BiSON
Birmingham
Solar-Oscillations
Network

How Do You Get to the Zoo?

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Abstract

Directions to the zoo are presented along with the answers to many other questions.

1   What is the zoo?

The Birmingham Solar-Oscillations Network (BiSON) data-acquisition system is a menagerie of programs, libraries, shell scripts, and device drivers all working together to collect helioseismology data at remote, automated stations.

In order to make the data-acquisition system, and the underlying Linux operating system, more understandable, we use an analogy with a zoo. You will learn all about this analogy, and how to deal with all of the programs in the zoo, when you get there. The purpose of this report is to tell you how to login on a BiSON data-acquisition computer, or, in the language of the analogy, how to get to the zoo.

Once you login on a zoo computer, the first thing you should do is type the command "**man zoo**". This will show you the zoo manual page which contains an introduction to the zoo. From there you will be able to begin exploring the zoo.

2   What preparations do I need to make before I set off for the zoo?

There are three things you must do before you begin your journey for the first time:

1. You must get an invitation. (You must get a username and password.) See Question 3.

2. You must do some research. (You need to learn a little bit about the Linux operating system.) See Question 4.

3. You must choose your route. (You need to decide how to connect to a zoo computer.) See Question 5.

Once you have finished these preparations, you can go to the zoo following the instructions in Question 6, 7, 8, or 9.

3 How do I get a username and password?

You can get a username and password on a zoo computer by sending an E-mail message to BiSON at *bison@bison.ph.bham.ac.uk.*

Access to zoo computers over the Internet is normally blocked to most other computers. At the time your account is created, the zoo computer will be set to allow access from whichever computers you may be using to connect to the zoo.

4 What do I need to know about Linux?

Don't panic. There is very little you need to know about Linux in order to enter the zoo. For a start, you will need to know how to login, how to get a command prompt, and how to enter commands.

You should also understand a little bit about how files are arranged into directories (folders). However, if you have used any other operating system before, you are probably already familiar with this.

Finally, you will need to know a few of the basic Unix commands like **ls** and **cd**. The one command that you will need to know is the **man** command. **man** is short for "manual" and it displays a page from the Unix users' manual. The first page that you will look at is zoo(7). This is the standard Unix way to refer to manual pages (or "man pages" as they are often called). zoo(7) means the page called "zoo" in Section 7 of the manual. You can look at the zoo(7) man page by typing the command:

```
% man zoo
```

This works because there are no other pages called "zoo" in any of the other sections of the manual. If there were, you would have to type:

```
% man 7 zoo
```

instead. Incidentally, if you want to learn about the **man** command, you can look at its man page:

```
% man man
```

When you are finished reading a man page, press "q" to get back to the command prompt.

Now that I have told you what you need to learn, I will now tell you how to learn it. First, if you are completely new to Linux and Unix, you need to read the (small) book by Jerry Peek called *Learning the UNIX Operating System.* It is listed in the bibliography at the end of this report [1]. You can buy this (inexpensive) book from Amazon.Com, or you can ask BiSON to send a copy to you (*bison@bison.ph.bham.ac.uk*). You can also find a copy of this book in all of our zoos.

Even if you are already a little familiar with Linux, you may want to read through this book anyway. In this case, you may want to ask to borrow a copy for a short time.

If your visits to the zoo will be brief and infrequent, and if you will normally be following specific instructions on how to fix something, then what you will learn from Jerry Peek's book will be more than adequate. However, if after reading this book, you find that you want to learn more, I recommend another book by Jessica Perry Hekman called *Linux in a Nutshell* [2] . This (bigger and more expensive) book contains a large list of Linux commands with descriptions and sections on specific things like the Emacs editor.

If you plan on spending a significant amount of time using Linux, then you need this book. Once again you can buy it from Amazom.Com, ask BiSON to buy a copy for you, or find a copy in the zoo.

