G&R HOST LINKS™

Servers

Installation and Configuration on UNIX/Linux

G&R

GALLAGHER
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The G&R Host Links product set is available on all major UNIX, Linux and Windows server platforms. This document is for use by those installing and configuring the UNIX/Linux servers in the product range.

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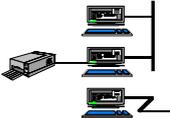
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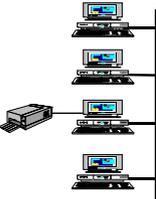
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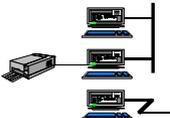
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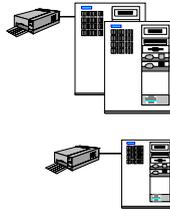
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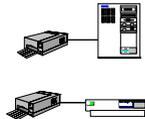
Bull/IBM
Mainframes

Scope of the products

The purpose of the Host Links product set is to make Bull and IBM mainframe applications accessible from the Open Systems world. It provides terminal, printer, file transfer and application-to-application connections from Windows and UNIX/Linux servers. This manual describes installation of the Host Links system on UNIX/Linux platforms, and configuration of the Host Links servers. Please refer to the manual *Installation and Configuration of Host Links Emulators* for details on configuring the UNIX/Linux terminal emulator products.

Gweb is a Web browser interface to the G&R/emulation libraries that allows generic Web browsers to access unmodified Bull or IBM mainframe applications with the appearance of a standard mainframe terminal.

Ggate is a gateway between TCP/IP and the Bull primary network. It can be used by PCs and Macintoshes running the Glink emulator or by any of the Host Links products.

Gspool is a network printer emulation that accepts ROP print output from Bull GCOS8/7/6 print applications, SYSOUT from Bull DPF8-DS, and IBM3287 print from the IBM mainframes. The latter via the SNA gateway in the Bull front end, or via TN3270 from a TCP/IP front end or SNA gateway.

GUFT is an implementation of the Bull Unified File Transfer protocol for exchanging files with GCOS8/7/6 systems, or other UNIX or Windows systems. The GUFT server runs on the Host Links platform. A GUFT client for Windows PCs is also available.

Gproxy is a monitor that can be used for administration of the G&R communications products. Optionally it can be used for load balancing over several gateways, and can also be configured to report to one or more SNMP network management systems.

GlAPI (Gline Application Programming Interface) is a set of program libraries that make it possible to write your own applications using the Gline product to hide the complexity of host connections. GlAPI includes both the G&R native programming interface, Gline API, and several libraries of CPI-C, which is the X/Open standard API for application-application communication.

Functional summary

The G&R Host Links products transform any Windows platform into a native DSA or DSA/ISO Workstation (DIWS) node in the Bull primary network, or into a 3270 cluster within SNA. Communication between the Windows system and the Bull systems is generally done using the Bull DSA session protocol. Communications with IBM systems is by TN3270/TN5250.

The DSA connections can be made in the traditional way using OSI-transport, which is a requirement when connecting via old-style Datanets. The Bull systems can be accessed over an X.25 WAN or Ethernet LAN through a Datanet or MainWay front-end. Alternatively access can be direct to GCOS6 using a LAN adapter or direct to GCOS7 using ISL. Access can be by an FDDI LAN direct to GCOS7 using FCP7 or direct to GCOS8 using FCP8.

The DSA connections can also be made over a TCP/IP network, using the Internet standard RFC1006 transport protocol to replace OSI-transport. MainWay front-ends with an ONP (Open Network Processor) have RFC1006 support in the standard product, allowing DSA sessions over TCP/IP into the MainWay. RFC1006 can also be installed in the FCP7 and FCP8 cards to support DSA connections direct to the hosts without passing through the front-end. The GNSP on newer GCOS8 systems accepts DSA/RFC1006 connections, as does the newer GCOS7 Diane systems. G&R Host Links systems are qualified with both.

The Ggate product may be used to off-load the DSA session protocol into gateways. By running Ggate on the system(s) with the host connections all other PCs, Macintoshes, Windows and UNIX machines in your network need only the very small and efficient Ggate protocol layer to connect over TCP/IP to a Ggate gateway with full primary network functionality. Ggate can make the host connection using OSI-transport or RFC1006. If you must use OSI-transport for the host connection, using Ggate will limit the need for OSI-stacks to the Ggate platforms.

IBM systems can also be accessed using Telnet 3270 (TN3270 or TN3270E) to connect to any TN3270⇔SNA gateway or front-end. The MainWay gateway, the TN3270 server on the Bull DPX/20 UNIX systems, the IBM TN3270 front-end and the TN3270 server for Windows are all qualified.

Bull systems can also be accessed using Telnet VIP (TNVIP). The TNVIP servers in the MainWay and in the Bull DPX/20 are both qualified. However, RFC1006 is supported in the MainWay front-ends with an ONP (Open Network Processor), and if used when communicating with G&R products it will increase throughput as compared to using TNVIP. It will also give a real, fully functional DSA or DIWS session over the TCP/IP network, as compared to the limited terminal session offered by TNVIP.

Product architecture

The UNIX/Linux versions of the G&R products are built in a modular way, and designed to take advantage of the multitasking capability of the UNIX/Linux platform. Thus a single instance of a product will in general consist of three quite separate processes, communicating with each other using pipes and shared memory. In general there will be:

- A video handler; which accepts user key input and transforms it into the internal standard format. It also maps all updates of the internal screen image into the control sequences required to update the specific screen being used.

- A product; for example an emulator which accepts key input in the standard format and updates the internal screen image according to the presentation being emulated. An emulator will also send and receive data to the mainframe system using the standard interface that applies to all communications protocols.

- A line handler; which maps the standard format for communications into the specific line protocol being used.

This structure has proven itself extremely efficient and very robust. We are able to develop a video handler for a new screen type, and we know that once it works with one G&R product it will work for all. We are able to develop a new line handler and know that once it works with one product it will work with all. We are able to develop a new product using a given screen and communications protocol, and know that the product will work with all screen types we support, and with all the communications protocols we support.

Ggate, Gspool and GUFT server differ slightly from the above model, as they don't need a video handler, only a line handler.

Some of the programs in the Basic product, like Gdir and Glist, also differ slightly as they don't need a line handler, only a video handler.

Architecture diagram

```
┌─────────────────────────────────────────────────────────────────┐
│          Protocol dependent Communication Facilities              │
└─────────────────────────────────────────────────────────────────┘
```

Line Handler

DIWS	DSA	TCP	X.25	TTY

GWEB	V78sim	Qsim	G3270	GUFT	Pthru	Gspool		Ggate

Video Handler

CGI	Glink	VIP	VTxx	DKU7102	TERMINFO	TTY

WEB SRV	TTY driver	Print	TCP socket
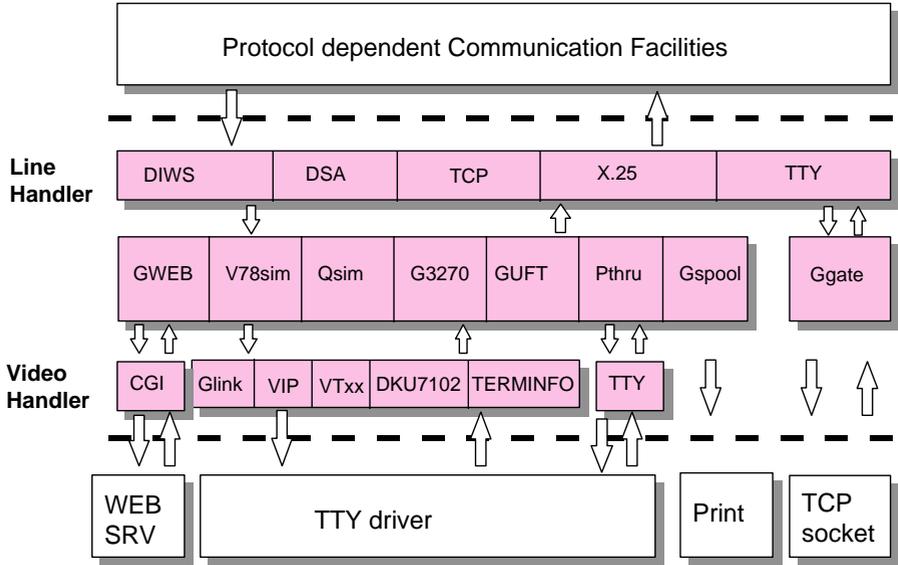
Delivery

We deliver the software in various ways; these instructions assume you have the distribution files in a directory on your system (e.g. `/tmp/hlinstal`). They are only used during installation and you may remove them afterwards. You should have received these files:

`install.630`	Installation script.
`srbhl.630`	Software Release Bulletin.
`Licenses`	Optional, license keys to give access to the software.
`Unzcccoo`	Unzip program; see below.
`pppcccoo.630`	One or more ZIP archives with software; see below.

The extension will vary for updates; **ppp** above refers to the product name:

'ppp'	product name	
bas	*Basic*	prerequisite
G32	*G3270*	
G52	*G5250*	
gga	*Ggate*	
gli	*Gline*	prerequisite
glp	*GlAPI*	
gsp	*Gspool*	
guf	*GUFT*	
pth	*Pthru*	
qsi	*Qsim*	
v78	*V78sim*	
Gpr	*Gproxy*	
Gwb	*Gweb*	

Prerequisite: *Basic* provides the menu structure for on-line help, the help utility and other utilities. *Gline* initializes the directory structure for communications, and installs sample configuration files.

The **ccc** above refers to the CPU family the product runs on. The **oo** above refers to the operating system family the product runs on. The platforms supported in any release are specified in the *SRB* (Software Release Bulletin) for the release.

The 630 extensions above refer to the Host Links version number. Major releases have the first digit incremented, e.g. 500 and 600. Minor releases have the middle digit incremented, e.g. 620 or 630. Maintenance releases have the last digit incremented, e.g. 621 or 631. Beta releases have a letter appended, e.g. 630a or 630b. Temporary fixes issued between maintenance releases also have a letter appended, e.g. 631a or 632a.

Some examples of complete filenames:

`ggaspaso.630`	Ggate for Sun SPARC, Solaris release 2.x, release 6.3.0
`gsp386l2.630`	Gspool for Intel x86, Linux kernel 2.x, release 6.3.0
`gwbppca5.630`	Gweb for Bull, AIX 5L for Power V5.1, release 6.3.0

These files are packaged in ZIP format archives using Info-ZIP's compression utility. This format is also compatible with PKWARE Inc's PKZIP version 2. The installation script uses the delivered `unzip` program to decompress the files.

From the above you should be able to pick the files you need from us. Make sure that all files end up in the same directory on your UNIX/Linux machine, and that all the file names are in lower case. These files and this directory will only be used during the installation, so you can place them in `/tmp`, your home directory, or whatever. Proceed as described in the installation chapter.

The Info-ZIP copyright requires us to tell you:

> Info-ZIP's software (Zip,UnZip and related utilities) is free and can be obtained as source code or executables from Internet/WWW sites, including the Info-ZIP home page: `http://www.info-zip.org/`

General requirements

For platform specific requirements please look in the section entitled *'Platform specific requirements'*.

Memory usage

The exact amount of memory used by the different application will vary from platform to platform. Our measurements indicate that typical memory usage per session is around 250KB for a Ggate session and 500KB for an emulator.

Using the SSL feature will significantly increase the memory usage. The actual increase is platform specific but will typically be from 250KB to 500KB per session.

For exact figures please contact G&R with information about hardware platform and operating system version.

UNIX/Linux shared memory

Each instance of a video handler needs one shared memory segment. Most UNIX/Linux platforms default to 50 or 100 of these. Please refer to your UNIX/Linux documentation on how to increase the number of shared memory segments.

