

UNIX Workshop

<http://www.comp.nus.edu.sg/~melvin/UWS/>

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Jurassic Park (1993)

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

– Alexis “Lex” Murphy, Jurassic Park (1993)

Outline

Introduction to UNIX

- Origins of UNIX

- UNIX Concepts

UNIX in SoC

- Checking your SoC email account

- SoC's sunfire server

- Creating text files

- Organising your home directory

- Some useful applications on UNIX

Summary

Resources

Acknowledgement

The materials for this workshop are adapted from the following sources:

- ▶ UNIX Workshop 2005 notes by Mark Tan (SoC, NUS)
- ▶ CS1101 Lab 0 notes by Aaron Tan (SoC, NUS)
- ▶ UNIX/Linux Tutorial for Beginners by Michael Stonebank (University of Surrey)

UNIX in SoC

The UNIX environment provided by the Solaris OS on our servers are used for:

- ▶ writing programs for your programming labs/assignments
- ▶ learning about operating system concepts (CS2106, Operating Systems)
- ▶ hosting a database driven site (CS2102, Database Systems)
- ▶ accessing SoC printers and checking your print quota
- ▶ reading your SoC email account

What is an Operating System?

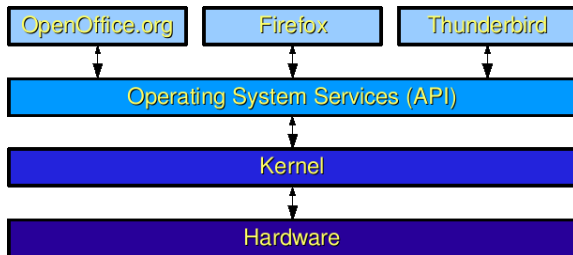


Figure: Relation between applications, OS and hardware

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Creators of UNIX



Figure: Dennis Ritchie (standing) and Ken Thompson working on a PDP-11.

Creators of UNIX



Figure: Ken Thompson (left) and Dennis Ritchie receiving the National Medal of Technology from President Clinton.

UNIX Family Tree

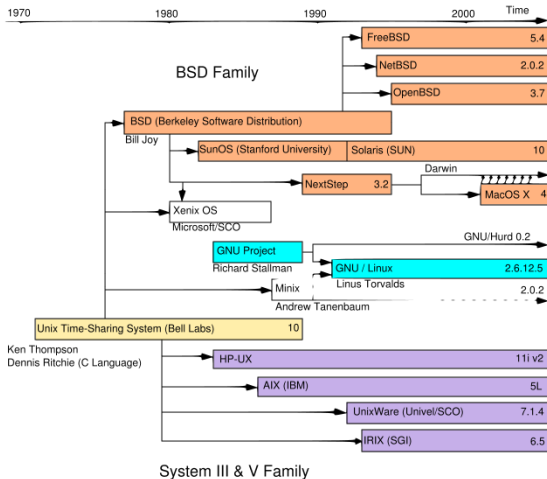


Figure: UNIX and its descendants

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Activity: Login to NUSNET

1. Press Ctrl-Alt-Delete.



2. Type in your NUSNET username, password and select NUSSTU domain.



3. Click on the Ok button.

Activity: Creating your UNIX account

1. Login to <https://mysoc.nus.edu.sg/~newacct> using your NUSNET username and password.
2. Read through the user-agreement and make sure you understand the obligations.
3. Decide your UNIX username. Your username should be between 5-8 characters and must be formed from your name. You may also use your NUSNET username.
4. Type in your new password (twice).
5. Submit your application.

Privileges

Your new UNIX account comes with the following privileges:

- ▶ Email : `unix_username@comp.nus.edu.sg`
- ▶ Website : http://www.comp.nus.edu.sg/~unix_username
- ▶ Solaris zone: `unix_username-z.comp.nus.edu.sg`
- ▶ Disk quota: 2Gb
- ▶ Print quota: 50 pages/month

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Checking UNIX email

You can access your UNIX email account via mySoC Webmail,
<http://mysoc.nus.edu.sg/~webmail>



mySoC
your personalized portal

30 July 2015, 11:45 PM | Home | Logout | SiteMap | Help

mySoC Webmail

Name:

Password:

Login

Your feedback/comments to SoC Helpdesk.

WebMail Information and FAQs.

