

PSiLINUX

Psilinux-ing your Psion...



How to put a little penguin inside your Psion by Edward Robbins

In this second PsiLinux article, having given an introduction to Linux and it's feasibility as an operating system for a Psion, I am dealing with actually getting a Linux system to run on your Psion. I will demonstrate how a small working system can be set up on a Psion Revo (or Diamond Mako), Series 5, 5mx, or 5mx Pro.

So what do we need?

To get started with installing Linux, you will need to know what a Linux system actually consists of. There are three key elements to any Linux system, big or small. They each require some introduction;

The Kernel

The kernel is the core of Linux; it is the part of Linux that actually interfaces with the hardware and runs

most of the low level system.

This is the part that has to be updated to support new hardware and is developed on by (along with countless millions of other volunteers) Linus Torvalds, the creator of the Linux kernel.

All of the Psion machines use Arm processors, and since there is already a mainstream Linux kernel for Arm processors the Psion kernel is a modified version of this with drivers for the Psion hardware such as the LCD Screen and the keyboard.

The File System

You may be familiar with the term file system. In this context, I am just meaning the place where files are stored. On a PC this is usually a hard disc drive. On a Psion running EPOC (the system that a Psion comes

installed with) this is RAM and Compact Flash storage for your files, and a ROM for Operating System Files.

On a Psion running Linux, either a 'RAM disk' can be used, or larger compact flash storage, but the ROM still stores the EPOC operating system while you are using EPOC since it ROM cannot be erased.

In the file system all the files and programs that make a Linux set-up work are stored along with programs that the user might need and any files created.

The Boot Loader

The boot loaders job is to copy the kernel into RAM (where programs have to be stored whilst they are running and - to avoid confusion - where they can also be stored in a RAM disk file system - see above), and then run or 'boot' the kernel.

The boot loader also has to tell the kernel where the file system is and can also pass other options to the kernel such as which program to run first when the kernel has booted.

Back it up!

Before you do anything with your Psion concerning running Linux, you should back it up. You will lose everything on the internal (C) drive when Linux is started, as well as settings like date and time, because the Psion will undergo a complete (hard) reset upon returning to EPOC, and no one wants to lose everything.

I keep my files backed up on a compact flash card so that I can copy back everything that was on my internal drive when I go back into EPOC, since files stored on compact flash are not affected.

Preparation

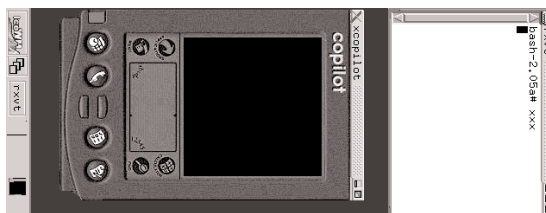
Now you actually need to get those three things listed above, all of which can be downloaded from the net.

First a kernel is needed.

The Psion kernels are specific to each Psion; there is one for the Revo, one

for the Revo Plus, one for the 5mx, etc. On the next page is a list of links so that you can

pick up the correct and newest kernel for your system.



Turn your Psion into an inferior palm pilot...

Download Links for The Kernel

Series 5 -

<http://linux-7110.sourceforge.net/files/Kernels/Series5/Binaries/Psion/glued-2.2.1-75-psion.gz>

Revo -

http://linux-7110.sourceforge.net/files/Kernels/5mx_and_Revo/Binaries/2.4.18-rmk6-5mx4/uk/psion_revo_8mb.gz

Revo Plus/Diamond Mako -

http://linux-7110.sourceforge.net/files/Kernels/5mx_and_Revo/Binaries/2.4.18-rmk6-5mx4/uk/psion_revo_plus_diamond_mako_16mb.gz

Series 5mx -

http://linux-7110.sourceforge.net/files/Kernels/5mx_and_Revo/Binaries/2.4.18-rmk6-5mx4/uk/psion_5mx_ericsson_m218_16mb.gz

Series 5mx Pro 24 -

http://prdownloads.sourceforge.net/linux-7110/psion_5mx_pro_24mb.gz?download

Series 5mx Pro 32 -

http://prdownloads.sourceforge.net/linux-7110/psion_5mx_pro_32mb.gz?download

Having downloaded a kernel, you then need a boot loader. There are two boot loaders for Psions; the first is Arlo, written by Peter van Sebille, and can be found at

<http://www.yipton.net/>

or for the latest release

<http://www.yipton.demon.co.uk/arlo/latest/arlo.zip>.

