

CS1102: Data Structures and Algorithm

General Java Program Compilation Guide

and

Lab 0 Walkthrough

Please note that:

Information for Lab 0:

- It is a purely take home lab, i.e. **no actual lab sessions will be conducted.**
- There is no deadline of submission. But it is good for you to finish this as a preparation for the coming labs.
- You will get 2% when you completed both part of this walkthrough document and achieve the requirement stated.

Overview

Welcome to CS1102! This document is the first part of the walkthrough to guide you on the following topics:

- Connecting to sunfire server
- Java program editing
- Java program compilation

Part 2 to come will guide you on using the *CourseMarker* system on the sunfire system.

Section A. Java Program Compilation on sunfire

This section gives you an introduction to the sunfire machine as well as the basic Java programming environment available on this machine. The steps given will also help you to become familiar with the process of editing, compiling, and running simple Java programs.

A.1 The major steps

To compile and run a Java program on the sunfire machine, we need to go through the following steps:

1. login to the **sunfire** machine
2. create and modify programs using the sunfire machine
3. compile and execute Java programs

Please check that you have the following before proceed:

1. A sunfire unix account. You can create/re-enable your account by going to:

`https://mysoc.nus.edu.sg/~newacct`

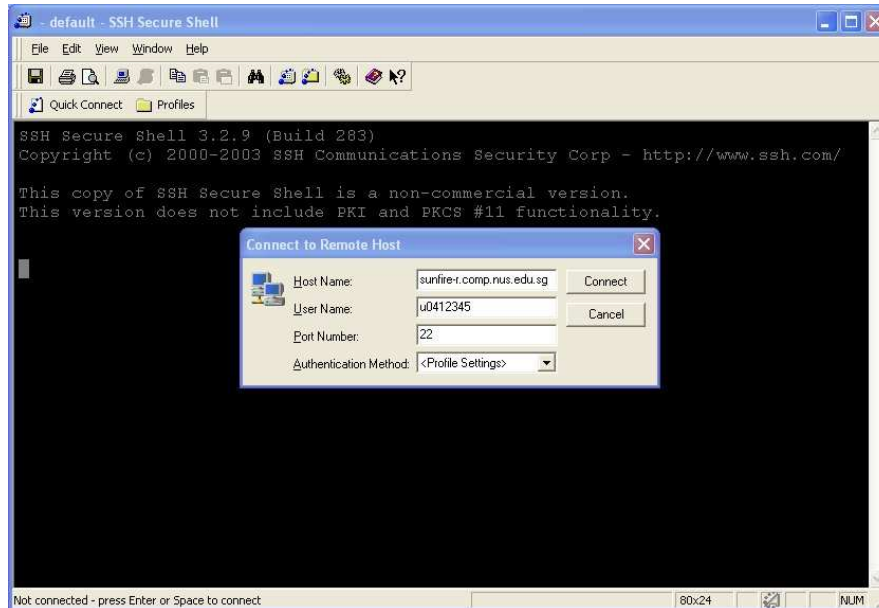
Use your NUSNET id and password to log in.

2. The SSH Secure Shell software. You can find a copy of the software in CS1102 IVLE workbin under “Lab Data” folder.

- Download and install it.

A.2 Logging In

Left mouse click on the **Start** button at the bottom-left corner, select **All Programs**, look for **SSH Secure Shell** folder, and left click on **Secure Shell Client**. A screen similar to the one shown below will appear. Click on **Quick Connect** button and a small window **Connect to Remote Host** will pop out.

