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Lecture-31 By Vivek Dubey

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COMPUTER SCIENCE AND ENGINEERING

CS403PC

COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING)

CS403PC

BHARAT INSTITUTE OF ENGINEERING AND TECHNOLOGY

Scheme of Operating System

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S. No.	Course Code	Course Title	L	T	P	Credits
3	CS403PC	Operating Systems	3	0	0	3
6	CS406PC	Operating Systems Lab	0	0	3	1.5

UNIT-5: File System Interface and Operations

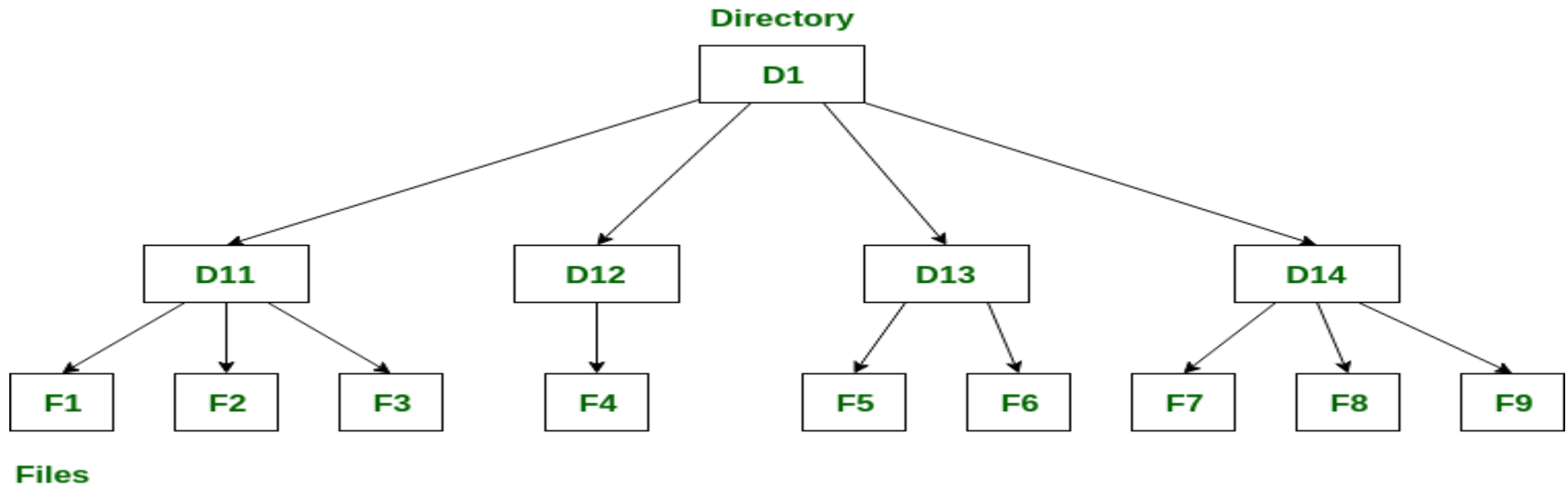


- Access methods,
- Directory Structure,
- Protection,
- File System Structure,
 - Allocation methods,
 - Free-space Management.
- Usage of open, create, read, write, close, lseek, stat, ioctl system calls.

Directory Structures in Operating System



- A directory is a container that is used to contain folders and files. It organizes **files and folders** in a hierarchical manner.