PTYs

If your terminal or PC logs in to the UNIX/Linux system over TCP/IP and Telnet or Rlogin, then you may also be limited by the number of so-called PTYs (pseudo-TTYs) you can have on the system. Please refer to your UNIX/Linux documentation to see if it's possible to configure more PTYs and how to do it.

Installation step by step

The default system directory for Gallagher & Robertson products is:

UNIX/Linux	/usr/gar

During installation you are given the choice of installing on a different directory. If you have previously used the *ServerX* products this will be detected and you can install on the *ServerX* system directory (default /usr/serverx).

The environment variable used to point to a different system directory is GAR_SYSDIR. For compatibility with previous releases SERVERX_SYSDIR is still supported as an alternative name for this variable, so that when you upgrade old installations there is no need to change anything.

For a new installation we strongly recommend that you create a new UNIX/Linux user id and group id for Host Links. An obvious choice of names would be:

```
username=gar

groupname=gar
```

and to let the system assign the numeric id's. Log in as, or 'su' to, this user whenever you install new releases, change configuration files or start background processes such as Gspool.

Here is an outline of why this is recommended:

- This user will own all files created by the installation routine, making it easy to identify files belonging to Host Links.

- If you use a disk quota system, the files' disk space will not be deducted from the quota of whoever installed them.

- This user can own all daemon processes, such as the background Gspool and GUFT servers, making them easy to identify.

- Host Links can be installed in such a way that only users belonging to the
  gar group can access the software.

Host Links default system directory is /usr/gar. Many of the Host Links
programs will look for text files, configuration files and macro files etc. in the
Host Links system directory. The installation script will give you a choice to
select another directory as the default system directory, but you should note that
if you do that, you must define a GAR_SYSDIR environment variable that
points all Host Links users to this directory.

Preparation

Create user gar

Before installing Host Links or any of its associated software you should create a
user for administration of the Host Links software. Create a new user id gar and
group id gar on your UNIX/Linux system.

Create /usr/gar

Log in or 'su' to the root user, create the directory /usr/gar and make the
gar user the owner of it with the 'chown' command.

Copy the software to your system

If the Host Links installation files are on a file server somewhere, copy them to a
temporary directory (e.g. /tmp/hlinstal) on your system. Your file server
won't recognize the new user gar until an administrator configures gar on it, so
it is a good idea to copy the files to the local system before you log in as gar.

Log out, then in again as gar

Log out, then log in again as gar before continuing with the rest of the
installation (or su to the gar user id).

Disable old Host Links releases

Stop any Host Links clients and servers that are running.

Remove any old Host Links system directories from your search path.

Installation

Run the installation script

The installation script is very careful not to overwrite configuration files that you have changed at your site. The sample files delivered will only be installed when you do the first time installation, not when you do upgrades. The same installation script is used both for new installations and for upgrades of old ones.

`cd` to the directory that contains the delivery files (`/tmp/hlinstal`).

Start the installation script with:

        sh install.630

where 630 is the Host Links version number.

The script checks your file system for G&R software directories (the historical directory `/usr/serverx`, and the standard `/usr/gar`) and suggests one of these as the default destination directory if it exists. If neither of these directories can be found, the install program suggests `/usr/gar` as the destination directory. The destination directory becomes the Host Links 'System directory'. We recommend that you enter `/usr/gar` as the destination directory, because the Host Links documentation often assumes this to be your System directory when describing configuration files and examples on how to start Host Links products.

The script asks you a few questions before it goes on to do the actual installation.

It shows you the user id and group id you are running with and reminds you that this user will own all files. Please check that you are running as user id `gar` and have group id `gar`, unless you are very sure that you want something else.

It offers to set permissions so that only members of the Host Links group can use the products. Let everyone use them unless you intend restricting access to the group id you are using for installation.

It asks for the directory into which you will install. The default suggested is /usr/gar unless you have previously installed Host Links on a historical directory. If you already have a Host Links installation and choose a new directory the installation is done as for installation on a new system including the sample configuration files, and you must thereafter copy over your various configuration files from your old installation.

It asks if you are installing a Host Links system that will be shared by several platforms, for example by NFS mounting the Host Links 'System directory'. Accept the default unless you plan to do this.

Choosing the correct DSA transport

The script informs you that there are two transport interfaces, and gives you the choice:

```
This delivery contains communication 'line modules' for DSA over
RFC-1006 (TCP/IP) transport and DSA over OSI transport. DSA over
OSI transport is necessary only for historical reasons, because
Datanets, MicroFePs and the GCOS7 ISL do not have TCP/IP
support.

Your choices are:

1. DSA over RFC1006 only
2. DSA over OSI and RFC1006 (requires OSI stack)
Your choice is [1]?
```

Choose option 2 only if you are absolutely sure that you need OSI-transport, and have an OSI-transport stack on your system. Please note that if you choose 2 during the installation and do not have an OSI stack installed, Host Links might fail to start. If you have an OSI stack installed on your Unix machine and choose 2 during the installation, but later remove the OSI software, Host Links might not work anymore.

You can correct this by changing the symbolic links in the /usr/gar/bin directory:

```
rm gl_dsa
rm nl_dsa
ln gl_dsa.rfc gl_dsa
ln nl_dsa.rfc nl_dsa
```

The licenses file

If some of the product license keys are missing from the supplied `licenses` file, or if this file isn't supplied electronically with the software, the license key can be installed later with the *Glicense* program. See the section entitled *Glicense* for information about G&R license keys.

Review the release information

When all the files have been installed, the ASCII version of the SRB `srbhl.630` will be found in `/usr/gar/install`. The installation procedure writes a log `instlog.630` in the same directory, and also installs sample configuration files there so as not to overwrite files from a prior release. For a first time release, sample configuration files are installed in the correct directories.

Set the path

Use the system-wide `/etc/profile` shell script to add `/usr/gar/bin` to the path for all users.

Allow rlogin mode for Host Links

If you will be using the rlogin mode of the G&R TCP/IP line handler (`gl_tcp`) when using G&R products to reach other UNIX/Linux systems you must carry out an extra step as superuser:

```
su
cd /usr/gar/bin
chown root gl_tcp
chmod u+s gl_tcp
```

Install the network software

The G&R communications products for accessing the Bull primary network use the DSA session protocol. This session protocol is delivered by G&R, but requires a transport interface on the Host Links platform. If your Bull mainframe has RFC1006 support then no more communications software is required. We include RFC1006 in Gline. If your Bull mainframe does not have RFC1006 installed, or if you choose not to use it, you will need an OSI-transport stack. There is no OSI-transport stack for Linux. For UNIX, the vendor who delivers the hardware platform normally delivers the stack. It must be configured in a way that is specific for each platform. Please refer to the section entitled *'Installing and configuring OSI stacks'* on page 41 which deals with OSI software installation on the different UNIX platforms.

Build network configuration (dsa.cfg)

After the installation program has been run, the file:

```
/usr/gar/config/dsa.cfg
```

will contain an example of a DSA configuration. This must be modified to reflect your network and the systems you will be accessing. See the sample file in the section entitled *Sample dsa.cfg* on page 29. Please refer to the *G&R/Gline manual* for more details and examples.

Remember to compile `dsa.cfg` with the `'glcc'` program **every time** you have modified your `dsa.cfg` file.

Test

Test your configuration. You will find the DSA test utilities useful e.g. *Gping*

```
gping -li dsa -dn b7dl -da iof -du jim -pw mydogsname
Gping - $$DSA: Connected to application
```

For details of the test utilities please refer to the Appendix.

Configure the Host Links servers

Host Links servers are started by simply executing the command line, see the product manuals for command lines and parameters. You can start them manually for test purposes, but typically you should set up the system such that the command is run each time the system boots. This applies particularly to Ggate and the DSA listener, but can also be used to start up Gspool instances that will listen for incoming connections and for the GUFT server. Gspool instances which listen for DSA connections and the GUFT server are however best set up for start on demand, see the section entitled *Starting applications on demand* on page 19.

Note that because Ggate forks a new process for each connection, it needs to be run by a user ID that has privileges to fork many processes. Typically this means running `gg_tcp` as `root` and not as the *Host Links* administrator user ID. The DSA listener also forks processes if configured to start programs on demand, but usually the default UNIX/Linux value for the number of forked processes is sufficient. However, if it is accepting incoming RFC1006 connections it must run as `root`, because access to the RFC1006 port is restricted to `root`.

Command line syntax

Products may be started at the UNIX/Linux prompt, or from shell scripts etc. with commands in the form:

```
product [-xx yyyyyy ]
```

where `-xx  yyyyy` is one or more legal parameters e.g.:

```
gg_tcp -k 60 -cpara '"-da iof -dp ourproject"'
```

starts Ggate using a 60 seconds keep-alive timer on client sessions. Appends the parameters –da iof and –dp ourproject to all client connections.

Start at system startup

On AIX systems you can start the Host Links servers directly from `/etc/inittab`, by placing the command lines at the end of the file:

```
gg_tcp:2:once:/usr/gar/bin/gg_tcp
nl_dsa:2:once:/usr/gar/bin/nl_dsa
gspool:2:once:su gar -c "/usr/gar/bin/gspool -dpf8 -id gs9 -dpfq -pc lp
                                             -li tcp"
```

On many other systems you can create a shell script e.g. `S99gar` with the content below, and place it in the `/etc/rc2.d` directory:

```
/usr/gar/bin/gg_tcp
/usr/gar/bin/nl_dsa
su gar -c "/usr/gar/bin/gspool  -dpf8 -id gs9 -dpfq -pc lp -li tcp"
```

The format and placement of these installation scripts vary from OS to OS and between versions of the same OS. Please consult your operating system manuals in order to obtain the correct method for creating startup scripts.

Starting applications on demand

Applications can be started on demand when DSA connections arrive. Currently Gspool and GUFTSRV can be started in this way, as well as user-written applications using GlAPI.

The `nl_dsa` listener handles this, so this must be started. A configuration file controls the mapping from the DSA mailbox name (`-mn`) and, optionally, extension (`-mx`) to the command line for the application to be started. There is one file for each DSA node name (`SCID`) for which connections are being accepted. It is placed in the

```
/usr/gar/servers/<scid>.gli
```

directory. The file is either `config.dsa` or `config.diw` for `nl_dsa` and `nl_diws` respectively.

Example file `/usr/gar/servers/grdl.gli/config.dsa`:

```
* Three printer mailboxes
listen -mn printer1 -cmd gspool -pc "lp -dprt1"
listen -mn printer2 -cmd gspool -pc "lp -dprt2"
listen -mn printer3 -cmd gspool -pc "lp -dprt3"
* UFT server
listen -mn filetran -cmd guftsrv
* User written application
listen -mn userapp -lim 1 -ext -cmd userapp arg1 arg2
```

See the *Host Links Gline* manual for details of start on demand.

Environment

Set Host Links profiles

The profiles are used to set various parameters for customization of the Host Links environment. This will in general not be necessary unless you have special needs. For information on the files and the available parameters see the manual ***Installation & Configuration of Host Links Emulators***.

Environment variables

Some configuration can only be done using UNIX/Linux environment variables. It isn't possible to configure these parts using the profiles or configuration files, as they actually specify where these files are and how they should be interpreted.

PATH

It is recommended that you add the location of the Host Links program files to your PATH. The location is `/usr/gar/bin` by default. The PATH update will normally be done for all users in the system-wide `/etc/profile` shell script, but may be set individually. Should you decide not to change the PATH then it is also possible to run any Host Links program by specifying the complete path name.

GAR_SYSDIR

This is not normally set. If you did not install Host Links in the default directory, `/usr/gar`, it has to be set to the name of the directory where you did install it.

