UNIX Workshop 2010

http://uws.assembla.me

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http://www.youtube.com/watch?v=dFUlAQZB9Ng

Jurassic Park (1993)

"It's a UNIX system! I know this."

– Alexis "Lex" Murphy, Jurassic Park (1993)

Modern UNIX

Figure: Modern UNIX-like operating systems (Linux, BSD, Solaris)

What do these sites have in common?

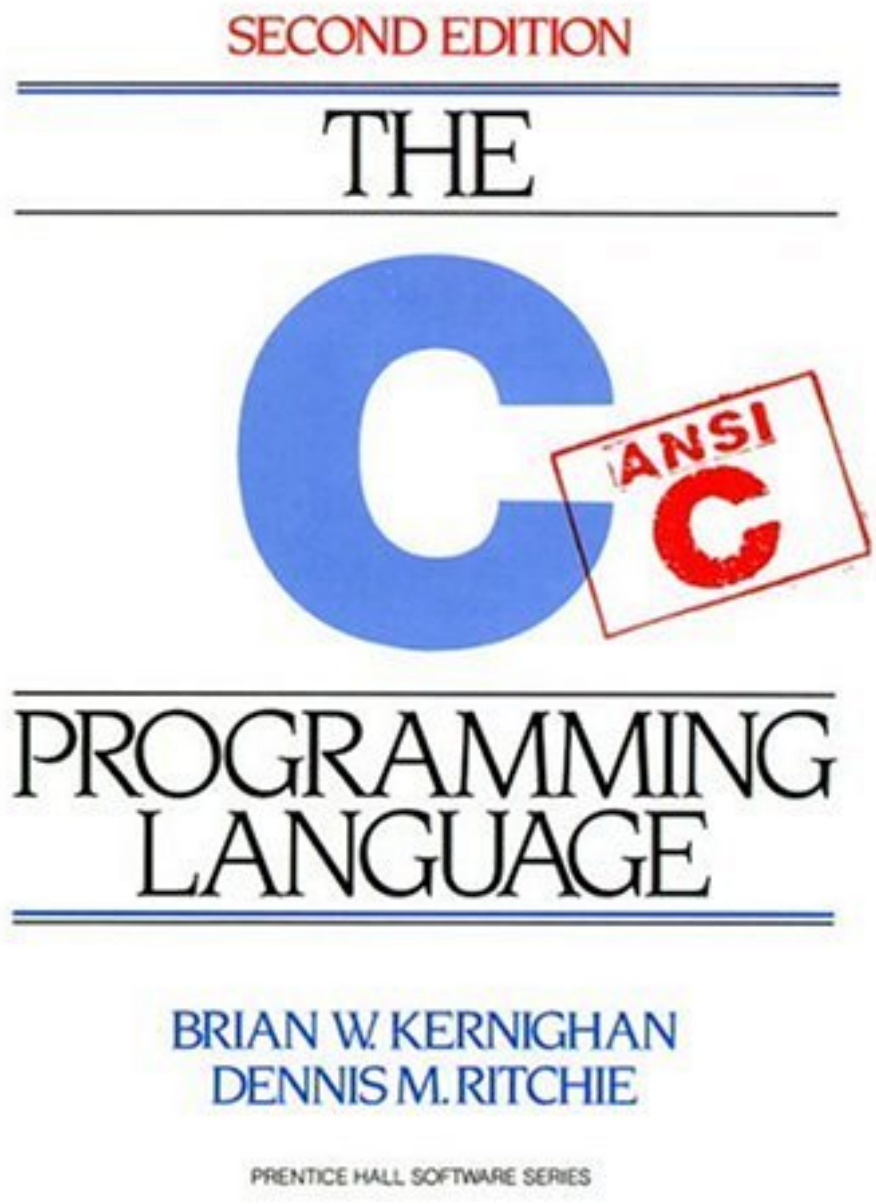
[1] http://w3techs.com, August 2010

What do these sites have in common?

67% of all web servers are running on UNIX[1]

[1] http://w3techs.com, August 2010

C was invented to write UNIX



You will be programming in UNIX

- CS1010 labs - developing C programs in UNIX.
- CS1020 labs - developing Java programs in UNIX

