Introduction to Unix-like System

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All graduate students should be indoormen

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Experience:
- Machine Learning TA (100-1)
- DSA TA (100-2)
- NASA TA (101-1)

Good at: Linear Algebra, Probability and Machine Learning

Poor at: Systems and Architectures
What is 217 Workstation Lab

- http://wslab.csie.ntu.edu.tw/
How many OS you know
What is UNIX

- Compliant with and certified according to the **Single UNIX Specification**
- First developed in 1969, including
  - Ken Thompson
  - **Dennis Ritchie**
  - Brian Kernighan
  - Douglas McIlroy
  - Michael Lesk
  - Joe Ossanna
- Multitasking and multi-user OS
- Unix-like System
Dennis Ritchie

All computer science students should know him
Unix-like

- BSDs
- **Linux**
- Mac OS
- Solaris
- Minix
- SunOS
Linux-Kernel

- Accessing hardwares
- Provides the functions you would learn from OS-related courses
- Can shed the parts you don’t need - Android
Distributions

- Built on the kernel with many applications
- **Ubuntu, Debian, Fedora, CentOS, Redhat, SUSE, ... etc**

(a) Ubuntu  
(b) Debian  
(c) Fedora  
(d) SUSE
Why use UNIX

- Stability
- Performance
- Security
- Price

"Given enough eyeballs, all bugs are shallow." - Linus

Question

Is UNIX a panacea?
Logging to 217 workstation

All in http://wslab.csie.ntu.edu.tw/ssh/
Path

- .
- ..
- ~
- Absolute path
Basic Commands

File
- cd
- ls
- mkdir
- rm
- mv
- cp
- find
- pwd

Man
- Manual rather than guys
  - ex: man ls
  - man man (-k)

Text
- cat
- more
- less
- tail
- head
- grep
- diff
- sort
- wc
- cut -d -f
- vim

Others
- whoami
- who
- ps aux
- top
- kill
- alias
- tar
- awk
- sed
- Insert: i
- Command: Esc
- Save: :w
- Exit: :q
- vmtutor
Redirect the input and output

- `<`
- `>`
- `>>`
- Demos
Combos - Pipe

Combine multiple commands with I/O redirection

Example - list /bin

ls -al /bin | more

Exercise

- How to find the arguments for recursive copying?
- How many processes are running
- How many users are logging
- Ans: who | cut -d ‘ ’ -f1 | uniq | wc -l
- Who are logging in ascending order
- Ans: who | cut -d ‘ ’ -f1 | sort | uniq
File Permissions

What is this

```
r01922001@linux16:~/research/note> [3] ll *
-rw-r--r-- 1 r01922001 graduate 562 12月 18
-rw-r--r-- 1 r01922001 graduate 601 12月 18
-rw-r--r-- 1 r01922001 graduate 54 12月 24
-rw-r--r-- 1 r01922001 graduate 54 12月 22
-rw-r--r-- 1 r01922001 graduate 354 12月 24
```
File Permissions

- r: read
- w: write
- x: execute
- rwx rwx rwx (User Group Others)
- chmod (be careful)
- su, sudo
Shell Script

Combine more commands with more flexibilities

**Scenerio1**

You need to do a sequence of commands such as

- mkdir test1
- touch ./test1/doc1
- touch ./test1/doc2
- mkdir test2
- touch ./test1/doc3

for 10 times ...

**Scenerio2**

You are a TA, you need to judge the students’ homeworks by

`diff ID ans`
Learning by Examples
Practice

*df* would list the usage of disks.

```bash
r01922001@linux16 ~/htdocs/present/NASA} [W2] df
```

<table>
<thead>
<tr>
<th>檔案系統</th>
<th>1K-區段</th>
<th>已用</th>
<th>可用</th>
<th>已用%</th>
<th>掛載點</th>
</tr>
</thead>
<tbody>
<tr>
<td>rootfs</td>
<td>14417392</td>
<td>11029172</td>
<td>2655856</td>
<td>81%</td>
<td>/</td>
</tr>
<tr>
<td>udev</td>
<td>10240</td>
<td>0</td>
<td>10240</td>
<td>0%</td>
<td>/dev</td>
</tr>
<tr>
<td>tmpfs</td>
<td>4955488</td>
<td>568</td>
<td>4954920</td>
<td>1%</td>
<td>/run</td>
</tr>
<tr>
<td>/dev/disk/by-uuid/584c03e1-0717-4d3f-990c-96b187c34442</td>
<td>14417392</td>
<td>11029172</td>
<td>2655856</td>
<td>81%</td>
<td>/</td>
</tr>
<tr>
<td>tmpfs</td>
<td>5120</td>
<td>0</td>
<td>5120</td>
<td>0%</td>
<td>/run/lock</td>
</tr>
<tr>
<td>tmpfs</td>
<td>14598420</td>
<td>0</td>
<td>14598420</td>
<td>0%</td>
<td>/run/shm</td>
</tr>
<tr>
<td>/dev/sda3</td>
<td>937155496</td>
<td>829930192</td>
<td>107225304</td>
<td>89%</td>
<td>/tmp2</td>
</tr>
<tr>
<td>tmpfs</td>
<td>14598420</td>
<td>229108</td>
<td>14369312</td>
<td>2%</td>
<td>/tmp</td>
</tr>
<tr>
<td>ntucsp:/e/phd</td>
<td>626945880</td>
<td>547084928</td>
<td>79660952</td>
<td>88%</td>
<td>/nfs/phd</td>
</tr>
<tr>
<td>ntucsp:/e/master</td>
<td>1588742712</td>
<td>1104429624</td>
<td>484313088</td>
<td>70%</td>
<td>/nfs/master</td>
</tr>
<tr>
<td>ntucsp:/e/os/linux</td>
<td>52327280</td>
<td>19937816</td>
<td>32389464</td>
<td>39%</td>
<td>/nfs/linux</td>
</tr>
<tr>
<td>ntucsp:/e/course</td>
<td>209461176</td>
<td>56118376</td>
<td>153342800</td>
<td>27%</td>
<td>/nfs/course</td>
</tr>
<tr>
<td>ntucsp:/e/undergrad</td>
<td>1072678712</td>
<td>474230336</td>
<td>598448376</td>
<td>45%</td>
<td>/nfs/undergrad</td>
</tr>
<tr>
<td>ntucsp:/e/faculty</td>
<td>468255176</td>
<td>384779272</td>
<td>83475904</td>
<td>83%</td>
<td>/nfs/faculty</td>
</tr>
<tr>
<td>ntucsp:/e/inm_master</td>
<td>519861584</td>
<td>333772728</td>
<td>186088856</td>
<td>65%</td>
<td>/nfs/inm_master</td>
</tr>
<tr>
<td>ntucsp:/e/dept</td>
<td>313444176</td>
<td>287940952</td>
<td>25503224</td>
<td>92%</td>
<td>/nfs/dept</td>
</tr>
</tbody>
</table>

Please count the total used space.  
**Note:** Do not use *df* –total