5   What are the different ways that I can connect to a zoo computer?

There are several different ways to login on a zoo computer. The easiest way is to walk to the zoo and sit down at the *console.* The console is the keyboard, mouse, and monitor actually attached to the zoo computer. If you are near to one of the BiSON stations, this may be the best way to login; go to Question 6.

Another way to connect to a station is by using a modem to *dial-up* the computer. This is the only way to connect to remote stations that are not connected to the Internet. If you want to dial-up to the zoo, go to Question 7.

Finally, another way to connect to a station is across the Internet. To do this, you must establish a secure shell (SSH) connection to the zoo computer. If you are familiar with *telnet* connections, you will recognize SSH connections as being very similar. The difference is that SSH encrypts all of the data sent across the network link so that other people on the network cannot overhear you password. An SSH connection will allow you to login on a zoo computer and get a command prompt. From there you can issue commands as normal.

Most Linux systems will already have an SSH client available for its users. If your system does not have one, ask your system administrator to install one for you.

Microsoft Windows, on the other hand, does not come with an SSH client. You will need to install one yourself. The software, and instructions for installing it, can be found on the BiSON web server at *http://bison.ph.bham.ac.uk/Kipper/Software/Ssh/*.

Once you establish an SSH connection with a zoo computer, you will be able to run any program that uses plain text as input and output. However, if you would also like to run graphics programs, you will need to be sure that you are sitting at an *X server* such as an X-terminal. The X protocol allows graphics-drawing instructions to be sent across an internet just like telnet and SSH allow text to be sent.

You may already be familiar with programs that draw windows on your desktop and allow you to push buttons and manipulate other items with a mouse pointer. These windows normally appear on the monitor attached to the computer that is running the program. With the X protocol, programs can draw windows on monitors attached to other computers. For example, if you are in Birmingham and you want to run a windows program on the computer in Narrabri, it would not be very useful if the Narrabri program drew its window on the monitor in Narrabri: You would not be able to see it. Using X, the Narrabri program can draw its window on your computer in Birmingham.

The X protocol was developed by the X Consortium, a group containing nearly all of the major software vendors and hardware manufacturers in the computer industry. Because of this, nearly all computer platforms and operating systems support X. One notable exception is Microsoft Windows.

If you are running Microsoft Windows and you would like to be able to run graphical zoo programs, you will need to install X-server software. The instructions for installing Exceed (an X-server implementation for Microsoft Windows) can be found on the BiSON web server at *http://bison.ph.bham.ac.uk/Kipper/Software/Exceed/*.

After you have made sure that your computer has an SSH client and, optionally, X-server software, you are ready to establish a connection to a zoo computer over the Internet. If you are using a Linux system, go to Question 8. If you are using a Microsoft Windows system, go to Question 9.

6   How do I login on the console?

The easiest way to login on a zoo computer is to actually walk up to the computer, sit down at the console, and type your user name and password. Zoo computers are turned on all of the time. However, when you sit down, the monitor may be turned off. So the first thing you may need to do is:

Turn on the monitor.

The screen may be blank due to the screen saver, to bring the screen back to life:

Slide the mouse.

Zoo computers run Linux, and Linux uses the *real* console (the monitor, mouse, and keyboard) to provide seven *virtual* consoles. The first six virtual consoles are text consoles. If you login on one of these, you will be able to run any text-only zoo program. The seventh virtual console is a graphics console. If you login on this console, you will be able to run any text-only program as well as any of the X-windows programs. To change to the graphics console (the seventh console):

Press CTRL/ALT/F7.[1]

You may also login on one of the six text virtual consoles if you want to. To change to the first virtual console, press CTRL/ALT/F1. To change to the second, press CTRL/ALT/F2. You can work out for yourself how to change to the other virtual consoles.

Enter your username and password.

Wait for the window manager to start.

This will take a very, very long time. Be patient.

Click on the terminal icon in the lower left corner.

This will start **xterm** and an **xterm** window will appear. Inside the window you will see the Linux prompt (%). From here you can:

Enter commands.

When you are done:

Right click on the desktop.

Click on "logout".

