Project #0-1: Installing Pintos

[CSE4070]

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Linux instructions & vim usage

Useful Linux instructions

- man
- mkdir/rmdir
- cp
- mv
- rm
- cat
- echo
- grep
- ps
- kill
- pwd
- su/passwd
- tar

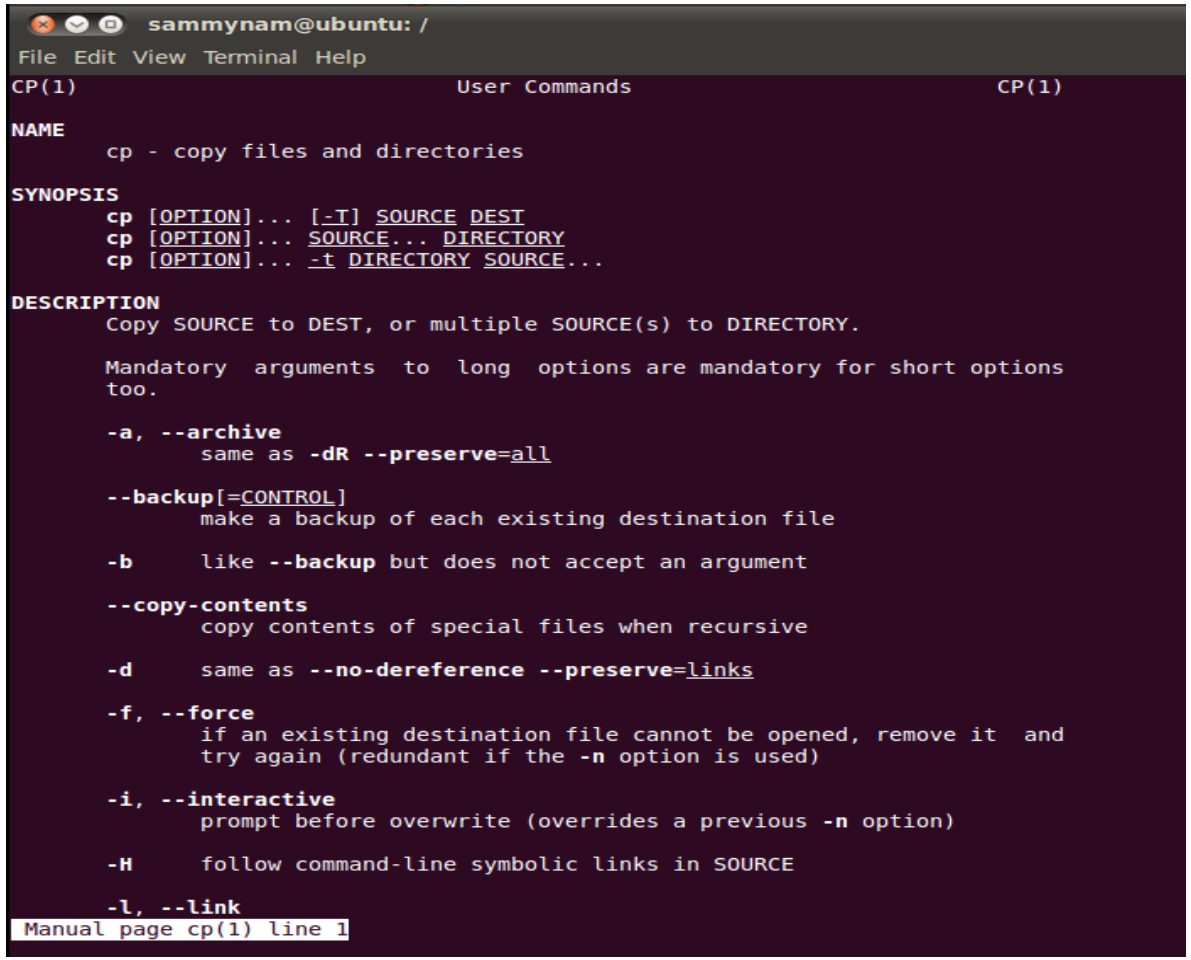
man

Provide description and usage for Linux commands

Usage) man [instruction]

Ex)

$ man cp



mkdir/rmdir

Make/remove directory

If the directory is not empty, use 'rm -r' to remove it

Usage) mkdir [option] [Directory Name]

rmdir [option] [Directory Name]

Ex)

