Command-line interpreter

A command-line interpreter is a computer program that reads singular lines of text entered by a user and interprets them in the context of a given operating system or programming/scripting language. The interaction takes place by means of a command-line interface [https://en.wikipedia.org/wiki/command-line interface]. Other common, but technically not quite correct, denominations are **console** or **shell**.

The OpenWrt standard unix shell [https://en.wikipedia.org/wiki/unix shell] is the Busybox-fork of the Debian implementation of the Almquist shell [https://en.wikipedia.org/wiki/Almquist shell] (see → http://www.in-ulm.de/~mascheck/various/ash/#busybox [http://www.in-ulm.de/~mascheck/various/ash/#busybox]). In case you want to read about it.

Start

At the end of the boot up process, the **init daemon** is started, this can be init [https://en.wikipedia.org/wiki/init] or systemd [https://en.wikipedia.org/wiki/systemd] or upstart [https://en.wikipedia.org/wiki/upstart], etc. OpenWrt currently uses `procd`. Following the boot up scripts located in `/etc/rd.d`, `init` will then start all sorts of programs, amongst them the chosen shell. This listens to keyboard strokes and outputs a more or less colorful command-line interface to the connected display.

But most devices you run OpenWrt on, have neither a keyboard nor a display adapter. So we need to access it over the serial port (=local) or over the Ethernet port (= over the network).

Network

To gain access to a shell over the network, you obviously need some other programs to help you with that. And the whole data exchange (aka communication) has to involve some kind of network protocol [https://en.wikipedia.org/wiki/Communications protocol].

Network protocols of choice are telnet [https://en.wikipedia.org/wiki/telnet] and SSH [https://en.wikipedia.org/wiki/Secure Shell]. Both follow the server ↔ client scheme. On the device running OpenWrt we deploy `telnetd` for the telnet protocol and `dropbear` for for the SSH protocol. Try PuTTY [https://en.wikipedia.org/wiki/PuTTY] for the real look-and-feel, but you should definitely also checkout WinSCP [https://en.wikipedia.org/wiki/WinSCP]! The latter won't work quite correctly, however Konqueror [https://en.wikipedia.org/wiki/Konqueror] with `fish://` does! See FISH (Files transferred over shell protocol) [https://en.wikipedia.org/wiki/Files transferred over shell protocol].

(OpenWrt does also include a SSH-client `ssh` and a telnet-client `telnet`, in case you want to login from it to somewhere else.)

Note: Before firstlogin only `telnetd` will run, and after only `dropbear`.

In case of a successful login `dropbear` will (generate a LOG and) spawn an instance of the specified shell (more shells can be installed simultaneously) with the users ID.

- Howto login to an SSH Server using PuTTY [http://www.electrictoolbox.com/article/applications/ssh-putty/]

Configuration

In OpenWrt this is done in the file: `/etc/profile` by setting environment variables [https://en.wikipedia.org/wiki/Environment variable] and aliases. It comes (of course) pre-configured and will work out-of-the-box, but you can alter and augment it's configuration:

- you can configure the command prompt [https://en.wikipedia.org/wiki/command-line_interface#Command_prompt] via the variable `PS1`. see → http://controlc.de/2010/03/12/bash-shell-einrichten/ [http://controlc.de/2010/03/12/bash-shell-einrichten/] and many many many other pages in the web on help with that
- you change the content of existent variables and can define new ones
- etc.

Copy & Paste

When in PuTTY, you can mark text content with the mouse and, without pressing any key (like [Ctrl]+[c]), it is being automatically stored. You can then insert it the usual way (with [Ctrl]+[v]) in an other windows, e.g. an open firefox. The other way around, you copy text the usual way [Ctrl]+[c]) and then paste it in PuTTY by pressing the [right mouse button]!

Numpad in PuTTY while using Vi

In PuTTY goto *"Terminal"* ⇒ *"Features"* and check *"Disable application keypad mode"*.

Issue commands

- For some orientation with the file system and the whole directories, check flash.layout.

At login you will be in your $HOME directory, which is `/root` for user root and would be `/home/user1` for user1, etc. Commands:

Command	Memorize	Description
`pwd`	*print working directory*	prints out the current directory you are in
`cd`	*change directory*	move through the file system directory tree: `cd ..`, `cd /`, `cd /etc/init.d`, `cd /tmp`
`ls`	*list*	print the content of the current directory, `ls -l /etc`
`cat`	*concatenate*	printing the content of a file on screen: cat `/etc/config/network`, `cat /tmp/dhcp.leases`
`cp`	*copy*	creates a copy of the specified file, `cp network network.bak`
`mv`	*move*	creates a copy of the specified file and deletes the original, `mv /tmp/opkg-lists/snapshots /mnt/sda1/opkg/packages`
`df`	*disk free*	Shows you available space. Again, see flash.layout for understanding `/rom`, etc. And see df [http://man.cx/df] for help with the command and it's options. Try `df -h`.
`free`		about free RAM
`uptime`		time elapsed since last boot
`dmesg`		print or control the kernel ring buffer
`logread`		Shows the messages from syslogd (using circular buffer)
`cat /proc/version`		
`cat /proc/meminfo`		more detailed data uppon RAM usage
`cat /proc/cpuinfo`		about your CPU
`cat /proc/mtd`		
`cat /proc/partitions`		
`cat /proc/net/nf_conntrack`		
`cat /proc/cmdline`		
`cat /proc/modules`		

There is a ton of commands with a ton of options. On a full blown Linux distribution you would issue a `man command` to learn about the command and its options. However OpenWrt is minimalistic and thus does not contain this functionality. So either read the man-pages (manual pages) on another GNU/Linux machine or read them online: e.g. at http://man.cx/ [http://man.cx/]. Man pages are in the process of being translated.

