WANPIPE™

Multi-protocol WANPIPE Driver for Linux®

U S E R ' S   M A N U A L

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Introduction

Wanpipe WAN routers/APIs consist of, intelligent adaptor cards, linux drivers and configuration/startup utilities. The WANPIPE package provides a physical and data link layer to the Linux kernel. Linux kernel, using its internal routing table performs the actual packet routing to and from WANPIPE interface.

Please consult the README files for the latest information on your release. Also look in the updates directory.

Installing WANPIPE Driver Package

Obtaining The Wanpipe Software

The WANPIPE package can be downloaded from the "/linux/current_wanpipe" directory located on Sangoma's FTP site (ftp.sangoma.com).

The latest software is under the following name:

```
wanpipe-X.Y.Z.tgz:
```

where XY.Z is a product version number. This archive should always be installed on a CLEAN Kernel.

It is recommended that a WANPIPE Driver package be installed on a Linux kernel that has no prior installation of WANPIPE Drivers.

WARNING: THIS VERSION ONLY SUPPORTS S508/S514 and 508/S514/FT1 cards.

PLEASE CONTACT SANGOMA TECHNOLOGIES INC. IF YOU WANT TO UPGRADE YOUR OLD S502E or S503 CARD.

Choosing the Kernel Version

The latest wanpipe packages contain patches for both 2.0.X and 2.2.X kernels. Please read the README files for more update information.

Unpack distribution archive

1.   Log in as superuser (root) and change your current directory to the root directory by executing 'cd /' command.

   Note: '/' is the top most directory in the filesystem, NOT the user root home directory

(which is usually /root).

You can also use the 'su -' command to log in as root from any other user account.

2.   Copy the wanpipe distribution package, previously downloaded from Sangoma ftp site, to the / directory and untar it.

ex: tar xvfz wanpipe-x.y.z.tgz

The files from this distribution are copied into the /usr/local/wanrouter/ directory.

3.   If you received your distribution on a diskette, insert it into a disk drive and execute the following command:

```
tar xf /dev/fd0
```

Note: The above command assumes that the diskette is in the primary disk drive (known as drive A: in MS DOS). If you want to use secondary drive (drive B:), substitute 'fd0' for 'fd1'.

Package Components

The WANPIPE Driver package includes the following components:

Driver Installation script	(/usr/local/wanrouter/Setup)
Driver start-up script	(/usr/sbin/wanrouter)
Driver configuration utility	(/usr/sbin/wanconfig)
Driver configuration files	(/etc/wanpipe#.conf and /usr/local/wanrouter/wanrouter.rc)
Interface configuration files	(/usr/local/wanrouter/interfaces/*)
Firmware modules	(/usr/local/wanrouter/wanpipe/*)
Kernel patch files	(/usr/local/wanrouter/patches)
Frame Relay Debug Monitor (/usr/sbin/fpipemon)	
Cisco HDLC Debug Monitor (/usr/sbin/cpipemon)	
PPP Debug Monitor	(/usr/sbin/ppipemon)
X25 Debug Monitor	(/usr/sbin/xpipemon)
Adapter's Memory Viewer	(/usr/sbin/sdladump)
FT1 CSU/DSU Configuration Util.	(/usr/local/wanrouter/config/cfgft1/cfgft1)
Wanpipe Configuration Utility	(/usr/local/wanrouter/config/wacfg/wancfg)
Sample files	(/usr/local/wanrouter/samples)
X25api sample code	(/usr/local/wanrouter/api/x25)
CHDLC API sample code	(/usr/local/wanrouter/api/chdlc)
Frame Relay API sample code	(/usr/local/wanrouter/api/fr)

WANPIPE Package Setup

Make sure that you have a complete, clean kernel source in your /usr/src/linux directory. A kernel source can be downloaded from ftp.us.kernel.org.

