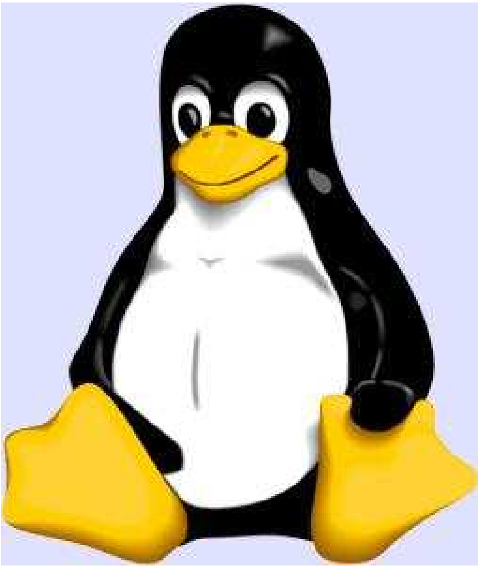
Getting Started With Linux and Fortran – Part 1

by Simon Campbell



[Tux, the Linux Penguin]

ASP 3012 (Stars)

Computer Tutorial 1

Contents

1 What is Linux?

Linux is a computer Operating System or ‘platform’. You are probably familiar with the very popular Microsoft Windows operating system which sells with most computer systems. Linux is one of the main alternatives.

There are two main features of Linux:

1. Linux is FREE - as is most of software that you can get for it (lots of software is available).
2. Linux is very customisable - you can change practically everything to suit your needs/wants.

Many scientists use the Linux platform in preference to Windows, for various reasons. It is the most common platform in the Astrophysics department at Monash.

In the past Linux was quite hard to get used to, but thesedays it’s much more user-friendly. The interface is now similar to Windows, except you have much more control over everything (if you want).

Linux takes a little getting used to but it is GREAT!

2 Booting Into Linux

Some computers at Monash actually have Windows *and* Linux installed - on the same machine. These machines are called ***Dual Boot*** machines.

When you sit down at a machine it will probably be running Windows (boring...). To get Linux on the screen we need to ***Reboot the machine***. When it is rebooting you will see a ***menu*** - use the arrow key to ***select Linux (Fedora Core)*** and press <enter>. If you miss the menu and end up back in Windows then you'll have to reboot again.

Next you will see a ***Login Screen*** - type in your user name and password (use KDE session).

You should now be in Linux!

2.1 Password Problems?

ITS should already have set up an account for you but things don't always go smoothly. Try using your normal Authocate login details in the Linux login screen. If this doesn't work then you will need to change your password. To do this, reboot into Windows (or if there's a free computer nearby you can use that instead) then go to the ITS 'change your password' webpage at:

https://mdsadmin.monash.edu.au/cgi-bin/changepwd

Allow between 1 and 15 minutes for the system to update, then try again. If this still doesn't work then you will have to go and ask ITS to fix it for you.

3 The Linux Desktop

The Linux desktop is similar to Windows. Unlike Windows, in Linux you actually have a choice of many desktops. I believe we will be using the KDE desktop (but they all work the same way anyway).

There should be a Red Hat Menu which is like the Start Menu in Windows - it has a list of all the programs available. Have a look around. Yes there are games in there too :)

If you like Linux you can always install it on your computer at home (ask the tutor for advice).

4 Programming in Linux

Now you are in Linux we can start the real work.

