of these Cleo utilities reside in the `/opt/sna/bin` or `/opt/tn3270/bin` directories.

1. The **sna_tune** utility can be used to automatically increase or decrease kernel tuning parameters. The kernel tuning parameter increases are intended to accommodate applications/HLLAPI using up to 254 LUs.
2. To automatically increase the SNA kernel tuning, run the following command:

```
# /opt/sna/bin/sna_tune INSTALL /etc/opt/sna/sna_tune.dat
```

Then reboot the system for the kernel tuning changes to take effect.
3. To automatically decrease the SNA kernel tuning, run the following command:

```
# /opt/sna/bin/sna_tune REMOVE /etc/opt/sna/sna_tune.dat
```

Then reboot the system for the kernel tuning changes to take effect.
4. The **tn_tune** utility can be used to automatically increase or decrease kernel tuning parameters. The kernel tuning parameter increases are intended to accommodate applications/HLLAPI using up to 254 LUs.
5. To automatically increase the TN3270 kernel tuning, run the following command:

```
# /opt/tn3270/bin/tn_tune INSTALL /etc/opt/tn3270/tn_tune.dat
```

Then reboot the system for the kernel tuning changes to take effect.
6. To automatically decrease the TN3270 kernel tuning, run the following command:

```
# /opt/tn3270/bin/tn_tune REMOVE /etc/opt/tn3270/tn_tune.dat
```

Then reboot the system for the kernel tuning changes to take effect.
7. The **cleostart_sna** utility can be used to start the SNA Server and all configured sna3270 emulators to run in the background. The utility first stops SNA and the emulators by running the **cleostop_sna** utility, and then starts the SNA Server by running `/opt/sna/bin/sna start` and then runs the `/opt/sna/bin/snastart` script that runs all the configured sna3270 emulators in the background. The **cleostart_sna** utility can be used to run automatically at system reboot time. The **cleostart_sna** utility is a script that resides in `/opt/sna/bin`, and can be modified to not run **cleostop_sna** automatically and/or only run selected sna3270 emulators.
8. The **cleostart_tn** utility can be used to start all the configured tn3270 emulators to run in the background. The utility first stops all the tn3270 emulators by running the **cleostop_tn** utility and then runs the `/opt/tn3270/tnstart` script that runs all the configured tn3270 emulators in the background. The **cleostart_tn** can be used to run automatically at system reboot time. The **cleostart_tn** utility is a script that

resides in /opt/tn3270/bin, and can be modified to not run **cleostop_tn** automatically and/or only run selected tn3270 emulators.

9. The **cleostop_sna** utility can be used to stop the SNA Server and all sna3270 emulator processes that are running. The utility makes sure that all sna3270 emulator processes are killed and all the shared memory and semaphore resources they used, are released.
10. The **cleostop_tn** utility can be used to stop all tn3270 emulator processes that are running. The utility makes sure that all tn3270 emulator processes are killed and all the shared memory and semaphore resources they used, are released. Additionally, **cleostop_tn** kills the tn3270 license daemon and release all the shared memory and semaphore resources the tn3270 license daemon was using. Then the tn3270 license daemon is restarted. This insures that the tn3270 licensed LU count is not compromised.
11. The **cleodotrace** utility can be used to create detailed SNA protocol traces in the /var/opt/sna directory. Specifically, the files created are /var/opt/sna/cleosna1.dmp and /var/opt/sna/cleosna2.dmp. Cleo SNA protocol tracing can be enabled by removing the # in front of the following statements in the /opt/sna/bin/cleostart_sna script.

```
##$SNABIN/snaadmin set_trace_file, trace_file_type = IPS,  
dual_files = YES, trace_file_size = 10000000, file_name =  
$SNAVAR/cleotrc1, file_name_2 = $SNAVAR/cleotrc2  
##$SNABIN/snaadmin set_trace_type, trace_flags = ALL  
##$SNABIN/snaadmin add_dlc_trace
```