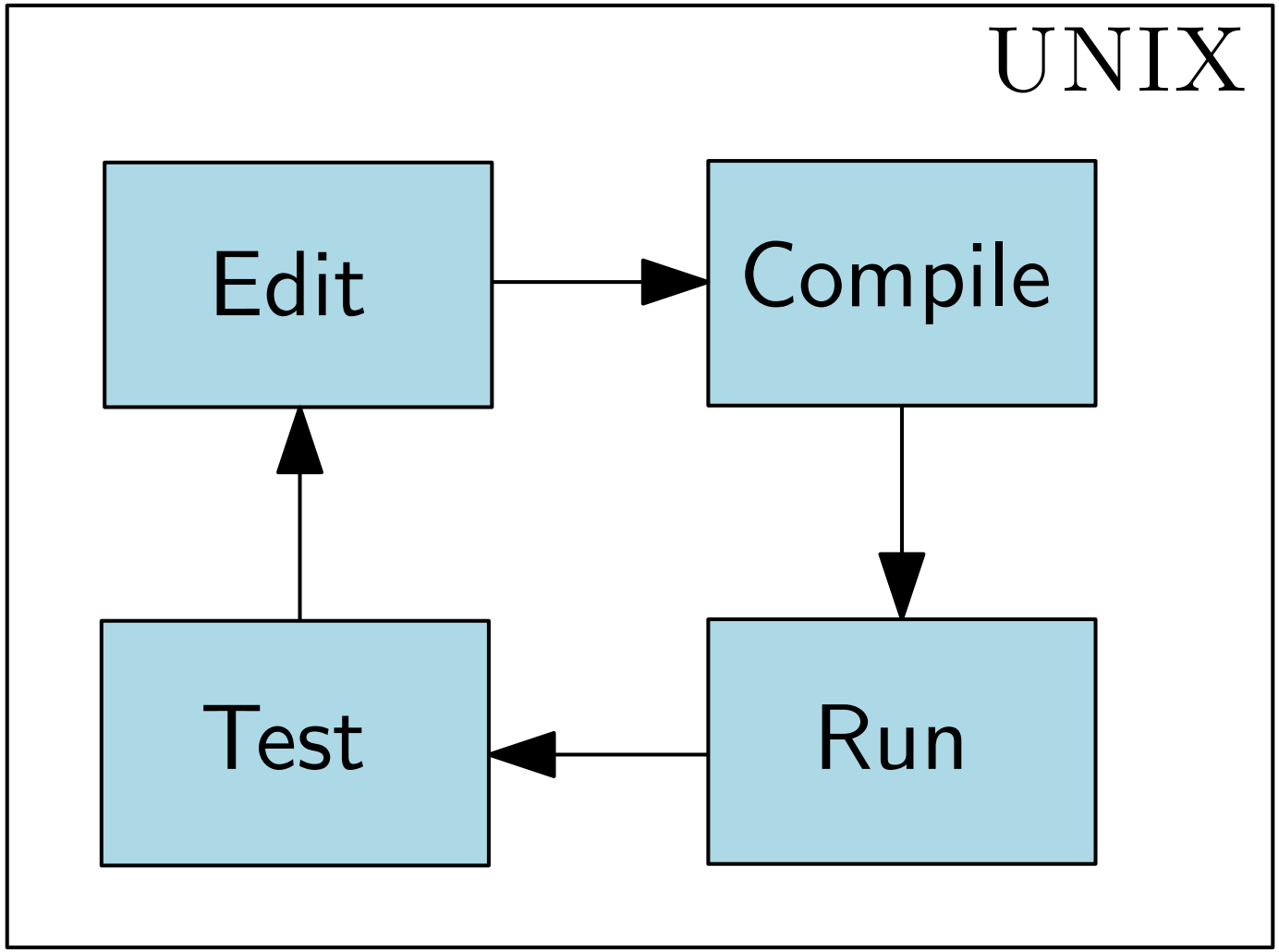


Figure: Workflow for writing programs

Activity: Login to NUSNET

1. Press `Ctrl-Alt-Delete`.

2. Type in your NUSNET user name, password and select the NUSSTU domain.

3. Click on the `Ok` button.

Activity: Creating your UNIX account

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

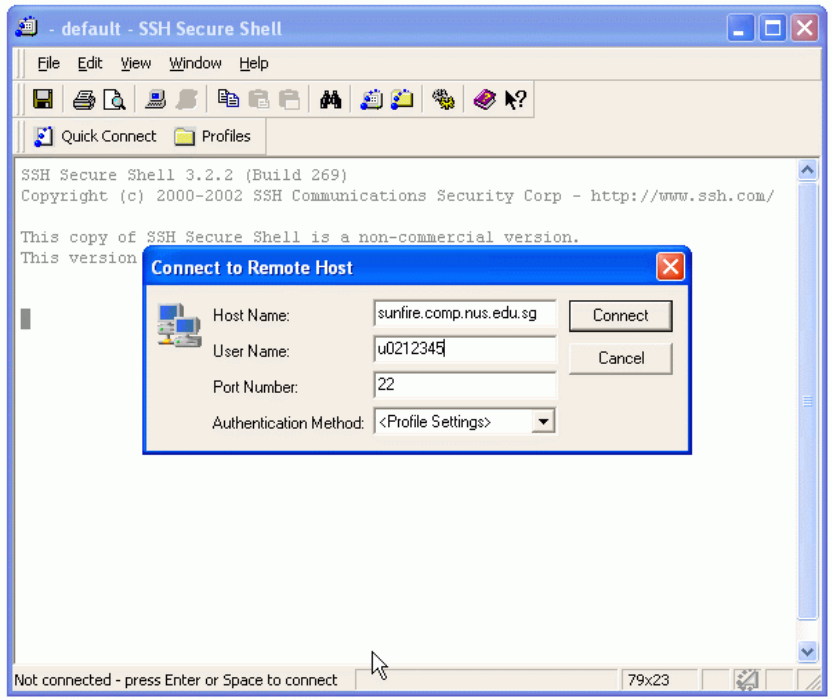
Login using your NUSNET user name and password.

sunfire server in the old Machine Room

Figure: sunfire server located in the Machine Room with our Central Facilities staff. Clockwise from top-left: Tan Chee Sin, Tan Kwang Pon, Budiman Tsjin and Lai Zit Seng (Systems programmer, ITU).

Activity: Connecting to `sunfire`

1. From the desktop, launch the `SSH Secure Shell Client` application.
2. Click on `Quick Connect`
   Host Name: `sunfire.comp.nus.edu.sg`
   User Name: your UNIX user name



3. Click on `Connect`.
4. Click on "Yes" at the Host identification dialog.
5. Enter your UNIX password in the password dialog.