GAR_MODE

This is not normally set. In some circumstances it may however be useful to specify the mode part of the user ID for a particular user in particular circumstances. It can be used in selecting special sections from Host Links profiles and configuration files. As UNIX/Linux doesn't have log-on modes they can instead set using this environment variable.

Host Links Server Administration

Gmanager

Gmanager is the Host Links administration tool. It can be used to control, configure and monitor all the G&R Host Links server programs.

The dialog and interaction between the server programs and Gmanager is based on information located in a database file _active.srv that is located in the Host Links servers directory. The first time a Host Links server program starts up it registers itself in this 'active' file. Thereafter the server program updates this database with status information whenever the server is active.

The Gmanager program is available in 2 different versions – a Windows GUI based version gmanw.exe and a character based subset gman (UNIX/Linux binary) or gman.exe (PC console application).

The basic functionality of the two versions is the same, but the Windows version interfaces directly to other Windows-only Host Links administrative tools (*Gconfig*, *Gservice*), and can also start the browser directly to view HTML reports produced by Gproxy, if enabled, or to view the HTML pages associated with a *Gweb* or *Glink for Java* installation.

The *Gproxy* reports, *Gweb* and *Glink for Java* web pages are of course available to administrators of UNIX/Linux Host Links systems, and can be viewed by starting a browser manually, and connecting to the appropriate URLs:

```
http://mysite.mydomain.com/Gproxy
http://mysite.mydomain.com/Gweb
http://mysite.mydomain.com/GlinkJ
```

A summary of the available functions follows. The Windows-only functions are marked.

Gmanager can be used to perform the most common Host Links administrative tasks i.e.:

➢ View the last reported status information from the servers

➢ Start new server

➢ Restart a server

➢ Send a command to a server

➢ View a server log file

➢ View a server trace file

➢ Load the DSA configuration into an editor

➢ Compile the DSA configuration

➢ Call *Gconfig* the server configuration program (Windows)

➢ `Start the configuration wizard (Windows)`

➢ Load the *Gservice* configuration into an editor (Windows)

➢ Start the Host Links server programs using *Gservice* (Windows)

➢ Edit the product specific configuration files

➢ Connect directly to the *Gproxy* HTML pages, if enabled (Windows)

➢ Connect directly to the *Gweb* HTML pages, if enabled (Windows)

➢ View program version numbers, program link information (Windows)

➢ View license info and license usage (Windows)

➢ View Host Links environment information, the 'VMAP' (Windows)

The commands that are accepted by all servers are:

➢ DOWN - terminates the server

➢ STATUS - reports server-specific status information to the log file

➢ PARAM - brings up a dialog box that allows the operator to give a command line parameter to the server. Note that some parameters do not work when given interactively i.e. they can only be handled at server startup time

➢ DEBUG ON/OFF - toggles on and off tracing interactively

Additionally, the server in question might support other interactive commands. For a description of the supported commands, check the server-specific documentation.

Gdir

This is a directory navigation and file edit/display/execute tool. The editor and display programs used are configurable so you can replace them with your favorites. The keyboard is configurable so that you can add shortcut keys that make several of your favorites available for use on the selected file. Gdir is supplied as a character based utility gdir (UNIX/Linux binary) or gdir.exe (PC console application).
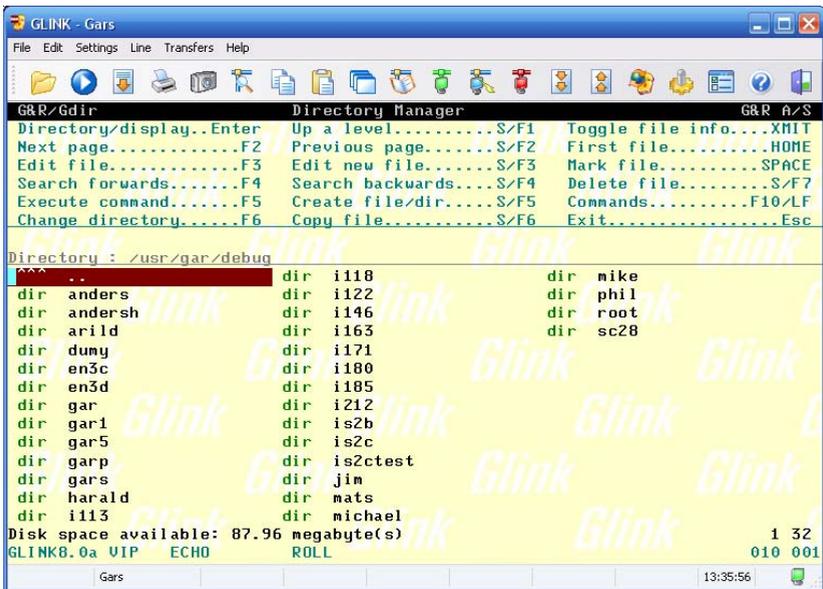
You might find this very useful when navigating in the Unix/Linux file system to look for Host Links configuration or trace files. In the Windows environment it offers somewhat different functionality than MS Explorer.

Tools

Gver

This is a utility program that lists the version number of the G&R Host Links release programs that you are using. Gdir is supplied as a character based utility gver (UNIX/Linux binary) or gver.exe (PC console application). It can be used to list only the release number, or to list details of all G&R software installed:

```
jim@gars ~ $ gver -r
6.3.0/spaso

jim@gars ~ $ gver

3270web   2398792 gweb/cpicweb 6.3.0/spaso Apr 6 2006 13:49:30
5250web   2492104 gweb/cpicweb 6.3.0/spaso Apr 6 2006 13:49:30
7800web   2469820 gweb/cpicweb 6.3.0/spaso Apr 6 2006 13:49:30
dkuweb    2488016 gweb/cpicweb 6.3.0/spaso Apr 6 2006 13:49:30
```

Gdump

This utility program lists the Host Links environment. It is supplied as a character based utility gdump (UNIX/Linux binary) or gdump.exe (PC console application).

Host print in DSA networks

Print to screen session

If the application mixes print with normal screen output using print addressing for the print blocks, and screen addressing for screen blocks Ggate simply passes print output to Glink, or if using TNVIP or Telnet, to a third party emulator.

Print on separate session

If mainframe print output is being sent to an independent mailbox then the DSA configuration file can be set up to merge this print with the terminal session. The resulting merged session looks to Glink or third party emulators exactly as if the application had used print addressing. Please refer to the *Gline* manual for details of the -pco option. Alternatively a copy of Gspool can accept the print as described below.

Gspool

If mainframe print output is being sent to an independent mailbox, then Gspool can be used to accept the print. Gspool functions quite independently outside of the user process and may be configured to connect to the mainframe, or to wait for the mainframe to connect to Gspool. Printers configured in DPF8-S&F must log on to GCOS8. Printers configured in RSM8 on GCOS8, in Twriter on GCOS7 and printers configured in the SNM on GCOS6 all wait for the mainframe to connect to them. There is no Remote Batch facility available on UNIX/Linux, so GCOS8 SYSOUT has to be delivered to Gspool via a GCOS8 SYSOUT spooling program such as RDF8, DPF8-DS, RSM8 or Dispatch8.

Glicense & license keys

All G&R products require a license key to run. If you are a G&R distributor you need a license key from G&R. If you are a customer you should have received the license keys from your distributor together with the software. The licenses are stored in text format in a file named `licenses`.

If `licenses` is delivered with the product files, it is merged with any existing licenses in the configuration directory when you run the install procedure.

UNIX/Linux	`/usr/gar/config/licenses`
Windows server	`C:\gar\config\licenses`

Glicense

The `Glicense` program is included in every software delivery, and it can be used even though no license key is installed. This allows you to create or modify your own licenses from a license card. You must execute `Glicense` from a user-id that has permission to write in the configuration directory (i.e. the Host Links administration user `gar` for Host Links). When executed with no parameters, `Glicense` will check for an existing `licenses` file. If found it will skip directly to the command dialog, but if there is no license then it will prompt you for distributor name, customer name and the main license key. Be careful to type the names and the key exactly as given to you by your distributor. It is important that you respect case and spaces between words.

To tell `Glicense` explicitly where the license file is, or where it should be written, supply the full path as an option. For example:

```
glicense /usr/gar/config/licenses
```

Enter the license information, text and keys, exactly as specified on the supplied license card.

Once the first time installation has been done, you can simply run `Glicense` without any options and it will automatically find the `licenses` file.

When started `Glicense` gives you the following prompt:

```
Enter command or '?':
```

If you enter '?' a list of the available commands is returned:

Use these commands to define/modify and save the `licenses` file.

A = Add	Add a new product to the license file.
D = Delete	Delete a product from the license file.
R = Read	Read in a new license file.
M = Merge	Merge in license keys from a license file
W = Write	Save the license file.
P = Print	Display a list of configured products.
N = New	Create a new license file.
H = Hardware	Change the hardware platform
X = eXpiration	Define an expiration date for all products.
V = Version	Set new version for all products
Q = Quit	Quit the `Glicense` program.
ENTER	The ENTER key quits `Glicense`

If you enter the Print command, the result will be something like this:

```
Enter command or '?': p
Distributor: Bull A/S   Customer: Arbeidsdirektoratet
Product: Basic
Product: Gline
Product: Ggate
Product: Gspool
Product: Qsim
```

License keys

Below you find a complete list of all Host Links and Glink for Java license keys:

License key	Products that require this key
basic	All products.
ggate	Ggate.
gspool	Gspool.
guft	GUFT server.
Guftc	GUFT client.
gproxy	Gproxy.
qsim	Qsim.
v78sim	V78sim.
g3270	G3270.
g5250	G5250.
pthru	Pthru.
sdkglapi	GlAPI SDK.
Glapi	GlAPI run-time.
Telnet	Enable Ggate Telnet support
Tnvip	Enable Ggate TNVIP support
ssl	Enables SSL support
Marben	Marben OSI Stack for Windows NT 4
Marben2K	Marben OSI Stack for Windows 2000
MarbenXP	Marben OSI Stack for Windows XP
Marben03	Marben OSI Stack for Windows 2003
Gweb	Gweb Professional Edition All terminal emulations
Gljopen	Glink for Java Open (VTnnn/ANSI/Minitel).
Gljpro	Glink for Java Professional Edition.

