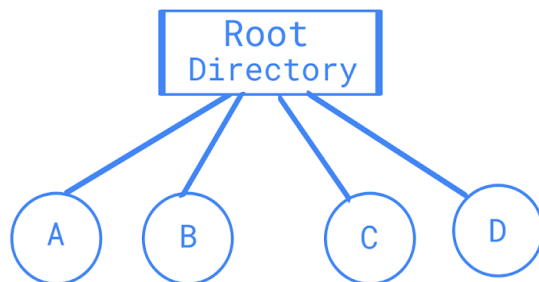# Experiment No. 3 Simulation of File Organisation Techniques

Aim: To write a program to simulate the following file allocation strategies.

a) Sequential b) Indexed c) Linked

Theory: **File Organization Techniques:** The directory contains information about the files, including attributes, location, and ownership. Sometimes the directories consist of subdirectories also. The directory is itself a file, owned by the operating system and accessible by various file management routines.

Single Level Directories: The simplest method is to have one big list of all the files on the disk. The entire system will contain only one directory which is supposed to mention all the files present in the file system. The directory contains one entry per each file present on the file system. It is the simplest of all directory structures, in this the directory system having only one directory, it consists of all files. Sometimes it is said to be the root directory. The following dig. Shows a single level directory that contains four files (A, B, C, D). It has the simplicity and ability to locate files quickly. It is not used in the multi-user system, it is used on the small embedded system.


Advantages

1. Implementation is very simple.
2. If the sizes of the files are very small then the searching becomes faster.
3. File creation, searching, deletion is very simple since we have only one directory.

Disadvantages

1. We cannot have two files with the same name.
2. The directory may be very big therefore searching for a file may take so much time.
3. Protection cannot be implemented for multiple users.
4. There are no ways to group the same kind of files.
5. Choosing the unique name for every file is a bit complex and limits the number of files in the system because most of the Operating System limits the number of characters used to construct the file name.

Two Level Directory:

In two level directory systems, we can create a separate directory for each user. There is one master directory which contains separate directories dedicated to each user. For each user, there is a different directory present at the second level, containing a group of user's files. The system doesn't let a user enter in the other user's directory without permission.

Two Level Directory
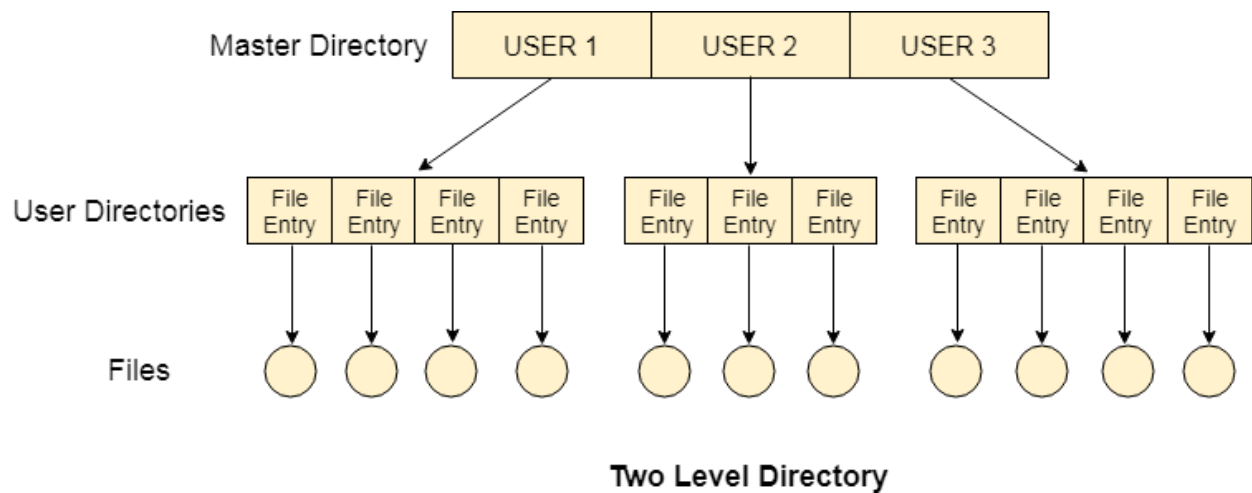
Characteristics of two level directory system

1. Each files has a path name as /User-name/directory-name/

2. Different users can have the same file name.

3. Searching becomes more efficient as only one user's list needs to be traversed.

4. The same kind of files cannot be grouped into a single directory for a particular user.

Every Operating System maintains a variable as PWD which contains the present directory name (present username) so that the searching can be done appropriately.