This is an EPOC program run on your Psion. The other is ProBoot, written by Tony Lindgren, which is for the 5mx Pro machines only, and will not feature in this article but I will show its usage later.

Next on the checklist is a working file system. This can be a complete Linux distribution stored on a compact flash memory card, with the X Windowing system and a host of programs, but for now we will be working with an initrd file system.

An initrd is a set of programs needed to run a basic Linux system, bundled into a small file which is then compressed.

When Linux boots the file is decompressed and stored in a RAM disc for access. This is how Linux can be run on a Revo, despite not being able to utilise compact flash storage.

The Series 5 is also limited in its Linux capabilities, because on the hardware side of things there are some key differences (plus it is just slower), and this coupled with the fact that it lags behind in develop-

ment means that at the moment it runs an older version of the Linux kernel (2.2 not 2.4).

There are a large number of available initrds suitable for a Psion. A typical Series 5 or 5mx system will be stored on compact flash, and therefore

the most usable initrds have been developed for the Revo, which lacks this facility.

Revol

Revol is a Linux distribution designed for the Revo. It includes an initrd with lots of useful programs and even a graphical interface, PicoGUI.



**Psion user support helpline?
There seems to be a penguin
stuck inside my Revo, he says
his names Tux**

A download for it can be found at
<http://fraggle.alkali.org/projects/revol/download.shtml>.

There are two versions; one for the Revo, and one for the Revo plus, the difference being due to their differing amounts of RAM.

Unless you are a Series 5 user, download the most suitable version for your machine in zip format (for 5mx use the Revo plus version), and unzip it on your PC using something like WinZip. If you don't have WinZip, try power archiver, which is freeware.

Inside there is a file called `initrd.gz`, which contains the file system you will need to use.

If you have a series 5, you will need to use a different `initrd`, as the Revol one does not work with these machines for some reason. A suitable one would be one of Klassjan's `initrds`, which can be found at

<http://linux-7110.sourceforge.net/files/People/Klassjan/initrds/>

for example, `initrds3.gz` or `initrddemo.gz`. Rename whichever you download to `initrd.gz` and you are ready.

5mx and Revo users may want to try other `initrd` systems, and these `initrds` will also work with these machines.

Let's do it...

You should now have three files;

1. Arlo.zip
2. <some kernel name>.gz
3. `initrd.gz`

The first thing to do is 'un-gzip' the kernel. The '.gz' bit at the end of the filename means that it is compressed in gzip format, but the boot loader, Arlo, needs the kernel in an uncompressed format.

I believe both WinZip and power archiver can decompress this file. Note, however, that some versions of Internet Explorer decompress this file for you, without renaming it. If you find that you cannot ungzip the file, this will be the reason and you should just rename it to take off the extension.

`Initrd.gz` does not need to be decompressed as Arlo can deal with it in compressed form.

Now copy `initrd.gz` and your decompressed kernel to your Psions lowest (root) directory. I would suggest using a compact flash for storage, but you can also use the internal drive.

Finally, you should unzip arlo.zip and copy the two folders to your Psions root directory, preferably the same disc as the previous files.

Arlo running in Epoc

Run Arlo from your extras bar, and you should be presented with a boot list. This is a list of different configurations to boot with. Press escape, and then menu. Jump to 'Options', 'Boot list' and you should be presented with the same list, but this time you can edit the boot list. Tap new to make a new boot option. Change the kernel and ramdisk lines to point to own kernel and ramdisk, then enter a description such as 'PsiLinux Demo'. Click 'Ok' and then again to dismiss the windows. Save the new option using 'Save' in the 'Options' menu, and then go to the boot menu and bring up the boot list again. This time you should see your option and be able to boot it by clicking 'Boot'.

