

UNIX Basics + shell commands

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Where UNIX started



Ken Thompson & Dennis Ritchie

- Multics OS project (1960s) @ Bell Labs
- UNIX on scavenged PDP-7 (1969)
- Space Travel game
- Good environment to do programming + a “fellowship” could form.
- B \rightarrow C (1971 - 1973)



DEC PDP-7


Homework

- Read
 - “A Brief History of System Administration” from the textbook, available on NTU COOL
 - Optional: Origins and History of Unix, 1969-1995 (more details)
- Zuvio question: what would you do in the “era of Unix”?

Where LINUX

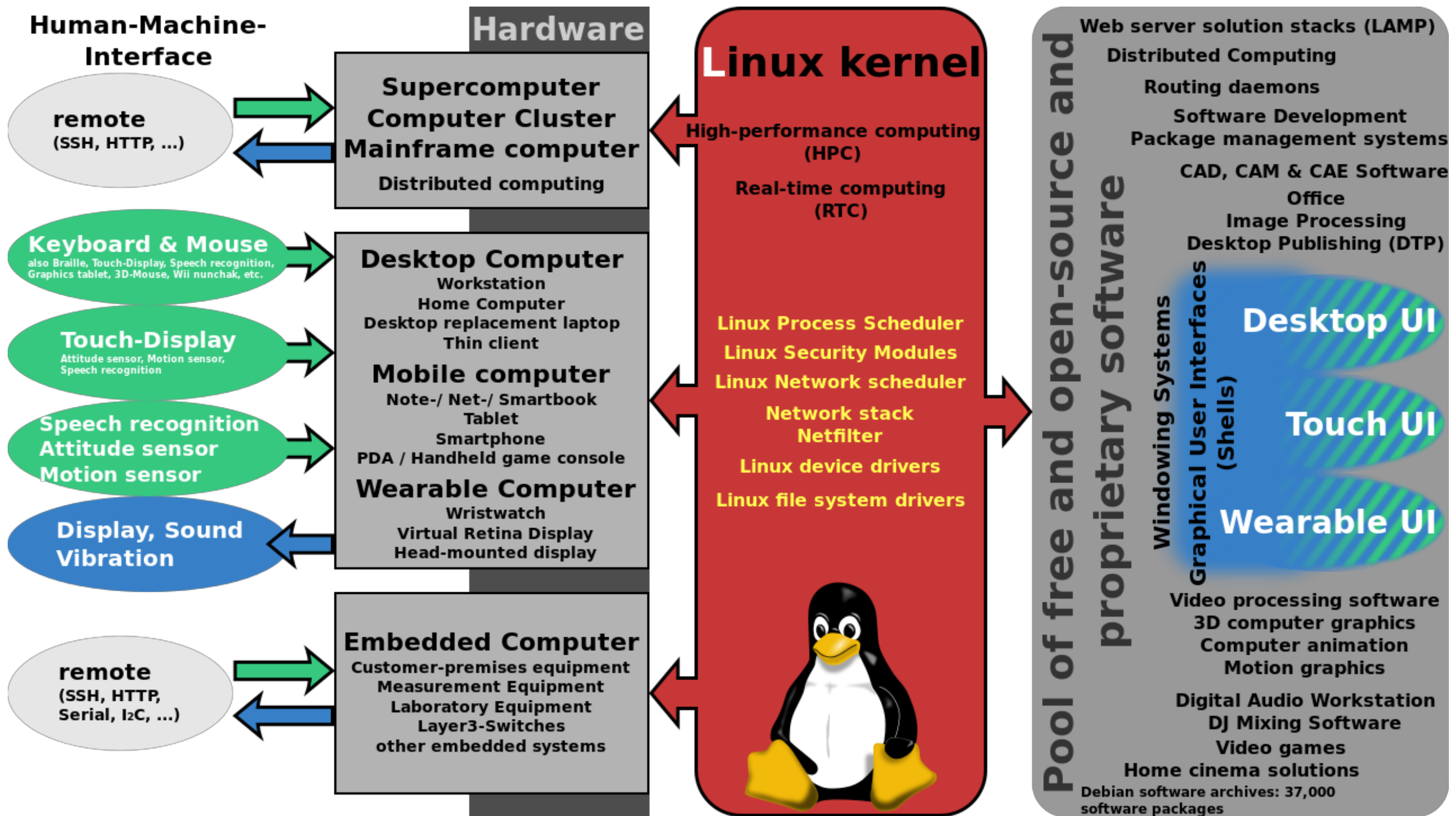


started

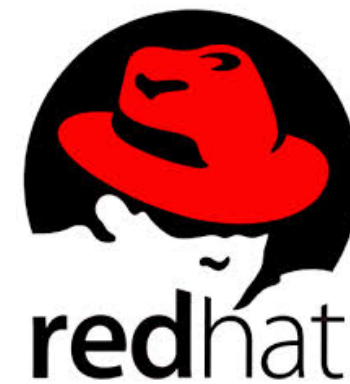
- Linus Torvalds: announced the Linux project (1991)
 - high cost of Sun's Unix
- Parallel: 386BSD
- Linux has Internet capability & X (1993)
- GNU toolkit  Richard Stallman & FSF
- “20 years of open-source software in different UNIX platforms”
- A “cheap UNIX system for everyone”



Linus Benedict Torvalds



Linux flavors



Linux族譜:

http://upload.wikimedia.org/wikipedia/commons/1/1b/Linux_Distribution_Timeline.svg

SSH to remote system

- https://wslab.csie.ntu.edu.tw/SSH_tutorial.html
- Make sure your terminal handles 中文 well
keyword: **encoding**, UTF-8, or Big5
- Choose a good font. Make the font size larger.

Exercise 1: SSH login without password

