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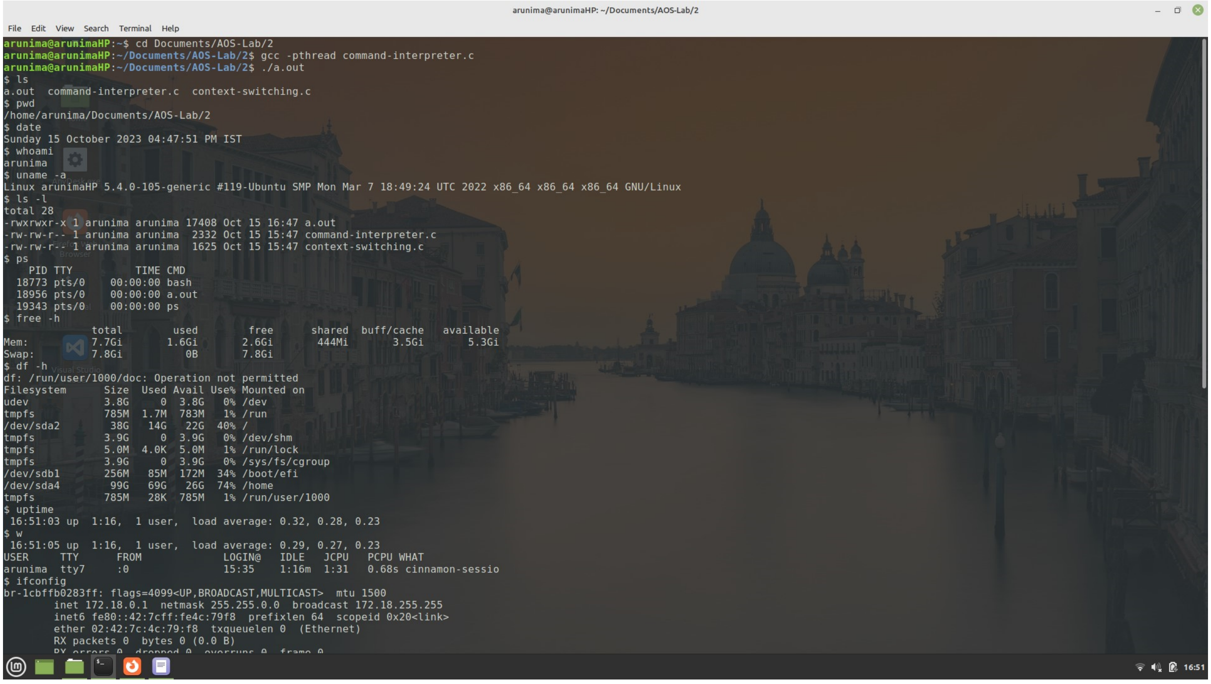
M. Tech CSE - 1st Year
23CSM1R04

Assignment 2.1

Implement a minimal command interpreter with support for I/O redirection features.

```c
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <unistd.h>
#include <sys/types.h>
#include <sys/wait.h>

#define MAX_COMMAND_LENGTH 1024
#define MAX_ARGUMENTS 32

// Function to display the command prompt ($)
void display_prompt() {
    printf("$ ");
    fflush(stdout);
}

// Function to split a command line into arguments
void parse_command(char *command, char **arguments) {
    int i = 0;
    char *token = strtok(command, " ");

    while (token != NULL) {
        arguments[i++] = token;
        token = strtok(NULL, " ");
    }
    arguments[i] = NULL; // Null-terminate the argument list
}

int main() {
    char command[MAX_COMMAND_LENGTH];
    char *arguments[MAX_ARGUMENTS];
    int background = 0;

    while (1) {
        // Display the command prompt
        display_prompt();

        // Read the user input
        if (fgets(command, sizeof(command), stdin) == NULL) {
            perror("Failed to read input");
            exit(1);
        }

        // Remove the newline character from the input
        command[strlen(command) - 1] = '\0';

        // Check if the user wants to exit
        if (strcmp(command, "exit") == 0) {
            printf("Goodbye!\n");
            break; // Exit the loop and the program
        }

        // Check for background execution
        if (command[strlen(command) - 1] == '&') {
            background = 1;
            command[strlen(command) - 1] = '\0';
        } else {
            background = 0;
        }

        // Parse the command into arguments
        parse_command(command, arguments);

        // Fork a child process
        pid_t pid = fork();

        if (pid < 0) {
            perror("Fork failed");
            exit(1);
        } else if (pid == 0) {
            // This is the child process
            // Execute the user's command
            execvp(arguments[0], arguments);

            // If execvp fails, report an error
            perror("Command execution failed");
            exit(1);
        } else {
            // This is the parent process
            // If not background execution, wait for the child to
complete
            if (!background) {
                int status;
                waitpid(pid, &status, 0);
            }
        }
    }

    return 0;
}
```