Types of Logical Structures of Directory



- There are several logical structures of a directory, these are given below:
 - **Single-level Directory**
 - **Two-level Directory**
 - **Tree-structured Directory**

Single-level Directory



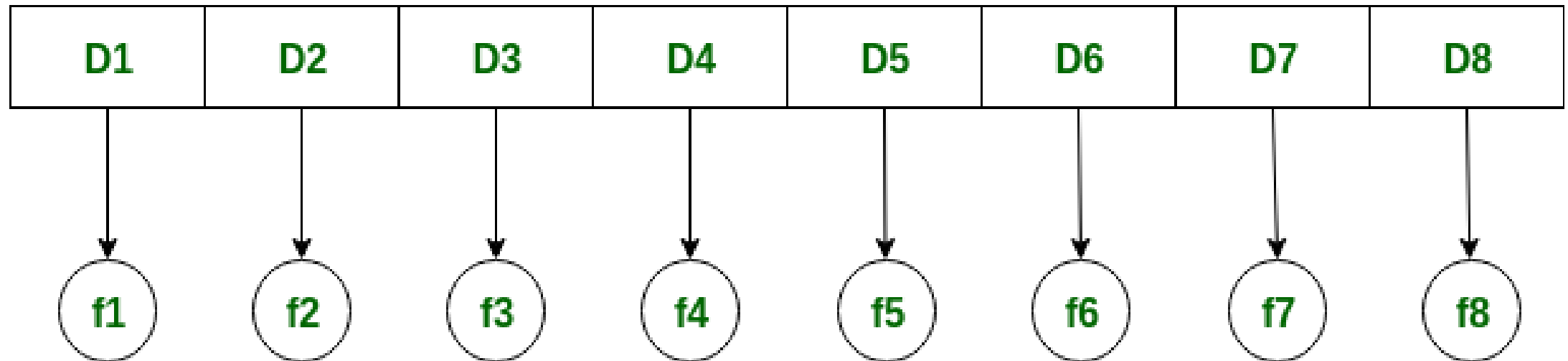
- The single-level directory is the simplest directory structure.
- In it, all files are contained in the same directory which makes it easy to support and understand.
- A single level directory has a significant limitation, however, when the number of files increases or when the system has more than one user.
- Since all the files are in the same directory, they must have a unique name. if two users call their dataset test, then the unique name rule violated.

A View of Single-level Directory

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Directory



Files

Advantages and Disadvantages Single-level Directory

- **Advantages:**

- Since it is a single directory, so its implementation is very easy.
- If the files are smaller in size, searching will become faster.
- The operations like file creation, searching, deletion, updating are very easy in such a directory structure.

- **Disadvantages:**

- There may chance of name collision because two files can have the same name.
- Searching will become time taking if the directory is large.
- This can not group the same type of files together.

