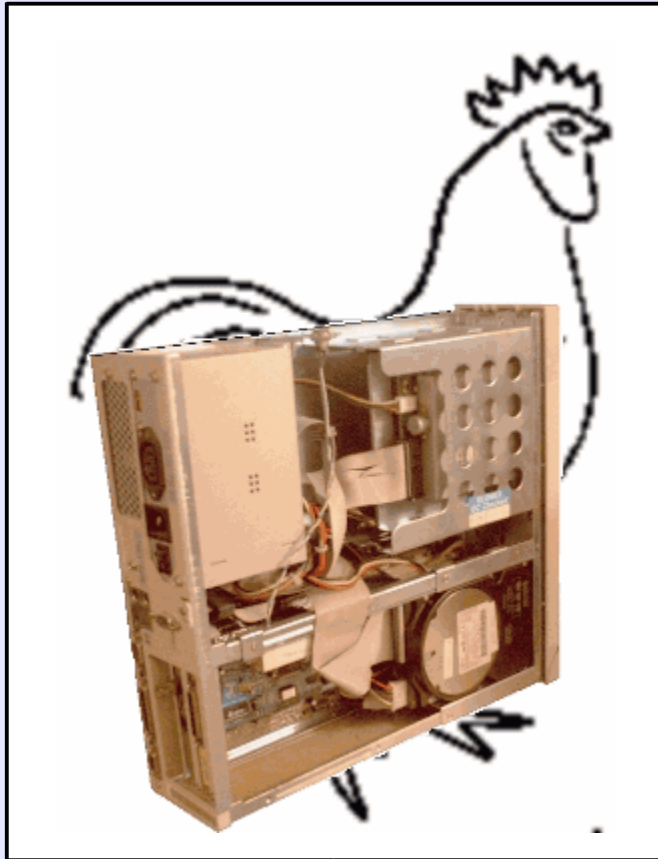


# Creating Linux Networks with Trash Technology

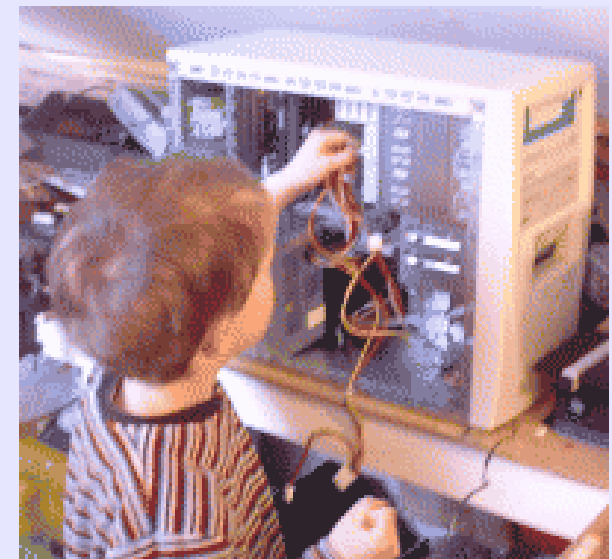


Paul Mobbs,  
The 'Free Range' Salvage Server Project  
<http://www.fraw.org.uk/salvageserver/>

# The 'Free Range' Salvage Server Project...

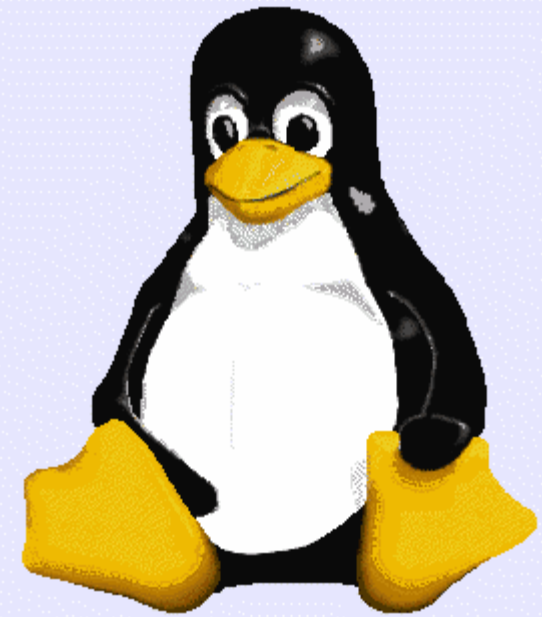
- ☞ A project to research the recycling of trash technology in support of community-based activities
- ☞ Developed by the Free Range Network, a 'disorganisation' of activists and technicians