$ mkdir temp

cp

Copy the file (Original file is preserved)

Usage) cp [option] [src] [dst]

Ex)

$ cp a.c temp

mv

Move file or rename file (Original file is disappeared)

Usage) mv [option] [src] [dst]

Ex)

$ mv a.c b.c

rm

Remove file or directory

Usage) rm [option] [filename]

Ex)

$ rm –rf temp

If you perform 'rm -rf *' in /(root) directory, all file in the system is destroyed

-rf option indicates recursive and force respectively

cat

1. Print the contents of file on the standard output

Usage) cat [option] [filename]

Ex)

$ cat tempfile

$ cat > test.txt (Get data from standard input; user can input data until user does [Ctrl+D]

$ cat < test.txt (Print the contents of the file)

2. Concatenate files

Ex)

$ cat test.txt test2.txt > test12.txt (Concatenate test.txt and test2.txt and make file test12.txt)

echo

Print string or system environment variables

Usage) echo [string…]

Ex)

$ echo $PATH

$ echo x

grep

Print lines matching a pattern from files or standard input

Usage) grep [option] PATTERN [File…]

-n : Print the line and line number in FILE which is matched

-i : Ignore case distinctions

-l : Print only FILE name, which contains PATTERN matched

Ex)

$ grep –n ftp /etc/groupt

$ grep –i the /etc/init.d/qmail

$ grep –il ftp /etc/init.d/*

ps

Report the list of current processes

Usage) ps [option]

-ef: Print the all processes with full-format listing

-au: Print the user name and start time of processes including other users' processes

Ex)

$ ps -ef

$ ps -au

kill

Send signal to processes

Representative signal is SIGKILL which is used to forcefully terminate process

Usage) kill [option] [process id]

-l : Print list of singals

Ex)

$ kill -9 4914 (force quit process #4914)

```
sammynam@ubuntu:~/Desktop$ kill -l
 1) SIGHUP       2) SIGINT       3) SIGQUIT      4) SIGILL       5) SIGTRAP
 6) SIGABRT      7) SIGBUS       8) SIGFPE       9) SIGKILL     10) SIGUSR1
11) SIGSEGV     12) SIGUSR2     13) SIGPIPE     14) SIGALRM     15) SIGTERM
16) SIGSTKFLT   17) SIGCHLD     18) SIGCONT     19) SIGSTOP     20) SIGTSTP
21) SIGTTIN     22) SIGTTOU     23) SIGURG      24) SIGXCPU     25) SIGXFSZ
26) SIGVTALRM   27) SIGPROF     28) SIGWINCH    29) SIGIO       30) SIGPWR
31) SIGSYS      34) SIGRTMIN    35) SIGRTMIN+1  36) SIGRTMIN+2  37) SIGRTMIN+3
38) SIGRTMIN+4  39) SIGRTMIN+5  40) SIGRTMIN+6  41) SIGRTMIN+7  42) SIGRTMIN+8
43) SIGRTMIN+9  44) SIGRTMIN+10 45) SIGRTMIN+11 46) SIGRTMIN+12 47) SIGRTMIN+13
48) SIGRTMIN+14 49) SIGRTMIN+15 50) SIGRTMAX-14 51) SIGRTMAX-13 52) SIGRTMAX-12
53) SIGRTMAX-11 54) SIGRTMAX-10 55) SIGRTMAX-9  56) SIGRTMAX-8  57) SIGRTMAX-7
58) SIGRTMAX-6  59) SIGRTMAX-5  60) SIGRTMAX-4  61) SIGRTMAX-3  62) SIGRTMAX-2
63) SIGRTMAX-1  64) SIGRTMAX
```

pwd

Check the current directory

Usage) pwd

```
sammynam@ubuntu:~/Desktop$ pwd
/home/sammynam/Desktop
sammynam@ubuntu:~/Desktop$
```

su/passwd

su : Switch user ID or become superuser

passwd : Change user password

Usage) su [options] [username]

Ex)

$ su (If USERNAME is omitted, switch account to superuser)

$ passwd (Change password of current account)

tar

Compress or extract file

Usage) tar [options] [pathname]