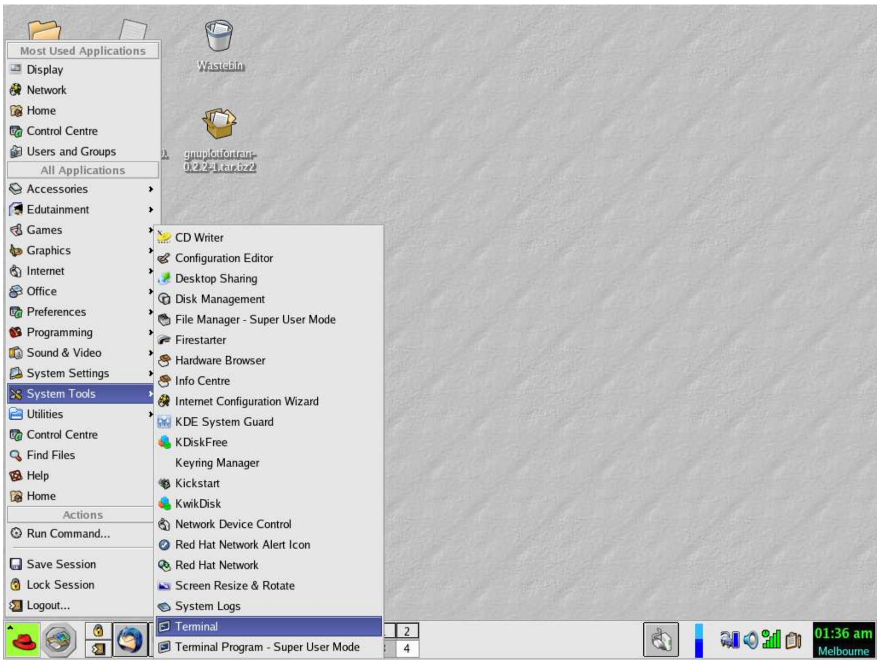
These tutorials are designed to teach you the computing side of Astrophysics. Thesedays computers are central to alot of scientific work. Using computers speeds up calculations enormously. Not only that, but alot of real-world maths/physics problems just ***can't*** be solved by hand (analytically) - the ***equations have to be solved numerically***.

You could use a calculator but it's much faster to write a computer program to do the calculations for you.

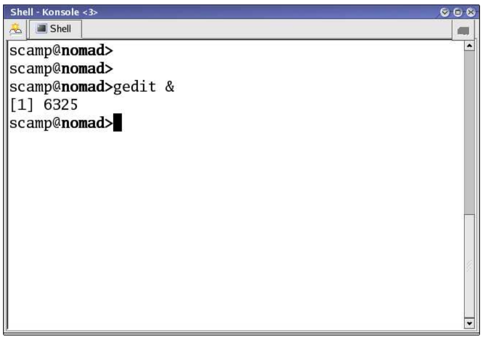
In these tutorials we will be making a basic model of the Sun by solving an equation numerically (Assignment 1). But first we need to know some basics about how to put a computer code (program) together.

4.1 Opening a TERMINAL

Once you are in Linux go to the Program Menu (red hat) and select **'System Tools'** then **'Terminal'**. You can also right-click on the desktop and select from that menu.



You will then get a window like this:



```
scamp@nomad>
scamp@nomad>
scamp@nomad>gedit &
[1] 6325
scamp@nomad>
```

This is called a Terminal (or *Shell)* and is the place where you can type in commands to start programs. You can also look around the directories (filesystem). We will usually need a Terminal open in these tutorials. You can open more than one at a time if you want. One thing to note is that ***Linux is case sensitive*** - it recognises the difference between uppercase and lowercase letters, so you have to get them right when typing file names and commands.

4.2 Learning the Ropes - Basic Linux Commands

Now we have a terminal open we can type in commands to tell the computer to do things. It's useful to experiment with commands so you get used to using them. Here are a few vital commands (the commands are in bold, your directory names or file names, in italics, follow the command):

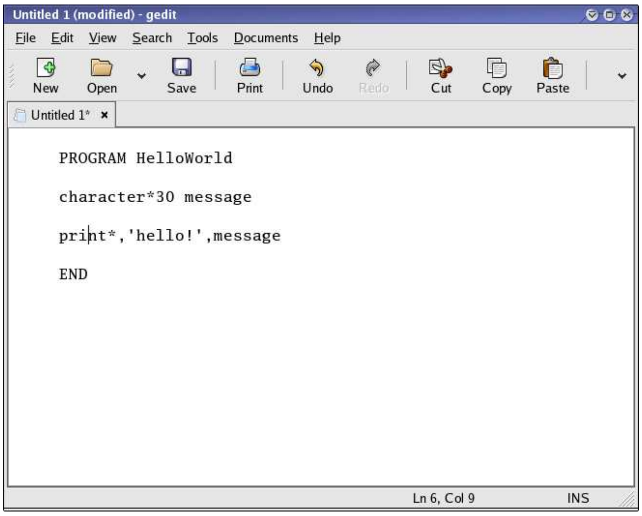
Command	Effect
ls	Lists contents of current directory
cd	Change to your home (default) directory - handy if you get lost
cd *dirname*	Change directory to *dirname* (ie. you move to that directory)
pwd	Tells you which directory you are in right now
rm *filename*	Deletes the file *‘filename’* (remove file)
mv *file1 file2*	Renames *‘file1’* to *‘file2’* (move file)
cp *file1 file2*	Makes a copy of *’file1’* and calls it *‘file2’*
mkdir *dirname*	Makes a new directory called *‘dirname’*
rmdir *dirname*	Deletes the directory called *‘dirname’*
cat *filename*	Shows you the contents of the file *filename*