Change current directory to /usr/local/wanrouter and execute the following command:

```
./Setup install
```

This script will perform the following functions:
C   verify distribution integrity and fix file permissions
C   apply kernel patches
C   install wanrouter start-up script (if desired)
C   create configuration files

Answer the following questions:

```
Install wanpipe ?  {y / n}
```
C   Select **YES** to install the wanpipe software.

```
Install patches ?  {y / n}
```
C   Select **YES** to install wanpipe software into the kernel.
C   Select the directory of the linux source, the kernel version will be detected   and a proper kernel will be patched. (Press enter for default: /usr/src/linux)

```
Install startup ?  {y / n}
```
C   If you want the wan router to start on boot up, select **YES.**
         Note:
         If you are running a **RedHat** distribution, a lock file destination in /etc/wanrouter.rc file must be changed to ROUTER_LOCK=/var/lock/subsys/wanrouter.

Linux Kernel Configuration/Compilation

Configure Linux Kernel

Change your current directory to /usr/src/linux:
```
      run 'make config'      (text mode configuration)
or:   make menuconfig'       (menu- driven configuration)
or    make xconfig'          (if you are running X-Windows.)
```

Note:
If you have never configured Linux kernel before, please read /usr/src/linux/README or ask someone who did for assistance. In short, the Linux configuration script will ask you a series of questions regarding your system configuration. Most questions require single-letter answer: 'y' to enable feature, 'n' to disable it or 'm' to implement feature as a module. Entering 'h' brings up a

help text (if available).

IMPORTANT:

When configuring the kernel, *MAKE SURE YOU ANSWER* **NO** to the following questions:

C   Set version information on all symbols for modules (CONFIG_MODVERSIONS)
C   Frame relay DLCI support (CONFIG_DLCI)

When configuring kernel, *MAKE SURE YOU ANSWER* **YES or M** to the   following
questions:
C   Code maturity level options   (CONFIG_EXPERIMENTAL)
C   Enable loadable module support   (CONFIG_MODULES)
C   Kernel daemon support   (CONFIG_KERNELD)
C   Networking support   (CONFIG_NET)
C   Unix domain sockets   (CONFIG_UNIX)
C   TCP/IP networking   (CONFIG_INET)
C   IP: forwarding/gatewaying   (CONFIG_IP_FORWARD)   2.0.X
C   Packet Socket   (CONFIG_PACKET) 2.2.x
C   IP: optimize as router not host   (CONFIG_IP_ROUTER)
C   Sangoma WANPIPE Router   (CONFIG_WAN_ROUTER) **set to "M" for 2.2.X**
                                            kernels / set to "Y" for 2.0.X kernels.
C   Network device support   (CONFIG_NETDEVICES)
C   WAN Drivers   (CONFIG_WAN_DRIVERS)
C   Vendor Sangoma   (CONFIG_VENDOR_SANGOMA) **set to "M" for**
                                            2.2.X kernels / set to "Y" for 2.0.X kernels.
C   /proc filesystem support   (CONFIG_PROC_FS)

After answering 'y' (for 2.0.X kerels) or 'm' (for 2.2.X kernels) to
CONFIG_VENDOR_SANGOMA. The following configuration options will then be presented:

C   Maximum number of cards/links   (CONFIG_WANPIPE_CARDS)

         Sangoma cards, S508 and S514, support multiple physical wan links(i.e separate data
         lines). Thus, the above number should reflect the total number of physical links that will be
         supported by the WAN router. WANPIPE drivers and the linux kernel see each physical
         link as a separate card.

         Therefore, if we were using a dual CPU S514 card, that supports four physical links a time,
         we would set the above number to 4 even though we only have one card.

         The driver can support up to 16 physical links. You may enter more than you actually have
         if you plan to add more cards/links in the future without re-compiling the driver, but
         remember that in this case you'll waste some kernel memory (about 1K per card/link).

C   WANPIPE Frame Relay support   (CONFIG_WANPIPE_FR)

Say 'Y' to this option, if you are planning to connect WANPIPE card to a frame relay network. If you say 'N', the frame relay support will not be included in the driver (saves about 16K of kernel memory).

C   WANPIPE Cisco HDLC support   (CONFIG_WANPIPE_CHDLC)

Say 'Y' to this option, if you are planning to connect WANPIPE card to a leased line using Cisco HDLC protocol (WANPIPE or API). If you say 'N', the Cisco HDLC support will not be included in the driver.

