[2021 Network System Programming Homework 4]

Rules:

1. Please use C language in this homework and run your program on Ubuntu 20.04.
2. Please provide Makefile to compile your homework.
3. Do not copy the others homework definitely.
4. If you have any question, please send email to sp_ta@net.nsysu.edu.tw or drop by Room EC5018. However, TA will not help you to debug program.

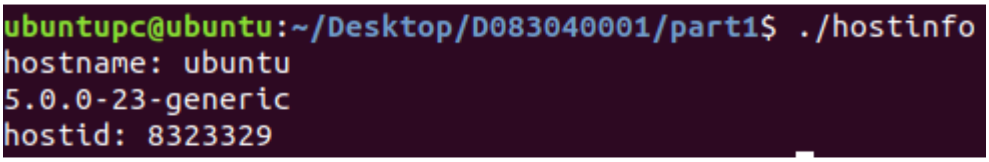
Turn in your homework:

1. Please compress your homework into zip archive.
2. Naming rules: “SP_HW4.zip”.
3. Upload your homework (zip file) to NSYSU Cyber University (網路大學).
4. Deadline: 2021/11/04 23:59. You cannot get any credit if you do not turnin your homework before the deadline.

This homework focuses on system programming and pipe.

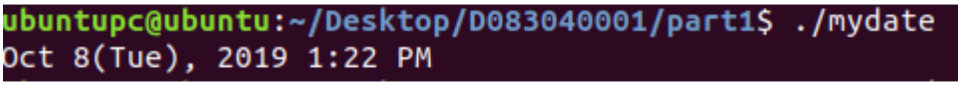
Part 1:

1. Write, compile, and run a program named **hostinfo** that prints out system information in the following format.
   Sample output:



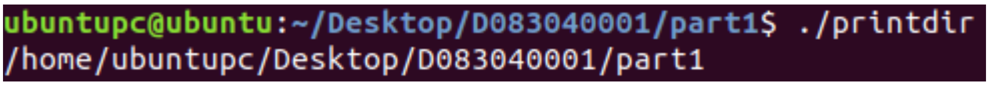
```
ubuntupc@ubuntu:~/Desktop/D083040001/part1$ ./hostinfo
hostname: ubuntu
5.0.0-23-generic
hostid: 8323329
```

2. Write, compile, and run a program named **mydate** that prints out the day and time in the following format.
   Sample output:



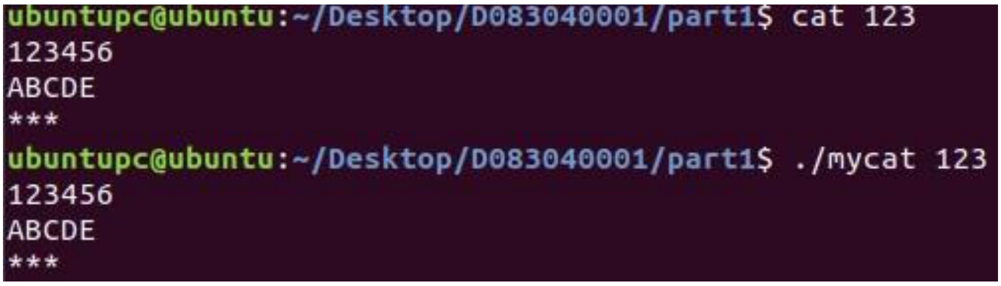
```
ubuntupc@ubuntu:~/Desktop/D083040001/part1$ ./mydate
Oct 8(Tue), 2019 1:22 PM
```

3. Write a program called **printdir** that prints the current directory. Determine what size buffer to pass to **getcwd()** for dynamic allocation.(**Do not** use pwd().)
   Sample output:



```
ubuntupc@ubuntu:~/Desktop/D083040001/part1$ ./printdir
/home/ubuntupc/Desktop/D083040001/part1
```