Command line interface

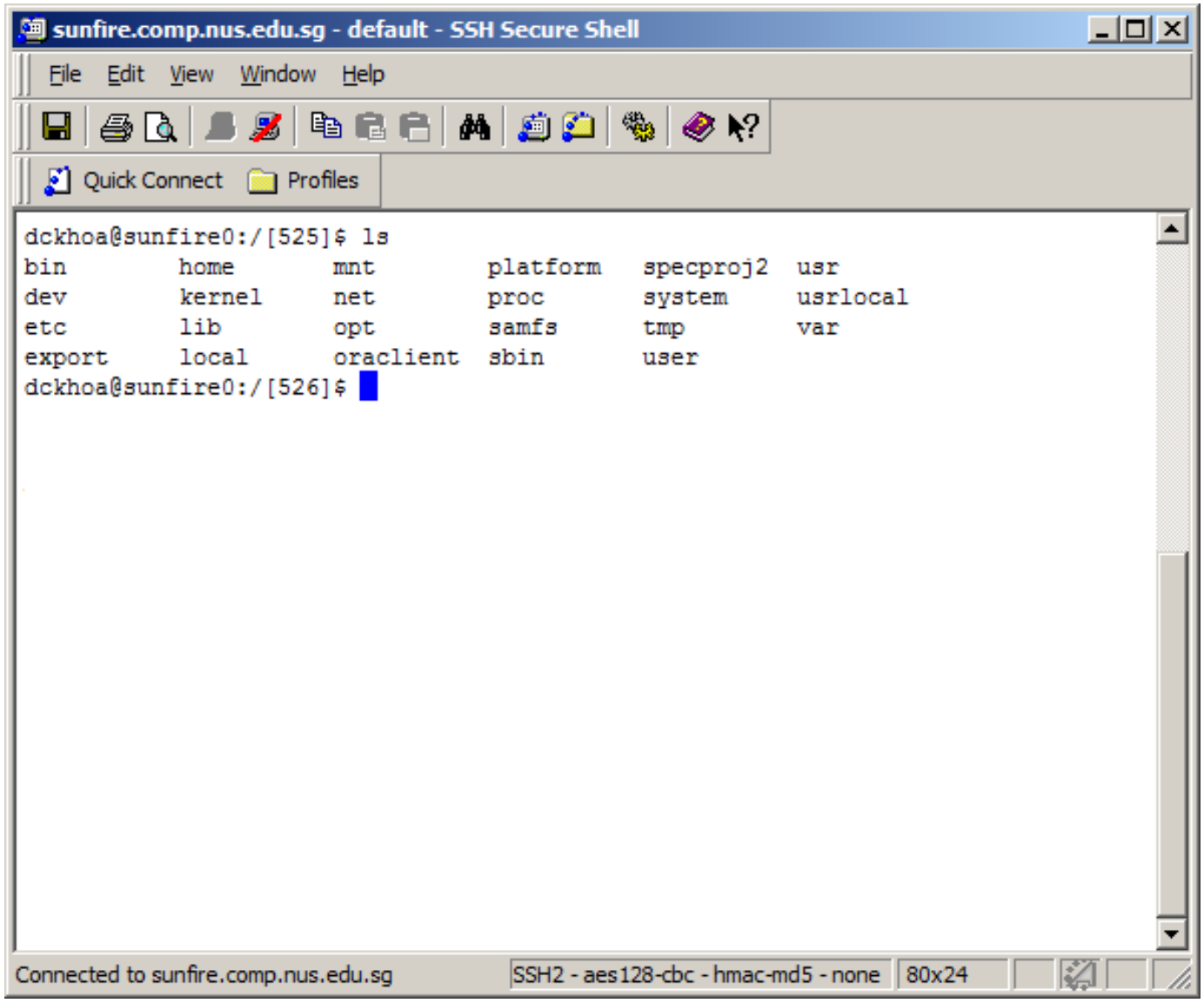


Figure: Command line interface on `sunfire`

UNIX Directory Tree

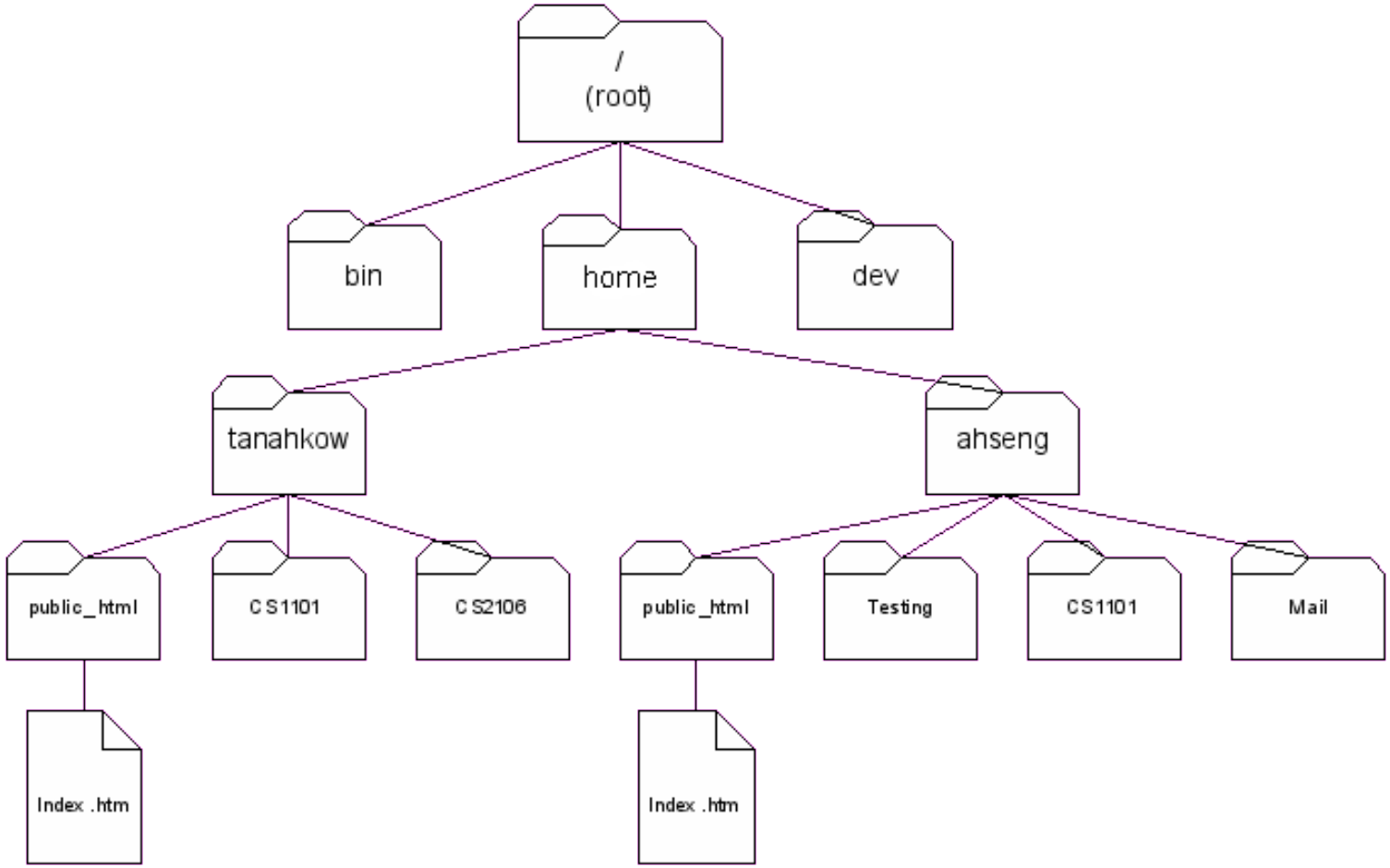


Figure: A subset of the UNIX directory tree showing home directories

Parts of a command

```
$ program argument1 argument2 ...
```

Activity: Working with files and directories

