

## Assignment - 1

Deadline : 9.09.2019 08:00 pm

**Languages Allowed: C/C++**

**Task :** Develop a working POSIX compatible shell with a subset of feature support of your default shell. Apart from basic working, required features to be implemented are listed below.

### Pre-requisites

- Multiprocess approach using **fork** syscall.
- **Pipes** for execution chaining and I/O redirection.
- **Signals** and **handlers** ( minimal usage ).
- **TRIE** data structure.
- Environment variables and export.
- Understanding of `".bashrc"` and `".profile"`.
- Following functions will be of help - `fork`, `exec`, `execvp`, `wait`, `waitpid`, `kill`, `dup`, `pipe`, `strncmp`, `strlen`, `malloc`, `free`, `getcwd`, `chdir`, `open`, `close`, `readline`, `gets`, `fgets`, `getchar`, `signal`
- Files permissions and ownership in \*nix or derived systems.
- **alarm()** posix function.
- Prompt and it's meaning for each field, E.g. `user@ubuntu:~$`

### DONT 's

1. No menu driven programs.
2. Do not use `system()` function.
3. You do not have to make any commands yourself. See `/bin` directory.
4. No support for shell scripting is needed.
5. Space handling for filenames is not mandatory, but if it helps while calling functions then do it.
6. This is not a design competition so nothing fancy is needed; for prompt string and format of displaying output from your process, keep it clean. Functionality is important.
7. **Avoid naming anything as test or something which clashes with internally existing tools or keywords.**

### Syntax

1. IO redirection with `'>>'` and `'>'` will be done for one source and one destination only.
2. For `'|'`, a minimum 3 programs must be in pipe. E.g. `cat file1.txt | sort | uniq > save.txt`. Do not hard-code for 3 programs.
3. Prompt must change for distinguishing users(`$`)@hostname and root(`#`)@hostname and also while searching in extended features.

## Implementation Requirements

### Shell Internals

1. Your program must be an input driven independent executable, no menu options are to be provided. It can take n number of strings in the format of a command following with its parameters itself.
2. For interactive processes it needs to be a waiting process.
3. For background command execution, '&' can be passed as last token of current command. You need to maintain a list for background processes and can be made into a foreground process by using 'fg' command. You can implement your own data structure or logic for it.
4. You must maintain a configuration file which your program reads on startup and sets the environment accordingly. Like your own ".bashrc".
5. Support for these initialization variable are to be provided - **PATH, HOME, USER, HOSTNAME, PS1**.
6. Association of ~ with **HOME** variable.
7. Look of **prompt via PS1** is to be handled.
8. Alias support for commands. E.g. **alias ll='ls -l'**.
9. Handle support for - **\$\$, \$? Similar to shell**.

### Extended Features ( NOT OPTIONAL )

1. Recording as script command, where a user can initiate recording of all input and output to a file, this happens in the background. It will be invoked as **record start** and **record stop**.
2. History as buffer - **searchable via TRIE**. This is a list of all commands executed ever. This can have a cap limit which can be configured via ".myrc" file in **HISTSIZE variable**. It will be invoked as **history**.
3. TRIE data structure for tab completion support is needed. List of directories to be traversed on startup which are mentioned in **PATH** variable for populating all command names into the structure.
4. Understanding of environment variables and **export**.
5. A reminder(text based) or alarm(just notification) feature in shell is to be implemented. Maintain a file and in memory structure with **time::data** pair to interrupt and show alarm/reminders or on startup show the missed ones.
6. Set default applications via .myrc file. This requires extension matching/mapping to your preferred application. Handle its I/O and parameter passing on executing.
  - a. E.g. **MEDIA=['vlc', 'vlc path', '.mp4']** in config file.  
So on running - open same.mp4 , it must invoke vlc.  
**# !! Mac users be careful for collision of open keyword in your shell.**