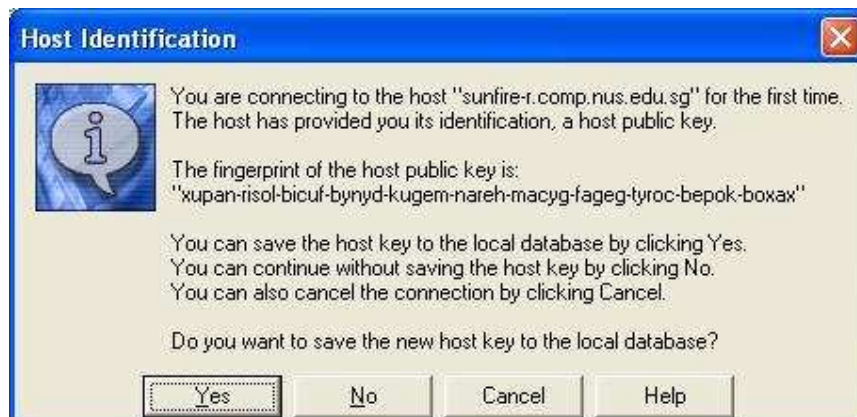


Under Host Name, enter either **sunfire-r.comp.nus.edu.sg** (works from within NUS or from any of the local ISPs, e.g. SingNet, StarHub, PacNet) or **sunfire.comp.nus.edu.sg** (works from within NUS only). You should use **sunfire-r.comp.nus.edu.sg** unless it does not work. Please ensure that you have already created your Unix Account as shown above. Your Unix Account is not the same as your NUSNET Account. If connecting to **sunfire-r.comp.nus.edu.sg** still does not work, you need to install and connect to NUS first using NUS VPN ([refer](https://network.nus.edu/vpn) to <https://network.nus.edu/vpn>).

Under User Name, enter your **SoC user-id**. Unix is case sensitive, so you must type "u09" and not "U09".

Ensure that the Port Number is 22 and click on the **Connect** button.

If you encounter the following window, just click "Yes".



When this is done, another small window will appear to prompt you for your **password**. Note that the user-id and password are **case-sensitive** (i.e. an "a" is different from an "A").

The password will appear on the screen as asterisks (***) so you need to type slowly and carefully.

Once you have logged into sunfire, you are automatically placed in your home directory. A directory is similar to a folder in Windows.

A.2.1 Notes before you proceed

- Do not click on the Close button (the button with a cross) at the top-right corner of the window. The correct way to log out of your UNIX account is explained in Section 9.
- The UNIX system is not GUI-based so the mouse is seldom used (if at all).
- You should see the UNIX prompt (read Section A.5). If you don't, check that you have not scrolled off the screen with the mouse. Bring the prompt back into view by scrolling back.
- If you do see the UNIX prompt but whatever you type does not appear, you might have accidentally locked your screen (locking can be done by pressing control-S or by pressing the "Scroll Lock" key). Unlock your screen by pressing control-Q (if you have pressed control-S earlier), or by pressing "Scroll Lock" again (if you have pressed "Scroll Lock" earlier).
- If you get stuck after typing a command or in a middle of an application, sometimes typing 'q' (quit) may get you out.
- If 'q' does not work, press control-C which is the interrupt key. Use this as the last resort. If it still doesn't work, seek help.
- Do not press control-Z, which is the interrupt key in DOS. Pressing control-Z in UNIX sends your job to the background, and if you have accidentally pressed control-Z, type 'fg' (foreground) to resume.
- Tip 1: You may use the up and down arrows to select a previously entered command. This saves you some typing time.
- Tip 2: You may use the tab key to fill out the complete filename. Ask your lab TA to show you how this can be done.

A.2.2 User-Ids and Passwords

When you have logged in successfully for the first time, you will be immediately asked if you would like to change your password. Enter 'n' (no) to skip it. Do **NOT** change your password as you are still new to the system and if you make any mistake, time may be wasted as you need to get it rectified at the Help Desk (located at basement level of COM1 building).

You may want to change your password some other time, after you have thought of a good password. Choose a password that is **6 to 8** characters long.

There are guidelines to choosing good passwords which are safer and less susceptible to break-ins. When you change your password, the system will check that your new password satisfies its stringent requirements, failing which it will reject the change. Generally, the system tends to accept passwords that consist of at least a mix of uppercase and lowercase characters, plus some digits. It is advisable that you prepare **a few passwords** before-hand, so that if one fails to pass the test, you can pick another without wasting too much time. You can change your password any time you like -- in fact, you are advised to change it regularly. The command to change password is **passwd**. It will take **half an hour to one hour** before your new password takes effect.

