GeoSciences at Edinburgh

LINUX in GeoSciences

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Session 3.1

LINUX in GeoSciences

- This section of the Introductory Computing Course will:
  - Explain what LINUX / UNIX is
  - Tell you why anyone would bother using LINUX rather than a PC
  - Outline of the GeoSciences LINUX network architecture
  - Explain how to access LINUX servers in GeoSciences
  - Describe the LINUX file system
  - Show you some basic commands
  - Show you how to access LINUX software applications
  - Explain how you get help on LINUX commands

What is LINUX / UNIX?

- A command-oriented operating system
- Grew from work in AT&T Bell Labs in the early 1970s
- Completely different from Microsoft Windows
- … but there are windowing systems which sit on top of UNIX
- UNIX was written by programmers for programmers
- Seems very unfriendly in comparison to Windows XP
- Similar concept of 'logging in'
- Has become a powerful and flexible environment used in business, science, academia and industry, particularly for servers

- LINUX is a variety of UNIX

- UNIX is what Apple Macs and ANDROID phones run

Reflections on UNIX

- "UNIX and L.S.D. both came out of Berkeley, California. This is not thought to be a coincidence"

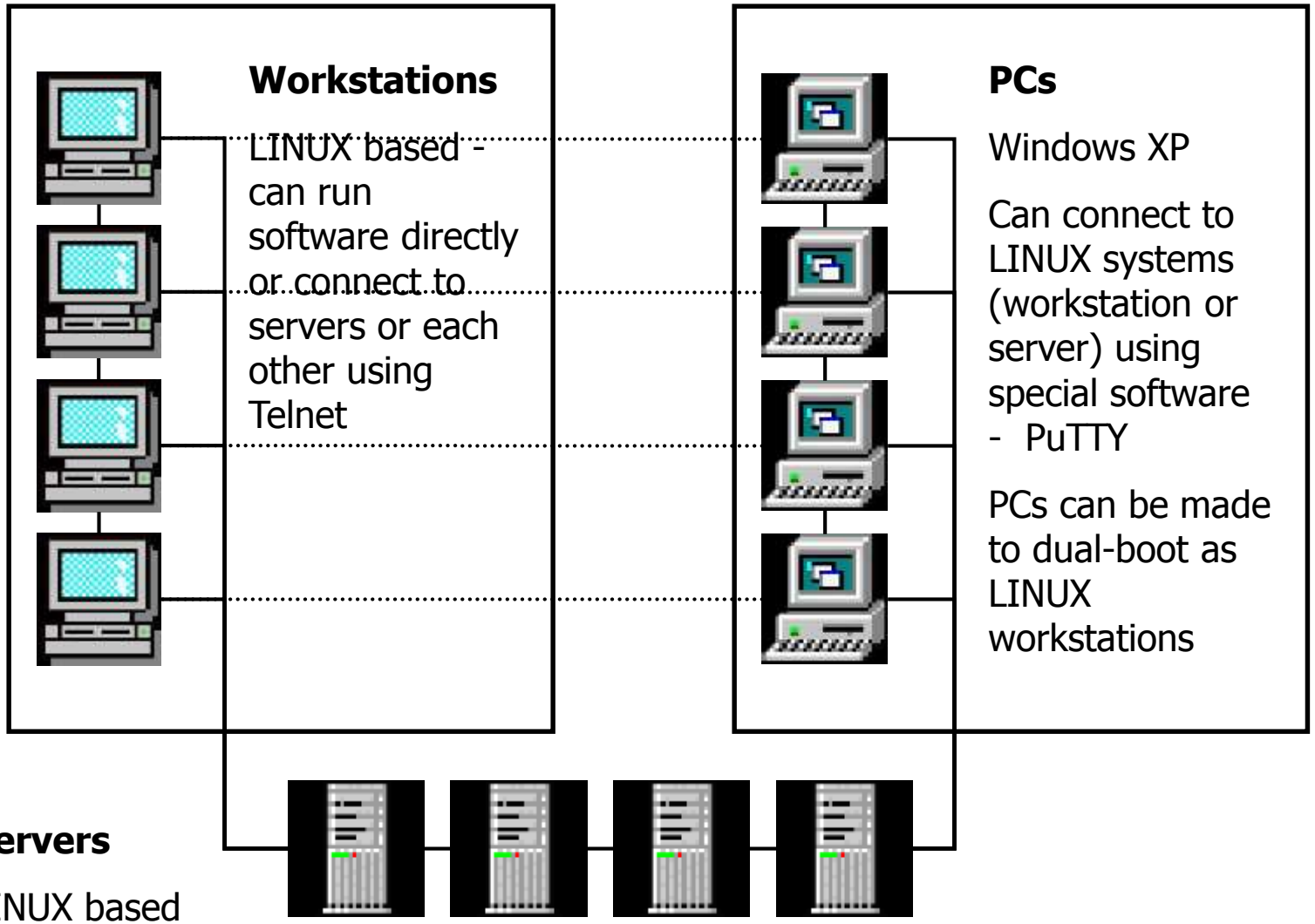
  Old Computer Sage's Proverb

- "Actually, UNIX is a very user-friendly system. It's just that it is particular about who it chooses to be friendly with."

Why Use It?

- More Control
- Faster to operate when you know what you are doing
- Systems tend to have more power – computing resources are concentrated in a central multi-user server
- "A Real Operating System"
- Systems are more reliable
- Better at managing their resources, especially where multiple people are trying to do multiple things
- More valued in the scientific and commercial environment
- Runs some packages that PCs don't
- You can do clever things like running *background processes* at a particular time when you are not around

GeoSciences LINUX Network



Accessing LINUX

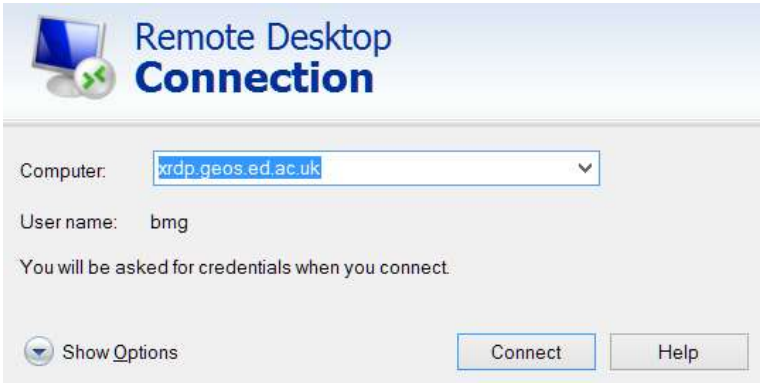
- You don't need to sit at the physical computer you are using
- Three main ways of accessing LINUX:
  - **Directly login to a workstation**
  - **Indirectly from a PC through PuTTY**
  - **Indirectly from a PC using Remote Desktop**
- Every LINUX machine in GeoSciences can be seen by every other LINUX machine
- Different machines may have different software on them
- You can **remotely access** one machine from another using **ssh**
- You can also get access from outside GeoSciences, using **remote desktop** (xrdp) or **PuTTY (ssh)**