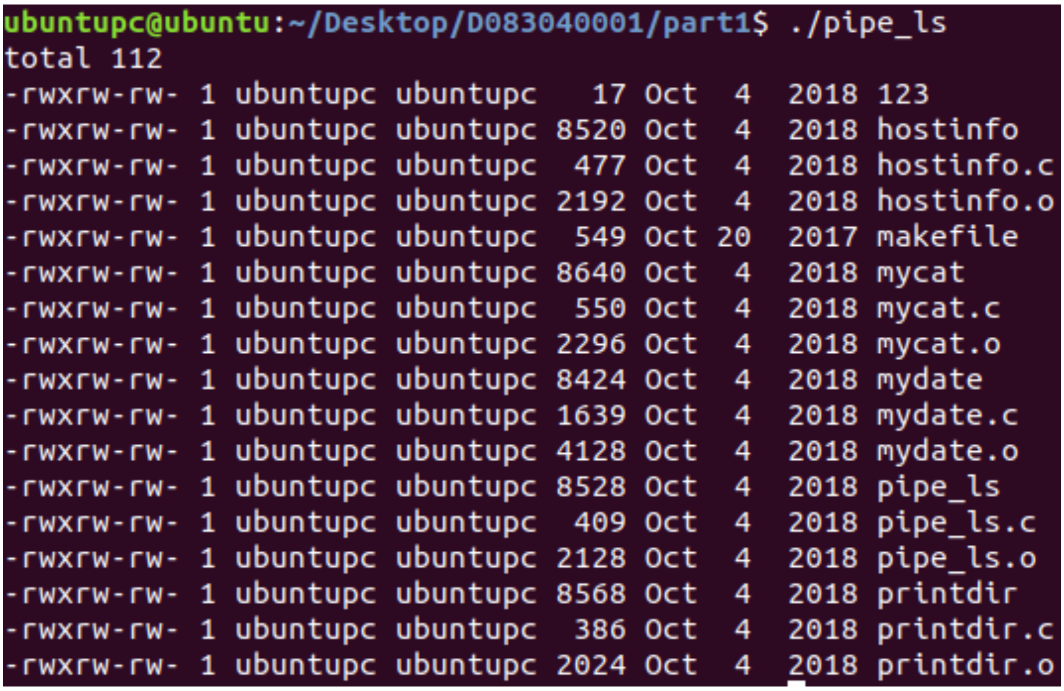
4. Write a program called **mycat** that is a simple version of the program cat. The program takes exactly one file name as argument; you should open it for reading and display its contents to the screen. Check that there is exactly one argument (argc == 2) and if not, display the usage message ”Usage: mycat filename”.
   Sample output:



```
ubuntupc@ubuntu:~/Desktop/D083040001/part1$ cat 123
123456
ABCDE
***
ubuntupc@ubuntu:~/Desktop/D083040001/part1$ ./mycat 123
123456
ABCDE
***
```

5. Write **pipe_ls** to practice using **pipe()** and **dup()**. Have your process start ls (using **fork()** and **exec()**) but read the output from ls over a pipe. The ls program writes output on descriptor 1, so some work has to be done to get the pipe connected. Write what you read on the pipe to **stdout**.

Sample output:



```
ubuntupc@ubuntu:~/Desktop/D083040001/part1$ ./pipe_ls
total 112
-rwxrw-rw- 1 ubuntupc ubuntupc   17 Oct  4  2018 123
-rwxrw-rw- 1 ubuntupc ubuntupc 8520 Oct  4  2018 hostinfo
-rwxrw-rw- 1 ubuntupc ubuntupc  477 Oct  4  2018 hostinfo.c
-rwxrw-rw- 1 ubuntupc ubuntupc 2192 Oct  4  2018 hostinfo.o
-rwxrw-rw- 1 ubuntupc ubuntupc  549 Oct 20  2017 makefile
-rwxrw-rw- 1 ubuntupc ubuntupc 8640 Oct  4  2018 mycat
-rwxrw-rw- 1 ubuntupc ubuntupc  550 Oct  4  2018 mycat.c
-rwxrw-rw- 1 ubuntupc ubuntupc 2296 Oct  4  2018 mycat.o
-rwxrw-rw- 1 ubuntupc ubuntupc 8424 Oct  4  2018 mydate
-rwxrw-rw- 1 ubuntupc ubuntupc 1639 Oct  4  2018 mydate.c
-rwxrw-rw- 1 ubuntupc ubuntupc 4128 Oct  4  2018 mydate.o
-rwxrw-rw- 1 ubuntupc ubuntupc 8528 Oct  4  2018 pipe_ls
-rwxrw-rw- 1 ubuntupc ubuntupc  409 Oct  4  2018 pipe_ls.c
-rwxrw-rw- 1 ubuntupc ubuntupc 2128 Oct  4  2018 pipe_ls.o
-rwxrw-rw- 1 ubuntupc ubuntupc 8568 Oct  4  2018 printdir
-rwxrw-rw- 1 ubuntupc ubuntupc  386 Oct  4  2018 printdir.c
-rwxrw-rw- 1 ubuntupc ubuntupc 2024 Oct  4  2018 printdir.o
```

