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Course: Operating System Laboratory

Assignment: 03

1) System call integer defining: Inside Kernel > syscall.h; add: **#define SYS_monitor 22**
2) System call prototype define: Inside Kernel>syscall.c; define: **extern uint64 sys_monitor (void);**
3) Array mapping syscall number define: Inside Kernel>syscall.c; **[SYS_monitor] sys_monitor,**
4) Per process state define: Inside Kenel>proc.h; add: **int sys_num;**
5) To free the information of a process after termination of the process, we have to define free process, Inside kernel>proc.c; add: **p->sys_num= 0;** in freeprog() function.
6) Inside Kernel>syscall.c; add :

```
char *syscallnames[] = {
 [SYS_fork] "fork",
[SYS_exit] "exit",
[SYS_wait] "wait",
[SYS_pipe] "pipe",
[SYS_read] "read",
[SYS_kill] "kill",
[SYS_exec] "exec",
[SYS_fstat] "fstat",
[SYS_chdir] "chdir",
[SYS_dup] "dup",
[SYS_getpid] "getpid",
[SYS_sbrk] "sbrk",
[SYS_uptime] "uptime",
[SYS_open] "open",
[SYS_write] "write",
[SYS_mknod] "mknod",
[SYS_unlink] "unlink",
[SYS_link] "link",
[SYS_mkdir] "mkdir",
[SYS_close] "close",
[SYS_trace] "monitor",
}
```

7) System call helper functions: Inside kernel>sysproc.c; add this:

   ```
   uint64
    sys_trace(void) {
   int sysnum;
   argint(0, &sysnum);
   if(sysnum <= 0 || sysnum > 22) {
   return -1;
   }
   myproc()->sys_num = sysnum;
   return 0;
   }
   ```

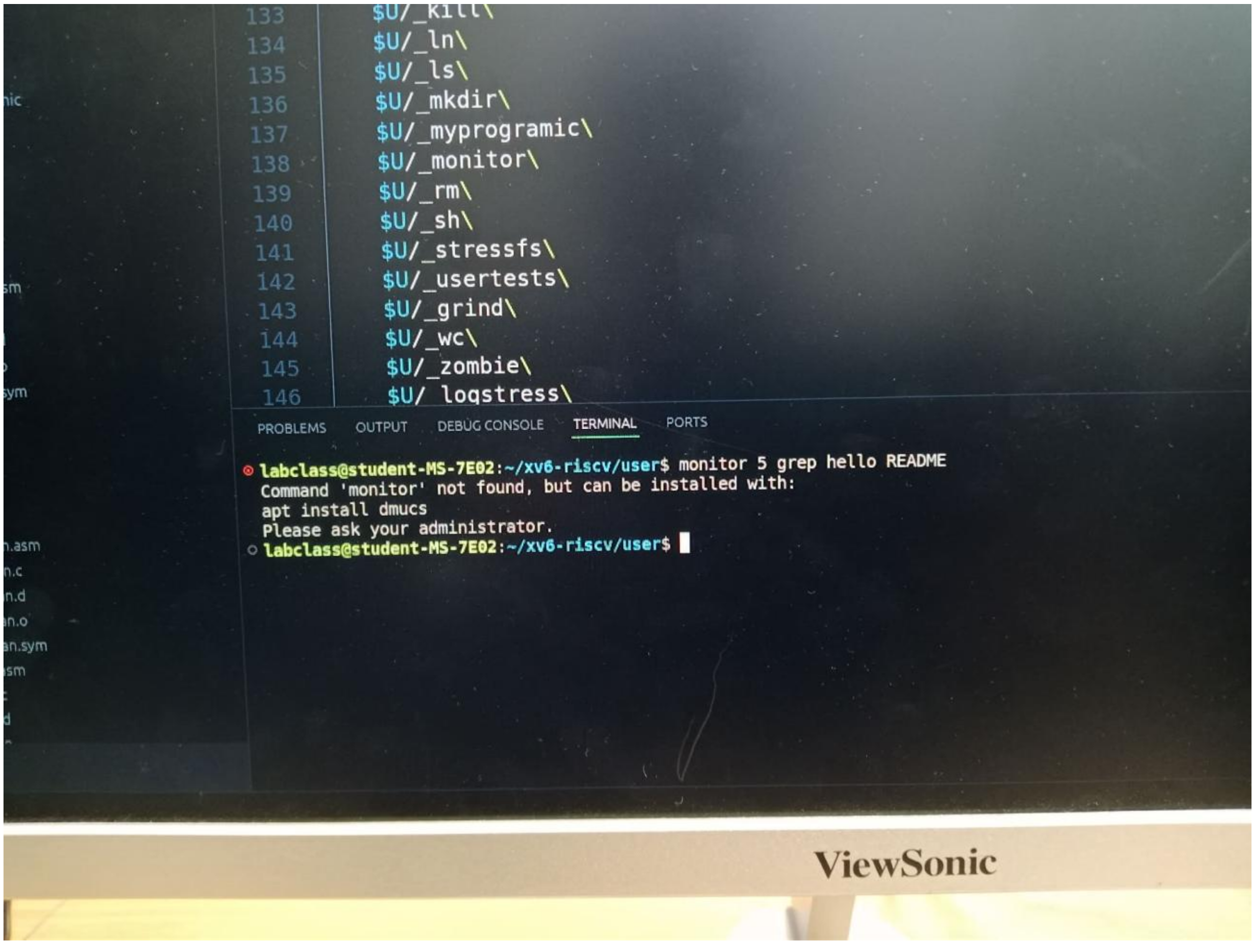
8) Monitor system call and print formatted output: Inside kernel>syscall.c; add:

   ```
   if(p->sys_num == num) {
   printf("pid: %d, syscall: %s, return value: %ld\n", p->pid, syscallnames
   [num], p->trapframe->a0);
   }
   ```

9) Now copy the monitor.c file inside the user folder.
10) Go to user > user.h; add: **int monitor(int);**
11) Go to user > usys.pl ; add: **entry(monitor);**
12) Add the new user program in user > Makefile > UPROGS; Add: **$U/_monitor**
13) Finally run the: make qemu and then run the system call:

    ```
    $ monitor 5 grep hello README
    ```

Output:



```
	$U/_kill\
	$U/_ln\
	$U/_ls\
	$U/_mkdir\
	$U/_myprogramic\
	$U/_monitor\
	$U/_rm\
	$U/_sh\
	$U/_stressfs\
	$U/_usertests\
	$U/_grind\
	$U/_wc\
	$U/_zombie\
	$U/_logstress\
```

```
labclass@student-MS-7E02:~/xv6-riscv/user$ monitor 5 grep hello README
Command 'monitor' not found, but can be installed with:
apt install dmucs
Please ask your administrator.
labclass@student-MS-7E02:~/xv6-riscv/user$ 
```