Two-level Directory

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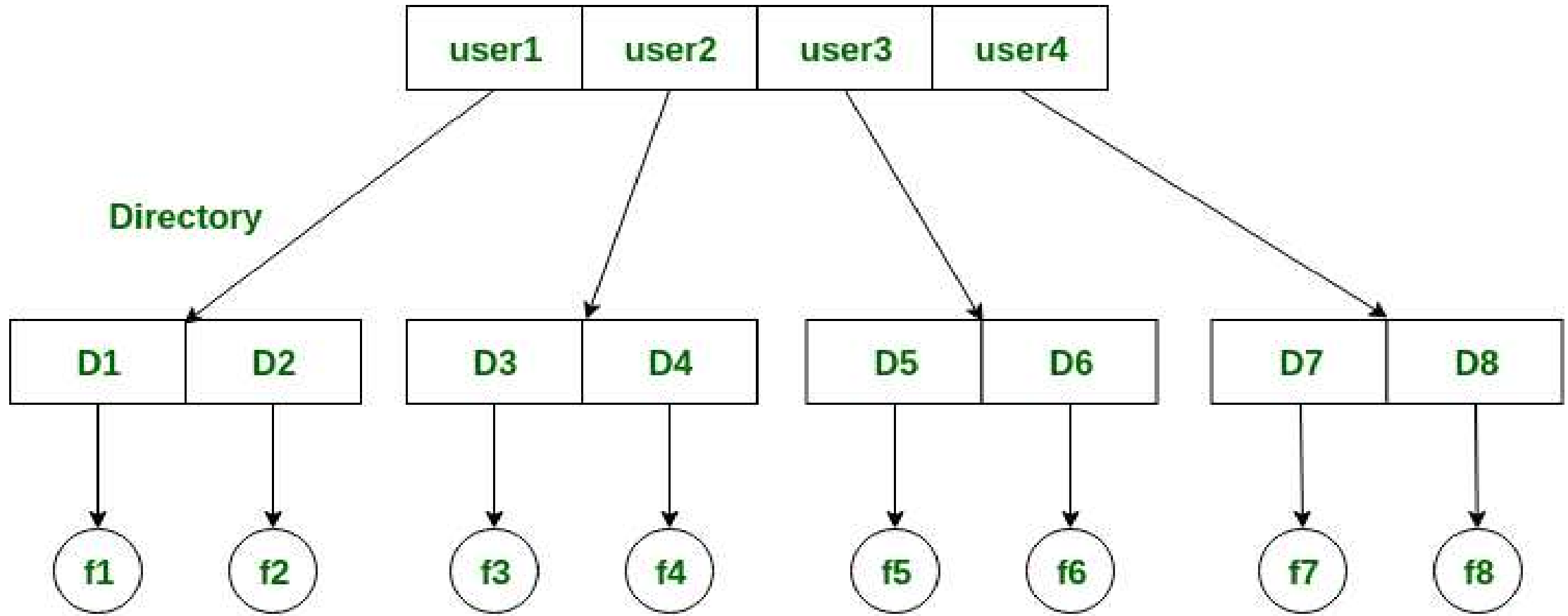
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- *As we have seen, a single level directory often leads to confusion of files names among different users. The solution to this problem is to create a separate directory for each user.*
- *In the two-level directory structure, each user has their own user files directory (UFD).*
- *The UFDs have similar structures, but each lists only the files of a single user. **System's master file directory (MFD)** is searched whenever a new user id's logged in.*
- *The MFD is indexed by **username or account number**, and each entry points to the UFD for that user.*

A View of Two-level Directory

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Files

Advantages and Disadvantages Two-level Directory

- **Advantages:**

- We can give full path like /User-name/directory-name/.
- Different users can have the same directory as well as the file name.
- Searching of files becomes easier due to pathname and user-grouping.

- **Disadvantages:**

- A user is not allowed to share files with other users.
- Still, it not very scalable, two files of the same type cannot be grouped together in the same user.

Tree-structured Directory

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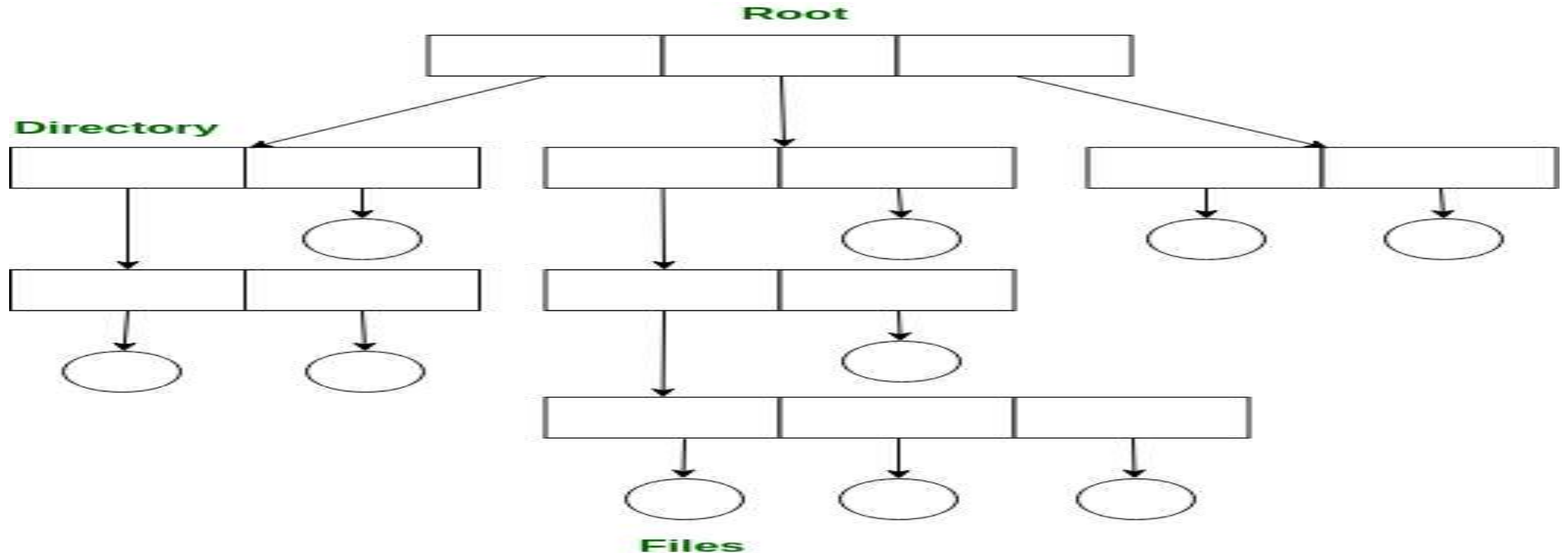