Notice: SoC Staff and Students who do not have SoC email account will not be able to access email via this WebMail interface.

Parent Office > School of Computing > SCS > SoC Access Portal

Figure: mySoC Webmail interface

Your mailbox part of your disk usage, which is 2Gb. You can forward your NUSNET email to your UNIX email using
<https://exchange.nus.edu.sg/autoforward>.

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sunfire server in the Machine Room



Figure: sunfire server located in the Machine Room with our Networks staff. Clockwise from top-left: Tan Chee Sin, Tan Kwang Pon, Budiman Tsjin (has since left SOC) and Lai Zit Seng.

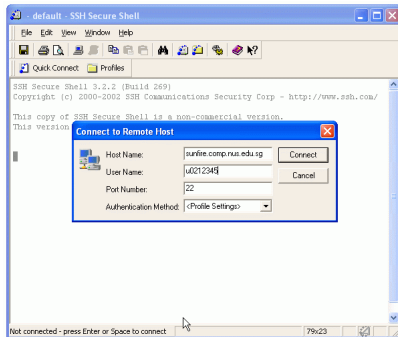
Activity: Connecting to sunfire

1. From the desktop, launch the SSH Secure Shell Client application.

2. Click on Quick Connect

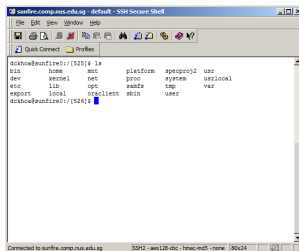
Host Name: sunfire.comp.nus.edu.sg

User Name: your UNIX username



3. Click on Connect. Enter your UNIX password in the password dialog.

Command line interface



The screenshot shows a terminal window titled "sunfire.comp.nus.edu.sg - default - SSH Secure Shell". The terminal displays the output of the command `ls` executed by the user `dothoe` on the host `sunfire01`. The output is a long listing of files and directories, including `bin`, `home`, `mot`, `platform`, `sperproj2`, `usr`, `dev`, `kernel`, `net`, `proc`, `system`, `usrlocal`, `etc`, `lib`, `opt`, `samba`, `tmp`, `var`, `export`, `local`, `oracleinst`, `sbin`, and `user`. The prompt `dothoe@sunfire01:[126]` is visible at the bottom of the terminal.

```
dothoe@sunfire01:[126]$ ls
bin      home    mot      platform sperproj2  usr
dev      kernel  net      proc     system     usrlocal
etc      lib     opt      samba    tmp         var
export   local   oracleinst sbin     user
```

Launching program by typing name follow by parameters.
Programs as functions, $f(x)$

Command line interface

- ▶ Silence is golden: there is usually no output when a program runs successfully
- ▶ Easy to automate repetitive tasks
- ▶ Default interface when accessing remote servers

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Text files are ubiquitous on UNIX

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

```

vim.c - GVIM1
File Edit Tools Syntax Buffers Window Help
vim.c - GVIM1
/* vimset
 * vimrc
 * VIM - V
 * vim_nemset
 * vim_tcl_init
 * vim_men_profile_dump
 * Do *the
 * vimdiff
 * See REA
 * vim_chdirfile
 * vim_chdir
 * viminfo
 * vim_snprintf
 * vim_free
 * vim_isdigit
 * Structure
 * vim_getenv
 * vim_strsave
 * vimrc_found
 * vim_strsave_escaped_ext
 * vim_strsave_escaped
 * VIM - V
 * vimconv_T
 * vimconv
 * Do *the
 * vim_strsave_up
 * Do *the
 * vim_strchr
 * See REA
 * vimmenu_T
 * vim_ishwhite
 * vim_regcomp
 * vim_regexec_n
 * #if define
 * #include "vim.h"
 * #endif
 * #define EXTERN
 * #include "vim.h"
 * #ifdef SPANND
 * [2] main.c [11c]
 * Scanning included files: arabic.c
 * -- Keyword completion (*NPP) match 1 of 64