Always **remember your password!** If you forget, you would need to approach the personnel at the Help Desk (COM1 building, Basement) to submit a request for a new password. Alternatively, you can go to <https://mysoc.nus.edu.sg/~iforgot> to change your password online (this requires your NUSNET ID and password).

A.3 Setting up your Account

If you are new to the sunfire server, you are encouraged to perform the following setup program. Although the program is intended for CS1101C students, it contains a number of nice configurations which are general useful. Note that you can skip this step if you have performed this before.

Run the **setup** program as follows (you should do this only **ONCE**). Type the following commands in your SSH Secure Shell window:

```
~cs1101c/lab0/setup
```

Check that you enter the above command **ACCURATELY** (the tilde character ~ is usually found on the top left of your keyboard next to the "1" key).

After the setup program runs successfully, you must type:

```
source .bash_profile
```

Remember to type the SPACE in between "source" and ".bash_profile". "Respect the spaces". Note that if the above command ran successfully, you will see no output. With many Unix commands, "*no news is good news*". This is very different from Windows or Mac where you are used to seeing a dialog box pop out. Try to get used to Unix quickly.

A.4 Online Help

An online help facility is available in the system via the "man" command ("man" stands for **MAN**ual). Type "man man" (i.e. get the manual page on the command "man") to find out more about the facility. To look for more information about any UNIX command, for example, "ls", type "man ls". To exit "man", press "q".

A.5 Basic UNIX Commands

The following are a few commonly used commands. This list is by no means exhaustive and you are urged to explore on your own. Note that UNIX commands are case-sensitive.

In the examples below, bold words are commands which you are expected to enter. Assume that you are u0701234, your default prompt may look like this (possibly a little different):

```
u0701234@sf3:~[xxx]$
```

sf3 is the internal name for sunfire; ~ indicates that you are currently in your home directory.

a. Directory commands

pwd to **Print current Working Directory** to show you which directory you are currently in

```
u0701234@sf3:~[xxx]$ pwd
/home/nusstu/u0701234
```

ls to LiSt files in your current directory

```
u0701234@sf3:~[xxx]$ ls
c      doc
```

You may also use "`ls -F`" for more information (`-F` is one of the many options/flags available for the `ls` command. To see a complete list of the options, refer to the man pages, ie. "`man ls`".)

```
u0701234@sf3:~[xxx]$ ls -F
c/      doc/
```

The slash (/) beside the filename tells you that the file is a directory (folder). A normal file does not have a slash (/) beside its name when "`ls -F`" is used.

Note that the directories `c/` and `doc/` are created by the setup program in section A.3. If you did not run the setup program, you will not see any file at all.

You may also use the "`ls -l`" command (dash L) to display almost all the file information, include the size of the file and the date of modification. Try it now!

cd to Change Directory from current directory to another

```
u0701234@sf3:~[xxx]$ cd c
u0701234@sf3:~/c[xxx]$ ls -F
ch1_1.c  ch2_1.c  ch2_2.c  ch2_3.c  ch2_4.c
```

Note that the prompt changes to `~/c` to indicate that you are now in the `c` directory below your HOME directory.

Entering "`cd`" alone brings you back to your HOME directory, ie. the directory in which you started with when you first logged into the system.

```
u0701234@sf3:~/c[xxx]$ cd
u0701234@sf3:~[xxx]$
```

mkdir to MaKe a subDIRectory in current directory

```
u0701234@sf3:~[xxx]$ mkdir another
u0701234@sf3:~[xxx]$ ls -F
another/  c/      doc/
```

rmdir to ReMove a subDIRectory in current directory -- note that a directory must be empty before it can be removed.

```
u0701234@sf3:~[xxx]$ rmdir another
u0701234@sf3:~[xxx]$ ls -F
c/      doc/
```

b. File commands**cp** to CoPy files

```
u0701234@sf3:~[xxx]$ cd doc
u0701234@sf3:~/doc[xxx]$ cp abridged.txt anotherfile
u0701234@sf3:~/doc[xxx]$ ls
abridged.txt  anotherfile  faq.txt      tutor
```