- ☞ As with other Free Range projects, a significant part of the project involves 'democratisation' of technical issues and information – to enable people to access information technology within the terms of their own environment



# We can only do this because of Gnu/Linux...

- ☞ Gnu/Linux is a 'free' operating system... but “free as in freedom, not in beer”
- ☞ 'Free software' is an alternative method of licensing – it doesn't reject copyright
- ☞ Most projects are released under the Gnu General Public License (GPL)



- ☞ 'Open software' is released under non-GPL licenses that do not allow the same rights



- ☞ Richard Stallman started The Gnu Project in the mid-1980s to tackle the problems created by the commercialisation of software – but he lacked a 'free' operating system
- ☞ Linus Torvalds started work on the Linux kernel in 1991
- ☞ Lack of commercial pressure means that Gnu/Linux can evolve progressively, it needn't be scrapped and reinvented every 3 years

# Gnu Licenses...



- ☞ **Gnu General Public License (GPL)** – for software
- ☞ **Gnu Free Documentation License (FDL)** – for publications
- ☞ You may copy and distribute the work, either commercially or non-commercially, provided that this License, the copyright notices, and the license notice saying this License applies to the work are reproduced in all copies
- ☞ You may copy and distribute a modified version of the work, provided that you release the modified version under precisely the same License
- ☞ Certain parts of the original work, if so identified by the author, should be preserved intact ('non-variant sections', 'front cover'/'back cover' texts, etc.)
- ☞ You may translate, or combine with other works, but this may require consultation with the original author(s) if this affects the conditions of the original release of the work

# Gnu/Linux is important to civil society because of the next phase in computer systems development...



- ☞ The next generation of Microsoft operating systems – which was called 'Palladium' but was recently re-branded 'Longhorn' – will implement the 'Trusted Computing Platform' (TCP) standard to enforce the protection of intellectual property rights.
- ☞ Programs will have to be audited by the TCP Association in order to demonstrate they conform to the basic rules of the system – cost... a lot
- ☞ If a non-TCP-compliant program is run on a computer when there are TCP compliant programs running, the TCP compliant programs shut down.
- ☞ Files will be tagged according to whether they are read-only, not printable, etc., and these rules will be enforced by the TCP system.
- ☞ In addition, online protocols like Microsoft's dot-Net system will integrate with TCP operating systems so that controls can be extended online – enabling a new beginning for e-commerce where online information is pay-per-view.



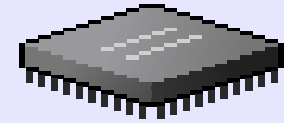
## But Gnu/Linux is also important to every computer user...

- ☞ TCP will enable online authentication of software – the software industry is increasingly talking about the 'renting' of software.
- ☞ TCP and online authentication also means that software manufacturer's could refuse to authenticate older software, forcing people to upgrade.
- ☞ The only viable alternative to TCP is Gnu/Linux – provided that hardware suppliers without the chips that will enable the second generation of TCP systems can be found there will continue to be an alternative
- ☞ An essential part of maintaining 'free' computer systems in this new environment will be the maintenance of older systems, and the creative use of old equipment to provide viable alternatives.

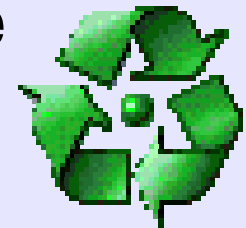


**...so we need to learn how to set up these alternative using Gnu/Linux**

## We need hardware...



- ☞ A Pentium-1 100MHz PC can be refurbished and installed with Linux making a usable computer for basic office tasks and accessing the Internet
- ☞ The average first life (it's first owner's use) is 2 to 4 years – average operational life of a computer from manufacture is 3 to 6 years
- ☞ In 2001, 1,500,000 computers were disposed of – about 20% of these were re-used. Most were landfilled or sent for metals reclamation (incinerated) *...that's an awful lot of Pentium-1s*
- ☞ The European Directive on Waste Electrical and Electronic Equipment (WEEE Directive, 2000/347) comes into force in 2005. Between 65% and 75% of non-domestic electrical equipment – including all those computers – will have to be recycled
- ☞ Longhorn comes into service late 2004/early 2005 – same time as the WEEE Directive comes into force



## Economics...

- ☞ Computers are becoming more powerful, but costs are not dropping significantly because the demands of proprietary software increases with computer power
- ☞ If buying software compatible with professional systems, system cost would be £1,500 to £2,100.
- ☞ Want a server? Windows Server 2003 costs >£700 for 5 users, and >£3000 for 25 users.
- ☞ A lower powered second user system (800MHz to 1GHz) would cost around £300, plus about £70 for a good Linux desktop distribution, and has a greater range of programs.