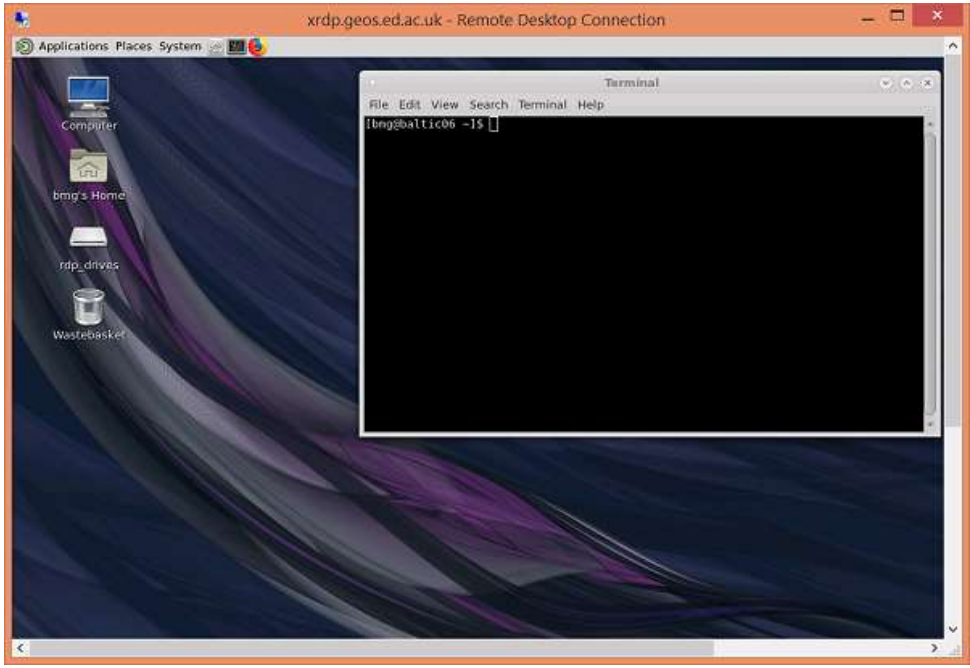
Using Remote Desktop

- Remote Desktop is software which allows you to another machine from a PC
- You can use a UoE service that allows you to connect to Linux servers from inside and outside the University network
- Start Remote Desktop from a PC. The first time, you will need to configure it with your username, suitable display size and an RD gateway of:

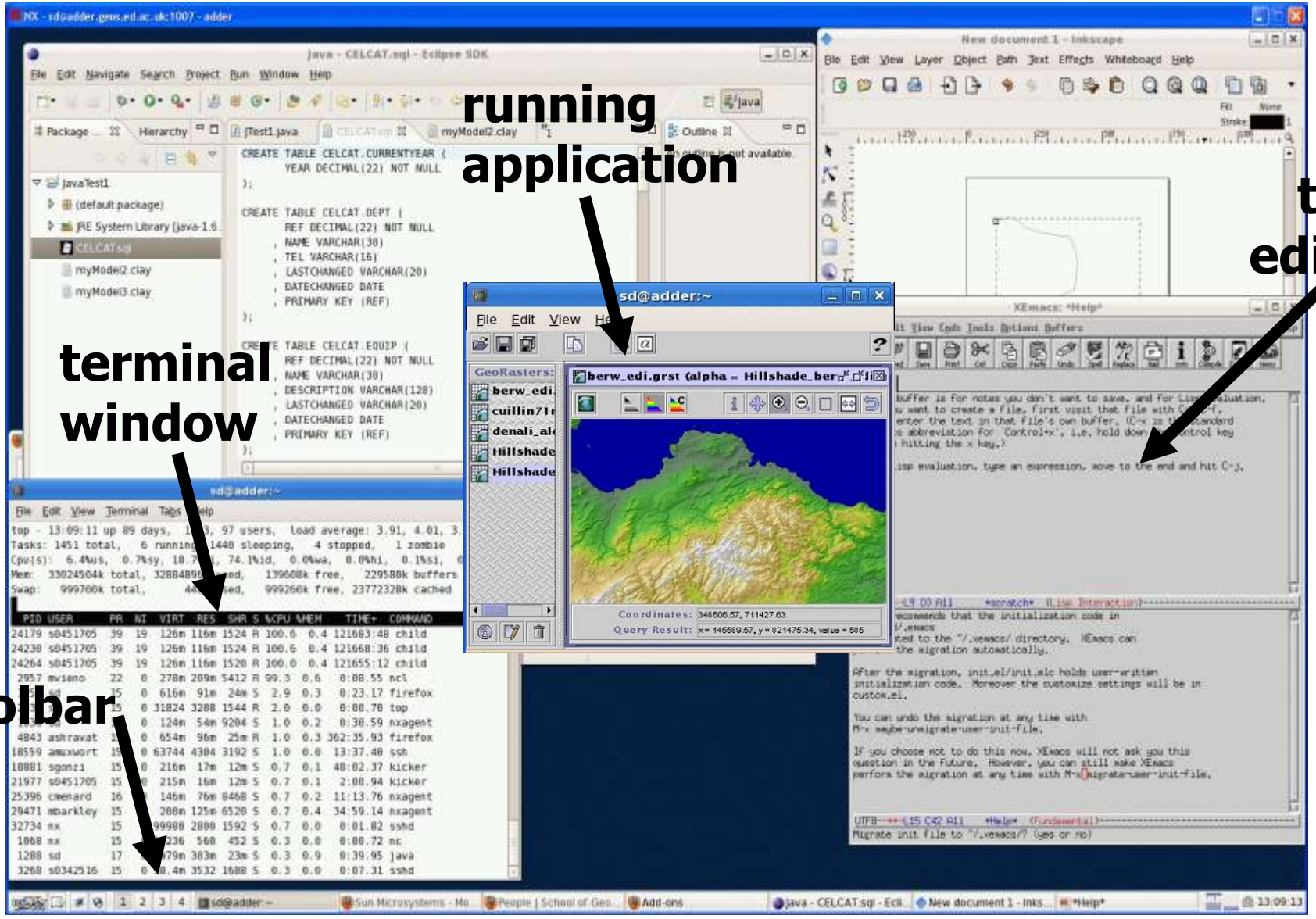
  rd-gateway.is.ed.ac.uk

- Each time it will prompt for your password
- A **window** will then pop up containing the Linux desktop
- You can start a terminal window for commands or open any graphical application





Workstation Desktop



The Bad News !

- There are several different "flavours" of the UNIX operating system (eg. LINUX): it is actually a ***set*** of operating systems that share common features
- You have to type almost all your commands at a prompt – the interface is inherently non-graphical
- Commands can be obscure and inconsistent - it depends who designed them in the first place - **`cd`** for change directory is easy enough but **`grep`** (global regular expression print) is used to search files for a piece of text !!
- The help files are written by aliens (programmers?) for geeks (programmers?)
- There are lots and lots and lots and lots (and lots) of commands you potentially need to learn

The Good News !

- The good news is that, as a user, the "flavours" all work very similarly