-c/x: Compress / Extract

-v: Verbosely list files processed

-f: Use file to compress or extract

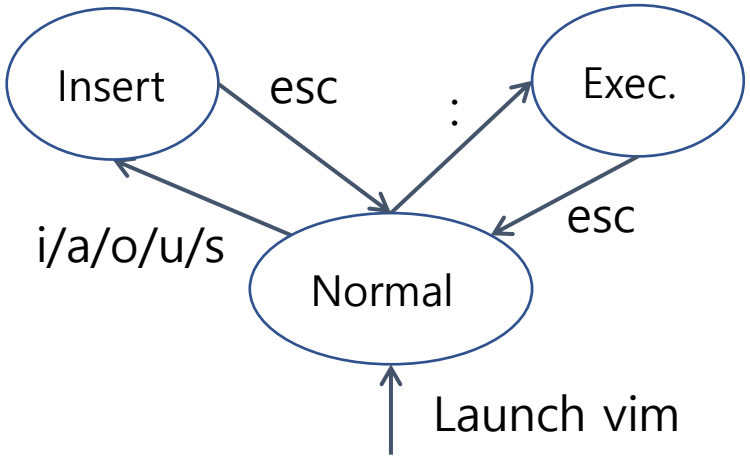
Ex)

$ tar -cvfz sample.tar.gz pintos (If pintos is a directory, it will be compressed into sample.tar.gz)

$ tar -xvfz sample.tar.gz (Extract sample.tar.gz)

vim

- Vim is Visual Interface iMproved which is improved version of vi



- Normal mode
  - yy+p: Copy and paste line, /: Search , x: Delete character , dd: Delete line , u: Undo,
  - v : Change into visual mode
- Insert mode
  - i : Insert, a : Append
- Execution mode (Type ': (colon)' in normal mode)
  - w: Save, q: Quit, wq!: Quit without saving

Pintos Installation

Caution

- We will use CSPRO9 (cspro9.sogang.ac.kr) and CSPRO10 (cspro10.sogang.ac.kr)
- So do not try to run Pintos on CSPRO (cspro.sogang.ac.kr) server
- Note that the CSPRO server indicates CSPRO9 or CSPRO10 from now on

Pintos & Emulator

- Pintos
- Simple OS Framework for 80x86 architecture
- Use system simulator that simulates an 80x86 CPU and its peripheral devices
- Project Category : kernel thread, user program, virtual memory, file system
  (Only kernel thread and user program projects will be covered in this class)
- Features
  1) Support user and kernel thread
  2) Allow running user program (basic UNIX commands like echo, ls, cat, pwd, …)
  3) Support simple file system
  4) Implemented in C language
  5) Well-Documented Project & Grading System
- We will user QEMU as an emulator for Pintos

Pintos Installation

1. Download Pintos file
   - We provide modified code in e-class, so don't use original source code from Stanford University
2. Extract the file
   - $ tar -xvzf pintos_moidified.tar.gz

✓ You don't need to QEMU in the CSPRO sever. It is already installed

Pintos Installation

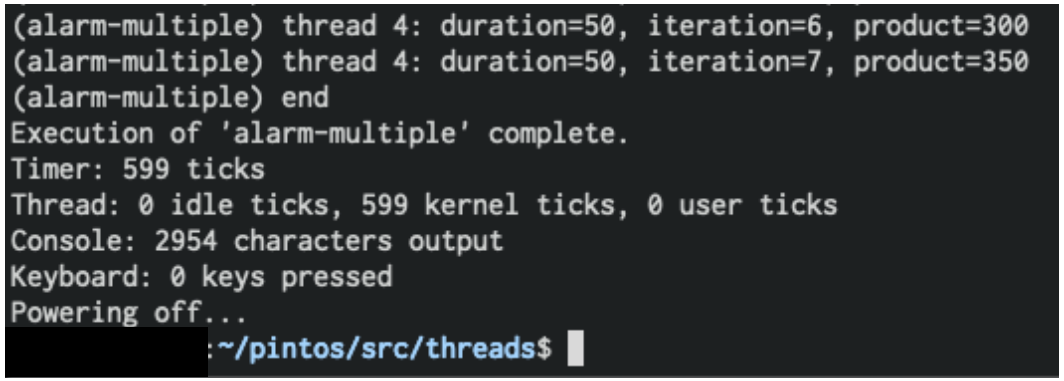
- Before launching Pintos, we need to setup .bashrc file in home directory
  1. Open ~/.bashrc with editor
  2. Add the following line at the end of the file
     export PATH=/sogang/under/YOUR_ACCOUNT/pintos/src/utils:$PATH
  3. Run the following command to apply the change in bash shell
     $ source ~/.bashrc

```
 90 # some more ls aliases
 91 alias ll='ls -alF'
 92 alias la='ls -A'
 93 alias l='ls -CF'
 94
 95 # enable programmable completion features (you don't need to enable
 96 # this, if it's already enabled in /etc/bash.bashrc and /etc/profile
 97 # sources /etc/bash.bashrc).
 98 if [ -f /etc/bash_completion ]; then
 99 . /etc/bash_completion
100 fi
101
102 export PATH=/sogang/under/cse20179999/pintos/src/utils:$PATH
```