## Proprietary Costs

(illustrative only, early 2003 prices)

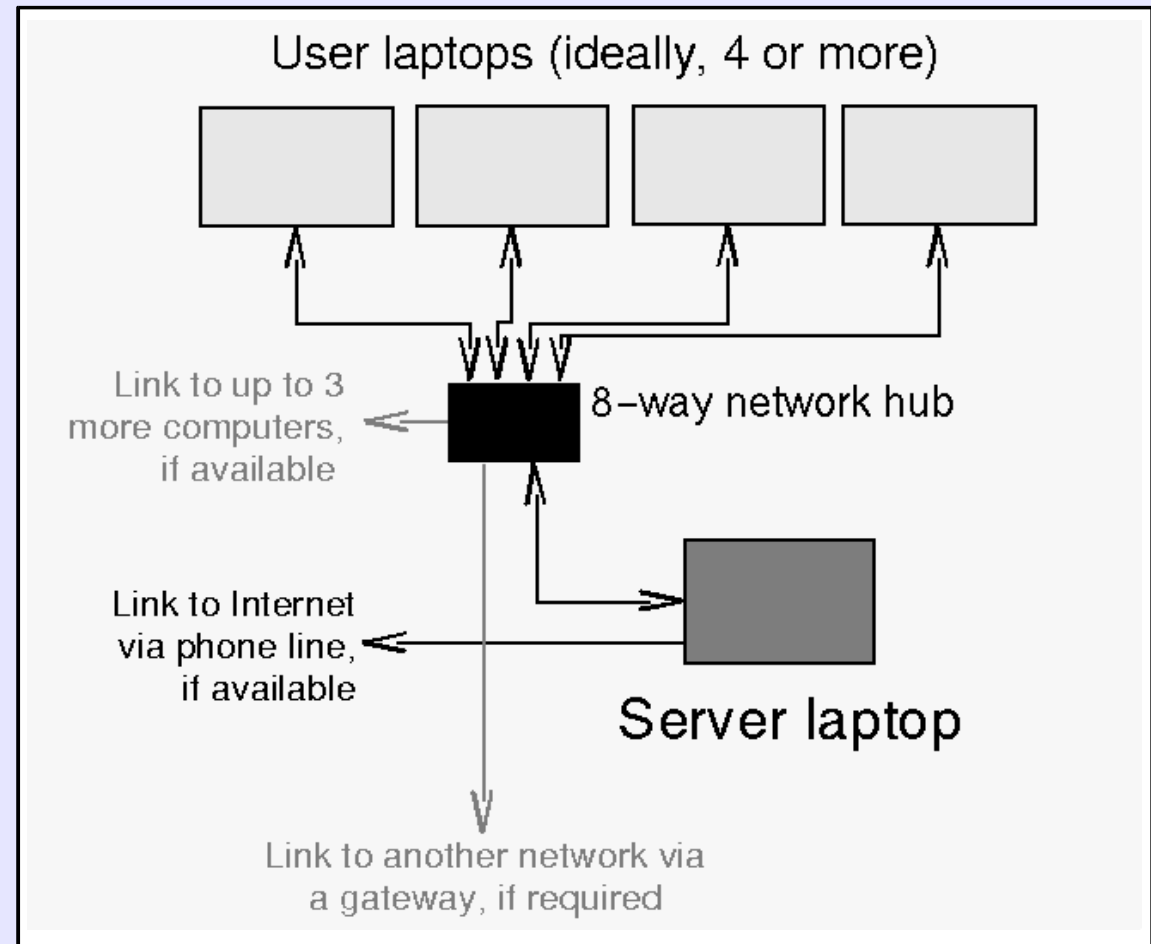


How much does a new computer cost if you want to do professional work?

Hardware (home computer)	£ 600
Microsoft Windows XP Home	£ 170
Microsoft Office XP Standard	£ 340
Microsoft Frontpage 2002	£ 130
Microsoft Publisher 2002	£ 100
Norton Anti-Virus	£ 35
Adobe Acrobat 6.0 Standard	£ 225
Adobe Photoshop 7.0	£ 500
Sub-total	£1,500
<b>Total</b>	<b>£2,100</b>

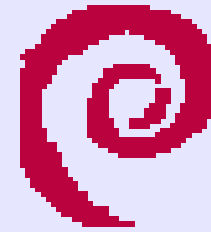
## Client-Server Networks...

