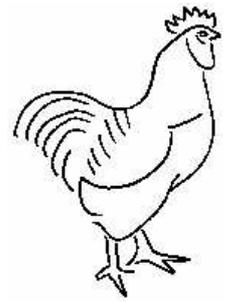


CLTC Documentation Sheet 1/A:

Linux Installation and Hardware Issues



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"The French do not have a word for entrepreneur"
President George W. Bush (possibly apocryphal, but who cares)

This sheet looks at the hardware issues relating to Linux installation – which are numerous and sometimes inconsistent. It looks at some of the issues that plague Linux installation, especially when using laptops, and how they were resolved within the setting-up of the Community-Linux Training Centre

Hardware needs drivers

The Linux operating system is predominantly supported by software developers, not hardware manufacturers. The problem this creates is that although Linux distributions have lots of useful programs, the computer hardware – the electronic components of a computer system – that these programs support is limited.

All computer hardware needs drivers. A driver is a small program that controls the electronic circuitry of the hardware, and enables it to communicate with the standardised architecture of the Linux operating system. Every time new (or modified) hardware is introduced a new driver is required by the operating system. This can create problems when standard equipment, such as a particular model of laptop computer, suddenly begins using a new set of components inside.

Compounding this problem, most computer vendors do not have up-to-date information on the hardware or 'chipsets' used in the computers they sell. Consequently, they can't tell you whether the hardware will run with a particular operating system – mostly they rely on the information provided by the manufacturer. Most will not give any indication

that Linux will run on their hardware, and when they do they are sometime wrong.

Installing Linux

The general rule is that the older the hardware is, the better-supported that hardware is by the Linux operating system. The cut-off point for support is the '386 PC – Linux does not install on a '286 PC because it needs at least a 32-bit processor. Conversely to the general rule, the when you try and run Linux on latest computers you nearly always will have some type of obstructive problem.

Beyond this general rule is another general principle relating to laptops – installing Linux on laptop/notebook machines can be horribly frustrating because of the nature of laptop hardware design. It isn't just that laptop hardware not supported in the same way as desktop PCs. It's also that laptop hardware is relatively short-lived, and hence is not around long enough for someone to write a driver program for it. The manufacturer's of laptops also vary the hardware design of laptop computers, perhaps even for the same model of laptop. This means that whilst an old model of laptop may be Linux compatible, the same model manufactured a year or so later may

not.

Had the CLTC been develop on desktop computers – and hence was not be as mobile in its use – life would have been far simpler. But by choosing to develop a laptop-based network we instantly created a major development problem. In particular, we had to spend a long time on the Internet checking reports on other Linux user's experiences of installing Linux of different makes/models of laptop (there are some details of information sources at the end of the sheet). This information gave us a range of equipment we could use. But even then we couldn't easily obtain it. We still had to check with a number of 2nd user equipment suppliers in order to find suitable laptops.

The other issue is that different Linux distributions provide different levels of hardware support. For example, on the five *Dell CPi* machines that we bought, Red Hat Linux did not provide support for the sound card. Mandrake Linux didn't provide support either. However, SuSE Linux did, albeit not in a very stable manner.

At the practical level, what differences between distribution affect is the choice of which distribution to load onto which machine. You may like a particular distribution, but when using laptops you may not be able to use it because it doesn't provide the right hardware support. This can, for devotees of a particular distribution, be a little restrictive.

In practical terms, the server laptop does not need multimedia capability (even if it did work, using it would affect the server's performance on the network), or even particularly good graphics. However, the clients do need as much functionality as possible. Therefore you need to ensure that the distribution you use on a particular computer provides the drivers/hardware support you need for as many functions as possible.

Of course, all these problem arise because hardware manufacturers believe it's in their best interest to support Microsoft's operating systems. Hopefully, as Linux begins to invade the desktop computer world over the next few years, this problem will slowly go away.

Motherboards and chipsets

The first issue to consider is the support for the components on the motherboard – that's the processor and the 'chipset' (the components that control data flow between the different parts of the machine).

