

Assignment 3

1 Introduction

After doing an assignment on command shell interface and learning the nuances of process creation and loading, it now becomes imperative as a systems programmer to understand how input/output redirection and pipes work. This assignment will give you a deeper knowledge of how any output can be redirected to the standard output and any input taken from as the standard input. It will also give you an understanding of process relationships and management.

2 Objective

To understand Linux process management and how i/o redirection and pipes work.

3 Description

Augment your mini command shell to include the facility for redirecting the output to a file and taking the input from a file. Additionally, your shell should also support the use of pipes i.e “|”.

3.1 Input / Output Redirection **(20 marks)**

Modify your mini shell to accept strings in either of these forms and perform redirection:

- (a) `executable_program > output_file`
- (b) `executable_program < input_file`
- (c) `executable_program < input_file > output_file`

Example:

- (i) `sort < in.txt > out.txt`
- (ii) `myls > files_List.txt`

3.2 Pipes

(20 marks)

Modify your shell to accept the names of two or more executable programs and redirect the output of the first program to the input of the second program, output of the second program to the input of the third program, and so on. The executable files will be separated by “|”.

Example:

```
(i)   ls | sort | wc
(ii)  myls | sort |wc
```

3.3 Background Process

(20 marks)

On many occasions a process can be executed in the background i.e without it being attached to any terminal. This requires the process to detach itself from the terminal and start a new session and become a session leader.

Your mini shell should facilitate the user to run any process in the background by appending a ‘&’ at the end of the input. Once a process goes into background, the shell prompt should appear and wait for the next input. The background process may send its output (if any) to the stdout.

Example:

```
[/usr/home/]$ gedit &
```

3.4 Command History

(20 marks)

It is often handy for users to have a shortcut key for their recently used commands. Incorporate such a logger functionality for maintaining the history of commands and bind it to the Up and Down arrow keys. The Up and Down arrow key should allow the user to iterate through the most recent commands.

The memory for the logger should be dynamically allocated. Initially, memory for only one command should be allocated. Whenever the buffer is full more memory should be dynamically reallocated in powers of 2.

3.5 Complete Shell

(20 marks)

Along with all the above functionalities and commands, your mini shell should execute any binary file that is either in the current path or any path (absolute/relative) given in the \$PATH environment variable.

Example:

```
myls | sort r > out.txt
```

myls is from your own program

sort is an external command

redirection and piping again from your own functions

4 Deliverables

It is mandatory that your code should follow proper indentation and doxygen style commenting. The C programs along with the Makefile and the generated doxy file should be submitted in a compressed tar file format with the name **rollno_a3.tar.gz**. The commands for generating documentation using doxygen should be included in the Makefile. There will be deductions in the awarded marks, if you fail to do so. All the source c files should remain in the same directory.