1. After login, you are place in your home directory, e.g. `/home/m/melvin`
2. You can check your working directory using the `pwd` command

   ```
   pwd
   ```

3. The `ls` command shows you the files in your working directory

   ```
   ls
   ```

4. Now create a new directory called `UNIXWorkshopFiles`

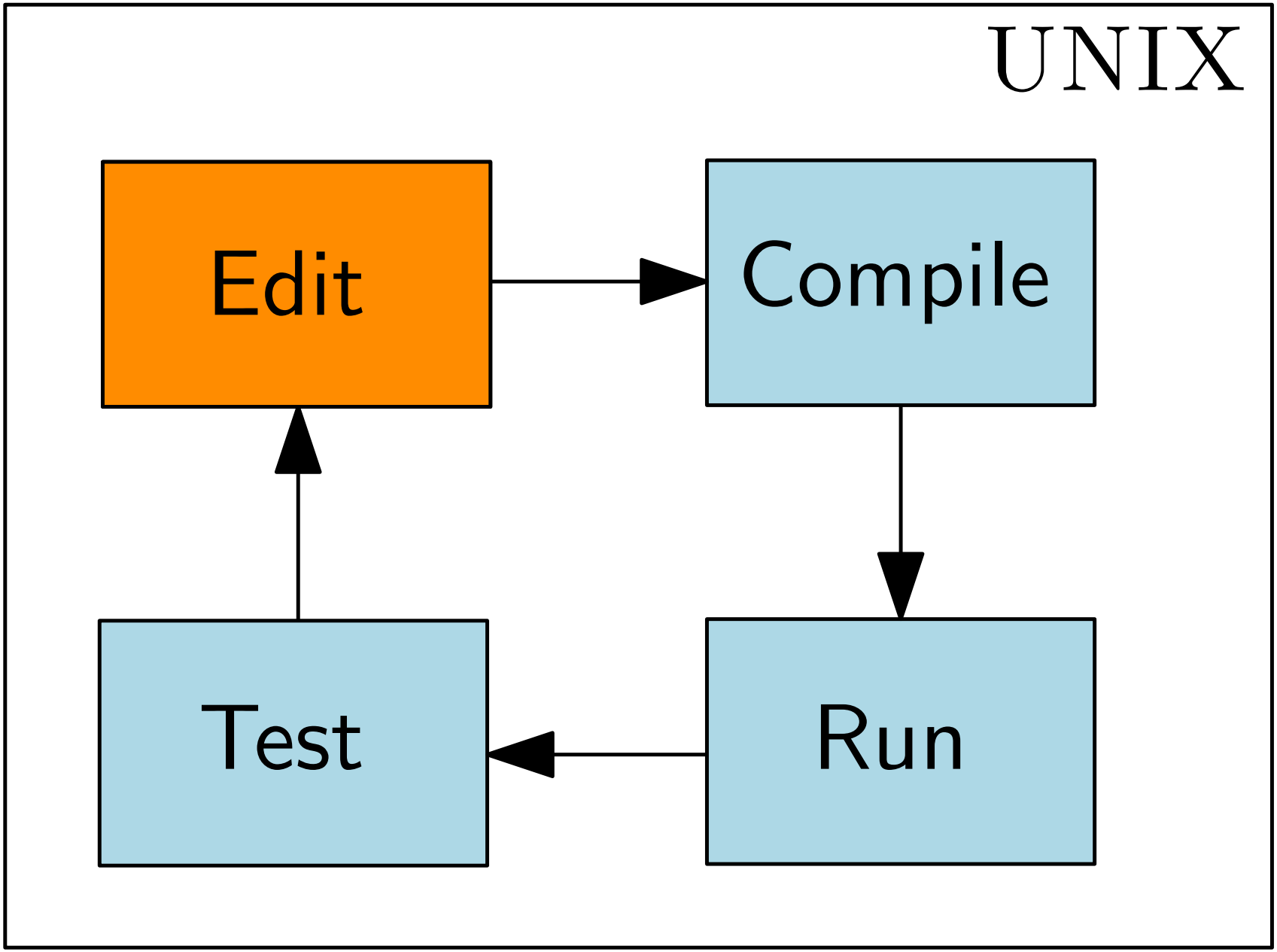
   ```
   mkdir UNIXWorkshopFiles
   ```

