Linux PPP FAQ

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This document contains a list the most Frequently Asked Questions (FAQ) about PPP for Linux (and their answers). It is really *not* a HOWTO, but is in 'classical' Question / Answer form. We have a different document which represents the PPP-HOWTO. It is written by Robert Hart.

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1 Preface

Please send any corrections to longyear@netcom.com.

This is but one of the Linux HOWTO/FAQ documents. You can get the HOWTO's from *sunsite.unc.edu:/pub/Linux/docs/HOWTO* (this is the 'official' place) or via WWW from the Linux Documentation home page. You cannot rely on the HOWTO's being posted to *comp.os.linux.answers*, as some news feeds have complained about their size.

Throughout this document, I have used the word 'remote' to mean 'the system at the other end of the modem link'. It is also called 'peer' in the PPP documentation. Another name for this is called the 'gateway' when the term is use for routing. Its IP address will show as the 'P-t-P' address if you use *ifconfig*.

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2 General information

2.1 What is PPP?

PPP, or Point-to-Point Protocol, is a recognized 'official' Internet protocol. It is a protocol used to exchange IP frames (and others) over a serial link. The current base RFC for PPP is 1661. There are many related ones.

Contrary to what some people think, it does not mean 'Peer to Peer Processing'; although you may do peer-peer communications using TCP/IP over a PPP link.

2.2 My university (company) does not support PPP. Can I use PPP?

In general, no. A 'classical' PPP implementation requires that you make changes to the routes and network devices supported by the operating system. This may mean that you will have to rebuild the kernel for the remote computer.

This is not a job for a general user. If you can convince your administration people that PPP is a 'good thing' then you stand a chance of getting it implemented. If you can't, then you probably can't use PPP.

However, if you are using a system which is supported by the people who are marketing the 'TIA' (The Internet Adapter) package, then there is hope. I do not have much information on this package, however, from what I have found, they plan to support PPP in 'the next version'. (My information may be old. Contact them directly. Information on TIA is available at *ftp.marketplace.com* in the */pub/tia* directory.)

If your system is not supported by TIA, and you choose not to use slirp, and you can't convince the admin group to support PPP then you should use the '*term*' package. Some service providers will object to you running '*term*'. They have many different reasons, however the most common is 'security concerns'.

There is a version of TIA for Linux.

In addition to TIA, Danny Gasparovski wrote a program called *slirp* which will perform functions similar to TIA. The program is currently available with the source code from the ftp site *blitzen.canberra.edu.au:/pub/slirp*. You should obtain the code if you wish additional information about this program. From the initial examination, it is seems to be an excellent contender to the commercial TIA program.

2.3 Where is PPP?

It is in two parts. The first part is in the kernel. In the kernels from 1.1.13, the driver is part of the network system drivers.

The second part is the 'daemon' process, *pppd*. This is a **required** process. The source to it is in the file *ppp-2.2.0e.tar.gz* located on *sunsite.unc.edu* in the */pub/Linux/system/Network/serial* directory.

Version 2.2 and above are designed to be used only with the 1.2 and later kernels. Please don't use this version with the 1.1 series kernels as they are out of date for either the tty driver or the networking software.

2.4 I just obtained PPP. What do I do with it?

Read **T**he **F**ine **M**aterial available.

Start by reading the *README* file and then the *README.linux* file. The documentation sources are listed below.

2.5 Where are additional sources of information for PPP?

(Where's the documentation? Is there a HOWTO?, etc.)

There are several sources of information for the PPP protocol as implemented under Linux.

- The *README* file in the source package.
- The *README.linux* file in the source package.

- The *Net-2-HOWTO* document.
- The *PPP-HOWTO* document.
- The Network Administration Guide.
- The *pppd* man page.
- The FAQ document for the comp.protocols.ppp newsgroup.

The HOWTO and this FAQ are stored in the usual place for the Linux HOWTOs. That is currently on *sunsite.unc.edu* in the directory */pub/Linux/docs/HOWTO*.

The Network Administration Guide is available in the */pub/Linux/docs/LPD/network-guide* directory on sunsite. It is also published by O'Riellly and Associates. So, if you want a really professional document, then buy a copy from your local bookstore.

The '*man*' pages are included in the source package. You will probably have to move them to the normal man directory, */usr/man/man8* before the *man* command may find them. Alternately, you may use *nroff* and *more* to view them directly.

The FAQ for comp.protocols.ppp describes the PPP protocol itself and the various implementations. You will find the FAQ for the usenet news group, *comp.protocols.ppp*, archived on *rtfm.mit.edu* in the */usenet* directory. It is in eight parts at the present time.

2.6 Would someone please send me scripts for PPP so that I may see how they are written?

There are a few scripts which are included with the source package for pppd. It will cover the normal types of access where you are requested to enter a UNIX login and password.

Specific 'scripts' for specific systems are not included. If you have problems with a specific connection then you should contact the help desk for your site, the local news group at the site, or the general usenet groups for Linux. Unfortunately, time does not permit me to answer questions for help on supplying a script for your specific system.

2.7 Where should I post questions about PPP?

The primary usenet group for the PPP implementations is *comp.protocols.ppp* or *comp.os.linux.setup*. Use this group for general questions such as 'How do I use pppd?' or 'Why doesn't this work?'.

Questions such as 'Why wont pppd compile?' are generally linux related and belong on the comp.os.linux.networking group.

Please don't use comp.os.linux.help even if your site should still carry this obsolete news group.

2.8 The PPP software doesn't work. HELP!!!

This is one of the most sickening questions. I realize that this is a plea for help. However, it is practically useless to post this message **with no other information**. I, and most others, will only ignore it.

Please see the question regarding errors which normally occur at the modem's disconnection. They are not the cause of a problem, only a symptom. Posting a message with only those errors is also meaningless.

What is needed is the output of the system log (syslog) when you run the *pppd* program with the option 'debug'. In addition, if you are using chat then please use the '*-v*' option to run the sequence with verbose output.

Please include the output from the kernel's startup. This shows the various kernel hardware information such as your UART type, PPP version, etc.

Please include all information that you can relating to the problem. However your system configuration, disk drive configuration, terminal type, mouse location and button status, etc. are irrelevant. What is important is the system to which your are trying to contact, the PPP (or terminal server) that they are using, the modem types and speed that you are using, etc.

Take care and go through the output. Remove the references to the telephone number, your account name, and the password. They are not important to analyzing the problem and would pose a security risk to you if you published them to usenet. Also discard the lines which neither come from the kernel nor pppd.

Do **NOT** run the pppd program with the option 'kdebug 31' and post that!

If the problem warrants examining the data stream, then you will be contacted by email and asked to mail the trace. Usenet already costs too much for too many people.

Information is written to various levels. The debug information is written to the debug level. The informational messages are written to the info level. The errors are written to the error level. Please include all levels the 'local2' group which come from the *pppd* process.

In addition, please do not delete the time stamp information. It is important.

3 Other implementations

3.1 Do you know of a implementation for PPP other than Linux? I would like one for HP-UX, or AIX, or ... (you fill in the blank)?

Check the PPP FAQ document mentioned above.

HP-UX is supported by the commercial Morningstar package. AIX is in the current 2.2 pppd package.

If you don't find one listed then post to the *comp.protocols.ppp* group and not the Linux group.

(Please don't mail me asking for 'Do you know of a PPP package for ...'? These requests will now be 'appropriately' filed. *;-)*)

The pppd package placed on sunsite does not contain the code which would use the some of the ports which use the streams interface. This is due to the reason that the streams interface contains a restrictive

copyright which prevents the commercial packaging of the source which contains the module. We, the people who have been working on the pppd package, have tried to contact the author of the original module for streams in an attempt to have the copyright changed. He was un-responsive at first. Now he can not be located.

For this reason, and due to the fact that the sunsite site is for Linux, I decided to remove the AIX, Next, and any other port of pppd which involved the original streams code. The SunOS and Solaris ports *are* included since their streams implementation has been rewritten. You should continue to find the BSD variation as well as the Linux form in the package. If you wish the pppd code for a system which uses streams then you will have to consult the PPP-FAQ for the location of the pppd archive site near you. Alternately, you can use archie. Just don't use the mirrors for sunsite as they will not have the code.