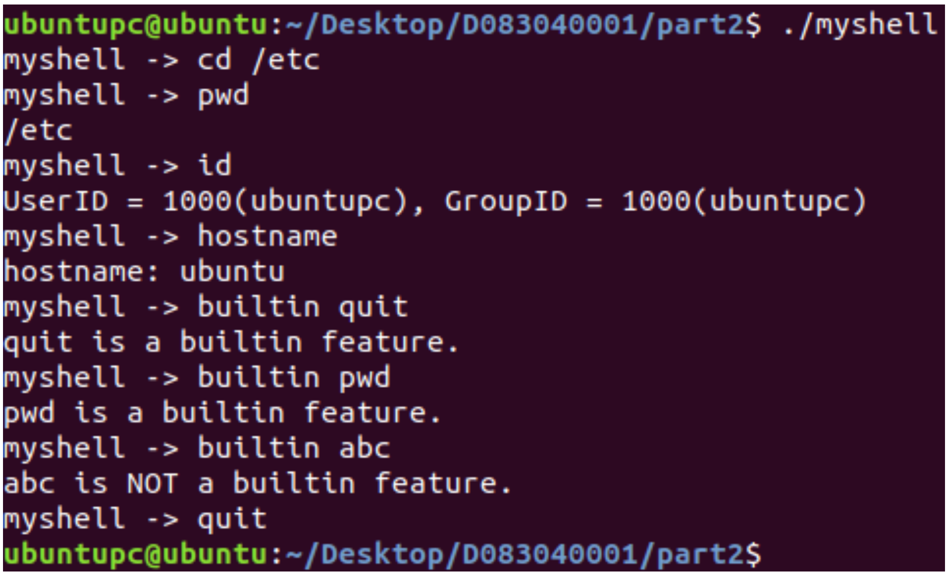
Part 2:

1. Edit the **builtin.c** file to recognize **cd**, **pwd**, **id**, **hostname** and **builtin**. Write functions implementing these commands, and compile then into your shell. The **builtin** command lists the functions built into your shell.

   Files provided:

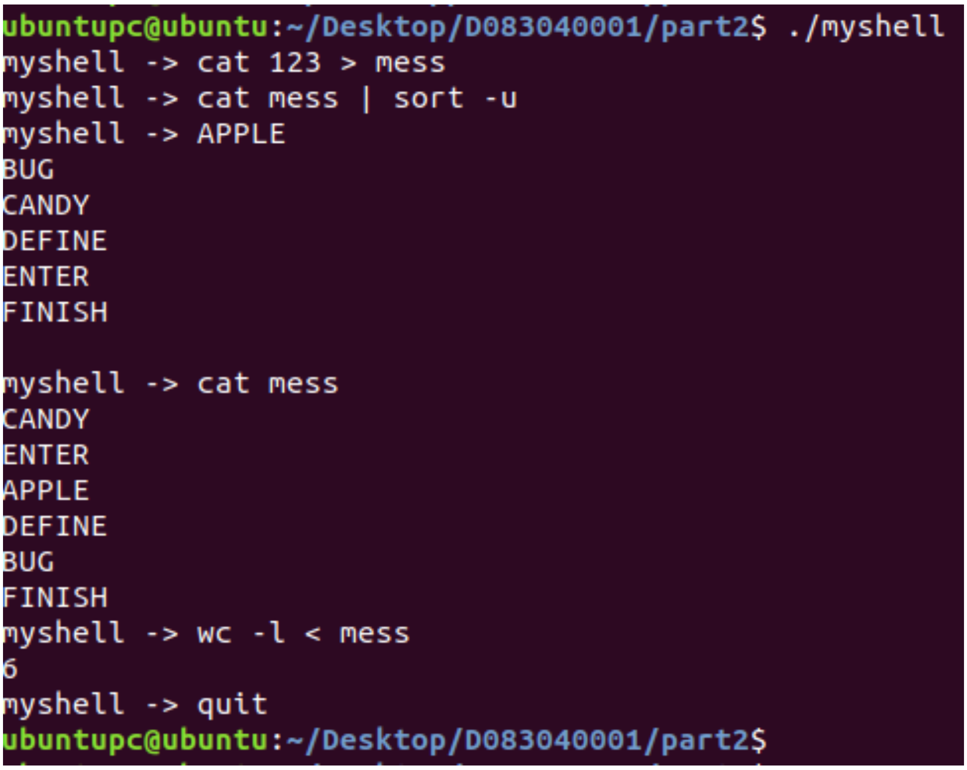
   builtin.c, parse.c, shell.c, shell.h

   Sample output:



```
ubuntupc@ubuntu:~/Desktop/D083040001/part2$ ./myshell
myshell -> cd /etc
myshell -> pwd
/etc
myshell -> id
UserID = 1000(ubuntupc), GroupID = 1000(ubuntupc)
myshell -> hostname
hostname: ubuntu
myshell -> builtin quit
quit is a builtin feature.
myshell -> builtin pwd
pwd is a builtin feature.
myshell -> builtin abc
abc is NOT a builtin feature.
myshell -> quit
ubuntupc@ubuntu:~/Desktop/D083040001/part2$
```