- You have to type all of your commands at a prompt - can give great versatility in designing your own custom commands and scripts which tie sets of commands together
- There is actually a graphical user interface (some people use LINUX as an alternative to Microsoft)
- You don’t need to learn very many commands before you can quickly do useful things
- LINUX is a very widely-used system so there are lots of helpful help pages on the web
- It has a number of advantages over a PC and Microsoft Windows XP-based systems

Files and Directories

- Folders are called *directories* on LINUX
- Different users files are held together on disks, but there are strong concepts of ownership, security, permissions and quota
- The ability to be able to let other people view or do other things to your files becomes quite sophisticated
- There are few restrictions on naming files and folders, but keep names simple as some software can't cope (short names, no spaces) otherwise you make life difficult for yourself

Your Home Directory

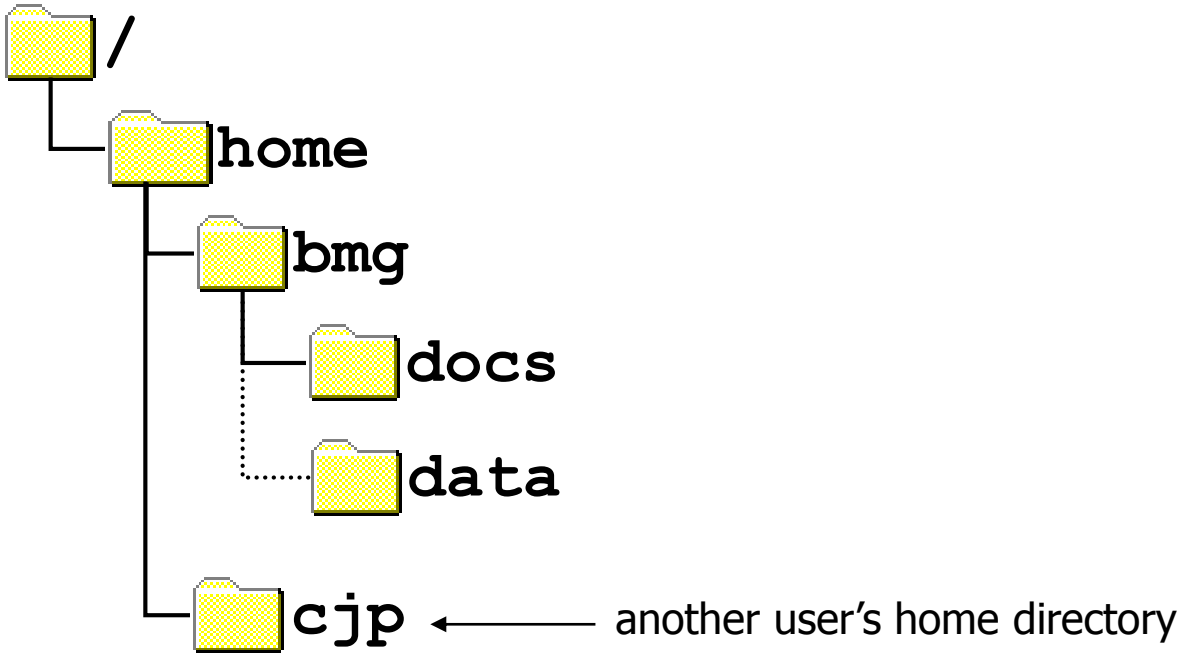
- You have a home directory, mine is:

  `/home/bmg/`

- You will always be placed in this directory when you log on
- You can create sub-directories as appropriate
- You can access this directory from any LINUX machine
- Importantly it is also exactly the same place as your M: drive on the PCs – so file sharing is easy

What does that mean?

- What does **`/home/bmg/`** mean?
- The directory system in LINUX is hierarchical (the same as a PC) and the character used to show a level change is the /
- So **`/home/bmg/`** is a textual representation of a directory structure that looks like this:



Basic Commands

- You are presented with a prompt:

```
[bmg@burn docs]$
```

  and you type a command:

```
[bmg@burn docs]$ ls
```

- Everything is case-sensitive; commands are always lower-case
- LINUX commands: take a strange combination of letters, or a word and remove the vowels !

`ls` – lists your files
`cp` – copies a file
`man` – help on specific command
`rm` – removes (deletes) a file
`logout` – logs off
etc.

- Commands can be followed by options and parameters:

`ls -l fred.txt` – **modifier is –l, parameter is fred.txt**

Starting Applications

- You simply type a different command at the prompt e.g.

```
[bmg@burn ~]$ xclock
```
starts a clock

- Some applications simply change the command prompt (e.g. sqlplus) - in this case you are **no longer sending command to LINUX** - you are a **now using an application** which has **its own set of commands**
- Others will be graphical and will pop up a new graphical window which you can prod with your mouse (e.g. xclock)
- In this latter case you need to either be using a LINUX workstation or run an **X-Windows Client** on the PC which mimics a workstation (software called NX)
- Running your own programs is somewhat dependent on the language (C, Perl, Java), but usually:

```
[bmg@burn ~]$ ./myprog
```

LINUX Help

- Is not very helpful for new users (sorry!)
- Is accessed by typing **`man <command>`** where **`<command>`** is the name of the command you need help with … but that means you need to know what you need help with … problem …
- To get started with LINUX, is much better to look at the help available on the Web - a good example is:

  `http://www.computerhope.com/unix.htm`

  You can start to use **`man`** when you are more familiar with how LINUX works, or if someone has told you a specific command you need to use...

What else can LINUX do?

- All manner of things, including:
  - Anything that a PC can do, but usually cheaper (eg. OpenOffice = MS Office – well, sort-of)
  - Being a sophisticated software development environment
  - Serving as a file-store (e.g. for you PC files!)
  - Acting as a web server
  - Providing database services
  - Passing email or net-news around the Internet
  - Providing a multi-media environment (eg. PVRs use LINUX; Android phones are based on UNIX)
  - Appears in other surprising places: many printers and most broadband routers are actually little UNIX systems

Finding out more…

- This was a very broad outline only. Try:
- UNIX Systems: **www.unix-systems.org**
- UNIXHelp: **www.computerhope.com/unix.htm**

And if you want more in-depth stuff on different UNIX flavours, try:

- LINUX: **www.linux.org**
- FreeBSD: **www.freebsd.org**
- And, if you want a little history, try: **www.bell-labs.com/history/unix/**