3.2 Did you know that there is a program called 'dp'?

Yes, we know. The *dp* package was considered very early in the development stage quite a few months back. It is nice. It supports 'demand dial'. It also only works with systems which support streams. This is primarily the SunOS (Solaris) operating systems.

The question of demand dial is covered later in this document.

Linux, at the present time, does not supports streams.

There are several other packages for PPP available on the 'net'. The 'portable PPP' package is very much like the TIA code. There is another package called simply 'PPP'. There is code for PPP in the KA9Q package.

The *slirp* and *TIA* code will do PPP as well.

Of all of the packages available, the pppd package was the closest to the requirements and functions of Linux to warrant the port.

(If you want more information about these other packages, ask in the *comp.protocols.ppp* group!)

3.3 What RFCs describe the PPP protocol?

The current implementation of PPP is a mixture of several.

The major portion of the PPP code is written against the RFCs 1331 and 1332. These RFCs were later obsoleted. 1331 was replaced by 1548 and that, in turn, was obsoleted by 1661 six months later. Most implementations of PPP will be happy to talk to the Linux PPP code.

This does not mean that the Linux PPP package is obsolete. It is only that at the time that the package was written the current RFC was 1331. Any changes in subsequent RFC documents has been incorportated within the pppd package and it is 'current' by today's standards.

A complete list is in the faq for comp.protocols.ppp.

[to quote the FAQ document]:

> All of 1134, 1171, and 1172 (and 1055, for that matter *:-)* have been obsoleted. They're

interesting only if you want to debug a connection with an ancient PPP implementation, and you're wondering why (e.g.) it asked you for *IPCP* option 2 with a length of only 4, and Compression-Type *0x0037*. (There's a lot of that still running around - be careful out there.)

Linux PPP will automatically detect these conditions and compensate for it.

4 Compatibility

4.1 Can PPP talk to a SLIP interface?

No. SLIP works with SLIP. PPP works with PPP.

Some vendors may offer products which work both as SLIP and PPP. However, they must be configured to run in one mode or the other. There is no present method to determine, based upon the protocol passed at the time of a connection, which combination of SLIP protocols or PPP is being requested.

4.2 Which is better? PPP or SLIP?

IT DEPENDS UPON MANY FACTORS.

The people who post this type of question have usually not read the *Net-2-HOWTO* document.

A good technical discussion is available at Morning Star's www server, *www.morningstar.com*.

4.3 Is CHAP or PAP better for authentication?

If you have the choice, use CHAP. Failing that, PAP is better than nothing.

4.4 What about CHAP which Microsoft uses with Windows NT?

CHAP is a Cryptographic Handshake Authentication Protocol. It means that it takes some form of a key and will encrypt the response using a one-way encryption algorithm. The algorithm is negotiated at the time that the CHAP protocol is requested. The most common is called MD5. It has an encryption code of 05 in the CHAP request.

Microsoft uses a DES algorithm which, until recently, was incompatible with the pppd process. If you wish to connect to a Windows NT server, there are a set of patches which are included with the pppd source code to support the DES style used by Microsoft.

Contrary to what some un-informed people believe at Stanford University believe, Microsoft did not just go against the recommendations of the IETF working group. The code values were properly requested and the implementation has been fully documented.

5 Authentication files

5.1 What goes into the /etc/ppp/pap-secrets file? Do you have a sample? Or, my ISP requires that I use PAP. How do I do that?

The PAP protocol is most often implemented as your user name and password. You need to include the name of the remote system, your account name, and the password. If the user on abbot wishes to call costello, the entry would be similar to the following.

```
#account   remote    password     IP address list
abbott     *         firstbase
```

To use PAP authentication with the simplest case, you should also include the 'user' option to specify which of the pap-secrets file entries is to be used. The option is explained in the pppd man page. However, the simplest for this example is:

user abbott

If your system needs to use PAP to authenticate itself with an ISP who requires that you use PAP then you need only do two things.

1. Add the entry to the /etc/ppp/pap-secrets file which lists your account name, an asterisk, and your password. If you have multiple accounts at different providers, each with the same name, then you would use the provider's name with in lieu of the asterisk and use the remotename option with pppd to specify the provider's name.
2. Use the 'user' option to pppd to specify the account name so that pppd knows which entry in the /etc/ppp/pap-secrets file is to be used.

That's all that you should do. Do *NOT* attempt to use the +pap, or +chap, or auth options. These will only cause your authentication sequence to fail since they all force the ISP to authenticate itself with you. Since most ISP's will not do this, and you have told pppd that the ISP must by using these options, then pppd will not permit the ISP to connect to you – or, to put it in practical terms, you connect to the ISP.

5.2 What goes into the /etc/ppp/chap-secrets file? Do you have a sample?

The most common problem is that people don't recognize that CHAP deals with a pair of secrets. Both computers involved in the link must have both secrets to work.

For example, if *abbot* wants to talk to *costello*, then *abbot*'s file would have:

```
#account   remote     password    IP address list
abbott     costello   firstbase
costello   abbott     who
```

And costello's file would have:

```
#account   remote     password    IP address list
abbott     costello   firstbase
costello   abbott     who
```

(Yes, it is the same data.)

The difference between abbott and costello would be the options that are used with pppd. The abbott system would have

```
name abbott remotename costello
```

while the costello system has just the opposite of

```
name costello remotename abbott
```

6 Construction problems

6.1 I get compile errors when I try to compile the kernel

This usually comes from skipping the 'make kernel' step in the instructions. The 'make kernel' is not a sequence telling you to build the kernel, but the actual command to be entered. That is, issue the command for 'make' and build the target called 'kernel'.

There are some problems with this logic however. If you are using Slackware 3.0, there is a bug in the 'rev' program with this package. Before the kernel sequence may be patched properly, you must first update the 'rev' program from the file `<ftp://ftp.cdrom.com/pub/linux/slakware/a8/util.tgz>`.

It is very important that you do not attempt to replace any file which this package does not replace itself. Do not attempt to force it to replace the ppp.c driver if the 'make kernel' does not wish to do this. There is a date stamp within the files and the files will not be replaced if you currently have a more current version of the driver already in the kernel.

Once the pieces have been installed, please rebuild the kernel at this time. Do this even if you have previously constructed the kernel to support PPP. The driver shipped with the 1.2 and early 1.3 kernels is not compatible with the 2.2 version of pppd.

Once you have rebuilt the kernel then you may resume to build the pppd process, chat, and pppstats.

7 Problems running pppd

7.1 pppd says that version 0.0.0 is out of date

There are several reasons which will generate this message.

- You are attempting to run the 2.1 version of pppd with the 2.2 kernel drivers. This may occur if you are using the 2.x series kernels and did not see the notice in the Changes file that you need the 2.2.0 version of pppd.

  It may also occur if you are using a script which has a fixed location for the pppd process. The 2.1 version of pppd was stored in the default location of /usr/lib/ppp/pppd. The 2.2 version moved to the more 'standard' location of /usr/sbin/pppd. If you have a script which is using the /usr/lib/pppd then it is probable that you are actually using the wrong version of pppd.

  This may also require that you re-compile front end programs such as dip or diald. These programs have the location of pppd embedded within them.

- You are attempting to run the pppd process from an account other than the root user and the process is not secured setuid to root. What happens is that the pppd process attempts to issue a request to find the version of the driver in the kernel. This request is only acceptable if the calling process is the root account. Since you are not running as the root user and have not secured the program to be setuid to root, then the request fails. Since the request to fetch the driver version fails, the default value is 0.0.0. This is the wrong version and the message is generated.

  Additional information is in the next question.

7.2 pppd says that that the kernel is not configured for PPP. I know that I enabled the option and built the kernel.

Make sure that you did rebuild the kernel and that you are running it.

Make sure that you don't have an old copy of pppd on your disk and you are running that version. The previous version of pppd was stored on /usr/lib/ppp. Many people objected to this location. The 2.2 code has moved the *pppd*, *chat*, and *pppstats* to the /usr/sbin directory. If your scripts still reference **/usr/lib/ppp** then you will probably run the old code.

7.3 pppd wont run unless you are root

The pppd process needs to make changes to the networking system and this can only be done if you are the root user. If you wish to run *pppd* from other than the root user then the pppd program needs to be secured 'suid to root'.

```
chown root /usr/sbin/pppd
chmod 4755 /usr/sbin/pppd
```

If you wish to control the pppd access to a select group of people, then make the *pppd* process owned by the group and do not permit all others to run the program.

