

1.112.4 Configure Linux as a PPP client Weight 3

Linux Professional Institute Certification — 102

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Outline

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1 Context

Topic 112 Networking Fundamentals [14]

1.112.1 Fundamentals of TCP/IP [4]

1.112.3 TCP/IP configuration and troubleshooting [7]

1.112.4 Configure Linux as a PPP client [3]

2 Objectives

Description of Objective

Candidates should understand the basics of the PPP protocol and be able to configure and use PPP for outbound connections. This objective includes the definition of the chat sequence to connect (given a login example) and the setup commands to be run automatically when a PPP connection is made. It also includes initialisation and termination of a PPP connection, with a modem, ISDN or ADSL and setting PPP to automatically reconnect if disconnected.

Key files, terms, and utilities include:

`/etc/ppp/options.*` — main configuration file for pppd

`/etc/ppp/peers/*` — allow users to use privileged options configured by the administrator

`/etc/wvdial.conf` — configuration for the wvdial dialer

`/etc/ppp/ip-up` — script executed when PPP connection made

`/etc/ppp/ip-down` — script executed when PPP connection terminates

`wvdial` — a PPP dialer

`pppd` — The daemon that implements the PPP protocol

3 What is PPP?

What is PPP?

- The Point-to-Point Protocol (PPP) provides a connection between two systems using a serial interface.
- Usually used with ADSL, a dial-up modem, or ISDN modem
- Can also use over a direct connection called a *null modem*
- I have often used PPP over a secure shell connection to create a tunnel over SSH
- Creates a new network interface: first is called `ppp0`, next one is `ppp1`,...
- Kernel needs to support PPP, but I have found no recent desktop distributions that do not provide compiled-in support for PPP.

4 PPP Clients and Servers

PPP Clients and Servers

- The same software — `pppd` — is used both for PPP dialup clients and PPP servers.
- A server simply uses software like `mgetty` to answer a modem, and an `/etc/inittab` entry like:

```
S1:2345:respawn:/sbin/mgetty ttyS1
```

... with some setup in `/etc/mgetty+sendfax/mgetty.config`
- However, the LPI objectives only include use of Linux as a client.

5 Overview of PPP connection

Overview of PPP connection

1. Client connects to server through a serial connection
2. Client authenticates to the server.
3. PPP starts on the client
4. PPP server usually provides address to client; client and server agree on various other parameters
5. client configures its network interface using information provided by the server, often including a default route.

6 Establishing the serial connection: chat scripts

Establishing the serial connection: chat scripts

- Much of the work in establishing the PPP connection is getting the modem to dial and talk with the other end.
- We use a program called `chat`, configured by a
- *chat script* for this, and also possibly for logging in, and sometimes starting PPP.
- Questions about chat scripts seem to appear in LPIC exams.

6.1 An example chat script

An example chat script

- Consists of pairs of *expected response* then *string sent*

```
ABORT BUSY
ABORT ERROR
ABORT 'NO CARRIER'
ABORT 'Invalid Login'
ABORT 'Login Incorrect'
'' ATZ
OK ATDT95672314
CONNECT ''
ogin: nicku
ssword: <password>
TIMEOUT 5
> ppp
```

What chat sees

- The chat script above was written for a session that looked like this:

```

ATZ
OK
ATDT95672314
CONNECT 31200/ARQ/LAPM/V42BIS

User Access Verification

login:nicku
Password:⟨password⟩

msusw2>ppp
Entering PPP mode.
...

```

6.2 Using wvdial to dial

Using wvdial to dial

- The wvdial program helps simplify the connection
- The program wvdialconf helps write a configuration file ~/.wvdialrc or /etc/wvdi which may need minor tweaking to use with pppd
- You can then use wvdial to dial the server, call pppd and handle the authentication
- In Ubuntu Hoary, I found this the simplest way to set up the use of PPP.