5. Switch to the new folder using the `cd` command

   ```
   cd UNIXWorkshopFiles
   ```

6. Use the `pwd` again command to check your working directory

   ```
   pwd
   ```


UNIX
Edit
Compile
Test
Run

Text files are ubiquitous on UNIX

Program source code are stored as text files. A good text editor can dramatically improve your productivity.

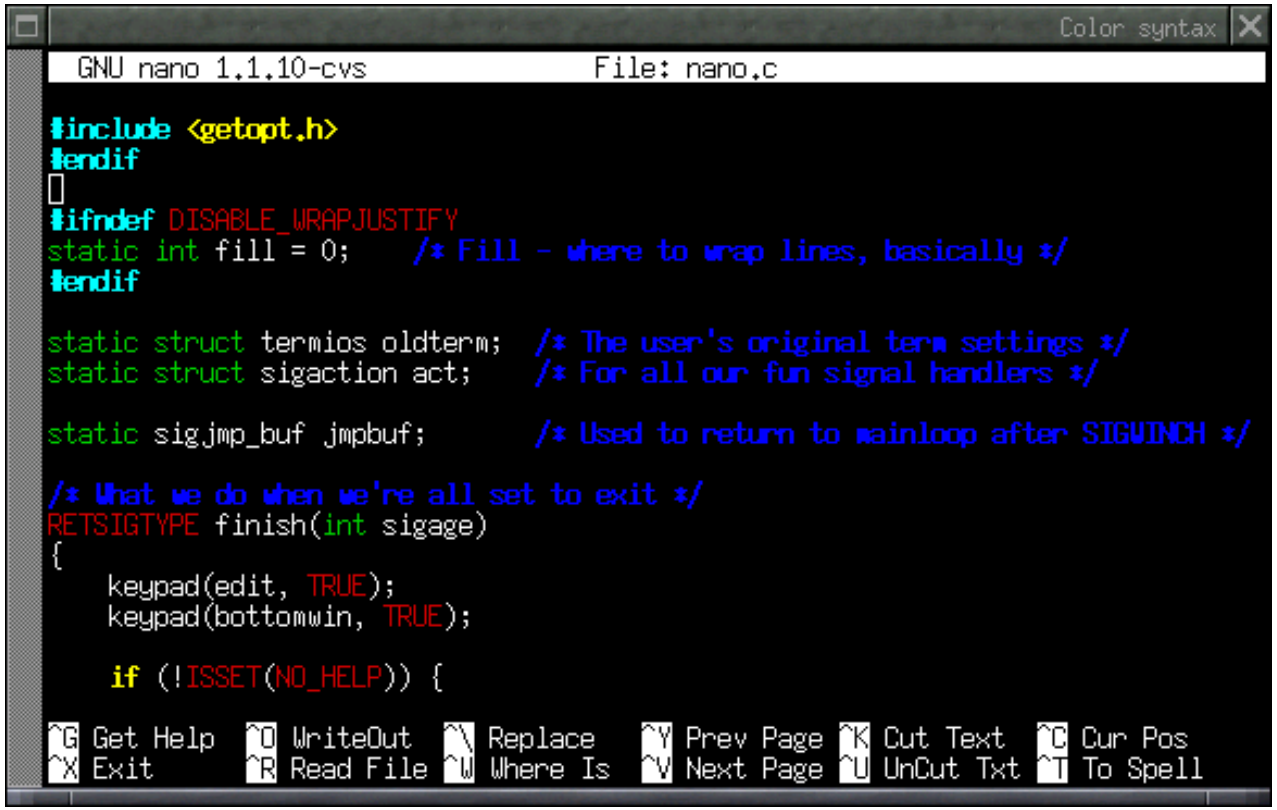


Figure: Screenshot of nano

Activity: Text editing with nano

1. Download the sample `GCD.c` program from the UWS website using wget