C   WANPIPE PPP support   (CONFIG_WANPIPE_PPP)

Say 'Y' to this option, if you are planning to connect WANPIPE card to a leased line using PPP protocol (WANPIPE). If you say 'N', the PPP support will not be included in the driver.

C   WANPIPE X25 support   (CONFIG_WANPIPE_X25)

Say 'Y' to this option, if you are planning to connect WANPIPE card to a leased line using X25 protocol (WANPIPE or API). If you say 'N', the X25 support will not be included in the driver.

Re-build Linux kernel

If you never compiled Linux kernel before, please read   /usr/src/linux/README or ask someone who did for assistance. Note that if your machine is slow and/or has little memory, re-building Linux kernel may take several hours.

After successfully configuring the kernel using 'make menuconfig' perform the following (from /usr/src/linux directory):

```
make dep          :to rebuild source code dependencies,
make clean        :to delete all stale object files,
```
                        Note:
Before you make clean, save your '/usr/src/linux/.conf' file to some other location and rename it to (ex: conf_old). This file contains your linux configuration; thus, if you ever have to reconfigure your kernel, copy this file back into the linux directory, rename it to '.config' and run 'make menuconfig'.

```
make bzImage      (2.2.X kernels) to build new kernel.
or make zImage    (2.0.X kernels)  to build new kernel.
```
                        Note:
'make zImage' will fail if the kernel size is too big. Thus, use 'make bzImage'. (usually for 2.2.x kernels)

With this method, you will have to update lilo boot manager manually (if it is being used). Otherwise, the new kernel will not load. With the method below (bzlilo), once the kernel is compiled the boot manager lilo will automatically be update to load the newly created kernel image on bootup.

        OR
`make bzlilo`   (2.2.X kernels) to build new kernel and update lilo.
or `make zlilo`   (2.0.X kernels) to build new kernel and update lilo.
                     Note:
                     'make zlilo' will fail if the kernel size is too big. Thus, use 'make bzlilo'.
                     (usually for 2.2.x kernels)

IMPORTANT:

Before we proceed to build new modules, it's advisable to remove the old, already existing modules.

C   Change directory to /lib/modules
C   Rename the "kernel_name" directory to "kernel_name.old".
         (Ex. If we are working with kernel 2.2.14, then rename the 2.2.14 directory to 2.2.14.old)

`make modules`   to build kernel modules,

`make modules_install`   to install modules.

If you ran bzlilo or zlilo, you are ready or reboot the computer with the newly compiled image; Otherwise, continue below.

Updating LILO

This section only applies if the kernel was compiled using bzImage or zImage.

After successful compilation, copy the new image usr/src/linux/arch/i386/boot/zImage (or bzImage which ever was compiled) into the /boot directory and rename it to vmlinuz_2.2.X (where X is the kernel number.)

(ex. cp /usr/src/linux/arch/i386/boot/bzImage /boot/vmlinuz-2.2.14)

Note:
Before you copy the new kernel into the /boot directory rename the old kernel image in /boot. (ex. mv vmlinuz-2.2.10 vmlinuz-2.2.10.old)

In /etc directory, edit the lilo.conf file and update the changes. For more info run 'man lilo'.

`lilo`   :execute lilo to update the changes to /etc/lilo.conf

When all this is done, reboot your machine to load the new image !!!

Configuring WANPIPE

Once the kernel has been properly compiled and the new image loaded, change directory to /usr/local/wanrouter and execute:

./Setup compile   to compile the wanpipe utilities.

Next step in setting up your wanpipe card, is to create a wanpipe#.conf configuration file where all hardware, protocol and interface information must be supplied. For ease of use and convenience Sangoma has developed a GUI application which should be used to create this file.

Change directory to /usr/local/wanrouter/ and execute:

./wancfg

Note: wancfg is a symbolic link to /usr/local/wanrouter/config/wancfg/wancfg utility.
Please read the README file in the above directory for more information about this
utility.

IMPORTANT:
WANCFG is a GUI application writen in, bash version 2, shell script. You must have bash version 2.0 or greater to run this script. To check your bash version, run

```
echo $BASH_VERSION
```

If you are running RedHat 6.0 or greater you should be able to run ./wancfg without recompiling wancfg tools.

