

UNIX

The Very¹⁰ Short Howto for beginners

Soon-Hyung Yook

March 27, 2015

Table of Contents

- 1 History of Unix
- 2 What is UNIX?
- 3 What is Linux?
- 4 How does Unix work?
- 5 How to Use it?

How old is UNIX?

- Unix originally dates back to 1969 with a group at Bell Lab.
- The original Unix OS was written in assembler.
- In 1973 Ken Thompson and Dennis Ritchie finally rewrite Unix in their new language, C.
- The first Unix installation in 1972 had 3 users and a 500KB diet.



Thompson and Ritchie work at DEC-PDP 11

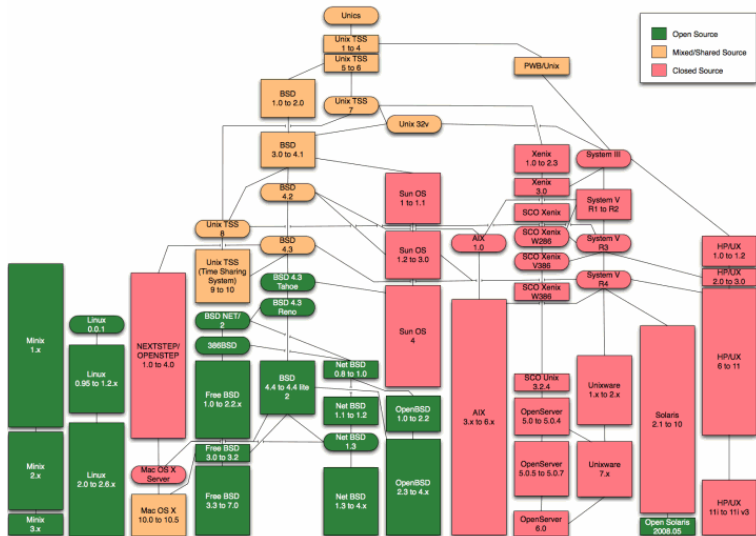
What is UNIX?

- Unix is a multiuser, multitasking **operating system (OS)**.
 - manage hardware resources.
 - manage directories and file systems
 - loading, excuting, suspending programs
- There are many names of Unix:
 - Solaris (Sun)
 - AIX (IBM)
 - True64 (Compaq)
 - IRIX (SGI)
 - System V (from AT&T)
 - BSD (from Berkeley)

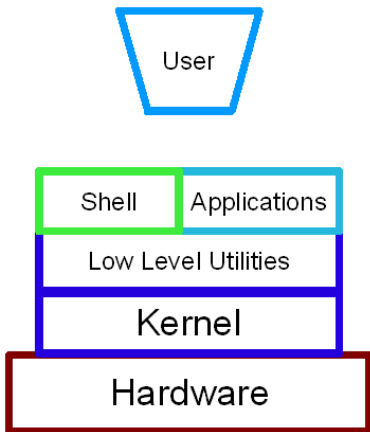
What is Linux?

- Linux is a clone of the Unix OS written from scratch by Linus Torvalds with assistance from developers around the world.
- Developed under the **GNU General Public License**
- The source of Linux is freely available.
- There are large number of Linux distributors:
 - RedHat, Fedora, CentOS, Scientific Linux
 - Slackware
 - Debian, Ubuntu, Mint, Lubuntu
 - SUSE, OpenSUSE
 - Gentoo
 - Mandrake
 - Arch
 - KNOPPIX