Screenshot



arunima@arunimaHP: ~/Documents/AOS-Lab/2
File Edit View Search Terminal Help
16:51

```
arunima@arunimaHP:~$ cd Documents/AOS-Lab/2
arunima@arunimaHP:~/Documents/AOS-Lab/2$ gcc -pthread command-interpreter.c
arunima@arunimaHP:~/Documents/AOS-Lab/2$ ./a.out
$ ls
a.out  command-interpreter.c  context-switching.c
$ pwd
/home/arunima/Documents/AOS-Lab/2
$ date
Sunday 15 October 2023 04:47:51 PM IST
$ whoami
arunima
$ uname -a
Linux arunimaHP 5.4.0-105-generic #119-Ubuntu SMP Mon Mar 7 18:49:24 UTC 2022 x86_64 x86_64 x86_64 GNU/Linux
$ ls -l
total 28
-rwxrwxr-x 1 arunima arunima 17408 Oct 15 16:47 a.out
-rw-rw-r-- 1 arunima arunima  2332 Oct 15 15:47 command-interpreter.c
-rw-rw-r-- 1 arunima arunima  1625 Oct 15 15:47 context-switching.c
$ ps
    PID TTY          TIME CMD
  18773 pts/0    00:00:00 bash
  18956 pts/0    00:00:00 a.out
  19343 pts/0    00:00:00 ps
$ free -h
              total        used        free      shared  buff/cache   available
Mem:          7.7Gi       1.6Gi       2.6Gi       444Mi       3.5Gi       5.3Gi
Swap:         7.8Gi          0B       7.8Gi
$ df -h
df: /run/user/1000/doc: Operation not permitted
Filesystem      Size  Used Avail Use% Mounted on
udev            3.8G     0  3.8G   0% /dev
tmpfs           785M  1.7M  783M   1% /run
/dev/sda2        38G   14G   22G  40% /
tmpfs           3.9G     0  3.9G   0% /dev/shm
tmpfs           5.0M  4.0K  5.0M   1% /run/lock
tmpfs           3.9G     0  3.9G   0% /sys/fs/cgroup
/dev/sdb1       256M   85M  172M  34% /boot/efi
/dev/sda4        99G   69G   26G  74% /home
tmpfs           785M   28K  785M   1% /run/user/1000
$ uptime
 16:51:03 up  1:16,  1 user,  load average: 0.32, 0.28, 0.23
$ w
 16:51:05 up  1:16,  1 user,  load average: 0.29, 0.27, 0.23
USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
arunima  tty7     :0               15:35    1:16m  1:31   0.68s cinnamon-sessio
$ ifconfig
br-1cbffb0283ff: flags=4099<UP,BROADCAST,MULTICAST>  mtu 1500
        inet 172.18.0.1  netmask 255.255.0.0  broadcast 172.18.255.255
        inet6 fe80::42:7cff:fe4c:79f8  prefixlen 64  scopeid 0x20<link>
        ether 02:42:7c:4c:79:f8  txqueuelen 0  (Ethernet)
        RX packets 0  bytes 0 (0.0 B)
        RX errors 0  dropped 0  overruns 0  frame 0
```