Whoosh, Linux in your pocket

After a few seconds the kernel should boot. You should see a penguin in the corner and lines of text running past too fast to read. You will then be presented with a command line.

The command line after start-up
Okay, so Linux has started, but what can you now do? To be honest, the full power of Linux cannot be unleashed with such a small file system, although Revol makes a good go of it.

For those of you who have used DOS before, the principal of the Linux command line is similar (although far more powerful). If you are using Revol, you can jump into a GUI (Graphical User Interface) by typing 'P' (must be a capital - Linux is case-sensitive) and pressing enter.

PSiLNUX



Arlo running in Epoc



```

EINNA: configuring the CF controller
NET4: Linux TCP/IP 1.0 for NET4.0
IP Protocols: ICMP, UDP, TCP
IP: routing cache hash table of 512 buckets, 4Kbytes
TCP: Hash tables configured (established 1024 bind 1024)
NET4: Unix domain sockets 1.0/SMP for Linux NET4.0.
NetWinder Floating Point Emulator V0.95 (c) 1998-1999 Rebel.com
iCCOMM protocol (Dag Brattli)
RAMDISK: Couldn't find valid RAM disk image starting at 0.
Freeing initrd memory: 4K
hda: hda1 hda2
hda: hda1 hda2
EXT2-fs warning: mounting unchecked fs, running e2fsck is recommended
UFS: Mounted root (ext2 filesystem).
Freeing init memory: 72K
init-2.05# cat /dev/fb
fb0          fb0current      fb1autodetect  fb2          fb2current
fb0autodetect fb1          fb1current    fb2autodetect
init-2.05# cat /dev/fb0 > /tmp/start,

```

The Command Line at Start Up

PicoGUI is a very lightweight (i.e. small and fast) GUI, which unfortunately doesn't have too many programs at this stage. It is pretty intuitive though, so you shouldn't have too much trouble with it.

It even has its own terminal program, so you can access the command line in the same way as a DOS-box in windows.

The Command Line

Using the command line takes some

getting used to. Basically, when on the command line you can run commands to manipulate files, and run programs by typing their name and pressing enter.

To changing the 'working directory' - the directory you are in at the moment - you type 'cd <directory name>'. Linux has multiple 'virtual terminals' (vts) This means that you can work with some command line program on one, and then switch to another to do something else.

```

# uptime :
11:53am up 1:16, load average: 0.00, 0.01, 0.00
# echo aqua theme rules!
aqua theme rules!
# cat /dev/fb0 > /sshot

```

Terminal (75x300)

The aqua theme in picogui is nice



Simon Howard, the creator of Revolver, ported the game Sopwith for the Revo

You should be able to change vt by holding the menu key and then pressing the number keys. You can also turn off your Psion in the normal way, and the backlight should work too.

However, the directory structure in Linux is far different to that of windows; instead of storing specific programs in specific places, Linux mostly stores specific types of files in specific directories. For example, executable files (like windows .exe files) are stored in '/bin/' (notice that a forward-slash, '/', is used unlike the windows back-slash, '\'), system executables (programs which manipulate parts of the system, for example programs to format a drive) are stored in '/sbin', and library files (like .dll files in windows) are stored in '/lib'.

Mounting a compact flash

Something that never fails to confuse a new Linux user is how discs are managed in Linux. There is no 'C drive' or 'A drive'. The bottom directory in Linux is simply '/', and is the root directory of the main file system (normally a hard disc, but in this case a RAM disc).

All other hardware is linked to in the '/dev/' directory. To browse another filesystem, it has to be 'mounted'. To mount a disc, fairly sensibly the command to use is 'mount'.

This command has to be told certain things though, like which disc to mount, and where to give the user access to it, as well as what kind of filesystem it is.