mv to MoVe files from one directory to another; can also be used to rename files.

```
u0701234@sf3:~/doc[xxx]$ mv anotherfile afile
u0701234@sf3:~/doc[xxx]$ ls
abridged.txt  afile      faq.txt      tutor
```

rm to ReMove files. Be **careful** with this command -- files deleted cannot be restored (unless they have been backed up during the normal backup cycle).

```
u0701234@sf3:~/doc[xxx]$ rm afile
rm: remove `afile'? y
u0701234@sf3:~/doc[xxx]$ ls
abridged.txt  faq.txt      tutor
```

c. Command to display text files

cat to string together or display (**CAT**enate) the contents of files onto the screen

```
u0701234@sf3:~/doc[xxx]$ cat abridged.txt
```

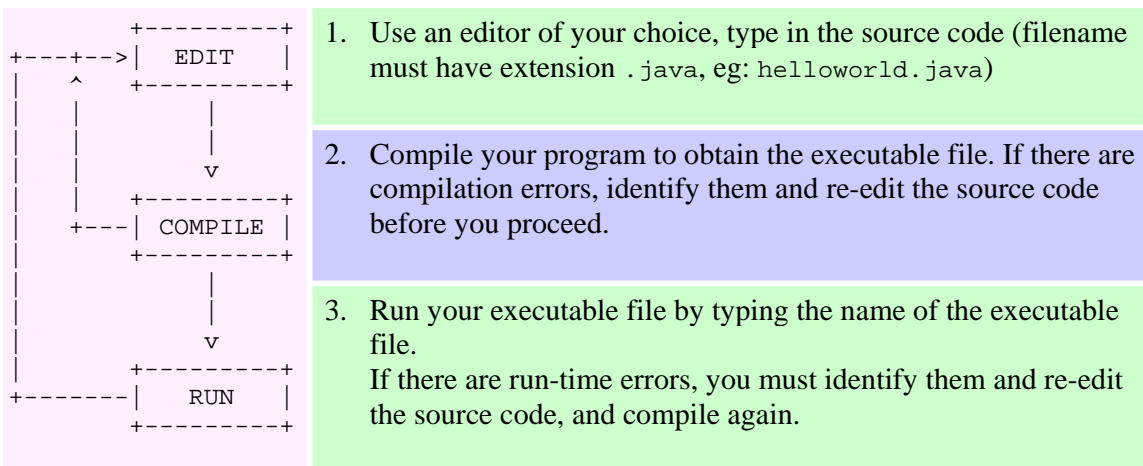
less variant of "cat" (includes features to read each page leisurely)

```
u0701234@sf3:~/doc[xxx]$ less -e abridged.txt
```

In "less", use <space> to move down one page, 'b' to move **B**ack up one page, and 'q' to **Q**uit from "less".

A.6 Running a Java Program

The process of creating a working Java program involves the following steps:



A. 7 Creating your own Java Programs

A. 7.1 Create your first Java program "first.java"

There are a number of editors available in sunfire: *Vim*, *vi*, *emacs*, *joe*, *pico*, *nano* etc. The more powerful one requires a longer time to learn. For this lab, you will use *vim* -- a powerful editor with many commands, but even with the knowledge of a few simple commands it is quite easy to use and very powerful. It is YOUR responsibility to pick an editor and master it, and in future labs we will assume that you are familiar with your editor and its various functions.

It is recommended that you create a directory to store all your Java programs. Placing all programs under your home directory can get messy real quick. Follow the following steps to create a new directory:

1. Enter "**cd**" (this will get you back to the home directory)
2. Enter "**mkdir java**" (creates a new directory java/ under home directory)
3. Enter "**ls -F**"

You should see the new directory **java/** along with other files and directories.

Go to the **java/** directory. Enter "**vim helloworld.java**", then press the "i" key. You will see that the words "-- INSERT --" appear on the bottom left corner of your screen. You are now in **INSERT** mode. While you are in **INSERT** mode, you may use the arrow keys (Up,

Down, Left, Right) to move around your program, as well as the Backspace key and Delete key to delete text. (This is contrary to what I mentioned during the briefing session. You can use the arrow keys in Insert mode after you set up your .vimrc profile) The PageUp and PageDown keys do not work, so do not use them. Do not use the scroll bar as it does not always work as expected.