Hierarchy of Unix Systems



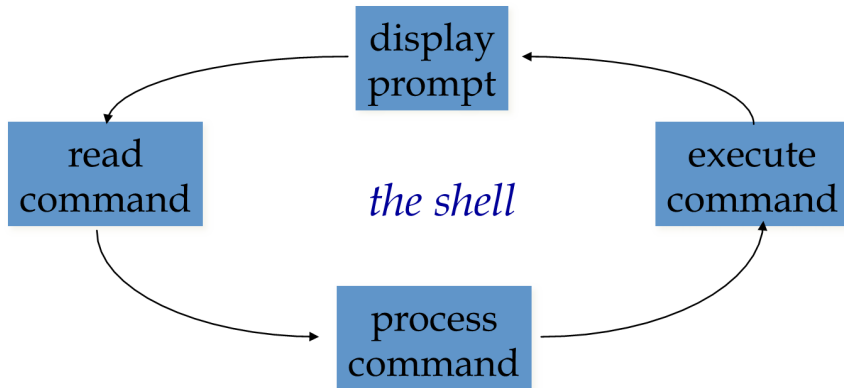
Kernel



- The kernel is the core of OS
- Kernel receives tasks from the shell and performs them.
- Users interact with the shell.
- Shells
 - csh, tcsh
 - bash
 - ksh (Korn shell)
 - sh (Bourne shell)
 - etc.
- Everything in Unix is either a *file* or a *process*.
- A process is an executing program identified by a unique PID (process identifier).
- make a shell script

What does the shell do?

- The Unix user interface is called the **shell**.
- The shell tends to do 4 jobs repeatedly:



User Interface

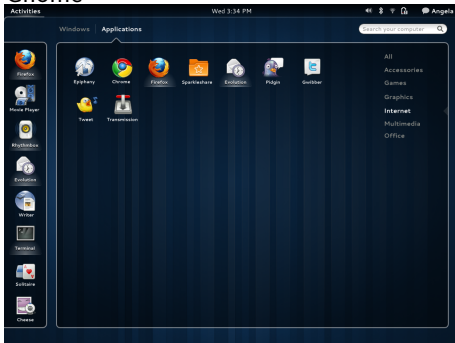
- Graphical User Interface (GUI): **X-Windows**.
- Command Line Interface (CLI): text based shell.
- Basically, the user interacts with UNIX through a shell.
- Remote access a shell: using **telnet**, **ssh**

X-Windows

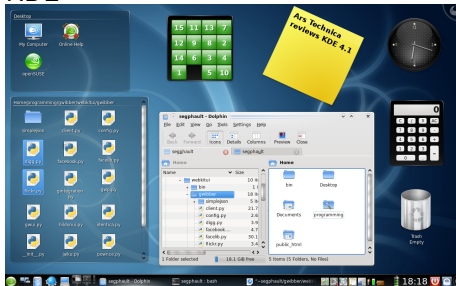
- X-Windows is the standard graphical layer for Unix systems
- Server-client
- X supports **remote connectivity**.
- Windows manager/Desktop Environments
 - WM: fvwm, window maker, open box, owm, etc
 - DE: Gnome, KDE, MATE, XFCE, LXDE, etc.

Examples of X-windows systems

Gnome



KDE



Unix Accounts

User Accounts

- To access a Unix system you need to have an **account**.
- Unix account includes:
 - username and password
 - userid and groupid
 - home directory
 - a default shell preference
 - other unimportant informations
 - “/etc/passwd”
- Username is a sequence of alphanumeric characters.
- Password should be a secrete string that only the user knows.
 - Not even the system (or administrator) knows a user's password.
 - Password is encrypted.
 - Strong recommendation: use the special characters and/or numbers.