WANCFG utility contains all the help files necessary to guide you through the wanpipe configuration. If you require more information please refer to the WANPIPE_CONFIG.txt file in /usr/local/wanrouter/doc directory.

Starting and Stopping order, for configured WANPIPE routers

Once all WANPIPE configuration files are crated, the next step is to define the startup and shutdown order. The file wanrouter.rc, located in /usr/local/wanrouter/ directory, contains the list of WANPIPE routers, called WAN_DEVICES.

This variable is used by the "wanrouter" startup script, to start and stop desired WANPIPE routers.

ex: If configured WANPIPE routers are: wanpipe1, wanpipe2 and wanpipe4,
        WAN_DEVICES variable should be set to:

        WAN_DEVICES="wanpipe1 wanpipe2 wanpipe4"

Configuring FT1 Cards

Check with the T1 provider at what speed your fractional T1 line is set to. (ex 64K, 128k ...
1.5M). The fractional T1 is broken down into 24 channels each 64K. Using the CSU/DSU one
configures the line speed by enabling or disabling channels 1 to 24.

For example: 64K line ->   enable channel 1,disable 2 to 24
               128K line -> enable channel 1 and 2, disable 3 to 24
               Full T1 (1.5M) -> enable 1 to 24

The configuration utility ' cfgfg1' is found in /usr/local/wanrouter directory.
Note: The cfgft1 is symbolic link to the /usr/local/wanrouter/config/ft1/cfgft1 utility.

IMPORTANT:

Cfgft11 is a GUI application written in, bash version 2, shell script. You must have bash version
2.0 or greater to run this script. To check your bash version run 'echo $BASH_VERSION'.

If you are running RedHat 6.0 or greater you should be able to run cfgft1 with out recompiling
cfgft1 tools.

For further information on recompiling wancfg tools please refer to the README file in
/usr/local/wanrouter/config/cfgft1 directory.

Before starting the CFGFT1 utility make sure you can start and stop the wanrouter using
'wanrouter start wanpipe#' (where # = 1,2...16 link number) command. This will ensure that the
wanpipe#.conf file created using WANCFG utility doesn't have any mistakes or hardware
conflicts.

The CFGFT1 utility contains all help files necessary to configure the CSU/DSU.

The CFGFT1 configurator has three mode of operations.
C   Standard Configuration
        This is the simplest configuration method. This method should be used by default and will
        be sufficient for 99% of the configuration cases.
C   Advancded Configuration
        This is a text based configuration mode, where commands are sent to the CSU/DSU
        directly. It should be used if standard configuration does not meet the requirements.
C   Auto Detect Configuration
        This option works only for B8ZS encoding and ESF framing modes.
        It will try to detect the speed of the line and automatically configure the CSU/DSU.

Advanced CSU/DSU Options

The Sangoma S514/FT-1 or S508/FT-1 DSU has three memory banks:
C   The factory default.
C   The user configured bank.
C   The scratch pad (working memory).

To check the current settings (bank settings), type **D0** <ENTER>.

Configuration changes are made as follows:

C   Type C <ENTER> to open the configuration mode.
C   Change the required settings.
C   After making these changes, type D1 <ENTER> to see the temporary configuration bank.
C   If these changes are correct, then type W<ENTER> to write the configuration to the non-volatile memory.
C   Type Q <ENTER> to exit the configuration mode.

COMMANDS

+n	Add channel n (where n is 1-24) to the active list
-n	Delete channel n (where n is 1-24) from the active list
M0	Set framing mode to ESF (ExtendedsuperFrame)
M1	Set framing mode to D4
K0	Set encoding mode to B8ZS
K1	Set encoding mode to AMI
L0	Set line build out to CSU (0db) or DSX-1 (0-133ft)
L1	Set line build out to DSX-1 (133 - 266ft)
L2	Set line build out to DSX-1 (266 - 399ft)
L3	Set line build out to DSX-1 (399 - 533ft)
L4	Set line build out to DSX-1 (533 - 655ft)
L5	Set line build out to CSU (-7.5 db)
L6	Set line build out to CSU (-15 db)
L7	Set line build out to CSU (-22.5 db)
P0	Set clock mode to normal (SLAVE)
P1	Set clock mode to master (LDM mode only)
W	Write configuration to non-volatile memory
F	Get factory default configuration
Q	Exit configuration mode and move temporary (scratch pad) configuration to default configuration
D0	Display actual configuration
D1	Display configuration in temporary memory
E0	Unit does not echo commands sent to it
E1	Unit echos back commands sent to it
T0	User test modes enabled
T1	User test modes disabled

NB: Whenever you have finished your changes, you MUST do a WQ in order for them to "take". After that do a D0 to check that the changes have, indeed been written to permanent memory.