7.4 unable to create pid file: no such file or directory

You need to create the directory */var/run*. On earlier Slackware distributions, this was a symbolic link to the */etc* directory.

This is a warning. The PPP software will work normally in spite of this message. However, the *ppp-off* script depends upon this file. It is a good idea to create the directory or make the link to the appropriate location.

The posix header, *paths.h*, defines the location for the pid file under the name '*_VAR_RUN*'. If you wish to use a different directory for PPP and others, change the value for this define and rebuild the software.

7.5 /etc/ppp/options: no such file or directory

You must create the directory */etc/ppp* and have a file called '*options*' in that directory. It needs to be readable by the *pppd* process (root).

The file may be empty. To make an empty file use the '*touch*' command.

See the *pppd* man page, *pppd.8*, for a description of this file.

7.6 Could not determine local IP address

This happens with many configurations of the Telebit Netblazer. The problem is not the terminal server, but the site which has not configured the terminal server with a set of IP addresses.

The Netblazer does not have your IP address. You do not have your IP address. The link will not work unless both IP addresses are known.

- The Netblazer does not have your IP address and you do not have your IP address.
- The Netblazer does know its IP address and you do not have its IP address.

The link will not work unless both IP addresses are known.

You must tell the Netblazer the IP addresses to be used. Use the local IP address and the remote IP address as a parameter to the pppd process.

Use the pppd option format of:

```
local_ip:remote_ip
```

(That is the local IP address, a colon, and the remote IP address.)

7.7 Could not determine remote IP address

See the previous answer.

7.8 I keep getting the message to the effect that the magic number is always NAKed. The system will not connect.

There is a one in over four billion chance that the two systems have chosen the same magic number. If you get a continual failure about the magic number, the chances that this is a fluke will geometrically reduce.

The two most common reasons for this failure are:

- The remote PPP software is not running when you think it is. Is the remote system configured to run PPP? Did you use the proper account? Did you use the proper password for this account? If you are using a scripting tool such as chat, then did you miss a prompt and are really talking to the logon process and not the PPP code? Is the PPP process in the expected location? Is the privileges suitable so that you may run it? This would indicate that the shell is doing the local echo of the data. This is the more common reason.
- The modem has disconnected immediately upon making the connection and logging you on to the remote. Most modems are configured to echo the data sent to them and you are seeing the local echo from the modem.

In either case, the Linux system is sending data to the remote which is being fed immediately back into the serial receiver. This is not an acceptable condition. You have what is called a '*loop*'.

7.9 protocol reject for protocol fffb

This usually occurs when you are trying to connect to a Xyplex terminal server. Version 5.1 of the Xyplex terminal server software, according to Xyplex, has numerous problems with PPP. It is strongly recommended that you update the Xyplex software to at least version 5.3.

If you must use Xyplex version 5.1, then use the pppd option '*vj-max-slots 3*' to limit the number of slots to three. The problem on the Xyplex server is that it will accept the request for the default 16 slots, but fail to operate beyond the third slot. It should have return a NAK frame with the limit, but it does not.

Alternately, you can disable the Van Jacobson header compression with the option '*-vj*'.

7.10 The PPP software connects, sends quite a few frames, but still does not seem to connect. Why is that?

Linux does not support RPI modems. If your modem is RPI then you will have to find a different modem. This is not likely to change in the future given the statements made by Rockwell's management.

Examine the system log when you use the '*debug*' option. (You will need the system log data anyway if you are going to ask for help.) If the trace shows that it is sending the *LCP*-request frame over and over again and the id number is not incrementing then you are not exchanging frames with the remote PPP software.

The common reasons for this for this are:

- You don't have the PPP software running on the other end. You are sending the PPP frames to some other program which is probably saying 'What is this #$%percent;^ ?'
- Please make sure that you have the PPP software started on the other end before you enter the PPP protocol sequence. Try to use a normal modem program and go through the logon sequence that you would normally do. Do you see the PPP frames being sent to you? The PPP frames are fairly distinctive. They will be about 40 characters in length and contain several { characters. They should

not have a carriage return character after them and are sent out in a burst with a pause between the bursts.

- The line is not 'eight bit clean'. This means that you need to have eight data bits, no parity, and one stop bit. The PPP link absolutely requires eight data bits. The pppd software will automatically put the line into eight data bits, no parity, and one stop bit. The remote must match this configuration or framing and parity errors may occur.

  PPP will escape characters. It is not possible for it to escape bits as kermit does. PPP will *not* work with a seven bit communications link.

- The remote is configured to require authentication such as *PAP* or *CHAP*. You have not configured the local system to use this feature. Therefore, the remote is discarding all of your frames until it sees a valid authentication frame from you. Since you are not configured to generate the frames, the *IPCP* frames which you send are being ignored. In this case, either configure the remote to not expect authentication or configure the local system to do authentication and supply the proper secrets.

  Examine the receipt of the LCP configure frame. If it shows an 'auth' type, then the remote is configured for authentication.

7.11 The /etc/ppp/ip-up scripts won't work.

The pppd process launches the program at the location /etc/ppp/ip-up when the IP layer goes up. It gives it parameters which define the line status. Such things include the device name, communications speed, and IP addresses.

However, what may not be clear is that it treats this file as a *program*. It is not a script. The program is started by using the exec() function of Linux.

What this means is that if you wish to use a script for these programs, then you must do two things.

- You need to have the file marked as executable with chmod. The proper mode for the file should be mode 100. Mode 500 is acceptable if you wish to read the file and mode 700 is acceptable if you wish to write to the file. The file should be owned by the root user.

- The file must have as the first line the sequence:

  ```
  #!/bin/sh
  ```

  The # character must be in the first character position of the very first line of the file. The interpreter program, /bin/sh in this case, may be any program which is expected to run the script. Most people will use the Bourne shell for this purpose. It is commonly stored in the location /bin/sh. Other commonly used interpreters are perl and csh. What is important is that the first two characters of the file be the # and ! characters respectively.

7.12 I can't execute /etc/ppp/ip-up: Exec format error

Please refer to the answer to the previous question.

7.13 How do I use PPP with a system which uses dynamic IP assignments? It assigns a different IP address to me with each call.

The assignment of the local IP address is a function of the options given to pppd and the IPCP protocol. You should use the 'magic' IP address of 0.0.0.0 if you must specify the local IP address. Most people simply leave the local IP address out of the option list.

The other option which is closely tied to this is called 'noipdefault'. The noipdefault option instructs the pppd process to not attempt to guess the local IP address from your hostname and the IP addresses in the /etc/hosts file. Most people use this option when the IP address is dynamically assigned. However, this option does not mean 'use dynamic IP addresses'. The use of dynamic IP addresses is automatic when the local IP address is not given.

7.14 How do I know what IP address was given to me when it is dynamically assigned?

Use the /etc/ppp/ip-up hook. The local IP address is the fourth parameter. This will be executed when pppd knows the IP address for the local system. The fifth parameter is the remote IP address if you should wish to know this value as well.

If you are curious about the value assigned then you may use the *ifconfig* program to display the current settings. It will show you the current values for both the local IP address and the IP address assigned to the remote under the P-t-P heading.

7.15 I just upgraded my system and now pppd reports that the option -v is not supported. Why?

Did you just upgrade to Linux '96 from Walnut Creek CDROM? It is also known as the Slackware 3.1 package. The problem is that the pppd executable in the /usr/sbin directory was renamed in that distribution and a script was installed in its place. This script was to find the version of the operating system and then either run the 2.2 or 2.1 version of pppd.

Unfortunately, the script does not work properly with the pppd process when you use the connect option.

So, to correct the problem, remove the script and replace it with the proper pppd executable.

7.16 The pppd process reports that it won't replace the existing default route. How do I get it to use the default route?

This is another Slackware 'enhancement'. The Slackware package added a default route to the ethernet controller during the startup sequence in the /etc/rc.init1 script. This statement is:

```
/usr/bin/route add default dev eth0
```

The problem is that the statement has absolutely no functionality with the proper routing. A default route is designed to be sent to a router, not just dumped on the ethernet controller.

The pppd process is configured to not replace a default route if a default route is currently used before it starts. It does this for security reasons. Since Slackware uses the default route incorrectly, the pppd process is unable to install a new default route.