- Make sure 中文 is displayed correctly.
- Answer the question on zuvio:
terminal font and size.
- Disclaimer:
do NOT copy your private key over the network!
do this ONLY on your own computer!
- keyword: ssh-keygen

MAN: your online manual

- Your first man: `man man`
- Sections 1-9 of the man pages
- `[]` 可有可無
- `|` 選一個
- `...` 重複
- `man -k` 要找的東西 —> 列出所有相關的

Choose your editor

- Standard editor: Vim
- For beginner: nano or joe
- (learn vim online): <https://www.openvim.com>

Pipes and redirection

- 0 (STDIN), 1 (STDOUT), 2 (STDERR)
- > : STDOUT 到檔案 (覆蓋)
>>: STDOUT 到檔案 (加到尾巴)
>&: STDOUT + STDERR 到檔案
2>: STDERR 到檔案
<: 檔案餵給STDIN
|: 左邊程式STDOUT接到右邊程式的STDIN
- Example: `echo "test message" > /tmp/blahblah`
- Example: `find / -name core 2> /dev/null`

路徑

- 樹狀的結構
- /: 根目錄, 以及分隔. e.g., /home/hsinmu
- ~: 我的家目錄
- ~hsinmu: hsinmu這個帳號的家目錄

Some commands to learn

- 檔案管理: ls, cd, mkdir, rm, mv, cp, find, pwd
- 文字檔案處理: cat, less, tail
- 程序管理: ps, kill, top
- 寫shell script常用: grep, sort, wc, cut, echo, tee

File attributes

Example:

```
ls -ld dsa/
```

```
drwxr-xr-x  2 hsinmu users          4096 10月 14  2010 dsa1/
```

```
ld -l tmp
```

```
-rw-r--r--  1 hsinmu users          12  3月  9 16:08 tmp
```

- Role: owner, group owner, and others
- 檔案: x: 執行, w: 寫入, r: 讀取
- 對目錄來說:
 - x: 可以進去, r: 列出裡面的檔案,
 - w: 新建、刪掉目錄中的檔案或改名