Let's Login



```

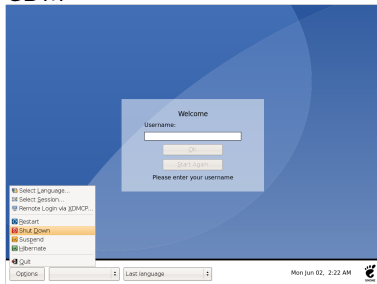
Renounting root device with read-write enabled.
/dev/sda1 on / type ext2 (rw)
Checking non-root filesystems:
fsck 1.34 (25-Jul-2003)
devpts on /dev/pts type devpts (rw,gid=5,mode=620)
proc on /proc type proc (rw)
Setting system time from the hardware clock (localtime).
Module dependencies up to date (no new kernel modules found).
Linux agpgart interface v0.99 (c) Jeff Hartmann
agpgart: Maxima main memory to use for agp memory: 322M
agpgart: Detected Intel 440BX chipset
agpgart: AGP aperture is 64M @ 0xf4000000
pcnet32.c:v1.27a 10.02.2002 tsbogend@alpha.franken.de
PCI: Found IRQ 10 for device 00:11.0
pcnet32: PCnet/PCI II 79C970A at 0x10e0, 00 0c 29 5b 82 80 assigned IRQ 10.
eth0: registered as PCnet/PCI II 79C970A
pcnet32: 1 cards found.
scsi1 : SCSI host adapter emulation for IDE ATAPI devices
Using /etc/random-seed to initialize /dev/urandom.
INIT: Entering runlevel: 3
Going multiuser...
Configuring eth0:
/sbin/ifconfig eth0 192.168.0.6 broadcast 192.168.0.255 netmask 255.255.255.0
Starting sysklogd daemons: /usr/sbin/syslogd /usr/sbin/klogd -c 3 -x
Starting OpenSSH SSH daemon: /usr/sbin/sshd
Updating shared library links: /sbin/ldconfig
Updating X font indexes: /usr/X11R6/bin/fc-cache

Welcome to Linux 2.4.22 (tty)

foo login: █

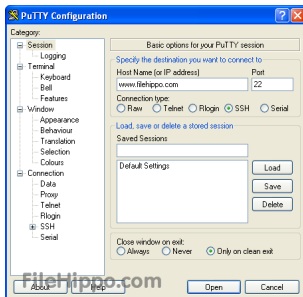
```

GDM



Remote Login

- Use ssh for security reason.
- Windows client programs:
 - putty
 - Xshell
 - other ssh-client programs

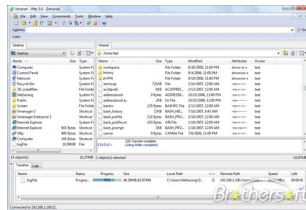
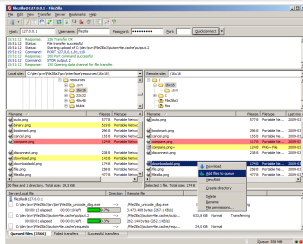


File Transfer

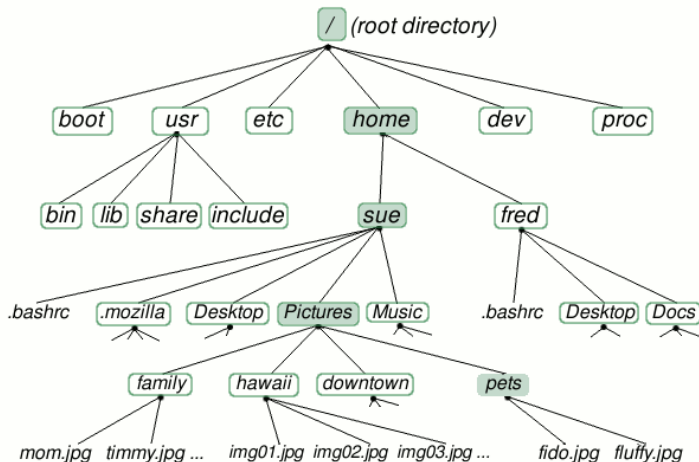
scp

```
scp syook@163.180.1.1:/home/syook/test.txt ./
scp ./test.txt syook@163.180.1.1:/home/syook/tmp
```

- Windows client programs:
 - Filezilla
 - Xftp
 - winscp
 - other scp-client programs



Unix Directory Tree



Directory and Files

Directory

- A directory is a special kind of file
- Unix uses a directory to hold information about other files
- The directory is often regarded as a container having other files and directories
- **Folder** in MS-windows systems

