OS project 1

R05922092 張耿健, B04902045 孫凡耘

April 3, 2017

Implementation Details

Environment: Oracle VM VirtualBox, version: 5.1.16
I followed similar steps described in the PPT when I build the kernel.
Implementation steps:

1. Add system call to the system call table.

2. Add macro #define ___NR_functionName xxx(my definition), update NR_SYSCALLS accordingly.

3. Add prototype of the system call with a prefix sys_ at syscalls.h.

4. Modify Makefile, add functionName.o to obj-y.

5. Rebuild and Reboot into the kernel that I just compiled, then run my test program using syscall(___NR_functionName, Parameters).

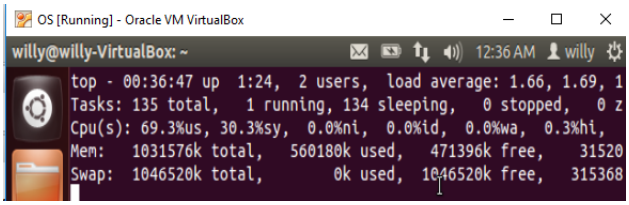
Faced Difficulties

Implementing show, min, and multiply is pretty simple. But the true difficulty comes when we try to implent CPU_Utilization.

1. Many simple operations that we are familiar with cannot be directly used in Kernel Space environment. For example, the use of FILE * or the arithmetic of floating point numbers, so we'll have to look up special functions or procedures to deal with it.

2. A big difficulty when implementing the system calls is that everytime we made a typo or silly mistake, it takes us a long time to figure it out since compiling the kernel is time-consuming. So I learned to code more carefully and double check for syntax errors before I recompile my kernel.

3. I found out that the result of my CPU_Utilization is 100%. At first, I thought this is unreasonable. But at last, I found out that it's not my problem. The CPU Utilization is indeed 100% on the virtual machine(the CPU is always utilized by user and system). I double checked it with top command and cat /proc/stat(the idle time, which is the fourth parameter, is not changing).



Results

```
// test min and multiply
printf("8*7 = %d\n", syscall(339, 8, 7));
printf("min(100, 1) = %d\n", syscall(340, 100, 1));
// test hello, check from dmesg
syscall(337);
//test show, check from dmesg
syscall(338);
//test CPU_Utilization(show percentage), check from dmesg
syscall(341);
```