Change file permission/ ownership

- `chmod`: change file permission
- Examples:
 - `chmod u+w blah`
 - `chmod 755 blah` (7=rwx, 5=r-x)
 - `chmod ug=rw,o=r blah`
 - `chmod a-x blah`
 - `chmod g=u blah`
- `chown`: change file ownership
- Example:
 - `chown nobody:nobody blah`

More advanced permission control: access control list (ACL)

- OS & filesystem dependent
- Identify user/group and then apply the permission
- POSIX-style ACLs are supported by ext* + a few other filesystems on Linux

Possible ACL entries

Format	Example	Sets permissions for
user::perms	user::rw-	The file's owner
user:username:perms	user:htlin:rw-	A specific user
group::perms	group::r-x	The group that owns the file
group:groupname:perms	group:users:rw-	A specific group
other::perms	others::---	All others
mask::perms	mask::rwx	All but owner and other

ACL examples

- getfacl: get file access control lists

Example: `getfacl tmp`

- setfacl: set file access control lists

Example:

`setfacl -m user::r,user:htlin:---,group:users:rw tmp`

`setfacl -x user:htlin tmp`

(-m: modify; -x remove)

Shell

- We will teach bash “the Bourne-again shell”
- Default login shell on most systems
- Check if it is your current shell:
echo \$SHELL
- If not, you need to change it.
Temp solution: bash -l
(run the shell as if it is a login shell.
避免環境參數問題)
- Commands are either shell built-in or a script/executable

&& 和 ||

- &&: 前面執行成功了, 後面才會執行
- ||: 前面執行失敗了, 後面才會執行
- Example 1:
`lpr /tmp/t2 && rm /tmp/t2`
- Example 2:
`cp —preserve —recursive /etc/* /spare/backup \
|| echo “Did NOT make backup”`

變數

- 給值時直接用

Example: `hsinmu_dir='/nfs/home/hsinmu'`

- 拿值的時候前面加\$

Example: `echo $hsinmu_dir`

- {}可以指定變數名稱到哪邊

Example: `echo ${hsinmu_dir}-dir`

- “: 照著印出所有

“”: 替換裡面該被執行的部分或變數

`: 執行裡面的指令，並將output放在這個位置

Example 1: `echo 'my current work dir is `pwd`'`

Example 2: `echo "my current work dir is `pwd`"`

Example: showusage

- Elements to learn:
 - `#!/bin/bash`
 - `if else fi elif`
 - `$# $0 $1 $2`: command-line argument
 - `$#`: 有幾個argument,
 - `$0`: 指令本身,
 - `$1, $2,`: 第幾個參數
 - function裡面: `$#` 有幾個參數, `$1, $2`, 第幾個參數

test

Example: if [\$message_leve -le \$LOG_LEVEL]; then

String	Numeric	True if
x=y	x -eq y	x is equal to y
x!=y	x -ne y	x is not equal to y
x<y	x -lt y	x is less than y
x<=y	x -le y	x is less or equal to y
x>y	x -gt y	x is greater than y
x>=y	x -ge y	x is greater or equal to y
-n x		x is not null
-z x		x is null

-d file	file exists and is a directory
-e file	file exists
-f file	file exists and is a regular file
-r file	you have read permission on
-s file	file exists and is not empty
-w file	you have write permission on
file1 -nt file2	file1 is newer than file2
file1 -ot file2	file1 is older than file 2

Example: str_and_number

`$((var))`: 把var裡面的東西當作數學式子計算並替換

```
a=1
```

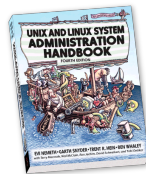
```
b=$((2))
```

```
c=$((a+b))
```

```
d=$((a+b))
```

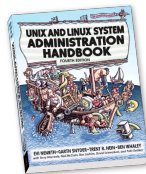
List of other things you can read

- Regular expression: very powerful tool (with grep)!
(Hint: HW1)



2.3

- In bash shell script:



2.2

- while and for loop
 - array
- vimtutor
- File attributes: setuid, setgid, and sticky bit