Linux distributions generally support classes of processors. However, what can be a problem is the chipset used with the processor. Whilst a processor may be fully supported, use that processor with a non-standard chipset and you start getting faults.

Usefully, it may be that the installation just doesn't work – 'usefully' because the fact it doesn't work is a good, reliable result that the Linux system is not compatible. Problems arise when your installation works 99.5% of the time, but just a few times a day part of the computer, like the sound card or keyboard, locks up when there's some minor error. This is usually because the chipset drivers are not fully compatible. This usually arises when slight variations have been made to the design of the chipset when that particular model has a minor redesign.

Variations in the design of hardware are not such a problem for Microsoft systems because the hardware manufacturer includes a disk with the new drivers with each motherboard. Each time there's a modification, they change the driver on the disk. But Linux requires that someone identifies the variation to the hardware and modifies the driver. This can take some time to propagate through to the hardware support contained in Linux distributions (but you can hunt down newer drivers via the 'Net direct from the developers who create them).

Peripherals

There are three problem areas with peripherals – anything that involves network cards, USB ports, and modems.

Like chipsets, peripherals require hardware drivers. Network and USB ports can be problematic, especially on laptops. This is because, to a greater extent than

motherboards, the electronics that interface peripherals can vary more between the same model of computer than the design of the motherboard/chipset. But the biggest problem is that whilst on a desktop you can usually swap-out that particular component with one that works, on a laptop you're usually stuck with what you've got. Solving problems with network cards, and USB interfaces, is often a matter of experimentation.

Modems are just a headache: full stop. Most modems sold today are 'winmodems'. Winmodems offload some of their functions to the processor. These are supported under Microsoft operating systems by the driver disk you get with the modem. But on Linux systems support for winmodems is limited. There are a few that are supported by module that provides the necessary support from the 'kernel' of the operating system, but not many.

To get around the problem of winmodems there are two solutions. Firstly, use an external modem that plugs into a serial port. This can't offload functions because its not physically possible to run a winmodem on a serial port. On desktop PCs, you can use an old 'ISA' slot internal modem. ISA-slot cards do not have the same control capabilities as PCI-slot cards, and therefore do not give the same compatibility problems. For laptops, the general alternative is to use a PCMCIA card. The electronics of the PCMCIA adapter gives some standardisation to the control of the cards slotted into them. For this reason, even if the internal modem or network card inside the laptop does not work, using PCMCIA cards usually provides a workable alternative.

On the CLTC, the problem doesn't really arise because we don't have modems or network adapters as standard. The Dell CPI's we used are not new enough for this. Instead we use Xircom 'combo' cards. These contain a network card and modem in a single, double-sized PCMCIA card.

Support for Linux hardware problems

To begin with Linux distributions provided a list of all the hardware supported by the

operating system. But as Linux has grown, and the range of peripherals and hardware supported has grown, providing an exhaustive list has become tedious for the developers of Linux distributions – especially those distributions that re-issue on a regular basis.

Most distributions now only provide general guidance. Even then, that guidance is based upon the model of the particular hardware device (video card, network card, etc) used in the computer, not the model of computer itself. Finding out the hardware specification of a particular computer system is that can only be done reliably by ripping the computer apart (very problematic when using laptops). Rarely do distributions state which make/model of a particular desktop or laptop computer will install without problems. Whilst only a few computer vendors sell pre-installed Linux-compatible machines this problem will persist.

One option, although scandalous for the die-hard Linux-heads, is to install Windows on the computer first. This will give you a general list of the hardware used on the system. However, it's not 100% reliable because it doesn't identify the revision/modification identity of a particular model of hardware device.

To address the problem of hardware compatibility there are a number sites on the Internet that provide information on the compatibility of different hardware. It was this source of information that was most helpful in selecting the hardware for the CLTC.

The most useful ones we found were:

- *Linux.org* Hardware Pages – <http://www.linux.org/hardware/index.html>
- *Linux-on-laptops* – information on installing specific models of laptop/notebook computer with various species of Linux – <http://www.linux-on-laptops.com/>
- *Linux newbie* – excellent source of help on hardware and installation for those new to Linux – <http://www.linuxnewbie.org/>

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