PINE 4.33			MESSAGE INDEX		Msg 12 of 23	
	9 Apr	9	Leslie Carr	(1,887)	Broadband User Question	
	10 Apr	9	Tim Chown	(2,280)	Re: Broadband User Ques	
+	11 Apr	10	root	(1,253)	{SPAM?} Account Confirm	
+	12 Apr	11	Marcin Rusti	(2,090)	The Slipknot Project	
	13 Apr	11	kuckuck@flye	(15,528)	{SPAM?}	
+ A	14 Apr	11	Richard Smit	(1,836)	Revo's & Life	
	15 Apr	12	Paul Lewis	(45,056)	A Year out With McLaren	
+ A	16 Apr	12	Harry Mason	(954)	chmod(1)	
	17 Apr	12	Jaque3wolfru	(4,352)	\$300-\$1000 per week fro	
	18 Apr	12	Block Buster	(5,867)	{SPAM?} Copy any DVD -	
+ A	19 Apr	13	Harry Mason	(1,641)	Chmod script	
	20 Apr	13	Harry Mason	(1,815)	Re: Chmod script	
+ A	21 Apr	15	Uladislav Ma	(1,770)	Re: psion revo touchscr	
	22 Apr	15	Gary Wills	(2,955)	RE: CM212 HCI Evaluatio	
+	23 Apr	16	Dave Kiddell	(1,355)	Re: cackman	

☐ Help ☐ FldrLis ☐ PrevMsg ☐ PrevP ☐ Delete ☐ Reply
☐ OTHER C ☐ ViewMs ☐ NextMsg ☐ NextP ☐ Undelet ☐ Forward

Using the pine program from Revol to read emails on the go with a Revo

If you have a compact flash disc, you can follow this procedure to mount it:

1. Type 'cd /' and press enter. This will move you to the root directory.
2. Disks are generally mounted in the /mnt/ directory. Go to that directory now by entering 'cd mnt' or 'cd /mnt' and pressing enter.
3. Once you are in this directory, you need to create a new directory. This will be the 'mount point', from this directory you will be able to browse your compact flash. Type 'mkdir epoc' and press enter.
4. At the moment the /mnt/epoc/ directory you have created is just a directory, to mount it, type 'mount /dev/hda1 -t msdos /mnt/epoc', and again press enter.

5. Type 'cd epoc' to go to the directory.

6. Type 'ls'. You should now see a list of the files and directories on your compact flash.

Looking at the syntax (what has been written after the command) of the mount command, you may be able to work out what we are telling it.

First, we say 'mount /dev/hda1'. This tells mount that the device we are mounting is hda1, the first hard disk drive (hard disk a; hda) and we want to see partition 1 (hda1).

Partitions are a way of splitting up drives into portions to make one drive look like several. A compact flash normally has only one partition, so this is the one we want. '-t'

means that we are about to tell the command what kind of file system to mount.

The type of the file system, means how the files are stored or laid out on the disk. Dos uses FAT16, windows 95 and 98 use FAT16 or FAT32, and windows 2000, NT and XP use FAT32 or NTFS, while Linux tends to use ext2 or ext3.

In order to work with Psions, compact flash cards must be formatted as FAT16, and we tell mount this by saying it is of type 'msdos'. The last part of the syntax simply tells the command that we would like to look

