

OS project1 report

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Faced difficulties:

- (1) 有加 `sudo make -j #` (# is the number of physical cores)，會讓 kernel rebuild 的時間快很多，也了解自己的 PC 有多少 cores。
- (2) 寫 CPU utilization 很麻煩的是不能 include `<stdio.h>`，也不能使用 File I/O(即 open、close、read、write)，必需使用 linux kernel module 的 API 才能達到和 File I/O 一樣的效果。
- (3) linux kernel module 只認 32bits，用 unsigned long long 做 division 要額外 include `<asm/div64.h>`裡的函式。
- (4) linux kernel module 最好使用 int，用浮點數會出問題。

Implementation details:

- (1) `show(void):printk` on the kernel log, and show the message by the command “`dmesg`”
- (2) `multiply(long, long):multiply` two value whose type is long, and return the result
- (3) `min(long, long):choose` the minimum between two value whose type is long, and return the minimum value
- (4) `cpu_utilization(void):open` the `/proc/stat`, read the values about cpu utilization, sleep two seconds, and read the values about cpu utilization again. Eventually, make some operations , `printk` the result of cpu utilization, and show the message by the command “`dmesg`” .

附圖：

```
ubuntu 12.04.4 32bits LTS [Running]
Terminal
edlin@edlin-VirtualBox: ~/Desktop
edlin@edlin-VirtualBox:~/Desktop$ gcc test.c
edlin@edlin-VirtualBox:~/Desktop$ ./a.out
100 * 100 = 10000
min(10, 100) = 10
edlin@edlin-VirtualBox:~/Desktop$
```

```
ubuntu 12.04.4 32bits LTS [Running]
Terminal
edlin@edlin-VirtualBox: ~/Desktop
[ 2.912252] usbhid: v2.6:USB HID core driver
[ 3.231626] Intel ICH 0000:00:05.0: PCI INT A -> Link[LNKA] -> GSI 11 (level, low) -> IRQ 11
[ 3.285823] init: failsafe main process (706) killed by TERM signal
[ 3.425585] ADDRCONF(NETDEV_UP): eth0: link is not ready
[ 3.512053] intel8x0: white list rate for 1028:0177 is 48000
[ 3.767529] vboxsf: Successfully loaded version 5.1.16 (interface 0x00010004)
[ 3.984612] e1000: eth0 NIC Link is Up 1000 Mbps Full Duplex, Flow Control: RX
[ 3.984978] ADDRCONF(NETDEV_CHANGE): eth0: link becomes ready
[ 4.523689] VBoxService 5.1.16 r113841 (verbosity: 0) linux.x86 (Mar  8 2017 15:57:03)
release log
[ 4.523733] 00:00:00.000131 main      Log opened 2017-04-02T12:23:43.576538000Z
[ 4.524155] 00:00:00.000824 main      OS Product: Linux
[ 4.524195] 00:00:00.000874 main      OS Release: 2.6.32.60
[ 4.524228] 00:00:00.000911 main      OS Version: #38 SMP Sun Apr 2 20:17:19 CST 2017
[ 4.524273] 00:00:00.000942 main      Executable: /opt/VBoxGuestAdditions-5.1.16/sbin/VBoxService
[ 4.524277] 00:00:00.000948 main      Process ID: 1127
[ 4.524281] 00:00:00.000954 main      Package type: LINUX_32BITS_GENERIC
[ 4.526807] 00:00:00.003492 main      5.1.16 r113841 started. Verbose level = 0
[ 5.235078] init: plymouth-stop pre-start process (1308) terminated with status 1
[ 14.399109] eth0: no IPv6 routers present
[ 29.589746] ISO 9660 Extensions: Microsoft Joliet Level 3
[ 29.615668] ISO 9660 Extensions: RRIP_1991A
[ 115.430537] Student_ID : B03902125, Name : Eddie Lin
[ 115.430539] Student_ID : B03902129, Name : Jay Chen
[ 117.428812] CPU utilization = 100.00%
edlin@edlin-VirtualBox:~/Desktop$
```