Algorithm: *Single level directory:*

Step 1: Start

Step 2: In the root directory, four options are available - Create file, Delete file, Search file, Display files and Exit. Then, ask the user to enter an option.

Step 3: If the user choose to create a file

3.1: Enter name of the file

3.2: If the name already used by another file, goto 3.4

3.3: Else, file is created successfully with the given name

3.4: goto Step 2

Step 4: If the user choose to delete a file

4.1: If directory is empty, goto Step 4.4

4.2: Enter name of the file

4.3: If that particular file is present in the root directory, it is deleted.

4.4: goto Step 2

Step 5: If the user choose to search for a file

5.1: If directory is empty, goto Step 5.4

5.2: Enter name of the file

5.3: If that particular file is present in the root directory, display a message informing file is found.

5.4: goto Step 2

Step 6: If the user choose to display all files

6.1: If directory is empty, goto Step 6.3

6.2: Display names of all the files stored in directory

6.3: goto Step 2

Step 7: If the user choose to exit goto Step 8

Step 8: Stop

Two-level directory structure:

Step 1: Start

Step 2: In the root directory, seven options are available - Create User directory, Delete directory, Create file, Delete file, Search file, Display files and Exit. Ask the user to choose an option.

Step 3: If the user choose to create a directory

    3.1: Enter name of the directory

    3.2: If the name already used by another directory, goto 3.4

    3.3: Else, directory is created successfully with the given name

    3.4: goto Step 2

Step 4: If the user choose to delete a directory

    4.1: If root directory is empty, goto Step 4.4

    4.2: Enter name of the directory

    4.3: If that particular directory present in root directory and is empty, then it is deleted.

    4.4: goto Step 2

Step 5: If the user choose to create a file

    5.1: Enter name of the directory

    5.2: If that directory exists inside root directory, Enter name of the file 5.2: If the name already used by another file, goto 5.4

    5.3: Else, file is created successfully with the given name

    5.4: goto Step 2

Step 6: If the user choose to delete a file

    6.1: Enter name of the directory

    6.2: If that directory exists inside root directory, Enter name of the file

    6.3: If that particular file present in the given directory, it is deleted.

    6.4: goto Step 2

Step 7: If the user choose to search for a file

    7.1: Enter name of the directory

    7.2: If that directory exists inside root directory, Enter name of the file

    7.3: If that particular file present in the given directory, display a message informing file is found.

    7.4: goto Step 2

Step 8: If the user choose to display all files

    8.1: If root directory is empty, goto Step 8.3

        8.2: Display names of all the user directories and files stored
            inside them

        8.3: goto Step 2

Step 9: If the user choose to exit goto Step 10

Step 10: Stop

Program:

<u>Single level directory</u>
```python
import os
def screen_clear():
    # for mac and linux(here, os.name is 'posix')
    if os.name == 'posix':
        _ = os.system('clear')
    else:
        # for windows platform
        _ = os.system('cls')

#global variables
fname=[]
j=0
c=0

def search():
    print("Enter file name to be searched:")
    fsearch = input()
    temp=[]
    f=1
    temp.append(fsearch)
    for i in fname:
        if(temp == i):
            print("Searched file is present in directory.")
            f=0
    if(f):
        print("Searched file is not present in directory.")
    print("------------------------------------------------------------------------\n\n")

def del_file(j):
    print("Enter file name to be deleted:")
    fdel = input()
    temp=[]
    f=1
    temp.append(fdel)
    for i in fname:
        if(temp == i):
```

```python
            fname.remove(i)
            fname.append([])
            print("File has been deleted from the directory.")
            f=0
    if(f):
        print("\nThe given file is not present in directory.")
    print("------------------------------------------------------------------------\n\n")

def display(j):
    if (not j):
        print("\nNo file present in the directory.")
    for i in range(j):
        print(fname[i])
    print("------------------------------------------------------------------------\n\n")

def main():
    j=0
    c=0
    ptemp=[]
    ch=0
    choice=0
    cman=0
    man=0
    name=[]
    screen_clear()
    while(1):
        print("1. Create Directory\t2. Create File\t3. Delete File")
        print("\n4. Search File\t\t5. Display\t6. Exit\n\nEnter your choice -- ")
        choice = int(input())
        if(choice==1):
            print("\n\nEnter the directory name:")
            dname=input()
            man=1
            print("\n")
        elif(choice==2):
            if(man):
                if(cman != 1):
                    print("Enter the number of files:")
                    nf=int(input())
```

```python
    for i in range(nf):
        fname.append([])
    cman=1
k=0
while(ch==1 or k==0):
    k=1
    l=0
    temp=[]
    print(fname)
    print("Enter file name to be created:")
    name=input()
    temp.append(name)
    for i in fname:
        if(temp == i):
            print("There is already ",name)
            break
        else:
            l=l+1
    if(l==nf and j<nf):
        ptemp=fname[j]
        if(ptemp!=[] or c>=nf):
            print("Cannot enter file. Please try again.")
        else:
            fname[j].append(name[:])
            print(fname[j])
            j=j+1
            c=c+1
    if(c<nf):
        print("Do you want to enter another file(Yes - 1 or No - 0):")
        ch=int(input())
    else:
        print("\nMaximum no. of files have been input.\n")
        print("Directory name is: ",dname)
        print("Files names are:")
        for i in range(j):
            print(fname[i])
        break
else:
```

```python
            print("Please enter the directory name.\n")
        elif(choice==3):
            if(not man):
                print("Please enter the directory name.\n")
            else:
                del_file(j)
                j=j-1
                c=c-1
        elif(choice==4):
            if(not man):
                print("Please enter the directory name.\n")
            else:
                search()
        elif(choice==5):
            if(not man):
                print("Please enter the directory name.\n")
            else:
                print("Directory name is: ",dname)
                display(j)
        else:
            break

if __name__ == '__main__':
    main()
```