Advanced Configuration S508/FT-1 example

Required configuration:
Channels 1-3 disabled,
Channels 22 and 23 enabled
Line build set to DSX-1 (399 - 533ft) ESF
framing mode Clock mode to normal

```
Type: C-1-2-3+21+22K0L3M0P0D1WQ<ENTER>

          OR
```

```
C<ENTER>      Open configuration mode
-1-2-3<ENTER>    Remove channels 1, 2 and 3 from the active list
+21+22 <ENTER>  Add channels 21 and 22 to the active list
K0<ENTER>  Set the encoding mode to B8ZS
L3<ENTER>  Set the line build out to DSX-1 (399 - 533ft)
M0<ENTER>  Set the framing to ESF
P0<ENTER>  Set the clock mode to normal
D1<ENTER>  Display the temporary configuration before saving
W<ENTER>      Update the user memory
Q<ENTER>      Close the configuration mode
```

If you are adding or removing many D0 channels, break up the command into 2 or more commands, as the command line buffer has limited length. For instance, to drop the line speed to 128kbps you need to remove channels 3 to 24.

```
Do:

C<ENTER>
-3-4-5-6-7-8-9-10-11<ENTER>
    -12-13-14-15-16-17-18-19-20-21-22-23-24<ENTER>
      WQ<ENTER>
      D0<ENTER>
```

and the correct configuration should be shown.

ALSO PLEASE REBOOT THE MACHINE AND RUN CFGFT1 UTILITY AGAIN WITH D0 COMMAND TO VERIFY THE CONFIGURATION.

Starting And Stopping the WAN Router

Once the WANPIPE configuration is completed, and all configuration files were created. One can start the WANPIPE router(s) using the "wanrouter" command.

```
wanrouter <cmd> (wanpipe#)
```

       `<cmd>`

start   start all WANPIPE routers defined by WAN_DEVICES variable, located in /usr/local/wanrouter/wanrouter.rc file.
Note: WAN_DEVICES variable, in wanrouter.rc, is defaulted to "wanpipe1", ie. first WANPIPE device. If multiple routers are required, add each subsequent router to the WAN_DEVICES variable in wanrouter.rc file.

                        ex: WAN_DEVICES="wanpipe1 wanpipe2"
Note: There must be space between wanrouter definitions. "wanrouter start"command will start both WANPIPE routers.

stop   stop all WANPIPE routers defined by WAN_DEVICES variable, located in /usr/local/wanrouter/wanrouter.rc file.
Please refer to the example above.

start wanpipe#   Start a specific router.

                        ex: To start wanpipe1 exclusively run:
                            wanrouter start wanpipe1

stop wanpipe#   Stop a specific router.

                        ex: To stop wanpipe1 exclusively run
                            wanrouter stop wanpipe1

                        Note: When starting or stopping a specific WANPIPE router, the WAN_DEVICES list, defined in /usr/local/wanrouter/wanrouter.rc, is ignored.

list   list all active, already running WANPIPE routers.

To obtain more information on "wanrouter" command, run the command without any comments and read the help information.

Using the Protocol Monitors

Included with the Wanpipe drivers are UDP management monitors for each of the supported protocols.

C   fpipemon : for Frame Relay protocol.
C   cpipemon : for CHDLC protocol.
C   ppipemon : for PPP protocol.
C   xpipemon : for X25 protocol.

You must be superuser (root) to run these monitors.