- ☞ A local area network allows computer users to share physical resources – printers, Internet connections, etc.
- ☞ Networks also allow services to assist computer users – local email, Intranets to share information locally, and centralised storage/backing-up
- ☞ Three things need setting up:
  - a. A server
  - b. The network hardware
  - c. Client machines



# Linux Distributions...

- ☞ A 'distribution' is the combination of a Linux kernel with a suite of programs, and a configuration/installation program to set everything up.
- ☞ The fact that the kernel is fairly identical, as are most of the programs, means that distributions are fairly compatible
- ☞ There are loads of distributions in circulation – there's even a package that lets you make your own distribution, “Linux From Scratch”.
- ☞ The major distributions are Red Hat, SuSE, Mandrake, Debian and Slackware. There are also many other distributions that specialise in particular installations – for example the Windows-like distros 'Redmond' and 'Lindows', or distros that install on older systems, such as 'Peanut'.



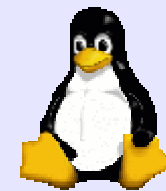
Debian



SuSE



Red Hat



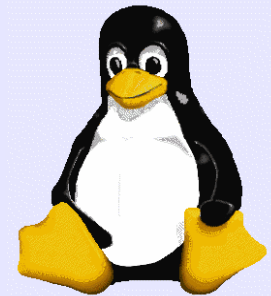
Mandrake

# Operating Systems...

Before designing the specifics of any network it is important to assess what hardware you have to play with. This in turn determines what operating systems can be used, which in turn affects what you can do with your network.

In general:

- ☞ '286, '386 and '486 machines are useless – use them for hardware training.
- ☞ Pentium-I/100MHz or better can be used as network clients.
- ☞ Pentium-II/III, 500MHz or better make good multimedia machines.
- ☞ For the server, a Pentium-II, 266MHz to 400MHz machine is more than adequate to look after 10 – 20 clients



# Operating Systems...

## Hardware Requirements of Different Operating Systems

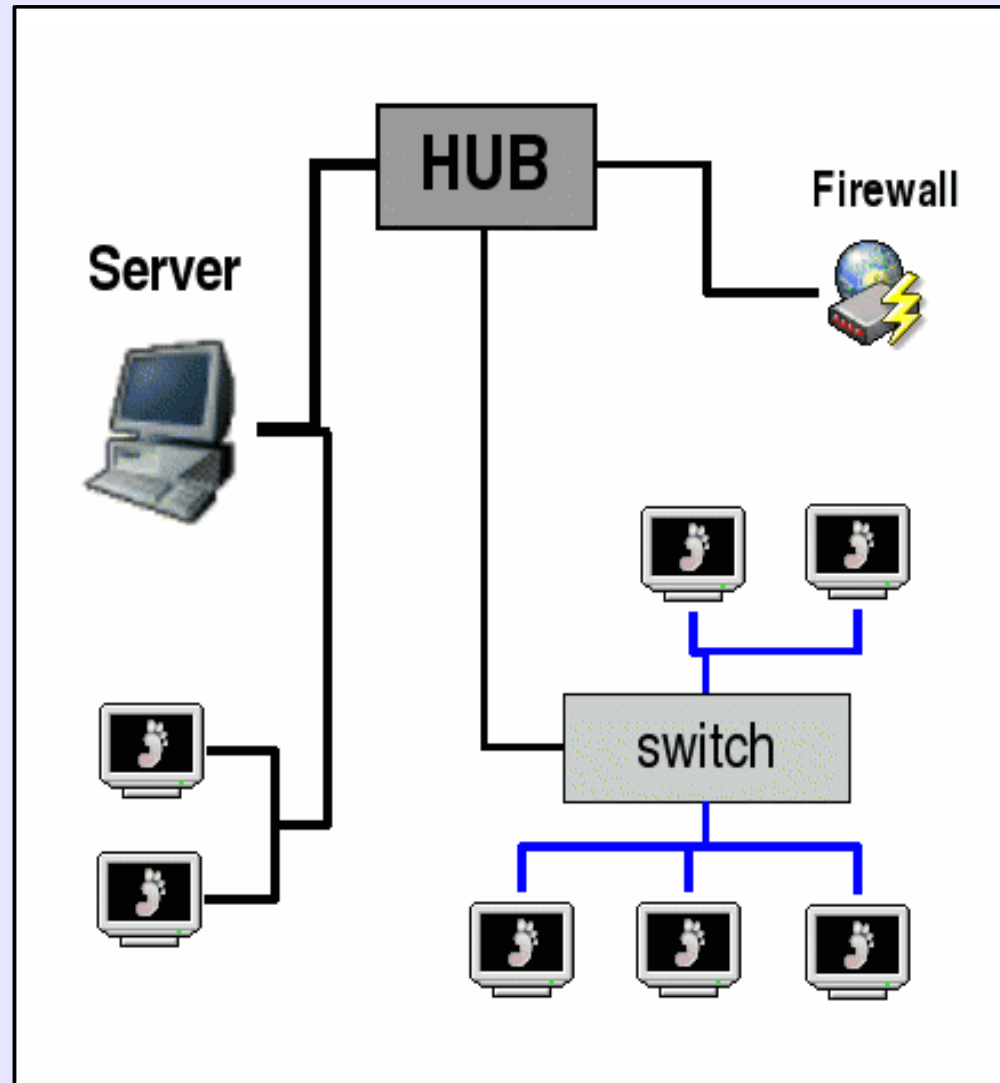
<i>Operating system</i>	<i>Processor</i>	<i>RAM, MB</i>	<i>Hard disk, MB</i>
<i>Windows:</i>			
MS-DOS/Windows 3.11	'386	2 (8)	50
Windows 95	'486	16 (24)	150
Windows 98/ME	'486	24(64)	500
Windows 2000 Pro	PI/133 (PII/300)	128 (256)	1,024
Windows XP	PII/300 (PIII/500)	128 (256)	1,584
<i>Gnu/Linux:</i>			
Debian 3.0 Linux ('Woody')	'386	12 (64)	250 (850)
Linux-Mandrake 7.1	'386	24 (64)	400 (800)
Linux-Mandrake 9.1	P-I	64 (128)	400 (1024)
Slackware Linux 9.0	'386	16 (64)	100 (500)
Red Hat 6.2	'386	16 (48)	200 (750)
Red Hat 9.0	P-I (P-II)	64 (128)	850 (1400)
SuSE Linux 6.4	'386	32 (64)	400 (750)
SuSE Linux 8.2	P-I	64 (128)	600 (1800)

