

NachOS

HW1: System call

Deadline: 2021/04/01 (THU)

Part I. Trace code.

1. Halt():

Study how shutdown is performed by system call in NachOS.

```
Step1. machine/mipssim.cc    --- Machine::Run()
Step2. machine/mipssim.cc    --- Machine::OneInstruction()
Step3. machine/machine.cc    --- Machine::RaiseException()
Step4. userprog/exception.cc --- ExceptionHandler()
Step5. machine/interrupt.cc  --- Interrupt::Halt()
```

2. Create():

Study how file is created by system call and the underlying functions in NachOS.

Also, study the operation of program counter. (Step6. Machine::OneInstruction())

```
Step1. machine/mipssim.cc    --- Machine::Run()
Step2. machine/mipssim.cc    --- Machine::OneInstruction()
Step3. machine/machine.cc    --- Machine::RaiseException()
Step4. userprog/exception.cc --- ExceptionHandler()
Step5. filesys/filesys.h     --- FileSystem::Create()
Step6. machine/mipssim.cc    --- Machine::OneInstruction()
```

Part II. Please implement four system calls of file system operation below.

1. int OpenAFile(char *name)

-name: the name of file to be opened

Return 1 if succeeds. Otherwise, return -1.

2. int WriteFile(char *buffer, int size)

-buffer: the content to be written into file

-size: the number of characters to be written

Return how many characters are written into file if succeeds. Otherwise, return -1.

3. int ReadFile(char *buffer, int size)

-buffer: buffer to save the content read from file

-size: the number of characters to be read

Return how many characters are read from file if succeeds. Otherwise, return -1.

4. int CloseFile()

Close the current file.

Return 1 if succeeds. Otherwise, return -1.

**Note: Only one file would be opened at once. This means the file system only maintains a single file.*

Hint1: You should only modify files in **filesys, **test** and **userprog** directories in hw1.*