To correct the problem you need to replace the default route statement in the /etc/rc.init1 script with a proper network route. See the Net-2-HOWTO for the instructions on what should be used.

7.17 When I run pppd it says that support is not in the kernel.

There are a few reasons for this to be generated.

- You are running the pppd process from an account other than the root account and the pppd process is not secured as being setuid to root. To correct for this, issue the command 'chmod 4555 /usr/sbin/pppd' while you are signed on as the root user.
- You are using modules and have not loaded the ppp.o module. This may require that you first load the slhc.o module to provide for the VJ header compression logic.
- You are not running the proper pppd process. If you are using the 2.x series kernels then you must use at least the 2.2.0 version of the pppd process. The 2.1 version is not supported with the 2.x series kernels.
- Likewise, if you are running the 1.2.13 kernel and have built the 2.1 version of the drivers into the kernel then you must run the 2.1.2d version of pppd.
- The pppd process as moved from /usr/lib/ppp/pppd used in the 2.1 version of the pppd process, to the 'new' home of /usr/sbin/pppd. It is expected that all future versions of pppd will be stored in this location. The change was in response to the FSSTND document for Linux. This change may require that you rebuild the dip or diald programs to reflect the new location of pppd.

7.18 How do I use PPP and a local network at the same time?

Break the problem into two parts. The first part is to get the ethernet network working properly. See the question about the default route concerning a problem with the Slackware '96 package.

Once you have the ethernet network working, then get the PPP link between the one system running pppd and the internet provider working. Do not concern yourself with the local network at this time. Just get the PPP link working.

Then, once you have the two pieces working, you can get the two of them working together. Use either a firewall system on the computer with the PPP link or use the IP masquerading software.

For more instructions on the firewall code, see the Firewall-HOWTO.

For more instructions on the masquerading code, see the Net-2-HOWTO.

7.19 Can I use the same local IP address for each line of a PPP server?

Yes, you may use the same IP address for all of the local addresses on each of your PPP devices. You may even use the same IP address as one of your ethernet or token ring controllers.

However, you must use a unique IP address for each of your remote IP addresses.

The routing for a point-to-point link is to the remote IP address, not to the local IP address.

7.20 How do I find my local IP address??

The local IP address is one of the parameters given to the /etc/ppp/ip-up program. It is the 4th (counting from the first) argument. The easiest method is to simply save the value at the time that the ip-up program is executed.

If you don't wish to do this then you can use the ifconfig program to display the parameters for the specific PPP device. One of the values is the IP address.

If you don't wish to do this then you can obtain the information from the system log. This is the least desirable method as parsing the standard log file is much more complicated than parsing the output from ifconfig.

The easiest solution is to simply store the value during the ip-up program in some specific file which you may access at a later date.

7.21 I can't connect to the merit network.

Some users of the merit network have indicated that it needs PAP. Did you try PAP authentication?

8 DIP

8.1 DIP does not have support for PPP's mode

The current version of dip-uri supports PPP in that it will execute the pppd process when you execute 'mode PPP'. However, there are many options which are needed for the proper operation of pppd. Since dip does not pass these to the program, they must be stored in the /etc/ppp/options file.

The dip program controls the establishment of the SLIP link. It controls the SLIP link with the aid of slattach, ifconfig, and route. These programs may be used to establish a SLIP link. They are not useful for the establishment of a PPP link.

The dip program may be used to dial the telephone and start the *PPP* software on the remote system. It is best used in this mode as the parameter to the '*connect*' option. However, you have the option to use dip to control the link. It is not important how pppd be executed to run the PPP link. It is only important that it be executed as it is a mandatory program for the PPP protocol.

While this is not a FAQ for dip, there is a common problem with dip and pppd. The dip process has the absolute pathname to the pppd process embedded within it. Until recently, the location for pppd was /usr/lib/ppp/pppd. It has moved to the /usr/sbin/pppd location. So, if you are unable to get dip to start pppd then check the pathnames in dip.

Additional information about the dip process is in the Net-2-HOWTO document.

8.2 DIP dies immediately when I do 'mode ppp'

The location of the pppd program file is stored within dip.

The 2.1 version of pppd was stored in /usr/lib/ppp/pppd. The 2.2 version has moved to the more 'standard' location of /usr/sbin/pppd. That is well and good. However, the problem is that now dip has the wrong location for pppd. When it attempts to run the pppd process as you do 'mode ppp', the dip program attempts to run the pppd program and it can't because it isn' there.

You can temporarily make a symbolic link from the /usr/lib/ppp/pppd location to the /usr/sbin/pppd file. However, a better solution is to rebuild the dip program so that it knows that pppd is at /usr/sbin/pppd.

9 Process termination

9.1 Is there a 'dip -k' for PPP?

No. There is no '*dip -k*'.

However, if you run dip -k, and have properly built the dip process so that it knows that the lock file directory is /var/locks, then you may use the command to terminate the pppd process. The reason that this works is that dip will terminate any process which owns the tty device, not just the one which it started. This may be a security concern for some (perhaps many) people. However, it is just the way that the program works. If you are concerned about dip doing this action then either secure dip so that it is executable by only specific people or remove it from your system and use slattach, route, ifconfig, and arp to do the dial-in functions of SLIP.

In the chat directory, there is a '*PPP-off*' script. This will stop the PPP link in the same manner as the '*dip -k*'.

I have included it below. (Cut it out. Store it in its own file.

Make the file executable with chmod.)

```
#!/bin/sh
DEVICE=ppp0
#
# If the ppp0 pid file is present then the program is running. Stop it.
if [ -r /var/run/$DEVICE.pid ]; then
        kill -INT `head -1 /var/run/$DEVICE.pid`
#
# If the kill did not work then there is no process running for this
```

```
# pid. It may also mean that the lock file will be left. You may wish
# to delete the lock file at the same time.
        if [ ! "$?" = "0" ]; then
                rm -f /var/run/$DEVICE.pid
                echo "ERROR: Removed stale pid file"
                exit 1
        fi
#
# Success. Let pppd clean up its own junk.
        echo "PPP link to $DEVICE terminated."
        exit 0
fi
#
# The PPP process is not running for ppp0
echo "ERROR: PPP link is not active on $DEVICE"
exit 1
```

In addition, you may still use 'dip -k' to terminate the pppd link. The reason is that dip does not care if it started the program which is using the serial device. It sends a SIGTERM to any process which owns the serial device. (This is not a great idea, however, that is the way that dip works.)

9.2 PPP does not hangup the modem when it terminates

There are several reasons for this.

- Did you use the pppd '*modem*' parameter? This parameter controls whether or not the *pppd* process is to control and honor the signals reflecting the modem status. This parameter is explained in the man page for *pppd*.
- Do you have the modem presenting the DCD signal and honoring DTR? The Hayes sequence for this is usually '&C1'. If you reset the modem during the connection sequence with 'ATZ' then ensure that your modem is configured correctly.
- The DTR signal is generated by the computer and instructs the modem to disconnect. Hayes sequence for this is usually '&D1' or '&D2' with '&D2' being the preferred setting for PPP. Many manufacturers will ignore the DTR condition in their 'factory defaults' setting.
- Did you use a cheap cable which does not pass the DCD signal? Macintosh 'Classic' cables are notorious for this problem. The Macintosh Classic does not use this signal.
- For dial-in connections, did you exec the pppd process properly? The pppd process should be 'exec'ed from the script rather than simply executed. If you attempt to simply run the pppd process then it will be the shell which will receive the SIGHUP hangup signal and not the pppd process. The 'shell' script should have a format similar to the following:

```
#!/bin/sh
exec pppd -detach modem ...
```

- The use of **dip** and **diald** has, on occasion, interfered with the ability of pppd to sense the loss of the carrier. In this case, you should use the lcp-echo-request and lcp-echo-failure options to detect the loss of the connection in-band. [Ed: Sorry for the technical terminology. 'in-band' refers to the use of the protocol itself to detect a condition. It is similar to using XON and XOFF as flow control characters. These characters are sent along with the data and perform the flow control operations. The 'in-band' is the opposite of 'out-of-band'. They both refer to 'band' as being short for 'bandwidth'. When something is 'in-band', it is within the bandwidth of the signals. That is, it takes some of the bandwidth to perform the additional function. 'out-of-band' would be the equivalent of using the RTS and CTS signal lines to do flow control. These do not take a character. These are not sent with the data. The signals are just additional lines that happen to do the required function.]