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[1]This means, press and hold both the CTRL and ALT keys at the same time, then press and release the F7 key, then release the CTRL and ALT keys.

7 How do I use a modem to dial-up to a remote computer?

You can connect to many zoo computers using a modem. At Carnarvon, there is no Internet connection, thus the only way to connect to the Carnarvon zoo remotely is using a modem. At other stations, including Narrabri and Birmingham, a modem provides an alternative method for connection in addition to the Internet. You may choose this method if, for instance, the Internet connection is temporarily not working.

In order to establish a modem connection, you will need a modem and a terminal. You type characters on the terminal, which will send them to the modem, which, after connecting to the zoo, will send them on to the zoo computer. The zoo will send characters back through your modem to your terminal which should display them to you in some fashion. The characters may be printed on paper, as is done by a traditional teletype terminal. Or, the characters may be displayed on a video monitor.

It is very hard to find real terminals these days, and even harder to find ones that print characters on paper. Instead, you will most likely use a computer along with some terminal-emulation software that makes the computer behave as if it was a terminal.

At this point, I would like to recommend the program **kermit**. It is arguably the best terminal-emulation software ever written. Its key feature is that a version of **kermit** has been written for "nearly every computer and operating system on the planet since 1981." **kermit**'s user interface and script programming language are consistent across platforms. This means that no matter what type of computer and operating system you have, the way you make a connection to the zoo is the same.

You can download **kermit** for free from *http://www.columbia.edu/kermit/*. You can buy the manual from Amazon.Com.

Now that you have a terminal, or a computer with terminal-emulation software, attach it to your modem and instruct your modem to dial the telephone number for the zoo. You may have to read your modem's manual to learn how to do this. Most modem manufacturers no longer include their manuals with their products anymore. However, it is often possible to download them from the appropriate web sites.

Some important zoo telephone numbers are shown in Table 1.

Table 1: Zoo Telephone Directory

Zoo	Number
Birmingham Control	+44-121-414-1438
Birmingham Dome	+44-121-414-4604
Carnarvon	+61-8-9941-8335
Narrabri	+61-2-6795-9219

Once your modem establishes a connection with the zoo, the zoo computer will then ask you for your username and password:

```
login: your-username
password: your-password
%
```

Once you enter your username and password, you will have a command prompt on the zoo computer. You can now enter commands. When you are finished, type:

```
% logout
```

And then tell your modem to hang-up the telephone line.

8   How do I connect to a zoo computer from Linux?

You can connect to a zoo computer from another computer running Linux by using **ssh**. If your Linux computer is running an X server, you will be able to use graphical zoo programs and have their windows appear on your monitor. But first, you may need to tell your X server to allow connections from the zoo. This is normally done with a command like this:

```
% xhost zoo-name
```

where *zoo-name* is the name of the zoo computer from which you want your X server to accept connections. Then connect to the zoo computer:

```
% ssh zoo-name
login: your-username
password: your-password
%
```

You now have a command prompt on the zoo computer. If your system administrator has setup X11 forwarding over SSH connections, you will be able to use both text-only and X-windows programs.[2] Now that you have logged in:

Enter commands.

When you are finished, type:

```
% logout
```

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[2]Even if your system is not set to forward X11 over SSH, you may be able to do it yourself by using the -**X** option to **ssh**. Or you can put "`ForwardX11 yes`" into your *$HOME/.ssh/config* file. If none of these work, then you have to use normal X11 connections by setting an environment variable with **export DISPLAY=***your-computer-name***:0**.