   ```
   wget http://uws.assembla.me/GCD.c
   ```

2. Edit the file using name `nano`

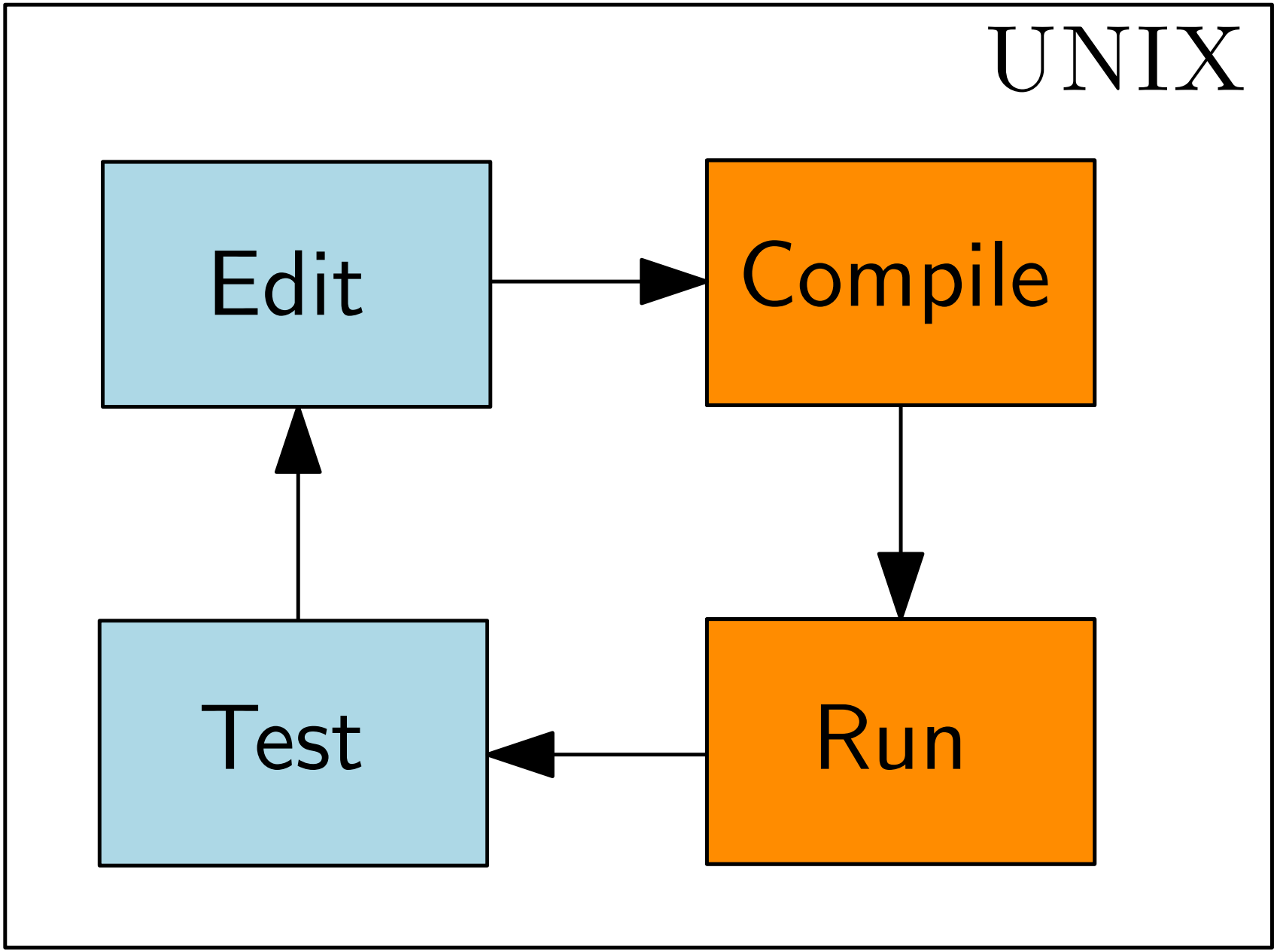
   ```
   nano GCD.c
   ```

3. Type in your name and matric number as indicated in the file.
4. Save the file and exit nano by pressing

   ```
   Ctrl-x
   ```

5. Check the contents of the file using the `cat` command

   ```
   cat GCD.c
   ```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Activity: Compiling and running