10 Data Transfer related issues

10.1 The ftp transfers seems to die when I do a 'put' operation. They will work correctly if I 'get' a file. Why?

Do you have the flow control enabled?

Flow control is set by the pppd option *crtscts* for RTS/CTS and *xonxoff* for XON/XOFF. If you don't enable the flow control then you will probably overrun the modem's buffers and this will prove to be disastrous with vj header compression.

It is important that the modem, not just the computer, have the proper setting for flow control. If the modem does not do flow control and the computer is expecting that the modem will tell it when the buffer overruns, then the buffer will overrun because the modem is not configured to tell the computer that it is full.

Likewise if the modem is configured to use RTS/CTS and your computer is configured to use XON/XOFF then you will not be able to recognize the modem's request to suspend transmission.

The modern modems are configured with the use of a command code to do flow control. Check in your manual for the appropriate command code and include it along with the modem initialization.

Do not fall into the "well, the modem does this by default so I don't have to configure the modem before I use it." trap. Do the configuration. Do it explicitly. If the manual says that &H1 sets RTS and CTS flow control (what is also commonly called 'hardware' flow control) then send the modem AT&H1 to set the flow control. Do it before you dial the number. Don't expect that just giving the modem ATZ will enable the flow control properly.

10.2 How do I use XON/XOFF for flow control?

The better flow control is CTS/RTS. However, if you can not do the hardware flow control with the signals CTS and RTS, then use XON/XOFF. The following three steps need to be performed.

- You need to specify the pppd option *xonxoff* . This tells the pppd process to configure the serial device for XON/XOFF flow control and to load the two characters into the tty driver.

- You need to specify the XON and XOFF characters in the pppd parameter *asyncmap*. This tells the remote system that is should quote the XON and XOFF characters when it wishes to send them to you. It is normally specified as the pppd parameter '**asyncmap a0000**'.
- Of course, don't forget to tell the modem to use XON/XOFF flow control. My *ZyXEL* modem uses a sequence '&R1&H4' to do this.

10.3 The modem seems to always connect at a strange rate. When I use minicom, the modem will always use 14400. However, PPP is using 9600 or 7200 or even 2400. How do I fix this?

Put the desired rate as an option to the pppd process. If you don't put the rate, then pppd process will use whatever rate is set currently at the time. Not all programs will restore all of the parameters to the previous settings properly upon exit. This may lead to strange rates configured for the serial device.

Linux does not support modems which use the RPI (**R**ockwell **P**rotocol **I**nterface) proprietary specification. Given the proprietary nature of the specification (even if you signed a NDA Rockwell will not release the code needed to interface to the modem) it is **extremely** unlikely that Linux will **ever** support this modem. The only solution, should you have a RPI modem, is to take it back to the dealer and get one which does not use RPI.

Some of the catch phrases to avoid are modems which are marked as having error correction in software, 'windows' compatible, or 'requiring a special driver' for full operation. These usually indicate that the modem uses RPI.

10.4 The ftp transfers seems to be very slow when I do a 'get' operation. The 'put' operation is much faster. Why?

Did you specify the option:

```
asyncmap 0
```

when you ran pppd? If you forgot the option, the peer must quote (double) all of the control characters in the range from 00 to 1F (hex). This will result in a statistical loss of about 12.5% in speed for all of the data which you receive.

Did you configure the remote system? If so, did you forget flow control on its modem?

10.5 The proxyarp function fails to find the hardware address.

Use the *ppp-2.1.2d.tar.gz* package. The *pppd* process was erroneously compiled with the 1.1.8 kernel and it used *Net-3* rather than *Net-2* definitions.

Additionally, you should refer to the proxy-ARP mini-HOWTO about the requirements for using proxy-ARP.

The 2.1 package had a limit of 64 network devices. At the the that the proxyarp function was written, 64 seemed to be a very likely limit as most people had one or two ethernet controllers. This is no longer the case when we consider that some systems routinely have 128 network devices.

The 2.2 package has raised the limit to 5000 network devices. That limit is excessive. However, it means that in all practial purposes, there is no limit. It is a compile-time define in the sys-linux.c module.

11 Routing and other problems

11.1 My route to the remote keeps disappearing! It last for about 3 minutes and then the route just goes away. Help!

This is not a question for PPP.

Hint: **DON'T RUN** *routed*!

If you need to send RIP frames to the peer for its routing purposes then use the bcastd program. The bcastd program is on sunsite.unc.edu.

11.2 I would like to attach my other computers on my network to the Internet through my PPP connection. I have only the one IP address which is assigned to me from my service provider. (It may even have been dynamically assigned.) How may I do this?

You may not. At least, you can't do it in the manner that you would normally want to do it. The problem is that your provider would not know about the IP addresses of your local network and therefore wont route the frames to your local system.

There are other solutions, however.

- You may telnet to your one computer running pppd and then use telnet or ftp to reach out to the rest of the Internet. This is not really much better then just using the computer directly, but it does work for simple things.
- You may run a 2.x series kernel and use the 'IP Masquerade' option. For instructions on how to use this facility you should refer to the Net-2-HOWTO document.
- You may run the *socks* program on your PPP system. This will perform the same facility as the IP Masquerade but it will take modified clients or a replacement run-time library. The advantage is that the socks program has been around for some years and many clients will understand the concept of a 'proxy' server which is needed to work with socks.

11.3 I can reach the remote server, but I can not get anywhere else.

Did you forget the '*defaultroute*' parameter to pppd? This parameter adds a default route into your routing system so that frames to all other IP addresses will be sent to the PPP device.

The PPP software will not replace the default route if you have one already set when you run pppd. This is done to prevent people from destroying their default route to the ethernet routers by accident. A warning message is written to the system log if the defaultroute parameter is not performed for this reason.

11.4 I have a default route and I still can't get anywhere else! Now what?

The problem then is not with the local Linux system. It most likely is routing problem on the remote end.

The remote system is not configured for '*IP forwarding*'. It is an RFC requirement that this option **NOT** be enabled by default. You must enable the option. For Linux systems, you will need to build the kernel and specify that you want IP forwarding/gatewaying.

The remote computers need a route back to you just as you need a route to them. This may be accomplished by one of four methods. Each has advantages and limitations. You need to do one and only one of these.

- Use a host route. At each host on the remote system, add a host route to your Linux IP address with the gateway being the terminal server that you use for your local access. This will work if you have a small number of host systems and a simple network without bridges, routers, gateways, etc.
- Use a network route. Subdivide the remote IP addresses so that your local Linux IP address and the remote terminal server address and the remote terminal server's ethernet address is on the same IP network. This will work if you have the IP addresses to spare. It will work very well if you have a Class-B IP network and can afford to put the all of the remote addresses on the same IP network. Then add a network route on each of the gateways and routers so that any address of the remote network is sent to the terminal server. Most configurations have many hosts but few routers. (At *sii.com*, we have over 300 active host systems with only 3 routers.)
- Use *gated* on all of the gateways and on the terminal server. This will cause the terminal server to broadcast to the gateways that it can accept the frames for your IP address. Since the hosts will have a default route to one of the gateways, the gateways will generate the ICMP re-direct frame and the specific host will automatically add its host route.
- Use proxy ARP on the terminal server. This will only work if your remote IP address is in the same IP domain as one of the domains for the network cards.

There is no clear solution. You must choose one of these.

If your remote router requires to receive RIP frames in order to update the route to your system then you should use the *bcastd* program on sunsite.unc.edu. This will generate the RIP frames without actually running gated.

11.5 I can not ping my local IP address

You are not able to do this because you wont normally have a route to the address. This is the normal operating environment.

If you wish to ping your own system then use the loopback address of 127.0.0.1.

You may be able to ping the remote address. However, some terminal servers may not allow this as the address may be 'phony' to them. It depends upon their environment.

In general, don't try to ping either address. Choose a third address which is well known to be available on the remote network such as one of your name server IP address.

While the PPP software will not perform this task, you may add the route table entry yourself once the link has been established. The syntax for the route statement is:

```
route add -host 192.187.163.32 lo
```

where the local IP address is represented as 192.187.163.32 in this example. This will tell the network software to route all frames destined to your local IP address to the loopback adapter. Once you add the appropriate route to the local IP address then you may use this address as the target to IP frames.

