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# P1. Designing a shell

## Assumptions :

- File I/O redirections will be present only at the beginning or at the end of a pipe. Moreover, these cannot be present on the right side of || or |||.
- Input and output redirection can both occur in a single solitary command as well. Eg. ls < file1.txt > file2.txt OR ls > file1.txt < file2.txt
- In interpreting commands pipes have least precedence.
- Nesting of || and ||| is not allowed. Eg ls || (ls || wc, wc), wc is INVALID.
- || and ||| have to occur at the end of a pipeline.
- & if present, occurs at the very end of a command.

## Design description :

- In the main() function, inside an infinite loop, we accept the user command.
- The command is tokenized using pipes as delimeters using tokenize() and process_commands() functions.
- A child of top level parent process is created and given the responsibility of executing the command while the main parent waits for it to finish if it is a foreground process, and doesn't do so if it is a background process.
- The parent sets the process group id of the child using setpgid() and makes this process group the foreground process group using tcsetpgrp() if it is a foreground command.
- Henceforth, all processes created by the intermediate child are in its process group. The process creates n children for n commands in a pipeline.

a) After the command has been tokenized, the executable file name is taken and searched for in the environment PATH variable. If we find that such a file exists( using access() call), we return that file path and call execv() with it. Otherwise we return an error and ask for a prompt again.
b) The parent sets the process group id of the child using setpgid() and makes this process group the foreground process group using tcsetpgrp() if it is a foreground command. Otherwise, the process group is a background process group.
c) All three operators >, < and >> are supported and file descriptors are remapped accordingly in the getDescriptors() function. Details of remapped file descriptors are printed on execution of every command.
d) For a pipeline of n commands, a new process is created for each command such that it reads input from the previous command and writes output to following program, both using pipes. For a pipeline of n commands, our design uses n pipes.
e) For implementing a ||, the intermediate child process takes the output from the command just before the || and sends it to the write ends of two pipes, each of which is meant for one of the comma separated commands. Similarly, ||| is implemented.

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f) Short cut command mode : To implement this mode, a lookup table is maintained(as an array of strings) which stores command corresponding to each index. This table is populated using sc -i <index> <command> and entries are deleted using sc -d <index>. A signal handler is implemented for SIGINT which scans a number and executes the corresponding command from the lookup table.This functionality is totally handled by the top level parent.