Running Pintos

- Build Pintos (Assume that you extract the file on your home directory)
  - $ cd ~/pintos/src/threads
  - $ make
  - Consequently, 'build' directory will be created in the current directory (src/threads)
- Run Pintos
  - Pintos provides 'pintos' utility that helps running Pintos by QEMU
  - 'pintos' utility is in src/utils
  - **Move src/threads** and run the following command (You should run it in src/threads, not src/utils)

    ~/pintos/src/threads $ ../utils/pintos -v -- -q run alarm-multiple
    Or
    ~/pintos/src/threads $ pintos -v -- -q run alarm-multiple
    (Note that you should input one space among '-v', '--' and '-q')



Running Pintos

- If you face the error like below, check the current directory where you run pintos

```
~/pintos/src/utils$ pintos -v -- -q run alarm-multiple
Use of literal control characters in variable names is deprecated at /home/hyeongu/pintos/src/utils/pintos line 914.
Prototype mismatch: sub main::SIGVTALRM () vs none at /home/hyeongu/pintos/src/utils/pintos line 938.
Constant subroutine SIGVTALRM redefined at /home/hyeongu/pintos/src/utils/pintos line 930.
Cannot find kernel
```

Problem

Since the current directory is src/utils, Pintos can not find its kernel and error occurs
If you execute Pintos in src/threads, Pintos will find the kernel in src/threads/build/kernel.bin

```
~/pintos/src/threads$ pintos -v -- -q run alarm-multiple
```

Solution

Project Test

- Each project has its own test program
  - Test program is in src/tests
  - You can use this program to test your implementation by yourself
  - For project 1, you can test by run 'make check' in src/userprog/
    - ~/pintos/src/userprog $ make check
    - PASS/FAIL will be printed for each test case

```
pass tests/threads/alarm-single
pass tests/threads/alarm-multiple
pass tests/threads/alarm-simultaneous
FAIL tests/threads/alarm-priority
pass tests/threads/alarm-zero
pass tests/threads/alarm-negative
FAIL tests/threads/priority-change
FAIL tests/threads/priority-donate-one
FAIL tests/threads/priority-donate-multiple
FAIL tests/threads/priority-donate-multiple2
```

Project#0-1

1. In **CSPRO9 or CSPRO10 (not CSPRO)** server, Run **$pintos -v -- -q run alarm-multiple** and capture the result of it (You can just capture the last few lines of the result **but your ID should be shown in the capture, refer the capture in pg. 22)**
2. Use your own account in the server
3. **Due Date: 9/22 (Sun.) 23:59**
   Late submission is allowed up to 3 days (~9/25) and **10% of point will be deducted per day**
4. **Submit the capture file on e-class website**
   (Please use .jpg or .png extensions. Do not use other formats.)
5. **File name should be the following form:**
   os#0_1_SESSION#_ID#.jpg / os#0_1_SESSION#_ID#.png
   e.g.) os#0_1_1_20171234.jpg (Prof. Park's class)
   os#0_1_2_20175678.png (Prof. Kim's class)
   5% of point will deducted for a wrong form
6. No need to submit Hardcopy

Project Schedule

Projects	Points	Contents	Periods	Lectures
Project 0-1	**1**	**Installing Pintos**	**9/16 – 9/22**	Manual will be provided
Project 0-2	3	Pintos Data Structures	9/21 – 10/6	9/21 (Sat.)
Project 1	6	User Programs (1)	10/5 – 11/3	10/5 (Sat.)
Project 2	4	User Programs (2)	11/2 – 11/17	11/2 (Sat.)
Project 3	6	Threads	11/16 – 12/8	11/16 (Sat.)

※ Once you copy other's codes, you will get F grade

Reference Homepages

pintos	http://www.stanford.edu/class/cs140/projects/index.html
pintos document	http://www.stanford.edu/class/cs140/projects/pintos/pintos.pdf