1. C programs are compiled using the `gcc` compiler.

   ```
   gcc GCD.c
   ```

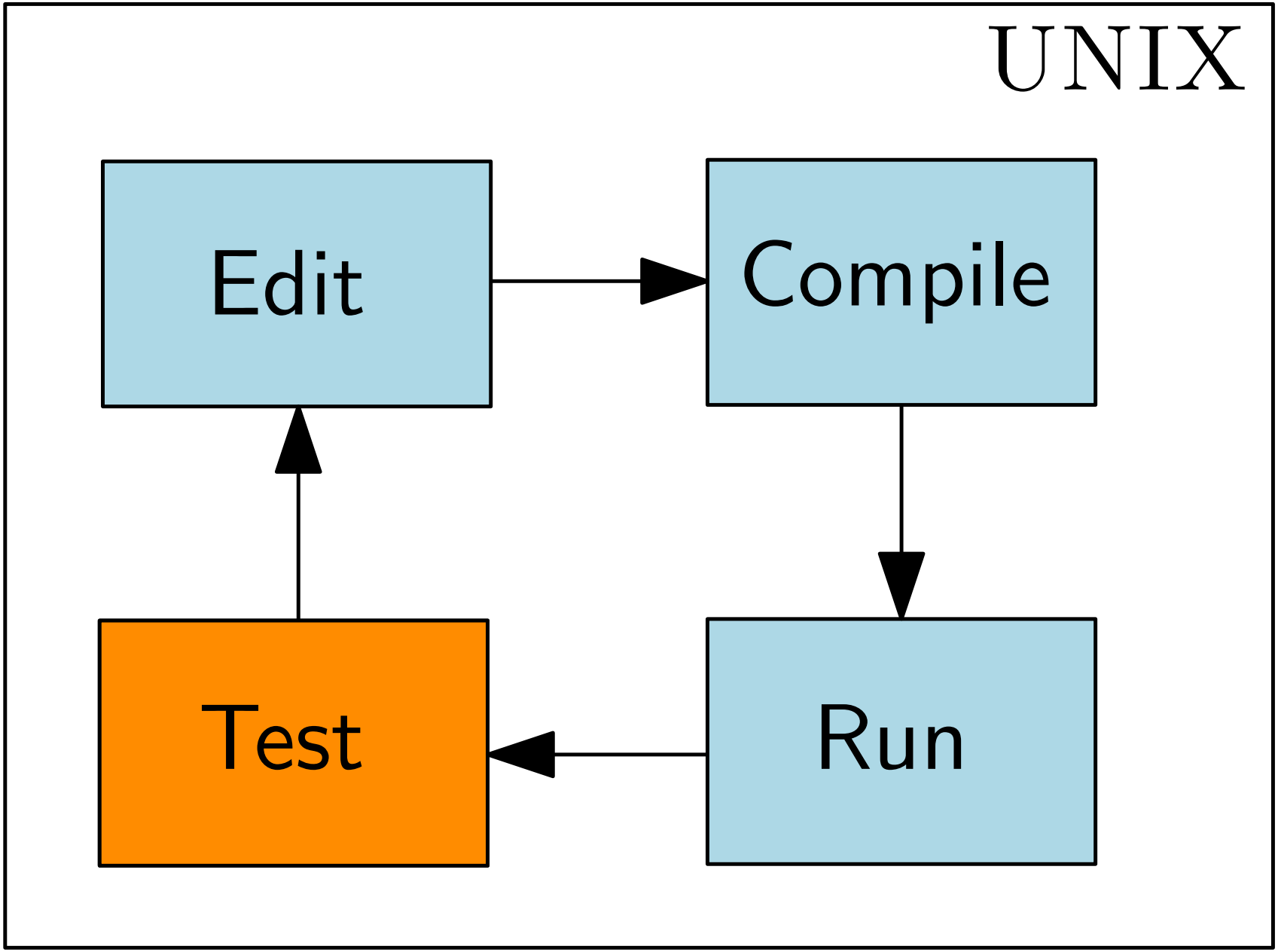
2. To run a program, you must add `./` in front of its name. The default name used by gcc is `a.out`
3. Run the GCD program

   ```
   ./a.out
   ```

4. Type in a pair of integers followed by the `Enter` key, for example

   ```
   58 24
   ```

5. Repeat step 4 as many times as you like.
6. To force the program to end, press `Ctrl-c`


UNIX
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Compile
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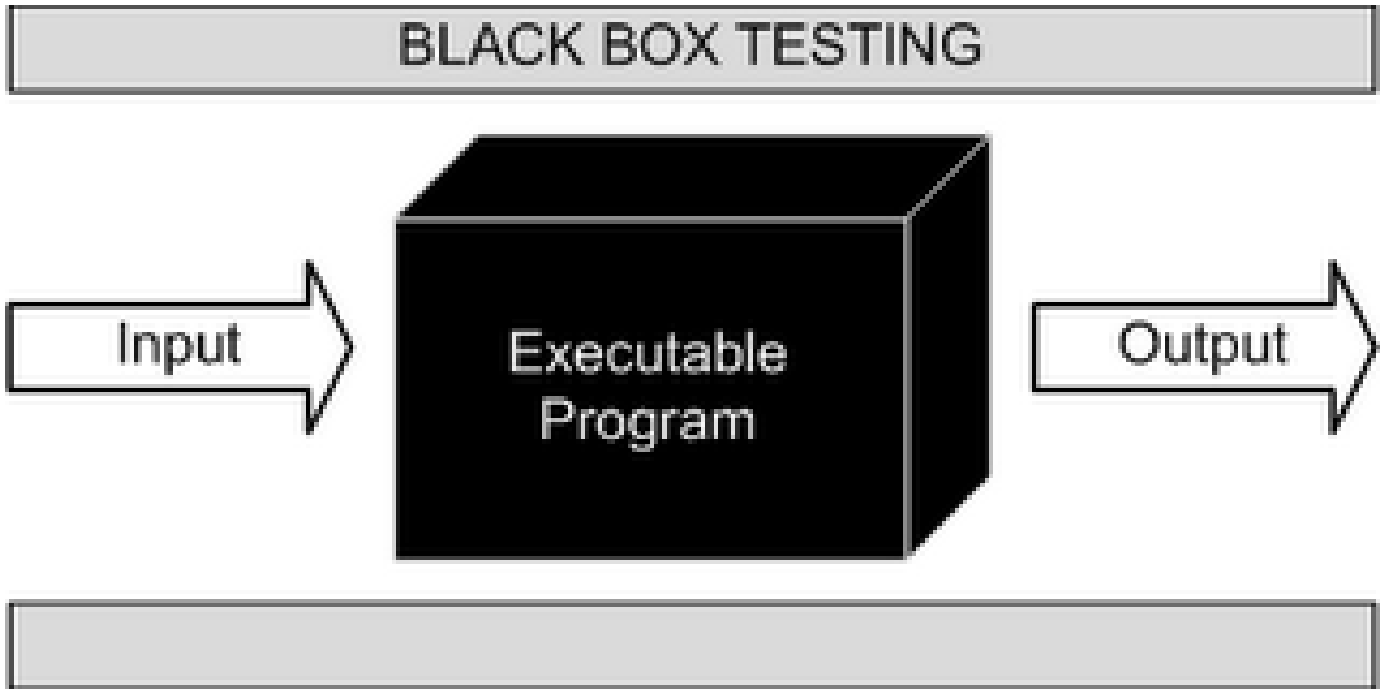
Testing