You will be responsible for deleting the route when the link goes down.

12 Interactions with other PPP implementations

12.1 How do I connect to a Windows NT server?

This question is becomming one of the most frequently asked questions about PPP. The Microsoft Windows NT platform is making substantial inroads into the corporate and commerial service organizations and the use of it's RAS services is seen as one of the reasons. It is just so easy to fill a few items in a form and have your Windows 95 system connect to the Windows NT platform that it is extremely tempting for many companies to offer Windows NT as their method of connection to either the corporate intranet or the Internet.

Yet, there are some difficulties with the use of Linux PPP and Microsoft Windows NT. There are a few different things with Windows NT as opposed to a UNIX platform.

There is no special script for connecting to Windows NT servers. If you are using chat (a UUCP expect-reply scripting tool), the script is nothing more than:

```
chat "" ATDT5551212 CONNECT
```

since it only needs to dial the Windows NT server and get the telephone to return a connected status. You can embelish it to look for things such as BUSY or VOICE or other errors from the modem, but those are not required. The only thing is to not expect "login:" or any other form of textual login sequence. Also, Windows NT server is 'quiet'. It does not send anything until you do. It will just answer the telephone and then wait.

There is nothing special about using PAP or MSCHAP with Windows NT and Linux PPP. The Linux PPP process supports the MSCHAP protocol if you apply the patches which are included with the source package and get the D.E.S. library from ftp.funet.fi. (The DES library was originally developed in

Australia. That country has the same restrictions on export of cryptography as do the countries of NORAD. So, since it has leaked to Finland, people should get it from there. I do not know who broke Australian law and that does not matter as long as it was not I.)

If you require to interface to a server which is configured to accept only encrypted authentication then you must use MSCHAP. If you can open up the server and accept "any authentication, including clear text" then you are best using PAP.

If you use PAP, then edit the /etc/ppp/pap-secrets file and put the entry which corresponds to:

```
account        remote            password
```

This is three words, seperated by one or more spaces, on the same line. I have left out the IP addresses as they are used more for the 'dial-in server' side of the pppd process. There is no limit to the line length. If your password or account name has spaces in it then use "password" or "account" (put quotes around it.) If the password has special characters which are not glyphs (printable characters such as a, b, c, etc.) then you may use \nnn for octal or \xNN for hexadecimal to enter the raw data as needed.

The field marked account is the name of the account on the Windows NT server, remote is either an "*" to mean that it is not used or it corresponds to the value used with the 'remotename' option to pppd and password is, obviously, the password.

Then you need to add either "user account" or "name account" where "account" is the matching item to your user name on the Windows NT server and matches the entry in the pap-secrets file.

Do not use the "+chap", "+pap", or "auth" options since these require that the remote system (Windows NT) authenticate itself with you. Normally the administrator won't put in your codes so this will fail and you will not be able to communicate.

The entry for the chap-secrets file is basically the same. The MSCHAP code will convert the ASCII code to UNICODE that Windows NT requires since it is a simple mapping function from ASCII to UNICODE for the first 128 characters.

The double entry in the chap-secrets file is because the CHAP authentication is assumed to work both ways. In fact, since the MSCHAP sequence only works in one direction at the present time (because the Windows NT server does not authenticate itself with the client because Microsoft chose not to do that section of the code) the second entry is just noise. However, the parser for the option in pppd will require that you have it to make MSCHAP an acceptable authentication protocol when requested by the Windows NT peer. The "secret" for this item can be anything but an empty string.

The difference between "name", "remotename", and "user" is:

user : Used for PAP authentication. It will default to the value assigned to "name" if you do not specify the "user" option directly.

name : The name of the local system. It is used by the CHAP and MSCHAP code to select the secret from the chap-secrets file. It will default to name of the local IP address if you don't specify it.

remotename : The name of the remote (peer) system. It is used by PAP, CHAP, and MSCHAP to select the item from the file. It will default to the name of the peer's IP address if you don't specify it.

The Microsoft authentication sequence is a CHAP style authentication with their DES encryption algorithm for the passwords.

So why didn't Microsoft just use CHAP with MD5 encryption then? CHAP does not send the clear text password across the 'wire'. The answer is that in order to use CHAP protocol, you need the clear text for the password to be used with the encryption algorithm. You would need to store this clear text on your disk file. (The pppd process stores it in the /etc/ppp/chap-secrets file.) Storing a password in clear text on the disk also violates the requirements for C2 registration.

The only real difference between CHAP and MSCHAP is that MSCHAP does not store the clear text for the secret (password). They are both as vulnerable for middle-man imposter threats. They are both just as secure. Yet, MSCHAP can be used on a C2 registered system; CHAP can not.

12.2 I tried to use MSCHAP or PAP with Windows NT and it fails with "E=691". Now what?

The error condition identified as 691 is Windows NT way of telling you "invalid user name or password". Cute, isn't it? It would have been better if they had included just a little more text with the message such as 'E=691 R="invalid user name or password"', but I guess that they had to save some memory some place and that was the place that they chose to do it. So, they left it as just this cryptic code number.

(There are about five other errors which may occur. Each is just a code number as well. For a list of the code numbers and their textual translation, you will have to query Microsoft's knowledge base on http://www.microsoft.com.)

Aside from the obvious reason of really not giving it a valid user name and password, the other reason is that it can not validate the entry that you did give it.

If your RAS server is a member or a secondary domain controller of a domain then you need to prefix the user name with the domain name. The reason that you must specify the domain name is that the RAS server must ask some other server to validate your account, it needs to know the domain name which corresponds to your account.

The domain name is pre-pended to the user name with a \ character separator.

However, since \ is special to pppd as it has the normal "C" language meanings then you need to use an entry in the pap-secrets or chap-secrets file which looks like:

```
domain\\account     remote          password
```

and use name "domain\\account" or user "domain\\account" as the option for pppd.

Then, you need to be careful about putting the \ character on the runline or as an un-quoted parameter to the connect option. The shell also uses \ for special purposes. This may mean that you would have to use name domain\\\\account just so that the pppd process sees name domain\\account so that it can give to Windows NT the sequence domain\account.

12.3 How do I support Windows 95?

Windows 95 PPP support is designed to work with Windows NT and similar servers which do not use a login and password prompt. For this to work, you would need to use a getty process which will recognize the LCP configure-request.

12.4 I am using a Trumpet (for MSDOS) and the connection simply terminates. Why is this happening?

Trumpet does not like any VJ header compression. Use the pppd option '*-vj*' to turn it off.

12.5 I am using dp-3.1.2 (with SunOS) and the system will not allow me to use anything but ping, or nslookup. Why is this happening?

There is a bug in the **3.1.2** version of dp. Please get the **3.1.2a** or later file from the dp ftp home site *harbor.ecn.purdue.ecu*. Until you can put the patch into dp, disable the vj header compression.

12.6 My provider wants to use a dynamic DNS address which is not the same with every connection. Yet, Linux wants just one address in the /etc/resolv.conf file. This works with Microsoft Windows 95, but how do I make it work with Linux?

Run a local 'cache-only' nameserver on your own Linux system.

Instructions on running the nameserver are in the Named-HOWTO. The only file which you need to obtain from the internet to enable the nameserver is the named.boot file. This is available from the ftp site at ds.internic.net. Then, use the address 127.1 as the address of the nameserver.

You will need to create a named.boot file as well as a primary for a dummy domain which will hold your localhost name and a primary domain for the 127 IP network. Again, instructions on how to do this are in the Named-HOWTO file.

13 Other messages written to the system log

13.1 Alarm

This is not a problem. It means that a timer has expired. Timers are a necessary part of the protocol establishment phase. This is a message to help the authors debug the program.

13.2 SIGHUP

The pppd process has received a HUP signal. The HUP signal is generated by the tty software when the remote system has disconnected the modem link. It means that the modem has put the 'telephone receiver back on the hook', or, 'Hung UP' the connection.

The kill program may also be used to send this signal to the pppd process.

The pppd process will terminate the link in an orderly fashion when it receives this signal.

13.3 SIGINT

The pppd process has received an INT signal. The INT signal is generated by the console software when you press the Ctrl-C key combination and pppd is the foreground process.

The kill program may also be used to send this signal to the pppd process. In fact, the recommended method to terminate the pppd link is to send the process an INT. See the question relating to 'dip -k' for a script which will perform this task. The pppd process will terminate the link in an orderly fashion when it receives this signal.

