

LAB EXERCISES:

1. Write a C program to emulate the `ls -l` UNIX command that prints all files in a current directory and lists access privileges, etc. DO NOT simply exec `ls -l` from the program.

Program:

```
#include <unistd.h>
#include <stdio.h>
#include <sys/stat.h>
#include <sys/types.h>
#include <dirent.h>

int main()
{
    DIR *myDirectory;
    struct dirent *myEntryToDirectory;
    struct stat statusBuffer;

    if ((myDirectory = opendir(".")) == NULL)
    {
        printf("We can not open the directory.\n");
        return 0;
    }

    chdir(".");
    while ((myEntryToDirectory = readdir(myDirectory)) != NULL)
    {
        lstat(myEntryToDirectory->d_name, &statusBuffer);

        if (!S_ISDIR(statusBuffer.st_mode))
        {
            printf("%s \t \t", myEntryToDirectory->d_name);
            printf((S_ISDIR(statusBuffer.st_mode)) ? "d" : "-");
            printf((statusBuffer.st_mode & S_IRUSR) ? "r" : "-");
            printf((statusBuffer.st_mode & S_IWUSR) ? "w" : "-");
            printf((statusBuffer.st_mode & S_IXUSR) ? "x" : "-");
            printf((statusBuffer.st_mode & S_IRGRP) ? "r" : "-");
            printf((statusBuffer.st_mode & S_IWGRP) ? "w" : "-");
            printf((statusBuffer.st_mode & S_IXGRP) ? "x" : "-");
            printf((statusBuffer.st_mode & S_IROTH) ? "r" : "-");
            printf((statusBuffer.st_mode & S_IWOTH) ? "w" : "-");
            printf((statusBuffer.st_mode & S_IXOTH) ? "x" : "-");
        }
    }
}
```

```
printf("\n\n");
}
}
}
```

Output:

```
@lplab-ThinkCentre-M71e: ~/Documents/190905513/OS_LAB/LAB2
student@lplab-ThinkCentre-M71e:~/Documents/190905513/OS_LAB/LAB2$ gcc q1.c -o q1
student@lplab-ThinkCentre-M71e:~/Documents/190905513/OS_LAB/LAB2$ ./q1
sample.txt          -rw-rw-r--
q1.c                -rw-rw-r--
.~lock.190905513_OSLab2.odt#          -rw-rw-r--
q2.c                -rw-rw-r--
190905513_OSLab2.odt          -rw-rw-r--
justtoshowop.txt      -rw-rw-r--
q1                    -rwxrwxr-x
student@lplab-ThinkCentre-M71e:~/Documents/190905513/OS_LAB/LAB2$
```

2. Write a program that will list all files in a current directory and all files in subsequent subdirectories.

Program:

```
#include <unistd.h>
#include <stdio.h>
#include <dirent.h>
#include <string.h>
#include <sys/stat.h>
#include <stdlib.h>

void printDirectory(char *dir, int depth)
{
    DIR *myDirectory;
    struct dirent *myEntryToDirectory;
    struct stat statusBuffer;

    if ((myDirectory = opendir(dir)) == NULL)
    {
        fprintf(stderr, "Directory cannot be opened: %s\n", dir);
        return;
    }
    chdir(dir);

    while ((myEntryToDirectory = readdir(myDirectory)) != NULL)
```

```

{
    lstat(myEntryToDirectory->d_name, &statusBuffer);

    if (S_ISDIR(statusBuffer.st_mode))
    {

        if (strcmp(".", myEntryToDirectory->d_name) == 0 || strcmp("..",
myEntryToDirectory->d_name) == 0)
        {
            continue;
        }

        printf("%*s%s/\n", depth, "", myEntryToDirectory->d_name);

        printDirectory(myEntryToDirectory->d_name, depth + 4);
    }

    else
    {
        printf("%*s%s\n", depth, "", myEntryToDirectory->d_name);
    }
}
chdir("..");
closedir(myDirectory);
}

int main()
{
    printDirectory(".", 0);
    exit(0);
}

```

Output:

```

@lplab-ThinkCentre-M71e: ~/Documents/190905513
student@lplab-ThinkCentre-M71e:~/Documents/190905513$ gcc q2.c -o q2
student@lplab-ThinkCentre-M71e:~/Documents/190905513$ ./q2
CD_LAB/
  Lab1/
    sample.txt
    q3
    q1.c
    190905513_CD_Lab1.odt
    reversesample.txt
    q2.c
    q3.c
    sample1.txt
    q1
    q2
    merged.txt
  Compiler Design Lab Manual.pdf
OS_LAB/
  LAB2/
    sample.txt
    q1.c
    .~lock.190905513_OSLab2.odt#
    190905513_OSLab2.odt
    justtoshowop.txt
    q1
q2.c
q2
student@lplab-ThinkCentre-M71e:~/Documents/190905513$

```

3. How do you list all installed programs in Linux?

Command:

`dpkg -l`

Output:

```
@lplab-ThinkCentre-M71e: ~/Documents/190905513/OS_LAB/LAB2
student@lplab-ThinkCentre-M71e:~/Documents/190905513/OS_LAB/LAB2$ dpkg -l
Desired=Unknown/Install/Remove/Purge/Hold
| Status=Not/Inst/Conf-files/Unpacked/halF-conf/Half-inst/trig-aWait/Trig-pend
| / Err?=(none)/Reinst-required (Status,Err: uppercase=bad)
++-----+
| Name          | Version          | Architecture | Description
++-----+
ii ally-profile-manager-indicator 0.1.10-0ubuntu3   amd64         Accessibility Profile Manager - Unity desktop indicator
ii account-plugin-facebook          0.12+16.04.20160126 all           GNOME Control Center account plugin for single signon - facebook
ii account-plugin-flickr            0.12+16.04.20160126 all           GNOME Control Center account plugin for single signon - flickr
ii account-plugin-google             0.12+16.04.20160126 all           GNOME Control Center account plugin for single signon
ii accountsservice                  0.6.40-2ubuntu11.6 amd64         query and manipulate user account information
ii acl                              2.2.52-3          amd64         Access control list utilities
ii acpi-support                     0.142             amd64         scripts for handling many ACPI events
ii acpid                            1:2.0-26.1ubuntu2 amd64         Advanced Configuration and Power Interface event daemon
ii activity-log-manager              0.9.7-0ubuntu23.16 amd64         blacklist configuration user interface for Zeitgeist
ii adduser                          3.113+nmu3ubuntu4 all             add and remove users and groups
ii adium-theme-ubuntu               0.3.4-0ubuntu1.1  all           Adium message style for Ubuntu
ii adwaita-icon-theme               3.18.0-2ubuntu3.1 all           default icon theme of GNOME (small subset)
ii aisleriot                        1:3.18.2-1ubuntu1 amd64         GNOME solitaire card game collection
ii alsa-base                        1.0.25+dfsg-0ubuntu1 all           ALSA driver configuration files
ii alsa-utils                       1.1.0-0ubuntu5    amd64         Utilities for configuring and using ALSA
ii anacron                         2.3-23            amd64         cron-like program that doesn't go by time
ii ant                             1.9.6-1ubuntu1.1  all           Java based build tool like make
ii ant-optional                    1.9.6-1ubuntu1.1  all           Java based build tool like make - optional libraries
ii apg                             2.2.3.dfsg.1-2ubuntu amd64         Automated Password Generator - Standalone version
ii app-install-data                 15.10             all           Ubuntu applications (data files)
ii app-install-data-partner         16.04             all           Application Installer (data files for partner applications/repos)
ii apparmor                         2.10.95-0ubuntu2.11 amd64         user-space parser utility for AppArmor
ii appmenu-qt:amd64                 0.2.7+14.04.2014030 amd64         application menu for Qt
ii appmenu-qt5                     0.3.0+16.04.2017021 amd64         application menu for Qt5
ii apport                           2.20.1-0ubuntu2.30 all           automatically generate crash reports for debugging
ii apport-gtk                       2.20.1-0ubuntu2.30 all           GTK+ frontend for the apport crash report system
ii apport-symptoms                  0.20              all           symptom scripts for apport
ii appstream                        0.9.4-1ubuntu3    amd64         Software component index
ii apt                              1.2.32ubuntu0.2   amd64         commandline package manager
ii apt-transports-https             1.2.32ubuntu0.2   amd64         https download transport for APT
ii apt-utils                        1.2.32ubuntu0.2   amd64         package management related utility programs
ii aptdaemon                       1.1.1+bzr982-0ubuntu all          transaction based package management service
ii aptdaemon-data                  1.1.1+bzr982-0ubuntu all          data files for clients
ii apturl                           0.5.2ubuntu11.1   amd64         install packages using the apt protocol - GTK+ frontend
ii apturl-common                   0.5.2ubuntu11.1   amd64         install packages using the apt protocol - common data
ii aspectj                          1.8.8-1           all           aspect-oriented extension for Java - tools
ii aspell                          0.60.7-20110707-3ub amd64         GNU Aspell spell-checker
```

4. How do you find out what RPM packages are installed on Linux?

Command:

`rpm -qa`

Output:

//RPM packages are not installed OR access to root is not given to the user *student* on lab's computer. Hence, cannot show the desired output.

```
@lplab-ThinkCentre-M71e: ~/Documents/190905513/OS_LAB/LAB2
student@lplab-ThinkCentre-M71e:~/Documents/190905513/OS_LAB/LAB2$ rpm -qa
The program 'rpm' is currently not installed. To run 'rpm' please ask your administrator to install the package 'rpm'
student@lplab-ThinkCentre-M71e:~/Documents/190905513/OS_LAB/LAB2$
```