`Tip` In firefox, you can use keywords [http://kb.mozillazine.org/Using_keyword_searches] to simplify the usage. Create a new bookmark, use `http://man.cx/?page=%s` as address and `man` as keyword.

editing files

To edit a file you need an editor, to edit a text file, you would use a text editor.

The standard text editor included is `vi [https://en.wikipedia.org/wiki/vi]`. Until you get used to it, vi is neither intuitive nor pretty.

- `vi` has two modes: *command mode* and *insert mode*.
- to enter command mode press [Esc] (escape key)
- to enter insert mode press either [i] for *insert* or [a] for *append*
- `vi` starts out in command mode

starting vi

Start with `vi` or `vi /etc/config/network` or `vi firewall.user` if you are already in the same directory.

editing

In order to edit the file, you have to be in *insert mode*. Press [i] or [a].

exiting vi

In order to get out of vi, you have to be in *command mode*. Press [Esc] (the escape key). Then issue one of the following commands:

- `:w` to write the current file to disc, this will overwrite the old file
- `:q` to quit without writing
- `:wq!` to (forcefully) write to disk and then quit vi
- `:%s/string1/string2/g` replace string1 with string2 in the whole file

configuring vi

Vi can be configured in *command mode* by setting certain variables:

- `:set ai` use auto indentation (sometimes annoying default)
- `:set noai` NO auto indentation

alternative text editors

If you do not like `vi`, try `joe`, `mg`, `nano`, `vim`, `vim-full`, `vim-help`, `vim-runtime`, `zile`

- `vim [https://en.wikipedia.org/wiki/Vim (text editor)]`
- `joe [https://en.wikipedia.org/wiki/Joe's Own Editor]`
- `nano [https://en.wikipedia.org/wiki/nano (text editor)]`
- `zile [https://en.wikipedia.org/wiki/Zile (editor)]`
- `mg [https://en.wikipedia.org/wiki/mg (editor)]`
- and there may be other text editors available in the OpenWrt repos 😉
- when logged in via WinSCP/Konqueror you can also use some Editor on your PC
- You may need to restart the system to let vim be installed properly.

Scripting language

OpenWrt uses busybox's [http://www.busybox.net/BusyBox.html] ash shell by default, which is in most parts *POSIX [https://en.wikipedia.org/wiki/POSIX]* conform. Visit *shell script [https://en.wikipedia.org/wiki/shell script]* for general Information about shell scripts.

Executing shell scripts

Shell scripts can be executed with:

```
sh /path/to/script.sh
```

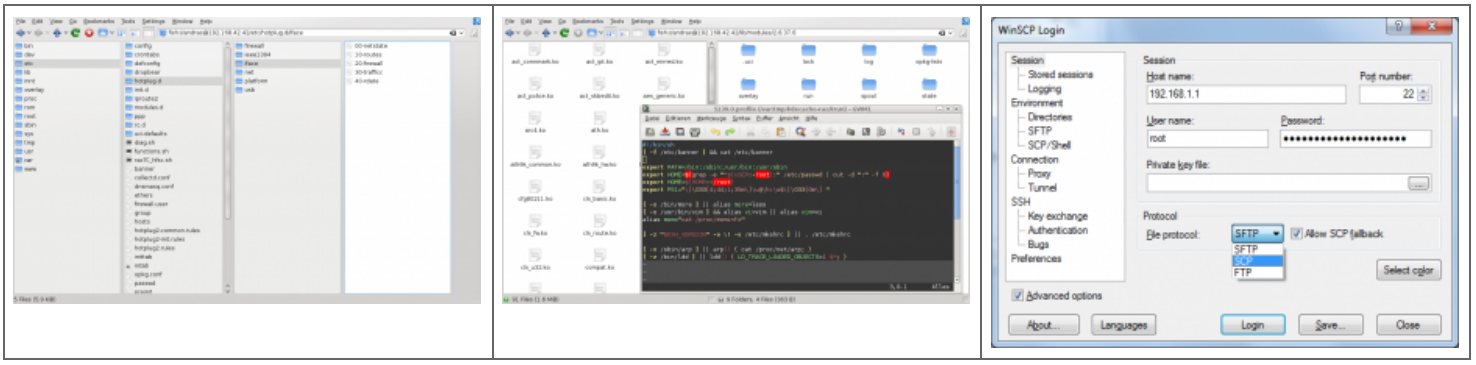
After changing the executable bit its also possible to run it without the sh in front:

```
chmod +x /path/to/script.sh /path/to/script.sh
```

File Managers

You may also want to try `mc [https://en.wikipedia.org/wiki/Midnight Commander]` or `deco [https://en.wikipedia.org/wiki/Demos Commander]`.

Use GUIs



Further Help

- http://wiki.debian.org/CommandLineInterface [http://wiki.debian.org/CommandLineInterface]