13.4 Unknown protocol (c025) received!.

The remote wishes to exchange Link Quality Reporting protocol with the Linux system. This protocol is presently not supported. This is not an error. It is merely saying that it has received the request and will tell the remote that 'I can't do this now. Don't bother me with this!'

The Morning Star PPP package will always try to do LQR protocol. This is normal.

13.5 Unknown protocol (80fd) received!.

The remote wishes to exchange Compression Control Protocol with the Linux system. This type of protocol is layered upon the basic data protocol and will, if successfully negotiated, result in a fewer number of bytes transmitted for the frame. This means that the transfer will be quicker.

However, there are many types of compressors which are used under the general 'umbrella' of a Compression Control Protocol. The 2.2 PPP package understands only one; the BSD compressor. This compressor works very similar to the Unix 'compress' program and uses a LZW compressor. Depending upon the size of the code, there can be a significant amount of kernel space needed to hold the compression and decompression dictionaries. This should not be used if you have a limited memory space and should not even be contemplated if you have 8Meg or less real (RAM) memory. In those cases you should invest in a decent modem which support compression.

Unless both sides can agree upon the type of compression the compression will not be used.

Another common compressor is called Predictor-1. This will take less memory and run faster. However, its compression is not as good in that it will send a little more data than the equivalent frame given to the BSD compressor.

Many commercial terminal servers will employ a compressor called 'Stacker(TM) LZW' or LZS protocol. This is a commercial compression agent. Apparently Stacker will give you a license for no charge. However, a specific license is required and that will usually prevent it being included with the pppd process.

The 2.3 package will additionally include the compressor known as 'deflate'. It is a variation of the common package called 'gzip'.

13.6 The connection fails with errors 'ioctl(TIOCGETD): I/O error' or 'ioctl(PPPIOCSINPSIG): I/O error'. What now?

Look at the boot messages when you boot the kernel. If it says '*PPP version 0.1.2*' then you have an old version of the *ppp.c* driver.

If it says '*PPP version 0.2.7*' then you have the current driver, for the 2.1.2 package however, it was not built with the same set of defines for the ioctl numbers. Ensure that you have only one file called '*if_ppp.h*'. It should be located in the kernel's *include/linux* directory. Once you have done this, rebuild the kernel and the pppd process.

If it says '*PPP version 2.2.0*' then you are using the driver for the 2.2.0 package. This version of the driver will only work with the 2.2 series of the pppd package. The 2.2 pppd program will only work with this version of the driver.

13.7 Sometimes the messages 'ioctl(PPPIOCGDEBUG): I/O error', 'ioctl(TIOCSETD): I/O error' and 'ioctl(TIOCNXCL): I/O error' occur. Why?

The remote system has disconnected the telephone. The tty drivers will re-establish the proper tty discipline and these errors are the result of the *pppd* process trying to do the same thing. These are to be expected.

13.8 My ifconfig has strange output for PPP.

Usually the ifconfig program reports information similar to the following. You will have different IP addresses.

```
ppp0      Link encap:Point-Point Protocol
          inet addr:155.190.0.1  P-t-P:155.190.8.1  Mask:255.255.0.0
          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
```

The information is for display purposes only. If you are using a recent kernel then update the nettools package with the current one on *sunacm.swan.ac.uk* in the directory */pub/Linux/networking/nettools*.

13.9 The file /proc/net/dev seems to be empty

Do not be concerned with the contents of the /proc/net/dev file. There was a time when it was suggested that you check this file to determine if the ppp devices have been created. Now this check causes more confusion than satisfaction since the devices are dynamically created.

Did you just issue the command *'ls -l /proc/net'* and are wondering why the size is zero? If so, this is normal. Instead, issue the command:

```
cat /proc/net/dev
```

You should not find the file empty. The size is always shown as zero, but that is the 'proc' file system. Don't believe the size. Do the command.

The 'more', 'less', and 'most' programs may not be used to view the file directly. If you wish to use these programs, use it as follows:

```
cat /proc/net/dev | less
```

The current versions of pppd do not pre-create the ppp devices as the earlier versions did. If you have instructions which say that you should look at the /proc/net/dev file to see if there are ppp devices then you should ignore them. The ppp devices will be automatically created as they are needed and when they are needed.

13.10 The kernel reports that the PPP devices are being unlinked when the system is being started.

This message is generated only from earlier attempts at making the ppp devices dynamic. The current code no longer generates these messages. If you are seeing these messages then you should upgrade the pppd package to at least the 2.2.0 code.

13.11 I just checked /proc/net/dev and there are no PPP devices. Where did they go?

They went nowhere. They were all unlinked during the startup of the system.

The devices will be created again as they are needed.

14 Network routing issues (using PPP as a 'cheap' bridge)

14.1 Slattach and ifconfig don't work as they do with SLIP

Do not use *slattach* and *ifconfig* with PPP. These are used for SLIP. The *pppd* process does these functions at the appropriate time. These must occur after the *LCP* and *IPCP* protocols have been exchanged.

You can not replace *pppd* with *slattach* and *ifconfig*. Most of the protocol support for PPP is in the *pppd* process. Only the IP and IPX processing is in the kernel.

The host route to the remote system will be automatically added by pppd. There is no option to NOT add the route. The pppd process will terminate if the route could not be added.

The default route may or may not be added. This is controlled by the option '*defaultroute*'. If you have a default route, it will not be changed.

If you must do routing for an entire network, then put the route command into the */etc/ppp/ip-up* script. The parameters to the script are:

```
$0 - name of the script (/etc/ppp/ip-up or /etc/ppp/ip-down)
$1 - name of the network device (such as ppp0)
$2 - name of the tty device (such as /dev/cua0)
$3 - speed of the tty device in Bits Per Second (such as 38400)
$4 - the local IP address in dotted decimal notation
$5 - the remote IP address in dotted decimal notation
$6 - the value of the ipparam parameter
```

14.2 I want the route to the network and not the route to the host.

On *sunsite* there is a package called *devinfo.tar.gz*. It contains some useful little programs which will extract the data from the device and to do various things with the dotted IP addresses.

The documentation is in the man pages in the file.

For example, if you want to route the entire IP domain to the remote, the following may be used in */etc/ppp/ip-up*.

Of course, if the values are not variable, then simply use the appropriate entry in the route command.

```
# Obtain the netmask for the ppp0 (or whatever) device
NETMASK = `devinfo -d $1 -t mask`

# Obtain the IP domain (without the host address by removing the extra bits)
DOMAIN = `netmath -a $5 $NETMASK`

# Do the network route now that the IP domain is known
route -net add $DOMAIN gw $5
```

15 Other features and protocols

15.1 What about support for 'demand dial'

Use the **diald** package. This is on sunsite in the same directory as the PPP source, */pub/Linux/system/Network/serial*.

15.2 What about 'filtering'

There are no plans to put filtering into the PPP code. The 1.3 kernel supports a firewall option and you should use that rather than attempt to find a method of putting firewall logic into a network device driver. Use either the *ipfw* or *ipfwadm* programs to define the rules for the firewall code in the kernel.

15.3 How about *IPX*?

It is in the 2.2.0e package.

15.4 How about NETBIOS?

There is a netbios PPP protocol. However, your better solution would be to use TCP/IP and the '*samba*' code.

Microsoft and others have used Netbios PPP protocol.

The nbfcp protocol is a public document and available from several sources. The Netbios protocol is not a valid address family at the present time for Linux. Until Linux supports the protocol, there is little need to support Netbios over PPP for Linux.

15.5 I need ISDN support. Is there any?

ISDN support revolves around having a working ISDN driver. The present design of the PPP driver does not lend itself well to the concept of a block of data being received. This is being changed. A driver for the Sonix interface is being developed.

15.6 I would like multi-point support. Is there any support?

Multi-point would be nice. I am not aware of anyone working on multi-point support at the present time.

15.7 How about just standard synchronous PPP?

There are small changes needed to support a serial interface which uses synchronous communications. The redesign of the PPP driver will help with this function as well. Kate Marika Alhola has expressed an interest in writing such a synchronous driver for her hardware. You should contact her at kate@iti.fi or kate@nic.funet.fi for further information.