Figures given are for text-only installations. Graphical installation figures are given in brackets.

These are only general figures, and hard disk space in particular can be manipulated to minimise installation size. Don't forget you need space on top for user files.

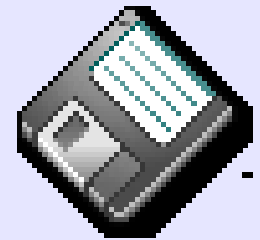
# Networking...

- ❏ Networks need planning to prevent capacity problems.
- ❏ The hub at the centre of the network can become saturated if too many machines are connected to it.
- ❏ Where the computers are widely spaced, fitting switches and grouping the machines cuts down on cabling and simplifies connections.
- ❏ Larger networks may need dividing into 'subnets' to manage capacity at the hub.



## Booting the installation process...

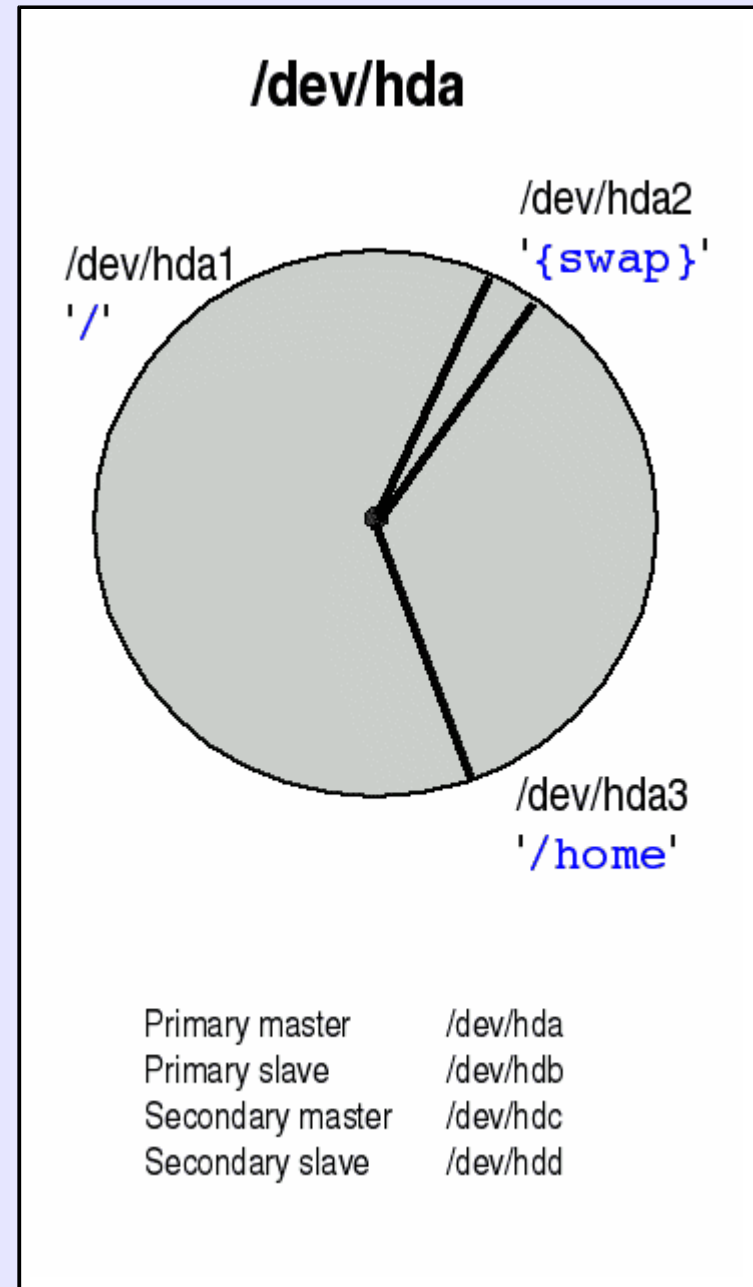
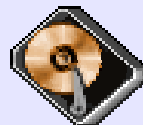
- ☞ Most installation CDs can be booted directly if this is allowed by the machine's BIOS system. Pressing Del or F2 when the machine starts gets you into BIOS, and the 'boot order' menu can be set to 'CDROM'.
- ☞ If the machine can't boot from CD, you have to boot from floppy disk. Again, you select 'floppy' in BIOS setting.
- ☞ Most distros don't include boot floppies any more, so you have to make them. Somewhere in the CD will be a directory containing disk 'images'. These are transferred to blank floppy disks using a Windows (MSDOS) program called 'RAWRITE', the Linux 'dd' command.
- ☞ Once the installation program boots, data is read from the CD. If the machine has no CDROM drive the boot program will also allow you to take data over a network (FTP/NFS) or even a serial/parallel port.



# Partitioning...



- Hard drive(s) must be partitioned before use. Drives can have up to 4 'primary' partitions. 1 primary partition may be configured to hold many more 'extended' partitions.
- Linux systems require a minimum of two partitions – 'root' and 'swap'.