**Hint2: You can reference functions defined in filesys/openfile.h and lib/sysdep.cc*

● Instructions

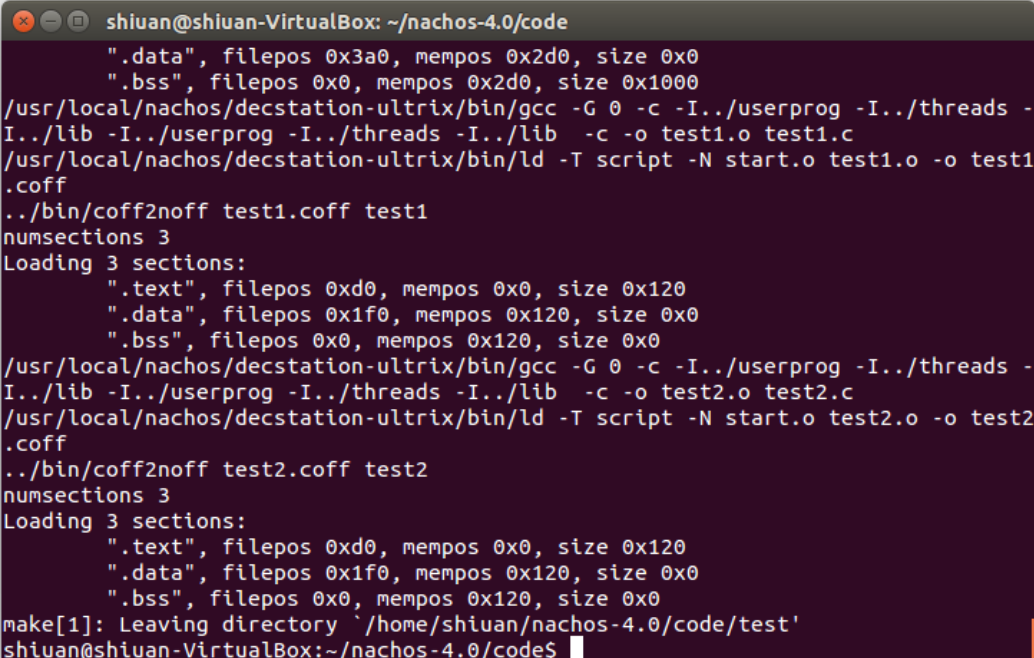
- Switch to the code folder

`cd nachos-4.0-hw1/code`

- Compile

`make clean` // necessary

`make` // ignore warning message

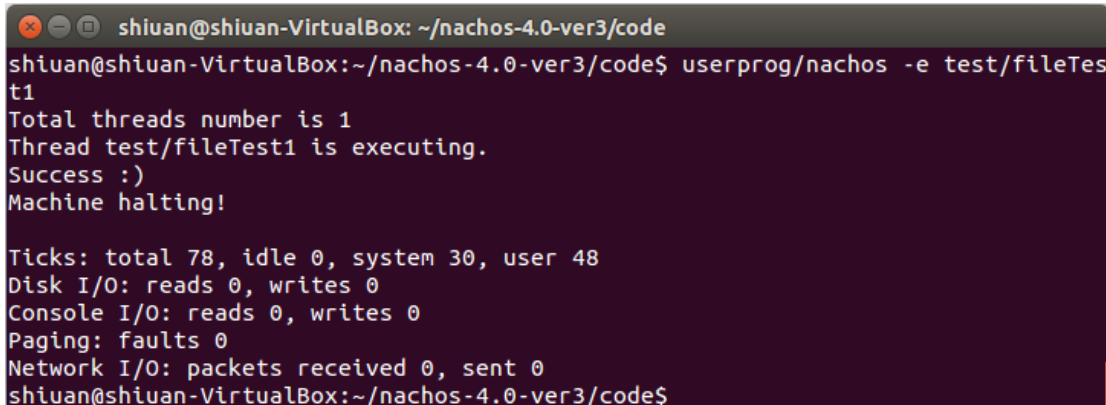


```
shiu@shiu-VirtualBox: ~/nachos-4.0/code
".data", filepos 0x3a0, mempos 0x2d0, size 0x0
".bss", filepos 0x0, mempos 0x2d0, size 0x1000
/usr/local/nachos/decstation-ultrix/bin/gcc -G 0 -c -I../userprog -I../threads -I../lib -I../userprog -I../threads -I../lib -c -o test1.o test1.c
/usr/local/nachos/decstation-ultrix/bin/ld -T script -N start.o test1.o -o test1.coff
../bin/coff2noff test1.coff test1
numsections 3
Loading 3 sections:
".text", filepos 0xd0, mempos 0x0, size 0x120
".data", filepos 0x1f0, mempos 0x120, size 0x0
".bss", filepos 0x0, mempos 0x120, size 0x0
/usr/local/nachos/decstation-ultrix/bin/gcc -G 0 -c -I../userprog -I../threads -I../lib -I../userprog -I../threads -I../lib -c -o test2.o test2.c
/usr/local/nachos/decstation-ultrix/bin/ld -T script -N start.o test2.o -o test2.coff
../bin/coff2noff test2.coff test2
numsections 3
Loading 3 sections:
".text", filepos 0xd0, mempos 0x0, size 0x120
".data", filepos 0x1f0, mempos 0x120, size 0x0
".bss", filepos 0x0, mempos 0x120, size 0x0
make[1]: Leaving directory `/home/shiu/nachos-4.0/code/test'
shiu@shiu-VirtualBox:~/nachos-4.0/code$
```

- test

1. `userprog/nachos -e test/fileTest1`

You should see the results as below:

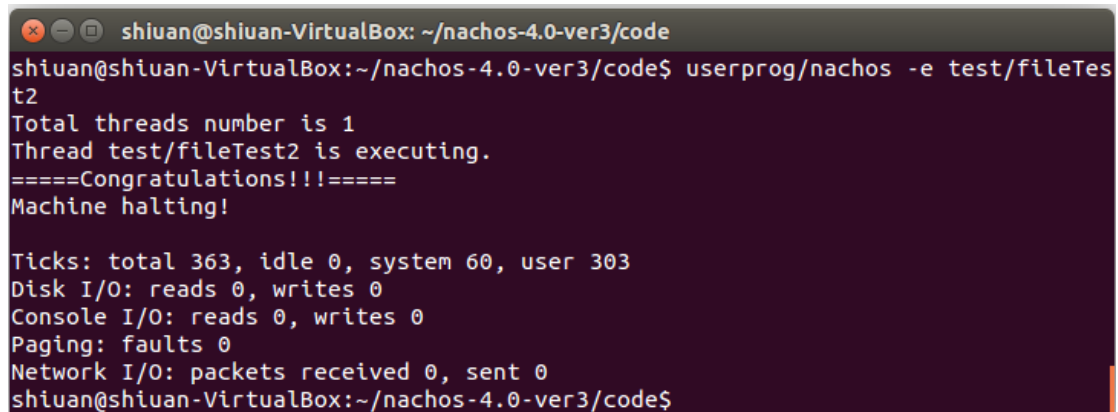


```
shiu@shiu-VirtualBox: ~/nachos-4.0-ver3/code
shiu@shiu-VirtualBox:~/nachos-4.0-ver3/code$ userprog/nachos -e test/fileTest1
Total threads number is 1
Thread test/fileTest1 is executing.
Success :)
Machine halting!

Ticks: total 78, idle 0, system 30, user 48
Disk I/O: reads 0, writes 0
Console I/O: reads 0, writes 0
Paging: faults 0
Network I/O: packets received 0, sent 0
shiu@shiu-VirtualBox:~/nachos-4.0-ver3/code$
```

2. `userprog/nachos -e test/fileTest2`

You should see the results as below:



```
shiuian@shiuian-VirtualBox: ~/nachos-4.0-ver3/code
shiuian@shiuian-VirtualBox:~/nachos-4.0-ver3/code$ userprog/nachos -e test/fileTest2
Total threads number is 1
Thread test/fileTest2 is executing.
====Congratulations!!!====
Machine halting!

Ticks: total 363, idle 0, system 60, user 303
Disk I/O: reads 0, writes 0
Console I/O: reads 0, writes 0
Paging: faults 0
Network I/O: packets received 0, sent 0
shiuian@shiuian-VirtualBox:~/nachos-4.0-ver3/code$
```

- **Report**

Including your results of code tracing, how you implement your system calls, and your team member contribution.

File name: HW1_Report_<group number>.pdf

- **Demo**

We will check your code and the results of your implementation on the spot.

Thus, **prepare your own devices** and make sure it works in advance.

Some questions about this homework will be asked, too.

Demo time will be announced later.

- **Grading**

Report ---30%

Demo ---70%

Implementation correctness --- 50%

Question --- 20%

- Please upload your report to **iLMS** before **2021/04/01 23:59**.
- **Late submission is not allowed.**
- Discussion is encouraged, but **plagiarism will be punished strictly**.
- Feel free to discuss with TAs, and it's encouraged to **discuss on iLMS forum**.