4.3 Opening a Text Editor

To write your computer program you will need a Text Editor program. A nice one is called ***gedit***. To start up gedit, just type:

gedit &

The ’&’ lets you keep using the same terminal for other commands. If you forget to use it you can close *gedit* and type it in again. You should see a window like this:


Untitled 1 (modified) - gedit
File Edit View Search Tools Documents Help
New
Open
Save
Print
Undo
Redo
Cut
Copy
Paste
Untitled 1*
Ln 6, Col 9
INS

```
PROGRAM HelloWorld

character*30 message

print*,'hello!',message

END
```

Now we can start writing a program!

4.4 The FORTRAN Computer Programming Language

We will be using Fortran 77 to write our programs. If you know other computer languages then feel free to use them. Linux comes with free Fortran 77 and C compilers.

Here we will just show how to make a very simple program. There is a separate Fortran Primer booklet available from the Stars webpage:

http://www.maths.monash.edu.au/~johnl/astro/ASP3012/stars.html

4.4.1 A Simple Fortran 77 Program

All this program does is print a message that you type in (eg. ’Hello World’) to the screen.

Type in everything in under the Fortran Command column in the table below ***into your gedit text editor***. Then ***save as hello.f***

IMPORTANT NOTES:

1. **Fortran is *not* case sensitive** - it doesn’t care if you use lowercase or uppercase letters (but rember that the Linux terminal does).
2. You need to **leave 6 blank spaces** at the start of each line
(eg. _______PROGRAM Helloworld).

Fortran Command	**Description**
PROGRAM Helloworld	The name of the program
CHARACTER*30 message	Declares the variable ’message’ as 30 characters long
PRINT*,’Please enter your message: ’	Prints the request to screen (don’t forget the comma!)
READ(5,*) message	Reads your keyboard typing and stores it in the variable ’message’
PRINT*,’The message you typed in was: ’, message	Prints out the statement, with your message at the end.
END	Tells the computer that the program is finished.

When you have typed all this into ***gedit*** (and saved it) you have made your first computer program!

4.4.2 Compiling Your Program

Now, before you can run the program you need to **COMPILE** it. Compiling just means translating the Fortran commands into a form that the computer can understand (binary/machine language). Computer languages like Fortran and C++ are made for us humans to make programming easier (ie. we don't have to speak machine language :)

Here is how to compile the program:

f77 -o hello.exe hello.f

The first command (f77) is the name of the compiler. The -o (little O) tells f77 that you want the ***Executable*** (the version of your program that the computer can understand) to be called 'hello.exe'. Hello.f is just your F77 program.

Now, if you list the contents of the directory, typing:

ls

Then you should see 'hello.exe' as well as 'hello.f'

4.4.3 Running Your Program

To run the hello.exe program you just type:

./hello.exe

You can run it as many times as you like :)

So that's all there is to writing, compiling and running a (basic) program! Now you can read up more on the Fortran language and write programs that do more interesting things :)

5 More Information

There is stacks of information about Linux and Fortran on the Internet - just do a Google search.

A few Astro PhD students have kindly made some web pages that may be of some use too:

http://www.maths.monash.edu.au/~scamp/tutes/asp3012/index.htm

http://www.maths.monash.edu.au/~gkenn/asp3012.html

Happy coding!