- Additional partitions can be made to improve the operation of the system, and to improve security and reliability.
- The major distros integrate partitioning into the installation process. Some of the smaller ones boot into a command line 'shell', where you use the basic Linux utilities to set up the system and then run an installation program.



# Package installation...

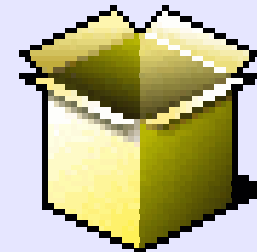
- ☞ Most distributions organise software into 'package groups' to install different classes of software.
- ☞ It's also possible to select packages individually, although this takes some knowledge of how programs work together.
- ☞ The important thing is to keep watch on the size of the installation – too much and you won't have enough free space for the system to operate.

## Linux File System Capacity

The table below lists the maximum file size and total file system capacity of different file systems. Note that most file systems can be 'tuned' to improve storage capacity or performance.

File system	File size limit, GB	File system limit, GB
Ext2/Ext3 with 1kB blocks	16	2,048
Ext2/Ext3 with 2kB blocks	256	8,192
Ext2/Ext3 with 4kB blocks	2,048	16,384
Reiser FS 3.5	4	16,384
Reiser FS 3.6	1.073 x 10 <sup>9</sup>	16,384

**If in doubt, just follow the default options - program packages can be installed after the main installation**



## Post-installation...

- ☞ Immediately after installation you need to install any packages not held on the installation disks, and configure networking and printing.
- ☞ Configure user accounts as required.
- ☞ User accounts need to have application that will be regularly used – e.g. Open Office – configured with standardised settings.
- ☞ The important thing is to keep watch on the size of the installation – too much and you won't have enough free space for the system to operate.