7 Flow Control

Flow Control

- A serial interface has a buffer which, when full, cannot accept more information
- Any more information received is lost
- Flow control is a way to stop this happening before the buffer is full
- There are two methods of flow control:

hardware flow control uses two standard serial control lines: *ready-to-send* (RTS) and *clear-to-send* (CTS)

- enabled with pppd using the option *crtcts*

software flow control uses two characters: XON and XOFF to send flow control information mixed with the data

- less efficient than hardware flow control

8 Names of serial ports in Linux systems

Names of serial ports in Linux systems

- The first serial port is /dev/ttyS0, the second is /dev/ttyS1,...
- Ancient text books, or ignorant authors of new books using obsolete sources :-) may refer to serial ports as /dev/cua0, /dev/cua1,...

9 Speed of data

Speed of data

- Compression allows the flow of data in and out of a modem to exceed the maximum speed of transmission over the phone line by a factor of four
 - so set the serial speed higher than the modem is capable of transmitting
- The speed of data transfer over a serial link is measured in bits per second (bps)
- The term “*baud*” is not the same as “bits per second”
 - baud is a measure of symbols per second. If there is only one bit per symbol, then baud = bit rate, but usually they are different
 - All the same, much confusion exists, and in wvdial.conf, the speed in bits per second is set using an option “Baud”.

10 pppd options

10.1 Where are the options put?

pppd options

- pppd options are set:
 - in /etc/ppp/options
 - in /etc/ppp/peers/*

- * Enables ordinary users to use options otherwise disallowed by `non-root` users
- on the command line of `pppd`

10.2 The options

Frequently used options

asynmap *<map>* — specifies which control characters (ASCII characters lower than space) will be sent as a two-byte escape sequence; usually, need this to be set to zero

connect *<script>* — the script called before PPP protocol starts, usually `chat` *<chat-script>* to dial the number

crtscts — Use hardware flow control

debug — debugging info to syslog for troubleshooting

defaultroute — set up a default route via remote PPP peer

lock — create a lock file to get exclusive access to the serial device

nodetach — keep `pppd` in the foreground for debugging

call *<name>* — read options from `/etc/ppp/peers/name`, including privileged options

persist — restart the PPP connection if it fails for any reason. *Mentioned in objectives*

11 Other methods of authentication

Other methods of authentication

The chap example above showed a client logging in responding to username/password prompts (uses `pppd` option `noauth`)

PAP — Password Authentication Protocol: started by client sending a username, password. This information is stored in a simple text file, `/etc/ppp/pap-secrets`. I have used PAP with most ISPs.

CHAP — Challenge Handshake Authentication Protocol: started by server, which sends its name and a challenge. Client responds with its name and a value derived from the challenge and its authentication information, which is stored in `/etc/ppp/chap-secrets`

MSCHAP — It will be a surprise to most that Microsoft, normally a vigorous supporter of IETF and other Internet standards, has gone out on a limb with this one, but it is a Microsoft specific version of CHAP used on MS RAS servers.

12 ISDN

ISDN

- Most ISDN modems are configured the same way as other dial-up modems.
- I configured a chat script for my parents' ISDN modem using `wvdial` on Ubuntu Hoary Hedgehog
- Main difference: the device is `/dev/ttyACM0`

13 ADSL

ADSL

- I use the package `rp-pppoe` from <http://www.roaringpenguin.com/pppoe/> to connect via ADSL to my Internet Service Provider (ISP)
- See the documentation with the package

14 ip-up, ip-down

ip-up, ip-down

- The script `/etc/ppp/ip-up` is executed when the PPP connection is established
- The script `/etc/ppp/ip-down` is executed when the PPP connection is disconnected
- I have used `/etc/ppp/ip-up.local` (executed from `/etc/ppp/ip-up`) to add static routes when making other PPP connections besides to my ISP
 - Also useful for telling a dynamic DNS provider that your IP address has changed
- Both are called with six parameters to let you know what IP addresses you have,...

15 Troubleshooting Connections

Troubleshooting Connections

- A *terminal program* is your best tool for troubleshooting a serial connection; examples:
 - minicom** — the program most likely to be asked about in the exam

kermit — a more powerful terminal program that has finally been included in most modern distributions since the license was made explicitly free for Linux distributors

- Add the option `debug` to PPP options
- Add the option `-v` to `chat`
- use the option `nodetach` to keep `pppd` in the foreground
- Increase the level of detail to debug logged by facility daemon in `/etc/syslog.conf`
- Monitor the `/var/log/messages` log file

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