- Once we have seen a two-level directory as a tree of height 2, the natural generalization is to extend the directory structure to a tree of arbitrary height.
- This generalization allows the user to create their own subdirectories and to organize their files accordingly.

A View of Tree-structured Directory

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A tree structure is the most common directory structure.
The tree has a root directory, and every file in the system has a unique path.

Advantages and Disadvantages of Tree-structured Directory

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- **Advantages:**

- Very general, since full pathname can be given.
- Very scalable, the probability of name collision is less.
- Searching becomes very easy, we can use both absolute paths as well as relative.

- **Disadvantages:**

- Every file does not fit into the hierarchical model, files may be saved into multiple directories.
- We can not share files.
- It is inefficient, because accessing a file may go under multiple directories.

Protection in File System

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- *In computer systems, a lot of user's information is stored.*
- **The objective of the operating system is to keep safe the data of the user from the improper access to the system.**
- **Protection can be provided in number of ways.**
 - *For a single laptop system, we might provide protection by locking the computer in a desk drawer or file cabinet.*
 - *For multi-user systems, different mechanisms are used for the protection.*

Types of File Access

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- **The files which have direct access** of the any user *have the need of protection.*
- **The files which are not accessible** to other users *doesn't require any kind of protection.*
- **The mechanism of the protection provide** the facility of the controlled access *by just limiting the types of access to the file.*
- **Access can be given or not given** to any user depends on several factors, *one of which is the type of access required.*

Types of File Operations

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- Several different types of operations can be controlled:
 - **Read** – Reading from a file.
 - **Write** – Writing or rewriting the file.
 - **Execute** – Loading the file and after loading the execution process starts.
 - **Append** – Writing the new information to the already existing file, editing must be end at the end of the existing file.
 - **Delete** – Deleting the file which is of no use and using its space for another data.
 - **List** – List the name and attributes of the file.



Access Control of File System

- To condense the length of the access-control list, many systems recognize three classification of users in connection with each file:
 - **Owner** – Owner is the user who has created the file.
 - **Group** – A group is a set of members who has similar needs and they are sharing the same file.
 - **Universe** – In the system, all other users are under the category called universe.

Other Protection Approaches



- The access to any system *is also controlled by the password.*
 - *If the use of password is random and it is changed often, this may be result in limit the effective access to a file.*
- The use of passwords *has a few disadvantages:*
 - *The number of passwords are very large, so it is difficult to remember the large passwords.*
 - *If one password is used for all the files, then once it is discovered, all files are accessible; protection is on all-or-none basis.*