Roll No: 23CSM2R20

# Assignment 3 part 2: HRU

HRU Operation:

- Create file
- Delete file
- Read from a file
- Write to a file

HRU Command:

- Verify user: Check certain conditions to make sure whether the user has read access to the file.
- Verify write access.
- Delete file: Check whether a user has rights to delete the file.

To implement the HRU, I have declared an access control matrix first where the number of rows is equal to the number of subjects(users), and the number of columns is equal to the number of objects(files in my case).
(S,O) = r means S has read access on O
(S,O) = rw means S has read-write access on O
(S,O) = rwx means S has read-write-execute permissions on O
(S,O) = rwxo means S has all the rights on O(means object S is the owner of object O).

Create object: Any user can create a new object and will have all the permissions on that object.
Delete object: If the subject wants to delete the object, first the permissions are checked. If the subject has enough permissions to delete the object, then only the object is deleted.
Read: Subject should have read access on the object, then only the subject can read the object.
Write: Subject should have write access on the object, then only the subject can write to the object.
While doing these HRU operations, HRU commands are checked if the subject has a particular access to the object.
I have implemented access control matrix(ACM), capability list, access control list as well in this part.
Access control list(ACL) is used to achieve our HRU goals in this program.(Refer the program for more clarity).

Following screenshots of program output are attached for the reference:

```
Enter your username:user1
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Access Control Matrix1:
 [['rwxo', 'r', '', 'r'], ['r', 'rw', 'rw', 'rwxo'], ['rw', 'r', 'rwxo', ''], ['r', 'rwxo', '', 'rw']]
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Access Control Lists:
 [[['file1', 'user1', 'rwxo'], ['file1', 'user2', 'r'], ['file1', 'user3', 'rw'], ['file1', 'user4', 'r']], [['file2', 'user1',
'r'], ['file2', 'user2', 'rw'], ['file2', 'user3', 'r'], ['file2', 'user4', 'rwxo']], [['file3', 'user2', 'rw'], ['file3', 'use
r3', 'rwxo']], [['file4', 'user1', 'r'], ['file4', 'user2', 'rwxo'], ['file4', 'user4', 'rw']]]
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Capability Lists:
 [[['user1', 'file1', 'rwxo'], ['user1', 'file2', 'r'], ['user1', 'file4', 'r']], [['user2', 'file1', 'r'], ['user2', 'file2',
'rw'], ['user2', 'file3', 'rw'], ['user2', 'file4', 'rwxo']], [['user3', 'file1', 'rw'], ['user3', 'file2', 'r'], ['user3', 'fi
le3', 'rwxo']], [['user4', 'file1', 'r'], ['user4', 'file2', 'rwxo'], ['user4', 'file4', 'rw']]]
Enter
1 to generate access list
2 to create an object
3 to delete an object
4 read from a file
5 write to a file
6 to exit.
Your choice: 2
Enter filename:file1
Enter data:Creating file one.
Enter
1 to generate access list
2 to create an object
3 to delete an object
4 read from a file
5 write to a file
6 to exit.
Your choice: 4
Enter filename:file1
user1 rwxo
------File Data--------
Creating file one.
Enter
1 to generate access list
2 to create an object
3 to delete an object
4 read from a file
5 write to a file
6 to exit.
```

```
6 to exit.
Your choice: 5
Enter filename:file1
user1 rwxo
Enter data:Writing to file1.
file1.txt Saved successfully.
Enter
1 to generate access list
2 to create an object
3 to delete an object
4 read from a file
5 write to a file
6 to exit.
Your choice: 3
Enter filename:file3
You dont have delete access.
Enter
1 to generate access list
2 to create an object
3 to delete an object
4 read from a file
5 write to a file
6 to exit.
Your choice: 6
Bye...
```