9 How do I connect to a zoo computer from Microsoft Windows?

You can connect to a zoo computer from another computer running Microsoft Windows using SSH. If you would like to run graphical zoo programs and have their windows appear on your Microsoft Windows desktop (and you have installed Exceed, see Question 5), start Exceed by typing:

```
C:> exceed
```

This command should be typed at a DOS prompt inside a DOS box. To open a DOS box on Windows, click *Start | Programs | MS-DOS Prompt*. You may also start Exceed from the start menu or by clicking on a desktop shortcut. In this report, we describe how to start programs by telling you what to type at a DOS prompt. This is because it is easier to say what to type than it is to describe what to click. This is especially true if you if you have created custom short-cut icons or have moved things around on the start menu. After you have (optionally) started Exceed, start the SSH client:

```
C:> ssht
```

and establish an SSH connection to the zoo computer using your SSH client by following the menus.[3] You will be prompted for your username and password. When the connection has been established, you should see the Linux (%) command prompt. If you want to run graphical zoo programs, you will need to tell the zoo where to draw the windows:

```
% export DISPLAY=your-computer-name:0
```

Then you can:

Enter commands.

When you are finished, type:

```
% logout
```

10 Can I use TELNET and FTP to connect to the zoo?

Zoo computers do have telnet and ftp daemons. However, when you use these protocols, everything you send is transmitted unencrypted across the network. This includes your password. Because of this, access to the zoo via telnet and ftp are normally blocked. If you need telnet or ftp access to the zoo, send a message to *bison@bison.ph.bham.ac.uk*. It may be safe to use telnet and ftp if the connection between you and the zoo is entirely along trusted local networks.

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[3]If you run into difficulties using your SSH client, the information in Questions 11 and 12 may be useful.

11 How do I use TeraTerm?

It is fairly easy to use TeraTerm as an SSH client. To start the program, type:

`C:> ssht`

If this does not work, then either you have not put the *ssht.bat* file in your *C:\Bin* directory (see *http://bison.ph.bham.ac.uk/Kipper/Software/Ssh/*) or your *C:\Bin* directory is not on your PATH. To put it on your PATH, you will need to put "`PATH C:\Bin`" into your *C:\Autoexec.Bat* file. You can also start TeraTerm from the start menu or by clicking on a desktop icon.

When the program first starts up, a dialog box will appear.

Put the name of the zoo in the "Host" box.

Make sure the "ssh" radio button is pressed.[4]

Click on "Ok".

A new dialog box will appear.

Put your username in the "Username" box.

Put your password in the "Passphrase" box.

Click on "Ok".

You should now see the Linux (`%`) command prompt.

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[4]If there is no "ssh" button, then the SSH extension to TeraTerm has not been installed correctly. You will have to do the installation again.

12   How do I use the OpenSSH client?

Once installed, the OpenSSH client is easy to use. You can start the client in a window by typing:

```
C:> sshw
```

If this does not work, then either you have not put the *sshw.bat* file in your *C:\Bin* directory (see *http://bison.ph.bham.ac.uk/Kipper/Software/Ssh/*) or your *C:\Bin* directory is not on your PATH. To put it on your PATH, you will need to put "`PATH C:\Bin`" into your *C:\Autoexec.Bat* file. You can also start the OpenSSH client from the start menu or by clicking on a desktop icon. In addition, you can run the text-mode SSH client from a DOS box by typing "`ssh username@host`".

Once you have started the OpenSSH client, you should notice that it says "Not connected - Press ENTER/SPACE to connect" down in the lower, left-hand corner. Therefore:

Press ENTER or SPACE.

A dialog box will appear.

Put the name of the zoo in the "Host Name" box.

Put your username in the "User Name" box.

Make sure the "Port Number" box contains "22".

Click on "Connect".

A new dialog box will appear.

Put your password in the "Password" box.

Click on "Ok".

You should now see the Linux (%) command prompt.

References

[1] Jerry Peek, Grace Todino, and John Strang. *Learning the UNIX Operating System.* O'Reilly & Associates, Inc., Sebastopol, January 1998.

[2] Jessica Perry Hekman, Ellen Siever, Stephen Spainhour, and Stephen Figgins. *Linux in a Nutshell.* O'Reilly and Associates, Inc., Sebastopol, third edition, August 2000.

[3] Jessica Perry Hekman. *Linux in a Nutshell.* O'Reilly and Associates, Inc., Sebastopol, January 1997.