Command line Usage: invoke command on prompt (ex `'fpipemon'`)

Note:
The UDP management port to be utilized can be configured with the UDPPORT option in the wanpipe#.conf configuration file.
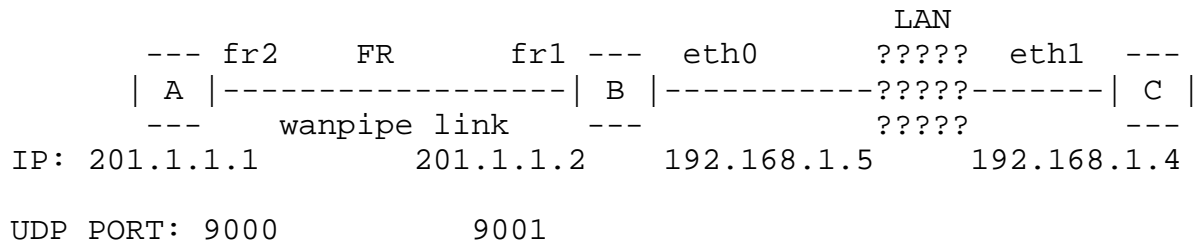
The monitor talks to the driver through a special UDP packet like an intelligent ping. All that is required for the monitor to work is that the UDP packets must get into the driver, and that the machine with the monitor must be reachable. You can therefore run the monitor to get user statistics from *any machine that is network connected to the Sangoma host*.

There are two parameters needed to access the link information using these monitors:

!   The UDP Port set in the wanpipe#.conf configuration file. The Default is UDP port 9000. Setting the UDP port to 0 disables the monitor. You can change the UPD port to distinguish between different Sangoma cards on a network

!   An IP address that forces the stack to try to send the UDP packet through the wanpipe driver. For instance, if you are on the host machine which has the card installed, you would use the IP address of the **opposite end of the link**. Note that you would *not use the IP address of the wanpipe card itself* if the UDP was coming "from the top", because the stack loopback function returns the UDP packet before it even reaches the wanpipe driver. If wanpipe is the default gateway, then any address not on the local network will do. The address does not have to exist, as the UDP packets are intercepted in the driver before they are transmitted, and are replied to in the form of a UDP response packet sent as if it was received off the link.

   You can also use the name of the interface instead of an IP address, and the monitor will automatically resolve that into the address of the other end of the Point-to-Point.

For example, on the network below, assume that the link FR is supported by two Sangoma cards.

```
                                              LAN
            --- fr2      FR       fr1 ---   eth0     ?????  eth1  ---
           | A |-------------------| B |-----------?????-------| C |
            ---       wanpipe link    ---                 ?????         ---
       IP: 201.1.1.1            201.1.1.2     192.168.1.5     192.168.1.4

       UDP PORT: 9000             9001
```

Network Interfaces: Machine A = fr2
                      Machine B = fr1 and eth0
                      Machine C = eth1

From Machine B, the wanpipe host, you would use the following command to read the modem
status on the card in B:

```
fpipemon -i fr1 -u 9001 -c xm
          OR:
fpipemon -i 201.1.1.1 -u 9001 -c xm
```

Note the address used!

From Machine C, you would use the same IP address. Machine C would not know about interface
fr1, so you have to use an explicit IP address:

```
fpipemon -i 201.1.1.1 -u 9001 -c xm
```

The packet is routed from C over the ethernet to B where it attempts to send the packet to A. The
packet gets intercepted by the driver, the request is answered and the response is sent back to C.

Machines B and C can also access data on A. In this case, there is no loopback route in the way
(we are coming from "underneath"). So we can use A's address:

fpipemon -i 201.1.1.1 -u 9000 -c xm

Note that it is the same address as in the previous example, but because the UDP port is different,
we get the data off the card in A, not B.

Likewise, A can access information off the card in B:

```
fpipemon -i fr2 -u 9000 -c xm
          OR:
fpipemon -i 201.1.1.2 -u 9000 -c xm
```

Security

Security considerations for the monitors is handled as follows:

C   You can simply turn them off by setting the UDP PORT to 0 in wanpipe#.conf.
C   Certain operations are only allowed from "above". For instance, you can only run the traces from above the stack. Any commands that can change the state of the link (such as testing the DSU/CSU) are only allowed from above the stack.

C   You can set the TTL for the replies to the UDP packets in wanpipe#.conf. So for instance, if you set the TTL to 2, only users immediately connected to the Host will be able to receive the responses.