License key	Products that require this key
Gljent	Glink for Java Enterprise Edition.
Gljall	Glink for Java All terminal emulations.
Gljsa	Glink for Java Standalone (No configuration server).
Gljsrv	Glink for Java Server (Configuration and License).
Gljcnx	Glink for Java Gconnect (J2EE connector)
Gljdsa	Glink for Java DGA (native DSA comms stack)
Gljggen	Glink for Java Gargen

Sample dsa.cfg

The following file is the sample delivered with Host Links for UNIX/Linux, and is found in

`/usr/gar/config/dsa.cfg`

The hash characters denote comments, and would be removed from the configuration directives after these have been edited to reflect your site and remote nodes.

```
# This file configures the gl_diws and gl_dsa line modules.
#
# The Gline configuration compiler, glcc, must be run to activate any
# changes done here.
# The following directives may be used:
# sc       - Session control
# rsc      - Remote session control
# ts       - Transport station
# tp       - Transport provider
# coname   - Connection name
# params   - Parameters
# pool     - Parameter pool
# costrict - Connection name strictness
# restrict - Parameter restrictions
# filter   - Access filter


# Some examples of usage of the first four directives follow below.
# Please refer to the Host Links Gline manual for details.
# Suppose your local DSA node name is is2c with DSA address 54:97.
# You want to connect with remote DSA nodes is2b, en3e, en3f and en40.
# is2b and en3e are reachable over WAN through the same front-end and
# you need gl_dsa DSA200 connections to en3e. en3f is also
# reachable over WAN, but through another front-end. Finally en40 is
# reachable over LAN.

# For machines with the Bull OSI XTI interface
# and Sun Solaris 2.x platforms you need something like:

# sc is2c -addr 54:97
# rsc is2b -ts fep1_wan
# rsc en3e -addr 54:62 -ts fep1_wan
# rsc en3f -ts fep2_wan
# rsc en40 -ts fep1_lan
# ts fep1_wan -class 2 -ns 123456 -tp wan
# ts fep2_wan -class 2 -ns 888888 -tp wan
```

```
# ts fepl_lan -class 4 -ns 080011223344 -tp lan
# tp wan -attach 123455
# tp lan -attach 08001123355


# For the SCO Unix, SVr4 on Intel and Hewlett-Packard HP-UX platforms
# you need something like:
# sc is2c -addr 54:97
# rsc is2b -ts fep1_wan
# rsc en3e -addr 54:62 -ts fep1_wan
# rsc en3f -ts fep2_wan
# rsc en40 -ts fepl_lan
# ts fep1_wan -class 2 -ns 123456
# ts fep2_wan -class 2 -ns 888888
# ts fepl_lan -class 4 -ns 080011223344


# An RFC1006 example of usage of the first six directives follows
# Please refer to the Host Links Gline documentation for details.
# Suppose your local DSA RFC1006 node name is 'mypc'.
# You want to connect with remote DSA RFC1006 node name 'ph21'
# which has IP address 1.2.3.4
# In addition, you want to use a connection pool named 'tp8ws001co'
# which references a pool of mailbox extensions named 'lidpool'.


# For the remote DSA RFC1006 node ph21, we'll give a symbolic remote
# session control id of 'ph21_rfc'. The gline parameter
# to access this system would be "-li dsa -dn ph21_rfc".
#
# The "tp rfc -who gar" indicates that the transport is G&R's rfc1006
# interface
#
# sc mypc
#
# rsc ph21_rfc -scid ph21 -ts ph21_rfc
# ts  ph21_rfc -class 0   -ns 1.2.3.4  -tp rfc
# tp  rfc       -who gar
```

```
# If you want to configure gline parameters centrally in the
# dsa.cfg file, this is done with the 'coname' directive.
# See the Gline manual for more information about configuring
# 'coname's and setting up filters to control access to them.
#
# In Glink you can select a coname entry in dsa.cfg by saving
# a 'DIWS/DSA host configuration' with the coname ('Connection name').
# In Host Links a coname is selected with the '-co' parameter.
#
# By the use of Glink 'Connection name': 'tp8ws2' you will get the
# parameters defined in 'coname tp8ws2' below:
#
# coname tp8ws2 -desc "TP8 workstation 2"
#      -dn ph21_rfc -da tpws2mbx -hm dps8 -dx mg01

# Another example of coname. This time getting the LID from a pool.
#
# coname tp8ws2 -desc "TP8 workstation 2" -pool lidpool
#      -dn ph21_rfc -da tpws2mbx -hm dps8
#
# pool lidpool
#   -dx mg01
#   -dx mg02
#   -dx mg03
#   -dx mg04


# coname's are also used for configuration of merged print, where
# data from a separate host session are merged into the terminal
# session, marked as print data.
# Glink or the Host Links emulation program enable this functionality
# through the use of the gline parameter '-pco <coname>' where
# 'coname <coname>' must be configured in dsa.cfg. If the gline
# parameter '-pcn' is used, the separate print session will
# be established by the line handler. The default is to wait for
# the host to establish the session.

# Merged print from TWriter on GCOS7. Gline parameter '-pco a2_print'
# The printer coname must wait for a connect from Twriter to printer
# mailbox mypctw
#
# coname a2_print -desc "Twriter print to MYPCTW"
#   -ln -mn mypctw -tm a2

# Merged print from TP. Gline parameters '-pco rop1 -pcn'
# The printer coname must connect to TP8 (mailbox mytp8) with LID rop1
#
# coname rop1
#   -da mytp8 -dx rop1 -dn ph24_lan
```

Platform specific requirements

The Host Links products are currently implemented on several different UNIX platforms, on Linux and on Windows. This chapter explains in more detail which platform(s) the different versions support. Also included for each platform are requirements for hardware, operating system, OSI stack, patches and disk space, as well as other useful notes.

386l2 (Linux)

This version supports Linux distributions based on Linux kernel 2.2 and above.

OSI software and hardware for Linux

There is currently no OSI stack available for Linux.

386so (Solaris)

This version supports implementations of System V Release 4 running on a multitude of generic and vendor specific Intel platforms. We have qualified Sun Solaris, but it may also run on other Intel versions of System VR4.

OSI software and hardware for Solaris

For DSA connections over LAN and X.25 we have qualified SunLink OSI release 8.1.1 with the latest OSI patch. Any LAN card supported by Solaris should work. Connections via X.25 also need SunLink X.25 release 9.1 with latest patch. Solaris release 7 needs Sunlink 9.2 with the latest patch. Any X.25 card supported by SunLink X.25 should work.

The real memory consumption is currently not known. The SunLink OSI stack supports a maximum of 1024 transport connections.

hpp11 (HP-UX Rel. 11)

This version supports Hewlett-Packard HP-UX release 10.11 on all HP platforms running this OS release.

There is currently no OSI support for this platform, use rfc1006 communications instead.

ppca5 (AIX 5.x)

This version supports AIX release 5.1/5.2 for PowerPC running on Bull Escala machines.

rs6a4 (AIX rel. 4.x DPX20, RS6000)

This version supports AIX release 4.3 (rs6a4) and above running on Bull DPX/20, Escala and Estrella and IBM RS/6000 machines.

For DSA connections via both LAN and X.25 you need the versions of Bull CNHG069-CNHG073/OSI_LOW-MAX3 and CNHG071/XTI-API that are supported by your AIX release. Possibly these products may be bundled with other Bull products you have already installed, this can be checked with the `lslpp -l` utility. All LAN and X.25 cards supported by the OSI_LOW software should work.

OSI releases prior to 02.02.08 support a maximum of 1024 connections. Newer releases support up to 2048 connections.

The real memory consumption is currently not known.

In order to use the X.25 line handler in Gline the OSI_LOW software also has to be installed.

spaso (Solaris 2.6 SPARC)

This version supports Sun Solaris 2.6/2.7/2.8 on Sun SPARC based machines or clones thereof.

For DSA connections via both LAN and X.25 you need SunLink OSI release 8.1.1. Any LAN card supported by Solaris should work. Connections via X.25 also need SunLink X.25 release 9.1. Any X.25 card supported by SunLink X.25 should work. For speeds up to 19200 bits/sec the standard serial ports may also be used.

The real memory consumption is currently not known. The SunLink OSI stack supports a maximum of 1024 transport connections.

In order to use the X.25 line handler in `Gline` the SunLink X.25 software also has to be installed.

Installing and configuring OSI stacks

Bull DPX/20 - IBM RS6000, AIX 4.1.x

You should note that Bull has removed the OSI session layer access method in this generation of their OSI stack. `Host Links` users migrating to this release of AIX and OSI stack must at the same time migrate to the more modern XTI interface. G&R Support for the OSI-session access method (MAD) available in the earlier Bull OSI-stacks is discontinued. All new functionality requires XTI.

Install Bull software

Start smit and walk through the following menus:

```
Software Installation and Maintenance
  Install / Update Software
    Install Bundles of Software (Easy Install)
    Install/Update Selectable Software (Custom Install)
```

Depending on system (Estrella, DPX/20 or Escala) you will now install the OSI software from the installation media (CD-ROM or tape) labeled 'Bull OSI COM ver. 2.x.x on AIX 4.1.x' as a bundle of software or by selecting the appropriate modules.

Make sure that you end up installing at least:

```
OSI-LOW  Layers 1-4
XTI-API
```

X.25 setup

Install and configure the software according to Bull DPX/20 documentation. We cannot help you here, as the correct parameters will vary from country to country and site to site. Normally the local Bull technicians know all about this.

Anyway, walk through the following `smit` menus:

```
Devices
 Communication
```

At this point you select the menu item that correspond to the installed adapter:

```
    X.25 CoProcessor/2 or Multiport/2 Adapter
or
    Hispeed WAN Comm Adapter
```

Depending on the adapter you navigate through the following set of menus.

```
    Adapter
       Manage Device Drivers for X.25 CoProcessor/2
       or Multiport/2 Adapters
           Manage X.25 CoProcessor/2 Device Driver
```

at this point you should select:

```
Add a Device Driver
```

if the device driver for your X.25 adapter has not been installed before. If it is already installed, select:

```
  Change / Show Characteristics of a Device Driver
```

or if you have a Hispeed WAN Comm adapter, you should first do an easy config through the menu item:

```
Easy Config with Bundle
```

if the device driver for your X.25 adapter has not been installed before. If it is already installed, select:

```
Change / Show Characteristics of an Hispeed WAN Comm Adapter
```

to end up in the following menu:

```
Change/Show Network Parameters
Change/Show Packet Parameters
Change/Show Frame Parameters
Change/Show Default for Permanent Virtual Circuits  (PVC)
Change/Show a Specific Permanent Virtual Circuit    (PVC)
Change/Show General Parameters
```

At this level, walk through the menus to adjust the parameters to the X.25 network.

When the X.25 logical group number in the network is different from 0 (in Norway, DATAPAK uses logical group no. 4), the trick is to adjust the parameter for: "Lowest logical channel number for a two-way SVC". In the Norwegian DATAPAK it should be:

```
Lowest logical channel number for a two-way SVC [1024]
```

This is because decimal 1024 is equal to hexadecimal 400, and the first VC used is 0 on logical group 4.

OSI transport and session setup

Start smit and walk through the following menus:

```
Communications Applications and Services
  OSI Networking
    OSI Configuration
```

If you do not already have a configuration, you have to create one. If you have a configuration, jump to the "Modify a configuration" section.

Create a configuration

To create a new configuration, you may create a default, minimum configuration called `OSIdefault` through the menu item:

```
Minimum Configuration
```

or you simply select the following menu and give the configuration a name. If this is your first configuration it is automatically selected. If not you have to select it as well.

```
Configuration Management
 Create a configuration
 Select a configuration
```

Return to the menu

```
OSI Configuration
```

Modify a configuration

Select adapter for OSI communication

First you have to select on which communication adapters you want to run OSI communication. You can select several adapters, both LAN and X.25 adapters. Do this by the selecting the following smit menus:

```
Configuration Definition
 Communications adapter access
  Add communications adapters
```

At this level you ask for a list of available adapters by pressing `F4`, and select adapter(s).

Activation of OSI stack

You are now ready activate the actual OSI services and configure your maximum number of OSI connections. Note that in OSI Stack C the XTI-API and OSI lower layers (1-4), which are the *Host Links* prerequisites, are automatically generated and loaded when the configuration is loaded.

Important:

> Some versions of the Bull OSI stack set the value of 'COTP LAN local retransmission time (T1)' to 3000 ms. This is too low. You must increase it to 10000 ms. The error symptom if this isn't done is that idle sessions are aborted with a transport disconnect error code of 04010430.

It is possible to configure up to 2.048 simultaneous OSI connections, and this is done by the following `smit` menus, by changing the default 64 in both lines. If you are accessing two different front-ends then the total number of sessions needed would be in the 'simultaneous' line, and the largest number to a single Datanet would be in the 'multiplexed' line:

```
Configuration of OSI Layers
  Max. no. of simultaneous COTP connections      [64]
  Max. no. of OSI COTP connec. multiplexed on a VC.  [64]
  Type of function assumed on system                 ES
```

Note that *Host Links* does not use the Bull-specific XTI configuration files that can be managed through the `smit` system. No XTI configuration is necessary at this point. See the sample file in the section entitled *Sample dsa.cfg* on page 29. Please refer to the *G&R/Gline manual* for more details and examples.