Two Level Directory

```python
import os
def screen_clear():
    # for mac and linux(here, os.name is 'posix')
    if os.name == 'posix':
        _ = os.system('clear')
    else:
        # for windows platform
        _ = os.system('cls')

def main():
    d={}
    fcnt={}
    dcnt=0
    while(True):
        print("\n1. Create Directory\n2. Delete Directory\n3. Create File\n4. Delete File\n5. Search File\n6. Display Files\n7. Exit");
        ch=int(input("Enter your choice -- "))
        if(ch==1):
            dname=input("Enter name of the directory : ")
            if dname in d:
                print("There is already another directory with the same name.")
            else:
                d[dname]=[]
                fcnt[dname]=0
                dcnt+=1
                print("Directory created successfully.")
            continue
        elif(ch==2):
            if(dcnt!=0):
                dname=input("Enter name of the directory : ")
                if dname in d:
                    if(fcnt[dname]==0):
                        d.pop(dname)
                        fcnt.pop(dname)
                        dcnt-=1
                        print("Directory has been deleted.")
                    else:
                        print("Directory is not empty, cannot delete a non-empty directory.")
```

```python
            else:
                print("Sorry, Directory not found.")
        else:
            print("No User Directories Found, Root Directory is empty.");
        continue
    elif(ch==3):
        if(dcnt!=0):
            dname=input("Enter name of the directory: ")
            if dname in d:
                fname=input("Enter name of the file: ")
                if fname in d[dname]:
                    print("There is already another file with the same name in this
directory!!")
                else:
                    d[dname].append(fname)
                    fcnt[dname]+=1
                    print("File created successfully in the directory : ",dname)
            else:
                print("Sorry, Directory not found.")
        else:
            print("No User Directories Found, Root Directory is empty.");
        continue
    elif(ch==4):
        if(dcnt!=0):
            dname=input("Enter name of the directory : ")
            if dname in d:
                fname=input("Enter name of the file : ")
                if fname in d[dname]:
                    d[dname].remove(fname)
                    fcnt[dname]-=1
                    print("File was found and deleted successfully from the directory :
",dname)
                else:
                    print("Sorry, File not found.")
            else:
                print("Sorry, Directory not found.")
        else:
            print("No User Directories Found, Root Directory is empty.");
        continue
```

```python
        elif(ch==5):
            if(dcnt!=0):
                dname=input("Enter name of the directory : ")
                if dname in d:
                    fname=input("Enter name of the file : ")
                    if fname in d[dname]:
                        print("File is present in the directory : ",dname)
                    else:
                        print("Sorry, File not found.")
                else:
                    print("Sorry, Directory not found.")
            else:
                print("No User Directories Found, Root Directory is empty.");
            continue
        elif(ch==6):
            if(dcnt!=0):
                print("\nDirectory --> Files")
                print("-------------------------------------------------------------\n")
                for dname in d:
                    print(dname,"--> ",end="")
                    for fname in d[dname]:
                        print(fname,end=" ")
                        print("\n")
                print("-------------------------------------------------------------\n")
            else:
                print("No User Directories Found, Root Directory is empty.");
            continue
        else:
            break

if __name__ == '__main__':
    main()
```

Output:

<u>*Single Level*</u>

1. Create Directory   2. Create File 3. Delete File

4. Search File   5. Display   6. Exit

Enter your choice --
1

Enter the directory name:
aaa

1. Create Directory   2. Create File 3. Delete File

4. Search File   5. Display   6. Exit

Enter your choice --
2
Enter the number of files:
3
[[], [], []]
Enter file name to be created:
aaa
['aaa']
Do you want to enter another file(Yes - 1 or No - 0):
1
[['aaa'], [], []]
Enter file name to be created:
bbb
['bbb']
Do you want to enter another file(Yes - 1 or No - 0):
0
1. Create Directory   2. Create File 3. Delete File

4. Search File   5. Display   6. Exit

Enter your choice --
3
Enter file name to be deleted:
aaa
File has been deleted from the directory.
----

1. Create Directory   2. Create File 3. Delete File

4. Search File   5. Display   6. Exit

Enter your choice --
5
Directory name is: aaa
['bbb']
----

1. Create Directory   2. Create File 3. Delete File

4. Search File   5. Display   6. Exit

Enter your choice --
2
[['bbb'], [], []]
Enter file name to be created:
aaa
['aaa']
Do you want to enter another file(Yes - 1 or No - 0):
1
[['bbb'], ['aaa'], []]
Enter file name to be created:
ccc
['ccc']

Maximum no. of files have been input.

Directory name is: aaa
Files names are:
['bbb']
['aaa']
['ccc']
1. Create Directory   2. Create File 3. Delete File

4. Search File   5. Display   6. Exit

Enter your choice --
3
Enter file name to be deleted:
aaa
File has been deleted from the directory.
----

1. Create Directory   2. Create File 3. Delete File

4. Search File   5. Display   6. Exit

Enter your choice --
5
Directory name is: aaa
['bbb']
['ccc']
----

1. Create Directory   2. Create File 3. Delete File

4. Search File   5. Display   6. Exit

Enter your choice --
2
[['bbb'], ['ccc'], []]
Enter file name to be created:
aaa
['aaa']

Maximum no. of files have been input.

Directory name is: aaa
Files names are:
['bbb']
['ccc']
['aaa']
1. Create Directory   2. Create File 3. Delete File

4. Search File   5. Display   6. Exit

Enter your choice --
4
Enter file name to be searched:
asdcas
Searched file is not present in directory.
----

1. Create Directory   2. Create File 3. Delete File

4. Search File   5. Display   6. Exit

Enter your choice --
4
Enter file name to be searched:
aaa
Searched file is present in directory.
----

1. Create Directory   2. Create File 3. Delete File

4. Search File   5. Display   6. Exit

Enter your choice --
6

Two-Level

1. Create Directory
2. Delete Directory
3. Create File
4. Delete File
5. Search File
6. Display Files
7. Exit
Enter your choice -- 1
Enter name of the directory : sss
Directory created successfully.

1. Create Directory
2. Delete Directory
3. Create File
4. Delete File
5. Search File
6. Display Files
7. Exit
Enter your choice -- 3
Enter name of the directory: sss
Enter name of the file: aaa
File created successfully in the directory : sss

1. Create Directory
2. Delete Directory
3. Create File
4. Delete File
5. Search File
6. Display Files
7. Exit
Enter your choice -- 1
Enter name of the directory : bbb
Directory created successfully.

1. Create Directory
2. Delete Directory
3. Create File

4. Delete File
5. Search File
6. Display Files
7. Exit
Enter your choice -- 6

Directory --> Files
----

sss --> aaa

bbb --> ---

1. Create Directory
2. Delete Directory
3. Create File
4. Delete File
5. Search File
6. Display Files
7. Exit
Enter your choice -- 2
Enter name of the directory : bbb
Directory has been deleted.

1. Create Directory
2. Delete Directory
3. Create File
4. Delete File
5. Search File
6. Display Files
7. Exit
Enter your choice -- 2
Enter name of the directory : aaa
Sorry, Directory not found.

1. Create Directory
2. Delete Directory
3. Create File

4. Delete File

5. Search File

6. Display Files

7. Exit

Enter your choice -- 4

Enter name of the directory : sss

Enter name of the file : aaa

File was found and deleted successfully from the directory : sss

1. Create Directory

2. Delete Directory

3. Create File

4. Delete File

5. Search File

6. Display Files

7. Exit

Enter your choice -- 2

Enter name of the directory : sss

Directory has been deleted.