Testing on UNIX

```
$ program < input > output
```

Activity: Creating the input

1. Instead of typing the input by hand as in the previous activity, we create an input file using nano.

   ```
   nano input
   ```

2. Type in pairs of integers, one pair per line, for example

   ```
   3 10
   15 25
   200 420
   ```

3. Save and exit nano.

Activity: Creating the correct output

1. Create an file for the correct output

   ```
   nano answer
   ```

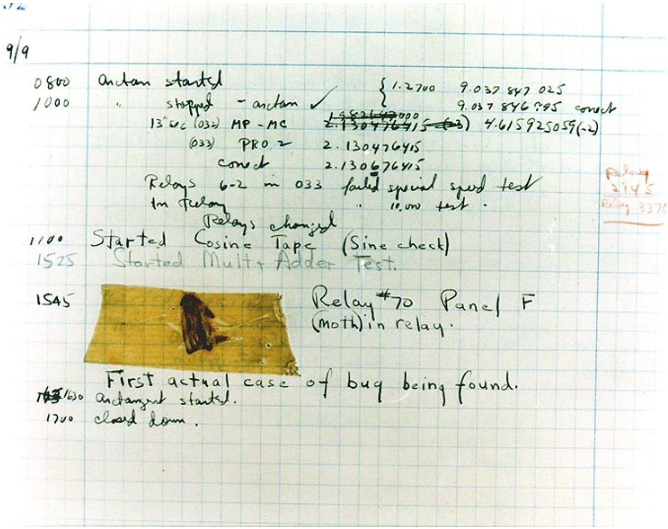
2. Type in the correct GCD for each pair of integers in the input

   ```
   GCD(3,10)=1
   GCD(15,25)=5
   GCD(200,420)=20
   ```

3. Save and exit nano.
4. Run the GCD program on the test case.

   ```
   ./a.out < input > output
   ```

When things go wrong



Activity: Find the bugs!

1. Open `output` in nano and verify if it matches the correct answer.

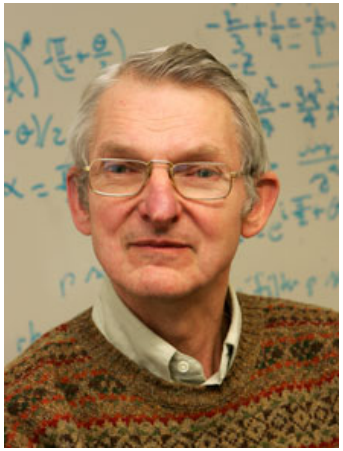
```
nano output
```

2. If they differ, you've found the bug!, else try again with different `input/answer` files
3. Hint: manually checking whether two files are identical is boring, try using the `diff` command

```
diff answer output
```

The UNIX Philosophy

Write programs that do one thing and do it well.
Write programs to work together.
Write programs to handle text streams, because that is a universal interface.



– Douglas McIlroy
(inventor of UNIX pipes)

Activity: SMS Word Count

Your friend from FASS is studying SMS language as part of a course project. She collected a number of SMS messages and would like to find out the frequency of each word.

Activity: SMS Word Count

For example, given the following text file:

```
U wan 2 haf lunch i'm in da
canteen now.
Haf u found him? I feel so
stupid da v cam was working.
Where r we meeting?
I went to ur hon lab but no
one is there.
```

The desired output is:

```
.
.
.
1 we
1 went
1 Where
1 working.
2 da
2 I
```

Activity: `sort` and `uniq`

Two UNIX utility programs are related to our task.

`sort`

Input:		Output:
dog		bat
bat	$\longrightarrow$	cat
log		dog
cat		log

`uniq`

Input:		Output:
dog		dog
dog	$\longrightarrow$	cat
cat		dog
cat		cat
dog		
cat		
cat		

Activity: SMS Word Count I

1. Download the file containing sms messages from `http://uws.assembla.me/SMSwords.txt` using wget

   ```
   wget http://uws.assembla.me/SMSwords.txt
   ```

2. Sort the file.

   ```
   sort SMSwords.txt
   ```

3. Sort and remove duplicates.

   ```
   sort SMSwords.txt | uniq
   ```

Activity: SMS Word Count II

4. We need to use a particular option of `uniq` which counts the number of duplicates, read the manual page for `uniq`. Press `q` to leave the manual page.

   ```
   man uniq
   ```

5. Sort and count words,

   ```
   sort SMSwords.txt | uniq -???
   ```

6. Sort by the frequency, so that more frequent words appear later,

   ```
   sort SMSwords.txt | uniq -???  | sort -n
   ```

Activity: Logging out of `sunfire`

To log out of `sunfire`, use the `logout` command,

```
logout
```

Useful programs/websites

- KiTTY, SSH client for Windows
  http://www.9bis.net/kitty/
- Cygwin, UNIX-like environment for Windows
  http://www.cygwin.com/
- Description of computing facilities in SoC
  http://docs.comp.nus.edu.sg/cf
- mySoC, web service portal
  https://mysoc.nus.edu.sg