Loading (and generation) of the new OSI configuration

Before loading the newly generated OSI configuration, you may have to unload your old configuration - currently running. This is done by selecting:

```
  Unload current loaded configuration
```

Finally you load the new OSI configuration by selecting:

```
  Load the last selected configuration
```

Host Links uses the `dsa.cfg` file for all local DSA and OSI configuration. Note that *Host Links* does not use the XTI configuration files, `/etc/xtihosts` and `/etc/xtiservices`, that are configurable through the XTI menu in `smit`. We chose to use `dsa.cfg` for these configuration purposes as it has a more intuitive format, and it is common to all UNIX/Linux systems supported by *Host Links*. See the sample file in the section entitled *Sample dsa.cfg* on page 29. Please refer to the *G&R/Gline manual* for more details and examples.

If you're not sure which X.25 or LAN address to use, use the `osiadapterinfo` command to list the adapters configured for OSI communication.

Troubleshooting

Learn how to use the `xdmanage`, `xdmonitor` and OSI protocol analyzer programs. They provide very good traces and are invaluable if you don't have an external line monitor like a Sniffer.

You will also find the new set of trace tools available from the following `smit` menu very useful:

```
Communications Applications and Services
  OSI Networking
    OSI Diagnosis Interactive Tool-Kit
      OSI Stack Information
      OSI API Trace Management
      OSI Layers Trace Management
      OSI Protocol Analyzer
      OSI Trace Save Without Analysis
```

`osisnapshot -dm` will display OSI memory status.

`osiconf -d configname` will display the configuration named in the command, and tell you if it is the currently selected and last generated configuration. It also tells you on which adapters XTI is defined, the number of connections and the timers configured.

`osiinfo` will display OSI stack information.

`pmaderror <error code>` may also be a useful command when you're not able to connect to remote systems or abnormally lose your connection.

Sun Solaris 2.x OSI stack

X.25 setup

Install and configure the software according to Sun documentation. We cannot help you here, as the correct parameters will vary from country to country and site to site.

One thing we have found is that Bull X.25 software often runs into problems if the X.25 call request sent by the Sun is too 'fancy'. We have found that the results are best if we run as described below.

As `root`, start the `/opt/SUNWconn/bin/x25tool` program.

```
Define/Modify interfaces
  X.25 links
   Set Link type to WAN (1980)

Create/Modify configuration files
  X.25
    Working Facilities
                 Set Allow extended call packets to off

File
  Save
    Working
```

Another thing worth mentioning is that there appears to be a bug in the Sun X.25 software: if you stop it without rebooting the machine, it does funny things like killing all running processes! It seems to be safest to always reboot after an X.25 configuration change. But try without first, it might work for you, and constant rebooting is no fun.

OSI over X.25 setup

As `root`, start the `/opt/SUNWconn/bin/ositool` program.

```
Stack Manager
  Configuration
    Devices
      Add
        X.25 device
       Set the SNPA address to match your X.25 address.

    Application Selectors
  Transport over CONS
    Set NULL PID if OSI on.
     Set Max. PDU Size greater or equal to the TPDU size you
     plan to use in dsa.cfg. This value will be the upper
     limit for TPDU size selection in dsa.cfg. The default
     is 512, and selectable values are 128, 256, 512, 1024,
     2048, 4096 and 8192.

    Resources
     Set the number of contexts and channels for High
     Interface, Transport over CONS, CONS and Low Interface
     to reflect the maximum number of connections. The
     default is 256 contexts and channels and the maximum is
     1024. Consult the SunLink OSI documentation for more
     information on how to assign context and channel
     values.

Network Layer Addresses
   Select the NSAP family: free-form
   Select Type: CONS
     If your X.25 address has an even number of digits, type
     in:36 followed by the X.25 address.
     If your X.25 address has an odd number of digits, type
     in:360 followed by the X.25 address.

Route Manager
  Category/Prefix Routes
    Select NSAP Prefix: 360
    Select X.25 Service
    Set Addressing Mode to CONS-80
    Set X.25 Link Type to 1980
```

Do the same for the 36, 521 and 52 NSAP prefixes.

There is a bug in the `ositool` program so that it sometimes displays CONS-80/1980 for the 36, 521 and 52 NSAP prefixes, even when it in reality is still set to 1988. You must go through and change all of them as above.

```
Save

Command
      Restart osinetd

Quit ositool
```

OSI over LAN setup

As `root`, start the `/opt/SUNWconn/bin/ositool` program.

```
Stack Manager
  Configuration
    Devices
        Select the DLPI device.
            Set the LSAP to 20.

    Application Selectors

    Transport & CLNS
```
Set `Max PDU Size` greater or equal to the `tpdusize` you plan to use in `dsa.cfg`. This value will be the upper limit for `tpdusize` selection in `dsa.cfg`. The default is 512, and selectable values are 128, 256, 512, 1024, 2048, 4096 and 8192.

```
    Resources
```
Set the number of contexts and channels for `High Interface`, `Transport & CLNP` and `Low Interface` to reflect the maximum number of connections. The default is 256 contexts and channels and the maximum is 1024. Consult the SunLink OSI documentation for more information on how to assign context and channel values.

```
ES-IS Configuration
    Select the LLC device.
    Set the Protocol Subset to Null Protocol
```

If the Default isn't set to point to the LLC device, change it so it does.

NOTE:

> There is a bug in the `ositool` program so that it sometimes loses this default setting, even if you haven't been in that part of the program at all! **Always** go into this menu when you run `ositool`, and change the default to point to the LLC device if it doesn't already. If you don't get OSI over LAN to work, always double-check this.

```
Network Layer Addresses
   Select the NSAP family: free-form
   Select Type: CLNP
       Type in the machine's LAN address in hex format.


   Save

Command
  Restart osinetd

   Quit ositool
```

dsa.cfg configuration

See the sample file in the section entitled *Sample dsa.cfg* on page 29. Please refer to the *G&R/Gline manual* for more details and examples.

dsa.cfg changes for DSA over X.25

Add the line:

```
   tp wan -attach xxxxxx
```

Replaces the xxxxxx with the local network address as specified in the Sun OSI config. Then point the TS records needing wan access here.

dsa.cfg changes for DSA over LAN

Add the line:

```
tp lan -attach xxxxxxxx
```

Replace the xxxxxx above with the LAN address of the Sun machine as specified in the Sun OSI config. Then point the TS records needing LAN access here.

Troubleshooting

Learn how to use the `x25trace` and `osi_trace` programs. Both provide very good traces and are invaluable if you don't have an external line monitor like a Sniffer.

Double-check that you haven't stumbled into the `ositool` bugs that are mentioned above.

HP HP-UX OSI stack

Install HP software

Install X.25/9000, Streams/9000 and OTS/9000 according to the instructions given in their respective HP9000 Installation and Administration guides. This implies that you should install any link product (i.e. X.25/9000 and LAN/9000) and Streams/9000 before installing OTS/9000. Note that in HP-UX 10.x the Streams software is integrated into the basic operating system and need not be separately installed.

X.25 setup

After you have installed the X.25/9000 hardware and loaded the X.25/9000 software with `update`, log in as `root` and do the following:

At the HP-UX prompt, type: sam

At the SAM Main window, highlight

   `Networking/Communications` and activate the `OPEN` button.

At the `Networking/Communications` window, highlight

   `Network Interface Cards` nd activate the `OPEN` button.

Highlight the X.25 card that you are configuring from the displayed list

Choose `Configure` from the `Actions` menu and follow the 5-step menu to complete the following 5 tasks:

Configure X.25 address

`Card Type`, `Card Name` and `H/W Path` are displayed and you are asked to enter:

`Configuration Filename:`
SAM suggests a name based on the device file, i.e. `/etc/x25/x25config_0` for card name `x25_0d.` Normally you should accept this suggestion.

`X.25 address:`
Enter the X.25 address assigned by the network provider.

`Programmatic Access Name:`
Enter a name to be used for Level 3 programmatic access.

`Network Carrier Type:`
Select the network type that corresponds to the provided X.25 network.

Configure Virtual Circuits

Configure the number of `Permanent`, `Switched (inbound)`, `Switched (two-way)` and `Switched (outbound)` VCs provided/subscribed to, and assign value(s) for first logical VC. Normally you would configure only the number of two-way VC's and the starting logical two-way VC.

Configure Internet address

It is not necessary to configure anything in this menu to run OTS.

Verify Level 3 values

Configure these values according to your X.25 subscription. The defaults are normally OK, but should be verified.

Verify Level 2 values

Configure these values according to your X.25 subscription. The defaults are normally OK, but should be verified.

Check your X.25/9000 configuration by running `x25stat/x25server` or `padem`.

OSI transport and session setup

Before starting the OTS configuration, you should verify that the link layers (X.25/9000 and/or LAN/9000) have been installed and configured properly, and that Streams/9000 and OTS/9000 have been installed without any error.

If you are installing OTS to run over the LAN link product verify that the LAN product is configured to run with the IEEE protocol enabled. The following command will show you:

```
grep lanconfig /etc/netlinkrc
```

The output should look like the following for each interface you plan to install OTS over:

```
lanconfig <lan interface> ether ieee
```

where `<lan interface>` is the LAN interface name (i.e. `lan0`, `lan1`, etc.). Use an editor to add 'ieee' to the lanconfig line(s) in the `/etc/netlinkrc` file and reboot the system (`/etc/reboot`).

OTS configuration involves definition of local sub-networks, remote destinations and finally a few manual modifications in a couple of files if you are installing OTS over a LAN interface.

Start the configuration by running the `osiadmin` program. This program calls up the `osiconf` program to do the OTS configuration tasks. When configuration is complete, you return to `osiadmin`.

Highlight `Configure OTS` and press SELECT ITEM or RETURN.

Select the configuration mode (or accept the defaults shown) and press DONE.

Under `Subnetwork Configuration`, select ADD in the `CLNS over 802.3` section if you are going to connect to mainframe systems over LAN and/or select ADD in the `CONS over X.25` if you are going to connect to mainframe systems via X.25 network and press SELECT ITEM.

Add CLNS over 802.3

Enter the following parameters in this sub-network form for each LAN interface you plan to use for *Host Links*.

```
Subnetwork name:
```

Enter a symbolic name that is meaningful to you (i.e. lan). It will be used later when you configure remote destinations.

```
Local network address(NSAP):
```

Enter the LAN address of your LAN interface in this field.

```
Device interface name:
```

Enter the device interface name in this field. It is not necessarily the same as the device file name. Typically it will be lanx, where x should be substituted with the logical unit number or select code. To view existing LAN card interface names, you may use the lanscan utility.

```
CLNP subset:
```

Select the Null subset by entering 0 in this field.

Press PERFORM TASK when you have filled in all parameters.

Add CONS over X.25

Enter the following parameters in this sub-network form for each X.25 card you plan to use for *Host Links*.

`Subnetwork name:`

> Enter a symbolic name that is meaningful to you (i.e. x25). It will be used later when you configure remote destinations.

`Local network address(NSAP):`

> Enter the X.25 address assigned to you by your network provider in this field. If your X.25 address is not an even number of digits, add an upper case F at the end of the address.

`Subnetwork standard(s) allowed:`

> Enter N in the ISO 8878 field, Y in the X.25 1980 field and N in the X.25 1984 and X.25 1988 fields.

`Subaddress/X.25 programmatic access:`

> You must enter one pair, so use the 2 last digits in your X.25 address together with the name defined for X.25 programmatic access during X.25 configuration.

> Press PERFORM TASK when you have filled in all parameters.

Add destination systems.

For each of the remote mainframes with which you are going to communicate fill in the `Add Destination System` form and press PERFORM TASK. If you reach all your mainframes through your local Datanet you only have to configure that Datanet in this form.