1. Create Directory

2. Delete Directory

3. Create File

4. Delete File

5. Search File

6. Display Files

7. Exit

Enter your choice -- 7

```
1. Create Directory      2. Create File  3. Delete File

4. Search File           5. Display      6. Exit

Enter your choice --
1


Enter the directory name:
sss


1. Create Directory      2. Create File  3. Delete File

4. Search File           5. Display      6. Exit

Enter your choice --
2
Enter the number of files:
3
[[], [], []]
Enter file name to be created:
aaa
['aaa']
Do you want to enter another file(Yes - 1 or No - 0):
1
[['aaa'], [], []]
Enter file name to be created:
bbb
['bbb']
Do you want to enter another file(Yes - 1 or No - 0):
0
1. Create Directory      2. Create File  3. Delete File

4. Search File           5. Display      6. Exit

Enter your choice --
5
Directory name is:  sss
['aaa']
['bbb']
-------------------------------------------------------------------


1. Create Directory      2. Create File  3. Delete File

4. Search File           5. Display      6. Exit

Enter your choice --
3
```

```
3
Enter file name to be deleted:
aaa
File has been deleted from the directory.
--------------------------------------------------------------


1. Create Directory       2. Create File  3. Delete File

4. Search File            5. Display      6. Exit

Enter your choice --
5
Directory name is:  sss
['bbb']
--------------------------------------------------------------


1. Create Directory       2. Create File  3. Delete File

4. Search File            5. Display      6. Exit

Enter your choice --
2
[['bbb'], [], []]
Enter file name to be created:
ccc
['ccc']
Do you want to enter another file(Yes - 1 or No - 0):
1
[['bbb'], ['ccc'], []]
Enter file name to be created:
aaa
['aaa']

Maximum no. of files have been input.

Directory name is:  sss
Files names are:
['bbb']
['ccc']
['aaa']
1. Create Directory       2. Create File  3. Delete File

4. Search File            5. Display      6. Exit
```

```
1. Create Directory       2. Create File  3. Delete File

4. Search File            5. Display      6. Exit

Enter your choice --
6
PS C:\Users\ananthu pillai\Desktop\S5 CS\SS Lab>
```

```
PS C:\Users\ananthu pillai\Desktop\S5 CS\SS Lab> python 3_Two.py

1. Create Directory
2. Delete Directory
3. Create File
4. Delete File
5. Search File
6. Display Files
7. Exit
Enter your choice -- 1
Enter name of the directory : sss
Directory created successfully.

1. Create Directory
2. Delete Directory
3. Create File
4. Delete File
5. Search File
6. Display Files
7. Exit
Enter your choice -- 3
Enter name of the directory: sss
Enter name of the file: aaa
File created successfully in the directory :  sss

1. Create Directory
2. Delete Directory
3. Create File
4. Delete File
5. Search File
6. Display Files
7. Exit
Enter your choice -- 1
Enter name of the directory : bbb
Directory created successfully.

1. Create Directory
2. Delete Directory
3. Create File
4. Delete File
5. Search File
6. Display Files
7. Exit
Enter your choice -- 6

Directory --> Files
--------------------------------------------------------

sss --> aaa
```

```
bbb --> ----------------------------------------------------------------


1. Create Directory
2. Delete Directory
3. Create File
4. Delete File
5. Search File
6. Display Files
7. Exit
Enter your choice -- 2
Enter name of the directory : bbb
Directory has been deleted.

1. Create Directory
2. Delete Directory
3. Create File
4. Delete File
5. Search File
6. Display Files
7. Exit
Enter your choice -- 2
Enter name of the directory : aaa
Sorry, Directory not found.

1. Create Directory
2. Delete Directory
3. Create File
4. Delete File
5. Search File
6. Display Files
7. Exit
Enter your choice -- 4
Enter name of the directory : sss
Enter name of the file : aaa
File was found and deleted successfully from the directory :  sss

1. Create Directory
2. Delete Directory
3. Create File
4. Delete File
5. Search File
6. Display Files
7. Exit
Enter your choice -- 2
Enter name of the directory : aaa
Sorry, Directory not found.
```

```
1. Create Directory
2. Delete Directory
3. Create File
4. Delete File
5. Search File
6. Display Files
7. Exit
Enter your choice -- 2
Enter name of the directory : aaa
Sorry, Directory not found.

1. Create Directory
2. Delete Directory
3. Create File
4. Delete File
5. Search File
6. Display Files
7. Exit
Enter your choice -- 2
Enter name of the directory : sss
Directory has been deleted.

1. Create Directory
2. Delete Directory
3. Create File
4. Delete File
5. Search File
6. Display Files
7. Exit
Enter your choice -- 7
PS C:\Users\ananthu pillai\Desktop\S5 CS\SS Lab>
```

RESULT:

The two file organization techniques namely, Single-level directory & Two-level directory have been studied and simulated successfully.