```

Figure: Screenshot of GVim

Vim is a modal editor

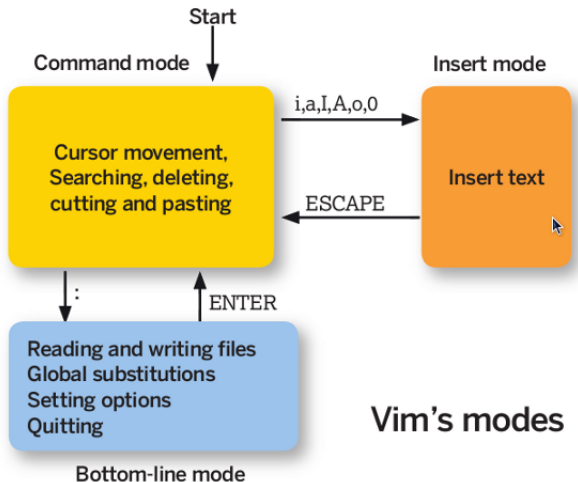


Figure: Different modes of Vim and how to switch between them

Activity: Text editing with Vim

1. From the Secure Shell Client window start Vim and create a new file using the command

```
vim hello.txt
```

2. Vim puts you in Normal mode by default. Switch to Insert mode using the 'i' key.

```
i
```

3. Type a short message to introduce yourself.
4. Now return to Normal mode by pressing the Escape key.

```
<Esc>
```

5. Save the file and exit Vim by pressing 'ZZ'

```
ZZ
```

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UNIX Directory Tree

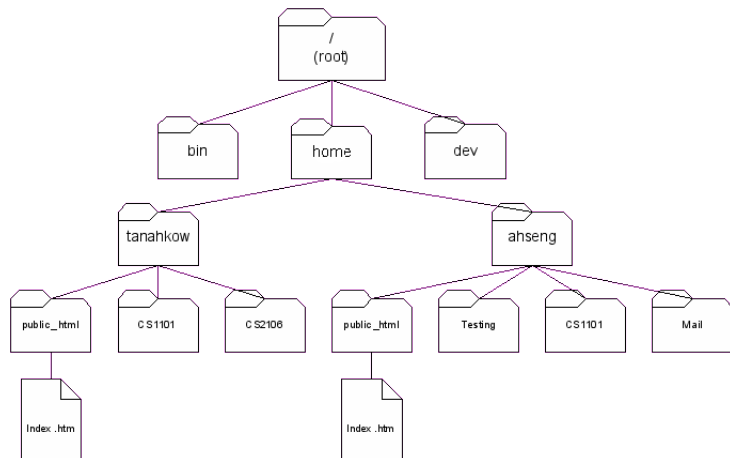


Figure: A subset of the UNIX directory tree showing home directories

Activity: playing with diff and grep I

1. What is `diff`? – compare differences between files
2. Text editing usually leaves a lot of backup files ending with `~`.
One day you want to figure out the differences between a file `text` and its backup `text~`...
Open in two editors and then eye-ball?

```
diff firstFile secondFile
```

3. A quick how-to

Activity: playing with diff and grep II

Let's see how text and text~ look like first

Output of cat text

```
same text
same text
Hello World!
still the same
still the same
```

Output of cat text~

```
same text
same text
Hello World~
still the same
still the same
```

Activity: playing with diff and grep III

Output of `diff text text~` :

3c3

< Hello World!

> Hello World~

Activity: playing with diff and grep IV

1. What is grep? *– look for a pattern in file(s)
`grep pattern file`
2. Sometimes it is useful to find the occurrences of some word in a (list of) file.
Say you suspect a typo in you source code,
open a text editor and 'Find'?
3. But what if you made the same typo in a lot of files?
'grep' makes your life easier
Let's find out how to 'grep'

Activity: playing with diff and grep V

Sample output of `grep h1 a.html`:

```
grep h1 a.html
```

```
<h1>Hello World!</h1>
```

Contents of a.html

```
<html>
```

```
<body>
```

```
<h1>Hello World!</h1>
```

```
</body>
```

```
</html>
```

Activity: playing with diff and grep V

Sample output of `grep h1 a.html`:

```
grep h1 a.html
```

```
<h1>Hello World!</h1>
```

Contents of a.html

```
<html>
```

```
<body>
```

```
<h1>Hello World!</h1>
```

```
</body>
```

```
</html>
```

A bit too easy, isn't it? Ready to get nasty?