`Network address (NSAP):`

Enter the full X.25 or LAN address of the remote system. If your X.25 address is not an even number of digits, add a capital F at the end of the address.

`Physical address (IEEE MAC or X.121):`

Enter the full X.25 or LAN address of the remote system.

`Outgoing subnetwork name:`

Enter one of the local sub-network names you created during sub-network definition.

`End System, Intermediate System or Both?:`

Enter 0 for End system in this field.

`Request reverse charge?:`

You should probably configure 0 for no reverse charging in this field. Consult your network administrator and communication partner if you are not sure.

Your configuration of destinations will end up in the `ots_dests` file that can be found in the:

`/etc/opt/ots/conf` directory

Edit ots_parms and ots_subnets files

These files can be found in the

`/etc/opt/ots/conf` directory

If you have configured OTS over X.25, edit `ots_parms`. You should set

`tpcons_null_pid          0`

If you have configured OTS over LAN, edit both `ots_parms` and `ots_subnets` files. In `ots_parms` you should set

`tpclns_propose_ext_fmt  0`

In `ots_subnets` you should set

`snet_lsap          20`

in every OTS sub-net you have configured over LAN.

When the configuration is completed, select Start OTS to start OTS for the first time.

ots_subnets

Example subnet file `ots_subnets`:

```
snet_clns_8023             lan
snet_local_net_address     02608C200441
snet_if_name               lan0
snet_clnp_subset           0
snet_checksum_on           0
snet_esis                  1
snet_esis_record_esh       1
snet_ish_ctimer            60
snet_esh_ctimer            60
snet_rci_hold_timer        30
snet_esh_checksum_on       0
snet_esis_reverse_path     0
snet_max_es_entries        250
snet_max_is_entries        15
snet_all_es_addr           09002B000004
snet_all_is_addr           09002B000005
snet_lsap                  20

snet_cons_x25              x25
snet_local_net_address     130355
snet_allow_iso8878         0
snet_allow_x25_1980        1
snet_allow_x25_1984        0
snet_allow_x25_1988        0
snet_pgm_access            x25
snet_x25_subaddress        NULL
snet_allow_fc_negotiation  1
snet_allow_fast_select     1
snet_allow_tc_negotiation  1
snet_bind_by_pid           0
```

ots_dests

Example destination file ots_dests:

```
dest_net_address             130366
dest_phys_address            130366
dest_out_subnet              x25
dest_esis                    0
dest_reverse_charge_req      0
dest_iso8878                 1
dest_x25_1980                1
dest_x25_1984                1
dest_x25_1988                1
dest_fc_negotiation          0
dest_fast_select             0
dest_tc_negotiation          0

dest_net_address             02608C2D8023
dest_phys_address            02608C2D8023
dest_out_subnet              lan
dest_esis                    0
dest_reverse_charge_req      0
dest_iso8878                 1
dest_x25_1980                1
dest_x25_1984                1
dest_x25_1988                1
dest_fc_negotiation          0
dest_fast_select             0
dest_tc_negotiation          0

dest_net_address             130399
dest_phys_address            130399
dest_out_subnet              x25
dest_esis                    0
dest_reverse_charge_req      0
dest_iso8878                 1
dest_x25_1980                1
dest_x25_1984                1
dest_x25_1988                1
dest_fc_negotiation          0
dest_fast_select             0
dest_tc_negotiation          0
```

ots_parms

Example osi parameters file `ots_parms`:

```
#----------------------------------
#                        | value |   minimum / maximum / factory/ default
#----------------------------------

#----------------------------------
#   Session
#----------------------------------
ses_tp_con_reuse_timer_init   120   #        30     1200      120
ses_tp_con_reuse_timer_resp   1200  #        30     1200      1200
ses_disc_abort_timer          180   #        30      600      180

ses_tsdu_q                    8     #         4       10        8

#----------------------------------
#   Session Flags              1=on(true)  0=off(false)
#----------------------------------
ses_reuse_tp_con              1     #         0        1        1

ses_fu_type_data              1     #         0        1        1
ses_fu_err_report             1     #         0        1        1
ses_fu_capability_data        1     #         0        1        1
ses_fu_activity               1     #         0        1        1
ses_fu_minor_sync             1     #         0        1        1
ses_fu_expedited_data         1     #         0        1        1
ses_fu_full_duplex            1     #         0        1        1
ses_fu_half_duplex            1     #         0        1        1
ses_ssap_id_in_ac             0     #         0        1        0

#----------------------------------
#   Transport Over CONS
#----------------------------------
tpcons_max_tpdu_size          2048  #       128     8192     2048
tpcons_window_size_tpdus      5     #         1       15        5
tpcons_max_con_mux_in         10    #         1       64       10
tpcons_max_con_mux_out        5     #         1       20        5

tpcons_ts1_ts2_timer          60    #        30      120       60
tpcons_long_con_timer         240   #        30      480      240
tpcons_short_con_timer        30    #        30       60       30
tpcons_tp3_ttr_timer          60    #        30      120       60
tpcons_tp3_ttr_incr           20    #        10      110       20
tpcons_tp4_retrans_timer      30    #        30      120       30
tpcons_tp4_num_retrans        12    #         1       19       12

#----------------------------------
#   Transport Over CONS Flags      1=on(true)  0=off(false)
#----------------------------------
tpcons_tp0_only               0     #         0        1        0
tpcons_pref_mux_class         2     #         2        4        2
tpcons_tp2_flow_control       1     #         0        1        1
tpcons_mux_net_cons           1     #         0        1        1
```

```
tpcons_dr_on_proto_err        0    #        0        1        0
tpcons_dr_er_on_proto_err     0    #        0        1        0
tpcons_sap_id_in_cc           0    #        0        1        0
tpcons_null_pid               1    #        0        1        0
tpcons_network_reset          0    #        0        1        0
tpcons_suppress_expedited     0    #        0        1        0
tpcons_tp4_chksum             0    #        0        1        0
tpcons_encode_priority        0    #        0        1        0

#---------------------------------
#   Transport Over CLNS
#---------------------------------
tpclns_max_tpdu_size       1024    #      128     8192     4096
tpclns_window_size_tpdus      3    #        1       15        3
tpclns_retrans_timer          6    #             1      120       6
tpclns_num_retrans           12    #        1       19       12
tpclns_window_timer          50    #        0      100       50
tpclns_ack_timer              1    #        1      100        1
tpclns_send_tpdu_q           10    #        1       20       10

tpclns_window_size_tind       5    #        1       20        5

#---------------------------------
#   Transport Over CLNS Flags     1=on(true)  0=off(false)
#---------------------------------
tpclns_suppress_ack           0    #        0        1        0
tpclns_ignore_ack_timer       0    #        0        1        0
tpclns_chksum_spurious_resp   0    #        0        1        0
tpclns_dr_on_proto_err        0    #        0        1        0
tpclns_ignore_chksum          0    #        0        1        0
tpclns_propose_chksum         0    #        0        1        0
tpclns_propose_ext_fmt        0    #        0        1        1
# multiple tpdus per end-unit data request.
tpclns_multi_tpdu_per_nudtrq  1    #        0        1        1
tpclns_encode_priority        0    #        0        1        0

#---------------------------------
#   CLNS
#---------------------------------
clns_lifetime_parm           50    #        1      255       50

clns_max_tpdus_reassemble    50    #       10     1000       50
clns_cntl_blk_alloc_quantum  20    #       20     1000       20

#clns_net_entity_title          # Hexadecimal number (optional)

#---------------------------------
#   CONS
#---------------------------------
cons_max_nsdu_size         2048    #      256     4096     2048
cons_max_route_entries      430    #        0     2550      430
cons_con_timer              300    #        0      600      300
cons_sndcp_con_timer        250    #        0      300      250
cons_sndcp_disc_timer       200    #        0      300      200
cons_x25_packet_size        128    #       16     4096      128
```

Troubleshooting

Learn how to use the osidiag and nettl programs. They may provide
useful traces that help you to investigate communication problems.

Appendix: Host Links Manuals

Below you find a complete list of all available Host Links manuals:

Installation	
Host Links Servers	Installation and Configuration on UNIX/Linux
Host Links Emulators	Installation and Configuration on UNIX/Linux
Host Links	Installation and Configuration on Windows
Line handling	
Gline	Line Handler and DSA/OSI Configuration
Ggate	Transparent Gateway
Gproxy	Network Manager & SNMP Proxy Agent
G&R SSL	Using SSL for security in G&R products
GlAPI	Application Programming Interfaces
Emulations	
Gspool	Network Printer Emulation
GUFT	Unified File Transfer
G3270	Emulating IBM 3270 Terminals
G5250	Emulating IBM 5250 Terminals
Pthru	Gateway to the Bull Primary Network
Qsim	Emulating Questar DKU7107-7211 & VIP7700-7760
V78sim	Emulating VIP7801 & VIP7814
Gweb	Web Browser Front-end for DKU, VIP7700-7760, VIP7800, IBM3270 and IBM5250 Emulations

Appendix: The text library

All the messages used by Host Links are kept in the text library `progtext[.ccc]` in directory `gar`, sub-directory `misc`, so the default texts for a site can be changed using the `gcptexts` utility:

gcptexts - Maintain program texts

```
gcptexts [-v] [-x module] [-o] library [[file] [file]..]

where           <library> is progtext with all module texts
      <module>    is a text module number to export, or 0 for all
      <file>      are the files containing program texts to import

Flags -v          verbose mode
      -o          overwrite ok when exporting
```

The host Links modules using the message library are:

```
Module      number for export
divutl      001
gdir        011
gedit       016
gline       006
glist       013
gmail       012
gmailer     015
gmenu       014
guft        028
gweb        030
mailutl     002
```

The texts are exported to one file for each module, where the file name is fixed and the same as the module name e.g. file 'gline':

```
#006   Attention: Do NOT modify this line!
001 You are not logged on to the gateway.
002 You are already logged on to the gateway.
003 You are not connected.
004 Already connected.
005 -LL parameter out of range.
```

Export the message texts used by Gline (module 6) to file 'gline':

```
gcptexts –v –x 6 progtext
```

Modify the file (not the first line identifier) and then import the messages.
You can import from multiple files using any file names:

```
gcptexts –v progtext myglinetexts mygwebtexts
```

Note that you can have several different `progtext` libraries, and select the one to be used by adding a LANGUAGE directive to the profile used by an individual user or group of users. The libraries are identified by a suffix of up to three characters e.g. `progtext.fr`, and this would be selected by adding the directive `LANGUAGE FR` in the profile. See the chapter entitled ***Profiles configuration*** for details. The default is `progtext` with no suffix, and if all users speak the same language you can simply update `progtext` with your translated version of the texts.