File name

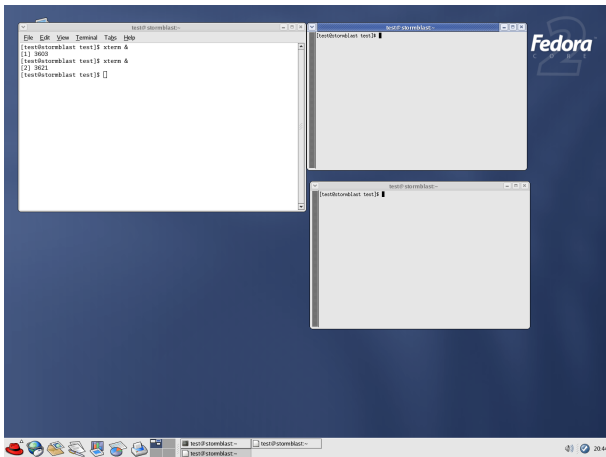
- Each file should have a unique name
- The file name in UNIX is case sensitive
- Devices are regarded as a file

Pathname

- The hierarchical path from the root: Absolute path
- The hierarchical path from the current directory: relative path

Basic Command

- If you are using the X-windows system, run xterm or gnome-terminal, etc.



Basic Command

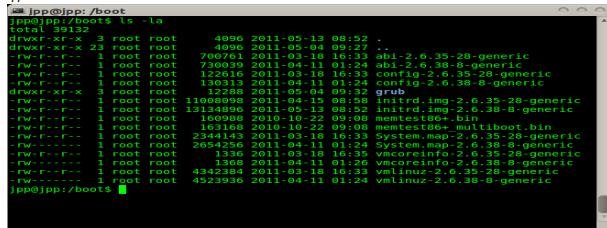
man: display the manual page (RTFM)!

man ls

ls: displays the names of files and directories.

- options l, a, etc.

ls -l -a



```
jpp@jpp: /boot
jpp@jpp:/boot$ ls -la
total 39132
drwxr-xr-x 3 root root 4096 2011-05-13 08:52 .
drwxr-xr-x 23 root root 4096 2011-05-04 09:27 ..
-rw-r--r-- 1 root root 700761 2011-03-18 16:33 abi-2.6.35-28-generic
-rw-r--r-- 1 root root 730039 2011-04-11 01:24 abi-2.6.38-8-generic
-rw-r--r-- 1 root root 122616 2011-03-18 16:33 config-2.6.35-28-generic
-rw-r--r-- 1 root root 130313 2011-04-11 01:24 config-2.6.38-8-generic
drwxr-xr-x 3 root root 12288 2011-05-04 09:32 grub
-rw-r--r-- 1 root root 1108098 2011-04-15 08:58 initrd.img-2.6.35-28-generic
-rw-r--r-- 1 root root 13134896 2011-05-13 08:52 initrd.img-2.6.38-8-generic
-rw-r--r-- 1 root root 160988 2010-10-22 09:08 memtest86+.bin
-rw-r--r-- 1 root root 163168 2010-10-22 09:08 memtest86+.multiboot.bin
-rw-r--r-- 1 root root 2344143 2011-03-18 16:33 System.map-2.6.35-28-generic
-rw-r--r-- 1 root root 2654256 2011-04-11 01:24 System.map-2.6.38-8-generic
-rw-r--r-- 1 root root 1336 2011-03-18 16:35 vmcoreinfo-2.6.35-28-generic
-rw-r--r-- 1 root root 1368 2011-04-11 01:26 vmcoreinfo-2.6.38-8-generic
-rw-r--r-- 1 root root 4342384 2011-03-18 16:33 vmlinuz-2.6.35-28-generic
-rw-r--r-- 1 root root 4523936 2011-04-11 01:24 vmlinuz-2.6.38-8-generic
jpp@jpp:/boot$
```