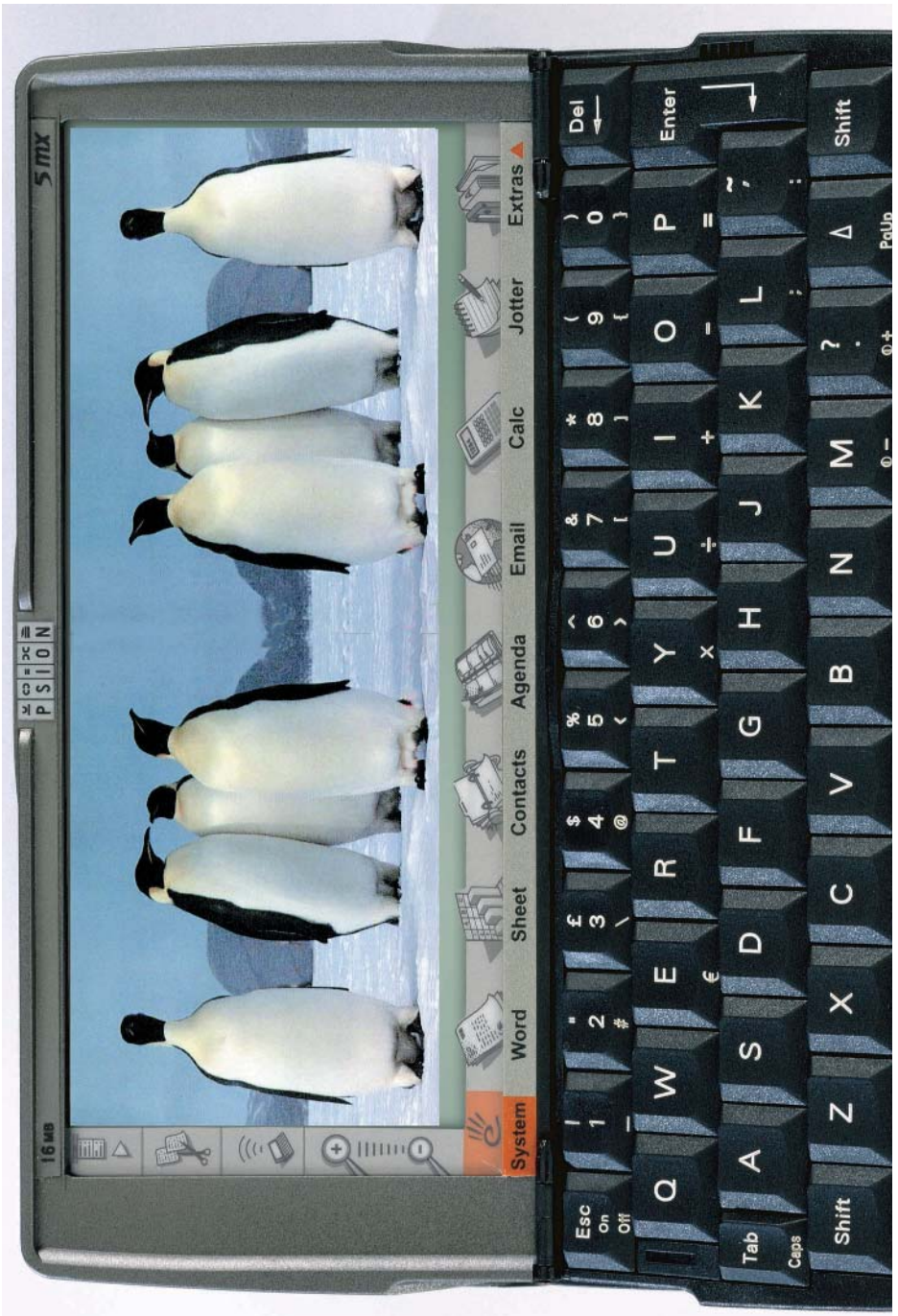
at the file system in the directory /mnt/epoc.

Command Line woes

Unfortunately, many first time users become frustrated by the command line and never really use it.

This is not a problem, as there are thousands of programs that are not command line based (although for every graphical program there is a command line one that does the same job) and many users never even see it.





From the command line you can browse the web, download your emails, write documents and edit spreadsheets. However, a complete discussion of how to use the command line is out of the scope of this tutorial.

A good place to start learning is the tutorials at

<http://www.tuxfiles.org/linuxhelp/cli.html>.

These cover all topics of using the Linux command line, and should help with anything you need to know.

Next issue I will be demonstrating how to set up a fully working Linux distribution on a Series 5mx, with X Windows and a fair amount of neat productivity programs and even some games.

For those that take the plunge, I hope to make it a worthwhile experiment, and for those that don't, at least you can see what you're missing!

After that I will begin to deal with other topics to show what you really can do with a Linux powered Psion.

If you have any problems or comments, feel free to mail me at edward.robins@tinyworld.co.uk, putting '[PsiLinux]' in the subject.

Have Fun!