Refer to APPENDIX for debug monitor usage and options.

Trouble Shooting and Diagnostics

If you encounter errors during installation and/or start-up, try to determine which command, utility or process causes the error. Carefully record and examine all warnings and error messages. Read appropriate section of this manual again and make sure you have not missed anything important.

Man pages are also available on topics like wanrouter, wanpipe#.conf, sdladump, cfgft1, fpipemon, and cpipemon.

Consult the FAQ on Sangoma Web Page www.sangoma.com.

Router Initialization Problems

When the WAN Router start-up is complete, all WAN devices defined in the [devices] section of /etc/wanpipe#.conf file should appear in the /proc/net/router directory.

Similarly, all network interfaces defined in the [interfaces] section should appear in the /proc/net/dev directory (provided that corresponding WAN device was successfully configured).

If some of the devices and/or interfaces are missing, then verify configuration file and check '/var/log/wanrouter' and '/var/log/messages' files for error messages and/or warnings.

WANPIPE Driver logs extensive diagnostics during its initialization into the system log file. To monitor logged system messages use the following command:

       tail -f /var/log/messages

You can watch for any errors and/or warnings during WANPIPE loading and initialization.

Router Configuration Problems

To verify the WAN device configuration, use Config and Status pseudo-files found in /proc/net/wanrouter directory. Doing 'cat' on these files reveals current device state and configuration. The sample output is shown below:

```
            cat /proc/net/wanrouter/Config
```

```
 Device name | port |IRQ|DMA|mem.addr|mem.size|option1|option2|option3|option4
 wanpipe2     |0x364 | 05|0  |0xEC000 |0x2000  |   5030|   7200|  65536|   6200
 wanpipe1     |0x300 | 12| 0 |0xEE000 |0x2000  |   5080|  16000| 131072 |   5800
```

```
            cat /proc/net/wanrouter/Status
```

```
 Device name |station|interface|clocking     |baud rate| MTU |ndev|link state
 wanpipe2     | DCE   | RS-232  |external |  56000   | 1600 |  2   |connected
 wanpipe1     | DTE   | RS-232  |external |  56000   |  256 |  2   |connecting
```

To obtain device statistics, do 'cat' on WAN device entry in /proc/net/wanrouter directory as follows:

```
            cat /proc/net/wanrouter/{device}
```

Router Interface Problem

To verify TCP/IP configuration of WAN interfaces, use Linux' ifconfig and route utilities. Interface status and statistics can be viewed with

```
    'ifconfig {interface}'
```
command. The output should look similar to this:

```
wan0 Link  encap:UNSPEC         HWaddr (whatever)
     inet addr:<your_ip_addr> P-t-p:<other_ip_addr>Mask:<netmask>
               UP POINTOPOINT RUNNING  MTU:1500  Metric:1
               Rx packets:0 errors:0 dropped:0 overruns:0
               Tx packets:0 errors:0 dropped:0 overruns:0
               Interrupt:9 Base address:0x360 Memory ee000-effff
```

The interface name will be the one that was defined in /etc/wanpipe#.conf [interfaces] section. If this interface doesn't show up, after wanrouter start (check using ifconfig) a mistake was made while configuring the wanrouter.

Make sure that interface name in /etc/router.con [interfaces] section is the same as the file name in /usr/local/wanrouter/interfaces/{name}

```
        ex. /etc/wanpipe#.conf

        [interfaces]
        wp1_ppp = wanpipe1, ,WANPIPE

        /usr/local/wanrouter/interfaces/wp1_ppp
```

Make sure all fields are correct in /usr/local/wanrouter/interfaces/{name} file. Refer to section 2.2.

Router Table Problem (Cannot PING)

View routing table by typing 'route' at the command prompt and make sure that routes to all remote networks and hosts exist. The output should look similar to this:

```
Destination     Gateway Genmask         Flags  Window  Use     Iface
<other_ip_addr> *       255.255.255.0   UH     0       0       wan0
```

If all the above looks ok, you should be able to ping remote host. If pings are not getting through, try to determine which part of the connection fails. There can be at least four possibilities:

C   pings are not being transmitted by the local machine
C   pings are not being received by the remote machine
C   pings are not being replied to by the remote machine
C   replies are not being received by the local machine

Quite often you can tell which part of the connection is not functioning by simply looking at the interface statistics output by the ifconfig utility at both local and remote machines.