Basic Command

permission

```

root@Gateway [/var/test]# ls -l
total 220
drwxr-xr-x  2 root root 1024 Jun 27 13:52 ./
drwxr-xr-x 21 root root 1024 Jun 16 03:32 ../
-rw-r--r--  1 root sys   79 Jun 27 11:28 dirlist.txt
-rw-r--r--  1 root root   45 Jun 19 06:59 document1
-rw-r--r--  1 root root   50 Jun 27 11:27 document2
-rw-r--r--  1 root root   26 Jun 27 13:51 document3.txt
-rw-r--r--  1 root root   26 Jun 27 13:51 document4.txt
-rw-r--r--  1 root root   73 Jun 27 13:50 document5.txt
-rwxr-xr-x  1 root root 214727 Jun 25 18:32 messages*
-rw-r--r--  1 root root  120 Jun 27 13:52 results.txt
root@Gateway [/var/test]#
  
```

Ready ssh2: 3DES 13, 27 16 Rows, 78 Cols ANSI

Basic Command

pwd

where am I?

```
# pwd
```

chmod

change the permission

```
# chmod 755 test.txt
```

chown

change the ownership

```
# chown -R syook:statphys test.txt
```

Basic Command

cd

change the directory

absolute and relative path

```
# cd /usr/bin
```

```
# cd ../../download
```

touch

make an empty file

```
# touch 111.txt
```

mkdir

make a directory

```
# mkdir tmp
```

Basic Command

cp

copy the file

```
# cp *.dat ../data/
```

```
# cp 111.txt 123.txt
```

mv

move the file

used to change the name of the file/directory

```
# mv *.dat ../data/
```

```
# mv 111.txt 123.txt
```

rm

remove the file

unrecoverable unlike the windows!

```
# rm *.dat
```

```
# rm 111.txt
```

```
# rm *
```

Basic Command

passwd

change the password

```
# passwd
```

ps

display the processes on the machine

```
# ps aux | grep syook
```

kill

Kill the process

```
# kill -9 [PID]
```

more (less)

```
# more test.txt
```

Basic Command

cat

```
#cat test.txt
```

wc

count the word

```
# wc -l test .txt
```


Job suspension and background running

Run a background process

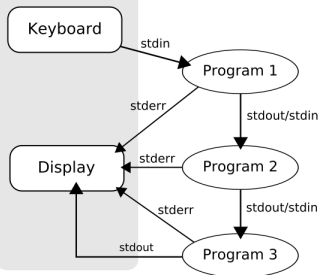
use `&`
`xterm &`

Suspend a process

use `^Z` (Ctrl+Z)
Change the state of suspended job into the background job
just type **bg**
`bg`

pipeline

Text terminal



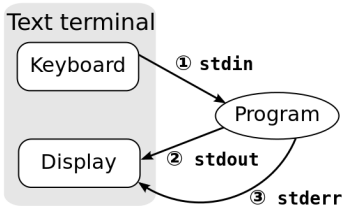
A pipe line of three programs run on a text terminal (wikipedia).

- a set of processes chained by their standard streams
- the output of each process (stdout) feeds directly as input (stdin) to the next one

```
program 1 |program2 |program3
```

```
# ls |grep test |less
```

redirection



The standard streams for input, output and error (wikipedia).

- redirection is a function common to most command-line interpreters, including the Unix shells.
- redirect the standard streams to user-specified locations

```
# ls >res.txt
# command < file
# command1 < infile > outfile
# command1 >> file (append to the file)
# command 2> file (save the stderr to the file)
# command 2>&1 (redirect the stderr to stdout)
```

Text Editors

- GUI (X-wiondows): anjuta, gedit, nedit, etc.
 - pretty much like the text editors on MS-Windows
- CLI: vi, vim, emacs
 - We will learn vi in more detail.

Logout

logout

logout

or

exit

or

^D (Ctrl+D)