She informs me that the current status of sync ppp is, that I have had it few months in 'production' use talking with Cisco(TM) in speeds 64K and 256K. The source is under the GPL license and it may be found in ftp://nic.funet.fi/pub/Linux/kernel/xnet-sync-driver-1.0.tar.gz.

16 Miscellaneous

16.1 Do you have a PPP compatible mail reader?

Huh? You have the wrong group if you want MSDOS. PPP has nothing to do with the mail user agent. All of the mail agents are compatible with PPP.

16.2 How about a news reader?

Refer to the previous answer.

17 Questions about chat

The chat program is packages with the pppd executable. This is not an endorsement for chat. Any program which will arrange to start the PPP protocol on the remote system may be used. However, since chat is included with pppd, many people use it. There are only a few common questions about chat.

17.1 My modem wont dial when I run chat

The modem is required to be in the command mode to issue dial commands. If your modem is 'online' then characters sent to the modem will be sent to the remote system.

If possible, configure the modem to monitor the DTR signal and to return to the command mode when the DTR signal drops. This will permit the computer to force the modem back to the command mode when the pppd process terminates at the end of a connection. It will then be in the proper state when the next execution attempts to dial the telephone.

If you can't do this then you should change the dial sequence so that it is similar to the following. It will ensure that the modem is in the command state prior to attempting to send the dial sequence.

```
TIMEOUT 3 '' \rAT OK-+++\c-OK AT\&D2\&C1 TIMEOUT 60 OK ATDT555-1212 CONNECT
```

The commands will change the timeout period to three seconds. This accommodates the *guard* time period used by many modems. It will then send **AT** to the modem and look for its response of **OK**. If it is not received in the three seconds, it will send the +++ sequence to the modem and wait for the modem to present the expected **OK** response. Once it receives the valid response it will configure the modem and dial the telephone number.

17.2 The modem dials only on every second attempt

Please refer to the above answer. It is usually the same issue.

17.3 The chat script stops after sending the account name and it never receives the password prompt.

Some systems, notably SCO, will flush the receive buffers after writing the prompts for user name and password. The chat program normally transmits the response immediately upon seeing the prompt. The result is that the reply from chat is flushed by SCO. The chat program continues to wait for the password prompt. However, the remote system is still waiting for the user to enter the account name.

The solution is simple. Slow down the responses from chat so that there is time for the remote system to flush the receive buffer before chat starts to send the response. Chat supports this with the \d parameter. Change the response strings similar to the following:

```
ogin:--ogin: \d\daccount assword: \d\dhello2u2
```

17.4 The chat script stops before finishing and fails to make the connection

A common method of using chat is to use the connect option and have it directly run the chat program, i.e. connect "chat ...". What is not so obvious is the method by which pppd implements the connect processing.

The pppd process uses the execl() function to start a shell. The shell is given the command line string which you supplied with the connect option. This has several advantages in that the parameters do not need to be parsed by pppd, they may be expanded, the path is automatically searched, etc. However, it does have some disadvantages as well.

The disadvantage is that the shell will re-interpret the option string again for special characters and act upon them. It will use the \ character to take the next character as a different meaning, it will use the & character to start a new sub-shell, and it will use the < and > to do I/O redirection.

So, if your prompt string is "protocol>" and you use just the string protocol> or even > then the shell will cause chat to fail to run. This is not a problem with chat. This is not a problem with the shell. They are both doing exactly what is expected.

So, how do you actually use the string protocol> as a prompt? Well, the answer is simple. Put a \ before the > character as in protocol\>. This tells the shell that the > is not an I/O redirection sequence but a simple character which is to be given to the chat program just like any other.

The same thing is required for the modem configuration options of AT&D2, etc. The & needs to be quoted as in AT\&D2.

The chat program also recognizes the \ character as being special within its own processing. This is performed so that strings may have special characters within them such as \r for a carriage return. If your prompt or the reply contains a \ then you need to give chat \\ for each \ character that you wish to use. (Remember that the shell will also need \\ for each of those as well if you don't put the sequence within quotes.)

17.5 When I attempt to run chat, it says that the -l parameter is invalid. Why?

There was a time when chat had the ability to set a lock file for the modem device. The name of the file was given to chat with the parameter -l.

However, that was a seriously *bad* idea and should not have been in the code in the first place.

The reason is that chat is a filter. It does not attempt to configure the modem for the proper rate. So, what people would do is run stty to set the rate, then run chat, and then attempt to run pppd. This was definitely not the way to do the connection.

The serial port sharing only works if all of the programs on your system follow the same rules and play by the same game. If you want to share the serial port then you need to use a lock file. This lock file must be created using the proper method before the serial port is touched. You are not permitted to run stty on the serial port until the lock file is first created.

Consider what would happen if you had run chat, and chat was in the middle of the dial sequence and then some cron event occurred which launched another program. That program just changed the BPS rate on your modem without attempting to lock the serial device first. I can tell you what would happen. The chat connection script won't complete.

So, for that reason, since chat is a filter and not meant to be a controlling program, the lock option was removed. Chat is not able to create a lock file for the modem. The lock file must be created by the program which configures the serial port and then runs chat, such as pppd.

17.6 I ran chat. It seems to want to use the local terminal as the modem and it does not talk to the modem. How do I specify the modem name to chat?

Chat is in a class of programs called a 'filter'. That is, it reads from the standard input, does some processing internally, and writes to the standard output.

So, if you really want to just run chat and have it talk to a modem then you need to use the I/O redirection operators < and > so that the standard input and output are redirected to the modem.

HOWEVER, if you are using chat with pppd, please do *not* run chat first and then attempt to run pppd after it. You should only use the combination of chat and pppd if you use the connect option for pppd to run the chat program.

The reason for this is that pppd will automatically redirect the standard input and standard output to the appropriate modem device before it runs the connect script (and chat). In addition, the necessary device locking will have been performed before it attempts to run the chat program.

If you just run chat first and then expect to run pppd, your system will fail should you have another program which is sharing the serial device. The locking will not have been performed, chat will not have re-configured the serial device so that it has the proper transmission rate, parity, stop bits, etc. and then when the other program, such as mgetty, comes along it will find that the lock file is not valid and

re-configure the modem again. In so doing, it will destroy the use of the modem by chat and chat or pppd will fail.

17.7 When I run pppd and chat along with mgetty then the connection does not start. If I stop mgetty, then pppd will work. Why?

For the serial port to be shared properly, a lock file is needed between the use of the serial port by mgetty and the use by pppd (and chat).

The pppd process uses the FSSTND location of /var/lock/LCK..ttyS0 to lock the device called 'ttyS0'.

There have been some pre-built binaries of mgetty in some distributions which use the much older location of /usr/spool/uucp/LCK..ttyS0.

In addition to the file location, the file format must be the same. There are two common methods of recording the pid information in the file. The first is the older method, used commonly by some pre-built binaries for the kermit terminal emulator, of storing the pid as a binary value. You can tell this format in that the lock file is four bytes in size.

The more modern method is to store the pid as an ASCII string. This file has a size of eleven bytes (ten bytes for the pid, one for the trailing newline character.)

If the file format does not match what mgetty expects then mgetty treats the lock as being invalid and seizes the device, drops the DTR (which usually hangs up on the connection), and reconfigures the modem.

The other cause for the condition is that you simply forgot to tell pppd that it must lock the serial port. To tell pppd that it needs to lock the serial port, use the option 'lock' when you run pppd.

In the context of the lock file, the name of the lock file is formed from the name of the serial device. That is good for the most part. The problem comes when people use 'modem' and 'ttyS0' to be the same thing. Some people have a symbolic link from /dev/modem to /dev/ttyS0. They then forget that mgetty is using the name ttyS0 for the name of the serial port and they use /dev/modem when they run pppd, telling it to create the lock. The pppd process does so, but the lock file created is called "LCK..modem". Then mgetty comes along and does not see that the serial device is locked (because there is no "LCK..ttyS0" file) and drops the DTR signal and the PPP connection is broken.

So, either use /dev/modem or /dev/ttyS0 for your modem. Choose one name. Get rid of the other. Use that name everywhere, not just in "most" of the places, but in "every" place.

We have been working on a solution to this problem. It involves getting rid of the reliance upon the name of the serial device and using the values that the operating systems really uses, the major and minor device numbers. However, that is not in place yet. Until it is, be careful and use the proper names for the devices on the system and you should not have a problem.