Getting serious about grep

1. Output of `grep h1 a.html*`

```
a.html:<h1>Hello World!</h1>
```

```
a.html~:<h1>Hello World~</h1>
```

Getting serious about grep

1. Output of `grep h1 a.html*`

```
a.html:<h1>Hello World!</h1>
```

```
a.html~:<h1>Hello World~</h1>
```

2. Output of `grep -n h1 a.html*`

```
a.html:3:<h1>Hello World!</h1>
```

```
a.html~:3:<h1>Hello World~</h1>
```

Getting serious about grep

1. Output of `grep h1 a.html*`

```
a.html:<h1>Hello World!</h1>
```

```
a.html~:<h1>Hello World~</h1>
```

2. Output of `grep -n h1 a.html*`

```
a.html:3:<h1>Hello World!</h1>
```

```
a.html~:3:<h1>Hello World~</h1>
```

3. Output of `grep -n -i 'heLlO wORlD' a.html*`

```
a.html:3:<h1>Hello World!</h1>
```

```
a.html~:3:<h1>Hello World~</h1>
```

Getting serious about grep

1. Output of `grep h1 a.html*`

```
a.html:<h1>Hello World!</h1>
```

```
a.html~:<h1>Hello World~</h1>
```

2. Output of `grep -n h1 a.html*`

```
a.html:3:<h1>Hello World!</h1>
```

```
a.html~:3:<h1>Hello World~</h1>
```

3. Output of `grep -n -i 'heLlO wORlD' a.html*`

```
a.html:3:<h1>Hello World!</h1>
```

```
a.html~:3:<h1>Hello World~</h1>
```

4. Find out more in 'man grep' !

Getting serious about grep

1. Output of `grep h1 a.html*`

```
a.html:<h1>Hello World!</h1>
```

```
a.html~:<h1>Hello World~</h1>
```

2. Output of `grep -n h1 a.html*`

```
a.html:3:<h1>Hello World!</h1>
```

```
a.html~:3:<h1>Hello World~</h1>
```

3. Output of `grep -n -i 'heLlO wORlD' a.html*`

```
a.html:3:<h1>Hello World!</h1>
```

```
a.html~:3:<h1>Hello World~</h1>
```

4. Find out more in 'man grep' !

5. grep on Linux is more fun! :p

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Activity: Printing



Figure: Lexmark printers at COM1

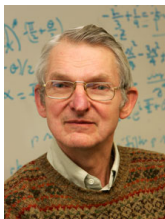
- ▶ View the status of the print queue, use `lpq`,
`lpq -P pstsc`
- ▶ Remove a print job after it has been sent, use `lprm`,
`lprm -P pstsc 89`
- ▶ Check your print quota, use `pusage`,
`pusage`

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

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	→	cat
log		dog
cat		log

uniq

Input:		Output:
dog		dog
dog	→	cat
cat		dog
cat		cat
dog		
cat		
cat		

Activity: SMS Word Count I

1. Download the file containing sms messages from <http://www.comp.nus.edu.sg/~melvin/UWS/SMSwords.txt> using wget

```
wget http://www.comp.nus.edu.sg/~melvin/  
UWS/SMSwords.txt
```

2. Sort the file.

```
sort SMSwords.txt
```

Activity: SMS Word Count II

- Sort and remove duplicates.

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

- 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
```

- Sort and count words,

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

Activity: SMS Word Count III

- Sort by the frequency, so that more frequent words appear later,
`sort SMSwords.txt | uniq -??? | sort -n`

Activity: Setting up your homepage (Optional)

Instead of using `hello.txt`, create a file named `index.html` and put it in your `public_html` directory. Remember to change its permissions to readable by all.

```
<html>
<head>
<title>Sample index page</title>
</head>
<body>
Hello World
</body>
</html>
```

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In this workshop, we have covered the following topics:

- ▶ UNIX from past to present
- ▶ Connecting to `sunfire` via `ssh`
- ▶ Text editing using `Vim`
- ▶ Using `sunfire` as a web host
- ▶ Manipulating text files using UNIX utilities

Activity: Logging out of sunfire

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

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Computing Resources in SoC

- ▶ Description of facilities in SoC,
<https://www.comp.nus.edu.sg/cf> and
<https://mysoc.nus.edu.sg/~wiki>
- ▶ Web based services, mySoC, <https://mysoc.nus.edu.sg>
- ▶ SoC Webmail <https://mysoc.nus.edu.sg/~webmail>
- ▶ SSH Secure Shell Client 3.2.9,
http://www.comp.nus.edu.sg/~cs1101x/2_resources/SSHSecureShellClient-3.2.9.exe