2. Modify the **redirect_in.c** file to recognize standard input and **redirect_out.c** file to recognize standard output. Add code to the **pipe_present.c** file to check for the pipe symbol. Add code to the **pipe_command.c** file to create a process to execute each of the pipe. Modify **is_background.c** to check the "&" symbol. Alter the **run_command.c** file to call these functions.
Files provided:
redirect_in.c, redirect_out.c, run_command.c, pipe_present.c, pipe_command.c, is_background.c
Sample output:



```
ubuntupc@ubuntu:~/Desktop/D083040001/part2$ ./myshell
myshell -> cat 123 > mess
myshell -> cat mess | sort -u
myshell -> APPLE
BUG
CANDY
DEFINE
ENTER
FINISH

myshell -> cat mess
CANDY
ENTER
APPLE
DEFINE
BUG
FINISH
myshell -> wc -l < mess
6
myshell -> quit
ubuntupc@ubuntu:~/Desktop/D083040001/part2$
```

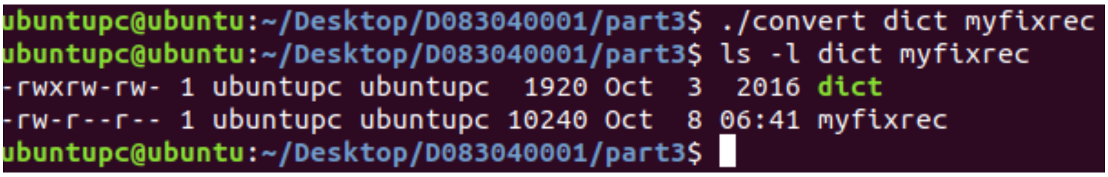
Part 3:

1. The first look up project lab familiarizes you with the format of the dictionary by completing the **convert.c** program that creates the dictionary of fixed-length records (fixrec) from a file of variable-length entries (dict). Add code to **convert.c** to change an editable file into a fixed-length record format.

   File provided:

   convert.c, dict.h, dict

   Sample output:



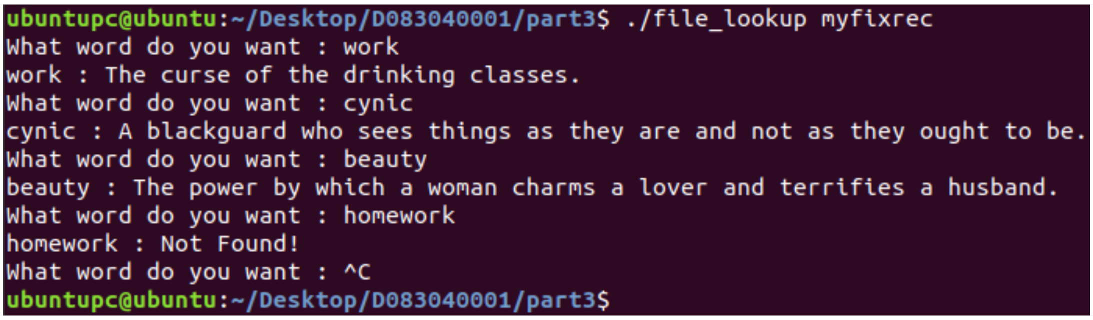
```
ubuntupc@ubuntu:~/Desktop/D083040001/part3$ ./convert dict myfixrec
ubuntupc@ubuntu:~/Desktop/D083040001/part3$ ls -l dict myfixrec
-rwxrw-rw- 1 ubuntupc ubuntupc  1920 Oct  3  2016 dict
-rw-r--r-- 1 ubuntupc ubuntupc 10240 Oct  8 06:41 myfixrec
ubuntupc@ubuntu:~/Desktop/D083040001/part3$ 
```

2. Add code to the **lookup1.c** file to do a simple linear search through a file of fixed length records. Link with **main.c**, the user interface module.

   File provided:

   lookup1.c, main.c

   Sample output:



```
ubuntupc@ubuntu:~/Desktop/D083040001/part3$ ./file_lookup myfixrec
What word do you want : work
work : The curse of the drinking classes.
What word do you want : cynic
cynic : A blackguard who sees things as they are and not as they ought to be.
What word do you want : beauty
beauty : The power by which a woman charms a lover and terrifies a husband.
What word do you want : homework
homework : Not Found!
What word do you want : ^C
ubuntupc@ubuntu:~/Desktop/D083040001/part3$
```