Appendix: Error Codes

OSI/DSA error codes

Below is a list of OSI/DSA error codes and the corresponding description. These are the same descriptions that the G&R/Gerror utility will display when given the DSA code as a parameter.

code	Description
00xx	**General Errors**
0001	Open Failure in LC - Reject for unknown reason
0002	Open Failure in LC - Acceptor customer node inoperable
0003	Open Failure in LC - Acceptor customer node saturated.
0004	Open Failure in LC - Acceptor mailbox unknown.
0005	Open Failure in LC - Acceptor mailbox inoperable.
0006	Open Failure in LC - Acceptor mailbox saturated.
0007	Open Failure in LC - Acceptor application program saturated
0008	Connection refused. Transport protocol error or negotiation failed.
0009	Open Failure in LC - Dialog protocol error or negotiation failed
000A	Open Failure in LC - Presentation protocol error or negotiation failed
000B	Open Failure in LC / Connection refused lack of system resources
000C	Open Failure in LC / Connection refused from GCOS7 duplicate user
000D	Open Failure in LC, Duplicate implicit LID / Q class not started
000E	Open Failure in LC, Duplicate GRTS Id / lack of memory resources
000F	Open Failure in LC, No Logical line declared for DACQ / 7 connection refused
0010	Open Failure in LC, GCOS 8 GW Missing translation / Incorrect device length in ILCRL.
0011	Open Failure in LC, DAC connection not initialized / Too many jobs executing
0012	Open Failure in LC, No binary transfer / impossible to start the IOF job
0013	Open Failure in LC, connection is not negotiated in FD mode / impossible to start the IOF job

0014	Disconnection - Timeout resulting from absence of traffic.
0016	Option missing for an RBF mailbox.
0017	Connection refused - Incorrect access right for MB.
0018	Connection refused - Incorrect access rights for the application.
0019	Connection refused - Unknown pre-negotiated message path
001A	Connection refused - Security validation failed.
001B	Connection refused - Unknown acceptor mailbox extension.
001C	Connection refused - Inoperable acceptor mailbox extension.
001D	Connection refused - Invalid Message group number.
001F	Disconnection - no more memory space.
0020	Connection refused - Unknown node.
0021	Connection refused - inaccessible node or Host down.
0022	Connection refused - saturated site.
0023	Connection refused - inoperable mailbox.
0024	(X.25) Packet too long. Problem with packet size. / Connection block already used.
0030	Syntax Error - option not known (received on close VC).
0031	(X.25) No response to call request packet - timer expired.
0033	(X.25) Timer expired for reset or clear indication.
0039	Disconnection - transport protocol error (MUX).
003C	Presentation Control Protocol Error
003E	The application has not the turn
003F	Message group closed
0040	(X.25) Facility code not allowed. / Connection refused - unknown node
0041	Connection refused - path not available.
0042	Connection refused - Duplicate USER ID / Facility parameter not allowed
0044	(X.25) Invalid calling address.
0045	(X.25) Invalid facility length.
0047	(X.25) No logical channel available.
004F	DNSC: (X.25) Invalid call packet length.
0050	Normal disconnection (GCOS3/8)
0051	Error or Event on LC initiated by GW
0052	Error or Event on LC initiated by GW.
0053	Error or Event on LC initiated by GW. TCall
0054	Error or Event on LC initiated by GW. DIA in LOCK State
0055	Error or Event on LC initiated by GW. DIA error
0056	Error or Event on LC initiated by GW. GW has no known explanation.
0057	Error or Event on LC initiated by GW. Reject mailbox permanent

0058	Error or Event on LC initiated by GW. No more input lines in DACQ
0059	Time-out on GCOS 3/8 gateway.
005A	Error or Event on LC initiated by GW. Disconnect from terminal without reason
005B	Error or Event on LC initiated by GW. Wrong letter or wrong record
005C	Error or Event on LC initiated by GW. Forbidden letter received
005D	Error or Event on LC initiated by GW. Forbidden letter received
005E	Error or Event on LC initiated by GW. No buffer for secondary letter
005F	Error or Event on LC initiated by GW. No buffer for fragmented letter
0060	Error or Event on LC initiated by GW. Disconnect on end of phase record
0061	Error or event on LC initiated by GW. No buffer for control letter.
0062	Error or event on LC initiated by GW. Mailbox in closing phase
0064	Error or event on LC initiated by GW. Flow control error.
0065	Error or event on LC initiated by GW. CH locked by operator.
0066	Error or event on LC initiated by GW. Disconnect with a normal TMG F2 exchange.
0067	Error or event on LC initiated by GW. Teletel rerouting error from DACQ
0068	Error or event on LC initiated by GW. Teletel routing error from DACQ
0069	Error or event on LC initiated by GW. Teletel rerouting error from TM
006A	Error or event on LC initiated by GW. Teletel rerouting error from TM
006B	Syntax error - text too long.
006C	Syntax error - illegal object in a GA command.
006D	Syntax error - unknown node Id.
0078	Syntax error - illegal command for this object.
0079	Syntax error - illegal date.
007F	(X.25) No route available for X.25 switching.
0081	No more network routes available for switching.
0082	(X.25) Hop count reached for X.25 switching.
0083	(X.25) Flow control negotiation error.
0085	(X.25) Frame level disconnection.
0086	(X.25) Frame level connection.
0087	(X.25) Frame level reset.
0090	Frame level not set.
0092	(X.25) X.25 Echo service in use.
0093	(X.25) Incorrect password for PAD connection.

0094	(X.25) No more PAD connections allowed.
0096	(X.25) TS SX25 or NU X25 objects locked.
009C	(X.25) Invalid packet header. X.25 protocol error.
009D	(X.25) Incompatible header. X.25 protocol error.
009E	(X.25) Logical Channel Number too high.
009F	(X.25) Incorrect packet type.
00B2	Use of invalid password through PAD
00B6	Unknown mailbox selection for PAD connection using the PAD password.
00C0	(X.25) Normal disconnection.
00D7	(X.25) TS image (of type DSA or DIWS) in LOCK state.
00DE	(X.25) NS RMT or NR SW in LOCK state.
00E1	Connection refused. Mailbox is not in ENBL state.
00E6	QOS not available permanently.
01xx	**Session Control**
0100	Logical connection accepted or normal termination
0101	Rejection for unknown reason or abnormal termination
0102	Acceptor node inoperable.
0103	Acceptor node saturated. When a node has no available resources
0104	Acceptor mailbox unknown.
0105	Acceptor mailbox inoperable.
0106	DNS: Acceptor mailbox saturated.
0107	DNS: Acceptor application program saturated.
0108	Transport protocol error or negotiation failed (DSA 200 only).
0109	Dialog protocol error or negotiation failed. (Wrong logical record).
010A	Time-out on session initiation / unknown LID
010B	Acceptor mailbox extension unknown.
010C	Acceptor mailbox extension inoperable.
010D	Invalid Session Number.
010E	Unknown node.
010F	System error. System generation error or insufficient memory space
0110	Application abnormal termination. Subsequent to an abnormal occurrence in the dialogue
0111	Normal terminate rejected.
0112	Protocol not supported.
0113	Session control service purged by user.
0115	Disconnection Time-out on message group initiation.
0117	Incorrect Access Right for MB
0118	Incorrect Access Right for the Application
0119	Pre-negotiated Message Path Descriptor unknown
011A	Security validation failed
011E	Incorrect object status

011F	Not enough memory space available.
0120	Node unknown.
0121	The channel object (CH) is in LOCK state
0122	Saturation - no plug available
0123	Object status = LOCK
0124	Connection block (TSCNX) already used
0125	Disconnection already running
0126	The connection block (TSCNX) is disconnected (or not connected)
0127	Change Credit value < 0
0128	Ineffective Change Credit (delta = 0)
0129	No more deferred letters
012B	"Reinitialization" Request
012C	"Reinitialization" in progress
012D	"Reinitialization" in progress, letters are dropped
012E	Close virtual circuit. Either no mapping exists between PA/NR or CL and VC/NS
012F	Null connection object index.
0130	Undefined function at Sysgen time.
0131	Letter too large with respect to the negotiated size.
0132	The received letter is longer than the size which was
0133	Disconnection of the session control user
0134	Interface error on EOR (End-Of-Record) processing.
013C	Presentation control protocol error.
013E	You do not have the turn.
013F	Message group closed.
0140	Session is closed.
0151	Request refused, no system buffers available.
0152	Incorrect addressing record.
0153	No presentation record in the ILCAL or ILCRL
0154	Negotiation failed on session mode
0156	Negotiation failed on resynchronization.
0157	Negotiation failed on END to END ACK
0158	No presentation record in the connection letter
0159	Negotiation failed on session mode
015A	Negotiation failed on letter size (in the Logical Connection record).
015B	Negotiation failed on resynchronization (in the Logical Connection record).
015C	Negotiation failed on end-to-end ACK (Logical Connection record).
015D	No support of the "letter" interface because Multirecord is not negotiated.
0160	Incorrect TSPACNX table.
0161	Protocol error on letter reception.

0162	Negotiation failure.
0163	Record header length error.
0164	Protocol error.
0165	Protocol error reception of control letter.
0166	Type or length error on interrupt letter.
0167	Protocol error on reception of data letter.
0168	Dialog protocol error.
0169	Unknown event.
016A	Protocol error on data transfer.
016B	Invalid status for a disconnection request.
016C	Invalid status for a recover
016D	Invalid status for a suspend/resume request.
016E	Negotiation failure.
016F	Unknown command.
0170	Error in presentation protocol
0171	Letter header length error in
0172	ILCAL is not DSA 200 protocol.
0173	Error in session record.
0174	Normal disconnection, without complementary reason code.
0175	Letter is not in ASCII or EBCD.
0176	Connection protocol letter header
0177	Letter header protocol error.
0178	Record header protocol error.
0179	Record header length error.
017A	Mbx record header length error.
017B	Error on buffer transfer.
017C	DSA 200 record header protocol
017D	DSA 300 record header protocol
017E	Unsupported connection options.
017F	Character error in ASCII string.
0180	No segmented record size.
0181	Invalid mailbox object index.
0182	Mapping error for a remote connection.
0190	No more buffers.
0191	Byte count is greater than GP.
0192	Byte count is greater than GP.
0193	Byte count is greater than GP.
0194	Byte count is greater than GP.
0195	Byte count is greater than GP.
0196	Byte count is greater than GP.
0197	Byte count is greater than GP.
0198	No more buffers.

0199	Byte count is greater than GP.
019A	Byte count is greater than GP.
019B	Byte count is greater than GP.
019C	Byte count is greater than GP.
019D	Byte count is greater than GP.
019E	Byte count is greater than GP.
019F	Byte count is greater than GP.
01A0	Invalid transfer state.
01A1	Suspend protocol running.
01A2	Suspend protocol running.
01A3	Recover protocol running.
01A4	Forbidden function in write request. ($WRITE)
01A5	Conflicting parameters for segmented record. (SWBREC)
01A6	Protocol conflict - suspend/recover.
01A7	Protocol not supported - letter/end-to-end ACK. (SWBLET)
01A8	Multi-record letter in progress.
01A9	Interrupt request forbidden.
01AA	Send control record request forbidden. (SCTROL)
01AB	Forbidden for TWA session - turn is here. (SREAD)
01AC	Termination forbidden - suspend or recover in progress. (STERM)
01C0	No space available for downstream connection request. (SMECNX)
01C1	No space available for upstream connection request. (SMUCNX)
01C2	No space available for upstream SCF connection. (SMRCNX)
01C3	No space available for session context. ($SCTX)
01E0	Enclosure or data length error for a write request. ($WRITE)
01E1	Enclosure or data length error for a write segment record request. (SWBREC)
01E2	Enclosure error for 'give turn' request. (SGVTRN)
01E3	Interrupt request is not demand turn, attention/data attention, or purge record.
01E4	Input status for a send control letter is not permitted.
01E8	Write request without turn.
01E9	Write segmented record request without turn.
01EA	Write segmented letter request without turn.
01EB	Send control letter request without turn.
01EC	Disconnection request without turn.
02xx	**Presentation Control**
0201	Protocol level not supported
0202	Application designation protocol error.
0203	Character encoding error. TM cannot support the proposed encoding.
0204	Character set error. TM cannot support the proposed character set.