Sdla Dump Utility

A debugging utility, sdladump, is also included with the distribution which allows viewing adapter local memory in hexadecimal dump format during run-time. Its command line syntax is:

```
sdladump {device} [{offset} [{length}]]
```

where: {device} name of the WANPIPE adapter, as it appears in the /proc/net/wanrouter/directory, e.g. wanpipe1

{offset}   adapter local memory address. Default is 0

{length}   size of the adapter memory area to be dumped. Default is 256 bytes (0x100)

Note that adapter must be configured before you can use sdladump utility.

Proc File System Statistics

Another useful debugging utility is the proc file system. You can use the following command :

        cat /proc/net/dev

        to get the information about your interface.

        In this case ppp0 is the interface built using WANPIPE. This information gives you how the driver for your device is behaving. Following is the explanation of the heading used:

packets :	States the number of TX/RX packets
errs:	States the number of TX/RX retries. The packet was not sent and will be retried. Please note that this is **not a real error count**, in spite of the name.
drop:	States the number of TX/RX dropped packets. This occurs when the link (interface) is down and application is trying to transmit.
fifo:	Not used by WANPIPE
colls:	States the number of TX/RX collisions. This means that the device was busy and the packet will be retried.
carrier:	Not used by WANPIPE

Line Problems

See www.sangoma.com/linedebug.htm.

Technical Support

If you are unable to diagnose and/or fix a problem yourself, you can ask Sangoma Technologies Inc. for technical support via fax or e-mail:

        FAX: (905)474-9223
        E-mail: ncorbic@sangoma.com or dm@sangoma.com

When sending your request, please provide us with the following information:
C   Detailed description of the problem
C   System type (CPU, speed, RAM size)
C   Linux kernel version number
C   WANPIPE driver version number
C   Adapter type
C   Communications link type and parameters (e.g. line speed)
C   Interface type (RS-232/V.35), DSU/CSU type (if any), etc.
C   Contents of the following files:
           /etc/wanrouter.rc

/etc/wanpipe#.conf
/var/log/wanrouter
/var/log/messages
/usr/local/wanrouter/interfaces/*

C Output of the following commands

cat /proc/interrupts
cat /proc/ioports
cat /proc/net/dev
cat /proc/net/wanrouter/Config
cat /proc/net/wanrouter/Status
cat /proc/net/wanrouter/{device}
ifconfig {interface}
route -n

All requests for technical support are normally replied to within 24 hours (excluding weekends and holidays).

APPENDIX

Multiple PCI cards

1. For multiple PCI card, the correct slot number must be entered. In order to find out a particular slot number in your PC, each card has to be loaded separately first with the autodetect feature.
2. Insert first PCI card into your PC
3. In wanpipe#.conf set the S514CPU to A or B and set the PCISLOT to 0 (autodetect)
4. Start the wanrouter (run 'wanrouter start')
5. Once the wanrouter starts successfully, view the /var/log/messages file. The driver will print out the actual slot number of your PCI card.
6. Write this number down !!
7. Take out your PCI card (Yes you have to reboot !!)
8. Insert the second PCI card into a DIFFERENT PCI slot !
9. In wanpipe#.conf set the S514CPU to A or B and set the PCISLOT to 0 (autodetect)
10. Start the wanrouter (run 'wanrouter start')
11. Once the wanrouter starts successfully, view the /var/log/messages file. The driver will print out the actual slot number of your PCI card.
12. Write this number down !!
13. Insert your first PCI card in to the first PCI slot. (Yes you have to reboot).
14. Now in /etc/wanpipe#.conf

wanpipe1:
 set the S514CPU to the same value as in Step 2,
 set the PCISLOT number to the number you wrote down
 in Step 5.
wanpipe2:
 set the S514CPU to the same value as in Step 8,

set the PCISLOT number to the number you wrote down
in Step 11.

15.   Restart your router, and both cards should come up.
16.   For more cards, repeat the process !