Notice that line numbers (1, 2, 3, etc.) are displayed on the left. This helps you to easily identify a number by its line. Line numbers are NOT part of Java code. This is extremely useful when identifying the location of compilation errors.

To copy text, you may use the mouse to highlight blocks of text, then right-click on the mouse and choose Copy. To paste your text, you must use the cursor keys to move the cursor to the desired position, then right-click on the mouse and choose Paste.

Type in the following program:

```
import java.io.*;

public class helloworld {

    public static void main(String [] args) {

        System.out.println("Hello World!");

    }

}
```

Note that for simplicity, the above program has no documentation. A good program should include documentation, at least the identity of the author, the purpose of the program and other relevant information. Keep this in mind when you write your own programs.

When you are done, press <ESC> then ZZ. You may also press "<ESC>:x<ENTER>" (more clearly seen as pressing the following four keys one after another: <ESC> : x <ENTER>) to save your program and exit from the vim editor. <ESC> means press the Escape key, then press the colon key (shift-;), then press x (the x is a lowercase x), and finally <ENTER> means press the Enter key. **Be careful not to press X (shift-x) as you may unintentionally encrypt your file and not able to recover it. It would be a big problem for you if you are doing sit-in lab or PE when that happens.**

If you want to save your file without exiting from the Vim editor, press "<ESC>:w<ENTER>", then press the "i" key again to go back into INSERT mode. It is a good habit to save your file periodically so that if the network or the system goes down for any reason, you will not lose your hard work.

When you startup vim, it begins in COMMAND mode. One way to go into INSERT mode is to press the "i" key. While we are in INSERT mode, we can type in our Java code. To switch back to COMMAND mode, we press the "<ESC>" key.

The following shows you a list of useful commands in vim:

- <ESC>:x<ENTER> : Saves your program and exits from Vim.
- <ESC>:wq<ENTER> : Saves your program and exits from Vim.
- <ESC>ZZ : (Note that the Zs are uppercase) Saves your program and exits from Vim.
- <ESC>:q!<ENTER> : Exits from Vim without saving your program.
- <ESC>ZQ : Exits from Vim without saving your program.

If you would like to learn more about Vim commands, please go to <http://www.comp.nus.edu.sg/~cs1101cl/vimkeys.html> Another useful reference can be found at <http://tnerual.eriogerg.free.fr/vim.html>

A. 7. 2 Compile and run your program

```
u0701234@sf3:~/c[xxx]$ javac helloworld.java
```

There will be error messages if your program has errors. Go to Step A.7.1 to make the necessary corrections and re-compile. If there are no compilation errors, a class file helloworld.class will be created. Proceed with program execution as follows:

```
u0701234@sf3:~/c[xxx]$ java helloworld
```

If you feel comfortable with the above steps, you can try out some bigger java programs from the textbook. Do not be discouraged by the compilation errors (you are bound to get a few ☺), it is more important to understand those errors quickly (what they mean and how to fix them).

A.8 Logging Out

When you have finished, you must always log out of the computer system as follows:

```
u0701234@sf3:~/c[xxx]$ logout
```

Typing "exit" or pressing `ctrl-d` will also have the same effect. You **MUST** remember to log out, otherwise anyone who comes by may delete all your valuable files away!

A. Appendix Transferring files to and from sunfire

The easiest way to transfer files between your sunfire account and your local machine / host / PC / laptop is to login to sunfire first using Secure Shell Client, then open the File Transfer program by clicking on "Window -> New File Transfer".

You will see the contents of your sunfire home directory on the right side. You can navigate around and copy and delete files here similar to how you would do it in a local folder. The right side of the window shows the files in your sunfire account, the left side of the window shows the files in your local machine. To transfer a file from sunfire to your local machine, right-click on the file you wish to transfer, and then choose "Download". To transfer a file from your local machine to sunfire, right-click on the file you wish to transfer, and select "Upload". Be sure to change to the right folder at the destination machine before you do the transfer.

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