0205	Character subset error. TM cannot support the proposed character subset.
0206	Incorrect record encoding.
0207	Incorrect parameter encoding.
0230	Data presentation control error. The presentation control proposed for this session cannot be used
0231	Device type is incompatible with the configuration.
0232	TM control protocol is incorrect.
0233	Device-sharing attributes are invalid.
0234	Initiator or acceptor configuration is not correct.
0235	Logical device index error.
0236	Number of logical devices is incompatible with the configuration.
0237	TM protocol record not supported.
03xx	**Terminal Management**
0300	Sysgen error WARNING. There is no mapped object; some objects will be spare.
0301	Operator requested session abort or logged.
0302	Idle time run out after secondary network failure.
0303	Idle time run out for no traffic.
0304	Form not found.
0305	Operator requested suspension.
0306	Destructive attention send on the session.
0307	Unknown TX addressed in this session. TM is unable to a the session.
030A	Protocol error. A record was received which did not comply with current standards
0310	Insufficient resources. The receiver cannot act on the request because of a temporary
031E	Incorrect value for Retry or Wait parameters on UP LL command.
0320	Function not supported.
0321	Parameter error. This can result
0322	Resource not available. The
0323	Intervention required (on principal device).
0324	Request not executable.
0325	EOI required.
0326	Presentation space altered, request executed.
0327	Presentation space altered, request not executed.
0328	Presentation space integrity lost.
0329	Device busy. The device is busy and cannot execute the request.
032A	Device disconnected.
032B	Resource not configured.
032C	Symbol set not loaded.

032D	Read partition state error.
032E	Page overflow.
0330	Subsidiary device temporarily not available.
0331	Intervention required at subsidiary device.
0332	Request not executable because of subsidiary device.
0340	TM cannot accept a new connection.
0341	Object status incorrect.
0342	The TM configuration is not correct.
0343	Unknown TX addressed on this session.
0344	Data presentation protocol error.
0345	Device type is incompatible with the configuration, or is not supported.
0346	TM control protocol incorrect.
0347	Device shareability attributes are invalid.
0348	Initiator or acceptor configuration is not correct.
0349	Logical device index error.
034A	Number of logical devices incompatible with the configuration.
0350	Disconnection of TM after reinitialization of the network.
0360	File not found. (Welcome and Broadcast Messages)
0361	Site not found. (Welcome and Broadcast Messages)
0362	NASF error. (Welcome and Broadcast Messages)
0370	No-session timeout. Device disconnected.
0371	No-input timeout. Device disconnected.
0372	No-output timeout. Device disconnected.
0373	Timeout due to no backup session being initiated.
0374	Timeout due to no backup session being established.
0375	Connection refused because of late activation of back up session.
0376	Disconnection of current session to switch to backup session.
0380	AUTOCN parameter not declared.
0381	Mixed ETB in data sent by VIP screen and cassette
0382	Data header sent by the terminal incorrect.
0383	Desynchronization in the exchange of data.
0384	KDS block count error.
038C	Remote terminal is not connected
0390	Unknown mailbox.
0391	No call packet to return.
0392	No "Possibility" command to return Protocol error
03C0	Slave device disconnection.
17xx	**Network Layer**
1701	PAD connection refused.
1702	Flow control error.

1706	Logical channel number not zero in restart packet.
1707	Illegal packet length or use of D-bit forbidden.
1708	Illegal header.
1709	Illegal Logical Channel Number.
1710	Invalid packet type for the automaton state. Protocol error
1711	Incorrect packet type.
1712	Inconsistent network parameters in the generation file.
1713	No more space.
1714	DSAC network layer object not usable.
1717	USED/ENBL transition. Transport station is locked.
1718	USED/ENBL transition. This is a back-up NR.
1719	USED/ENBL transition. Dynamic close due to load.
171A	USED/ENBL transition. Transfer time-out has elapsed.
171B	USED/ENBL transition. This is a back-up NR.
171C	USED/ENBL transition. Transport station is idle.
171E	USED/ENBL transition. NR object is locked.
171F	ENBL/LOCK transition. NR HDLC has no more memory space.
1721	Remote station is inaccessible via the configured network. Check
1723	Incorrect PAD password.
1724	Virtual circuit already in use. LCN (Logical Channel Number) too high.
1725	Invalid virtual circuit.
1726	Packet too short. Protocol error for the equipment directly connected to the Bull Datanet.
1727	Incompatibility between the generation parameters of two communicating systems on window or packet size.
1729	Packet size in communicating systems not the same.
1731	Timer runs out while waiting for call confirmation.
1732	Timer runs out while waiting for clear confirmation.
1733	Timer has run out while waiting a reset confirm.
1740	Call setup or call clearing problem.
1741	Open failure on virtual circuit. No flow control on this NS.
1742	Incorrect facility. Protocol error for the equipment directly connected to the Bull Datanet.
1744	Unknown subscriber.
1745	End of time-out on reset confirm. Invalid facility length. Protocol error for the equipment directly
1747	No logical channel available.
1749	End of time-out on call confirm.
174F	Incorrect packet length. Protocol error for the equipment directly connected to the Bull Datanet.
1755	Flow control, window, packet size or reset error.

1760	Frame disconnection.
1770	Frame connection.
1771	Frame reset.
1781	No more network routes available for X.25 switching.
1782	Maximum of 15 switches have been used,
1783	Flow control negotiation error.
1785	Frame level disconnection.
1786	Frame level connection.
1787	Frame level reset.
1790	Frame level not established.
1791	No more logical paths available for the PAD.
1792	Echo service busy.
1793	Incorrect PAD password.
1794	All the PAD virtual circuits are used
1795	X.25 initialization not possible.
179B	LCN not null in restart packet
179D	Incompatible header (receive error: all VC of concerned NS
179E	LCN greater than NBVC in NS directive
179F	Incorrect packet type
17A0	Invalid facility.
17B0	Normal disconnection.
17B1	X.25 Echo in use.
17B2	No more logical channels available.
17B3	No more PAD connections allowed.
17B4	TS SX25 or NU X25 object locked.
17B5	Buffer capacity overflow.
17B6	Normal disconnection.
17B8	Unknown calling SNPA (Sub-Network Point of Attachment).
17B9	Internet problem.
17CB	Call collision on VC
17CC	Incompatible generations (NR object without mapping).
17CE	Invalid status NR locked.
17CF	Lack of space.
17D0	Unknown subscriber.
17D4	TSCNX already used for another connection. SCF internal error.
17D7	Transport station locked.
17DD	Proper NS locked.
17DE	Invalid status NR locked.
17DF	Lack of space.
17E0	Forbidden parameter or invalid value.
17E1	Invalid transition.
17E2	Upward-mapped object (TS) not locked.

17E3	No object mapped above.
17E4	NR not locked (MP NR -ADD/-SUB) or virtual circuit already open.
17E5	NR is last in list and the TS is not locked.
17E6	No object mapped above (UP NR -PRIO). NR not mapped on TS.
17E7	Upward mapped object not locked
17E9	Mix of datagram and connection network
17EB	Class inconsistent with NR.
17EE	Incompatible generations. NR object without mapping.
17FF	Wrong parameter in administrative CALL
18xx	**Transport Layer**
1800	Normal disconnection initiated by the correspondent
1801	Local saturation at connection request time.
1802	Failed negotiation at connection time.
1803	Duplicate connection. Two or more requests have been issued for the same connection.
1804	Redundant request.
1805	Retransmission Time-out at transport level.
1806	Survey time-out at transport level.
1807	Transport protocol error.
1808	Session Control specified is not available (inaccessible).
1809	Requested Session Control Id unknown by remote transport.
180A	Termination because of disconnection by administration.
180B	Session Control/Transport interface error.
180C	Connection request on non-sharable VC in case of ISO Transport. ISO: header or parameter length is invalid.
1817	Station in shut-down state.
181F	No memory space at connection time.
1821	Session Control inaccessible by configured session routes. ISO: Session entity not attached to TSAP.
1824	Collision between Close NC and Open TC.
182E	Remote station not configured.
182F	Resource saturation.
1831	ISO: No route for the called NSAP.
1832	ISO: Received NSAP addresses are wrong.
1833	Segmentation violation.
1834	ISO:QOS priority not available temporarily, due to a local condition (for example, lack of resources).
1835	ISO:QOS priority permanently unavailable locally (for example, due to an error in the system generation).
183A	ISO: Remote reason not specified.
183C	ISO: Remote transport entity congestion at connect request time.
1840	Server in terminating state. TC has been re-assigned on another NC.

18A1	An additional NC has been assigned to a TC.
18B0	NC has been re-assigned on another VC.
18EF	Disconnection at Transport level caused by reception of RESTART DSA during the transfer phase.

Windows Sockets error Codes

Below is a list of Windows Sockets return codes and the corresponding description.

Hex code	Windows Sockets Access Error name	Description
2714	WSAEINTR	The (blocking) call was cancelled via WSACancelBlockingCall()
2719	WSAEBADF	The socket descriptor is not valid.
271E	WSAEFAULT	An invalid argument was supplied to the Windows Sockets API.
2726	WSAEINVAL	An invalid call was made to the Windows Sockets API.
2728	WSAEMFILE	No more file descriptors are available.
2733	WSAEWOULDBLOCK	The socket is marked as non-blocking and no connections are present to be accepted.
2734	WSAEINPROGRESS	A blocking Windows Sockets call is in progress.
2735	WSAEALREADY	The asynchronous routine being cancelled has already completed.
2736	WSAENOTSOCK	The descriptor is not a socket.
2737	WSAEDESTADDRREQ	A destination address is required.
2738	WSAEMSGSIZE	The datagram was too large to fit into the specified buffer and was truncated.
2739	WSAEPROTOTYPE	The specified protocol is the wrong type for this socket.
273A	WSAENOPROTOOPT	The option is unknown or unsupported.
273B	WSAEPROTONOSUPPORT	The specified protocol is not supported.

273C	WSAESOCKTNOSUPPORT	The specified socket type is not supported in this address family.
273D	WSAEOPNOTSUPP	The referenced socket is not a type that supports connection-oriented service.
273E	WSAEPFNOSUPPORT	
273F	WSAEAFNOSUPPORT	The specified address family is not supported by this protocol.
2740	WSAEADDRINUSE	The specified address is already in use.
2741	WSAEADDRNOTAVAIL	The specified address is not available from the local machine.
2742	WSAENETDOWN	The Windows Sockets implementation has detected that the network subsystem has failed.
2743	WSAENETUNREACH	The network address can't be reached from this host. There is probably a problem in the way you have set up TCP/IP routing for your PC (most likely you have not defined a default router).
2744	WSAENETRESET	The connection must be reset because the Windows Sockets implementation dropped it.
2745	WSAECONNABORTED	The connection has been closed.
2746	WSAECONNRESET	
2747	WSAENOBUFS	Not enough buffers available, or too many connections.
2748	WSAEISCONN	The socket is already connected.
2749	WSAENOTCONN	The socket is not connected.
274A	WSAESHUTDOWN	The socket has been shutdown.
274B	WSAETOOMANYREFS	
274C	WSAETIMEDOUT	Attempt to connect timed out without establishing a connection.
274D	WSAECONNREFUSED	The attempt to connect was forcefully rejected. The service on the other side is not available.
274E	WSAELOOP	Too many symbolic links were encountered in translating the path name.
274F	WSAENAMETOOLONG	
2750	WSAEHOSTDOWN	The host machine is out of service.
2751	WSAEHOSTUNREACH	The host machine is unreachable.

2752	WSAENOTEMPTY	
2753	WSAEPROCLIM	
2754	WSAEUSERS	
2755	WSAEDQUOT	
2756	WSAESTALE	
2757	WSAEREMOTE	
276B	WSASYSNOTREADY	Indicates that the underlying network subsystem is not ready for network communication.
276C	WSAVERNOTSUPPORTED	The version of Windows Sockets API support requested is not provided by this particular Windows Sockets implementation.
276D	WSANOTINITIALISED	A successful WSAStartup() must occur before using this API.
2AF9	WSAHOST_NOT_FOUND	Authoritative answer host not found.
2AFA	WSATRY_AGAIN	Non-authoritative answer host not found, or SERVERFAIL.
2AFB	WSANO_RECOVERY	Non-recoverable errors, FORMERR, REFUSED, NOTIMP.
2AFC	WSANO_DATA	Valid name, no data record of requested type.