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OPERATING SYSTEMS

File System

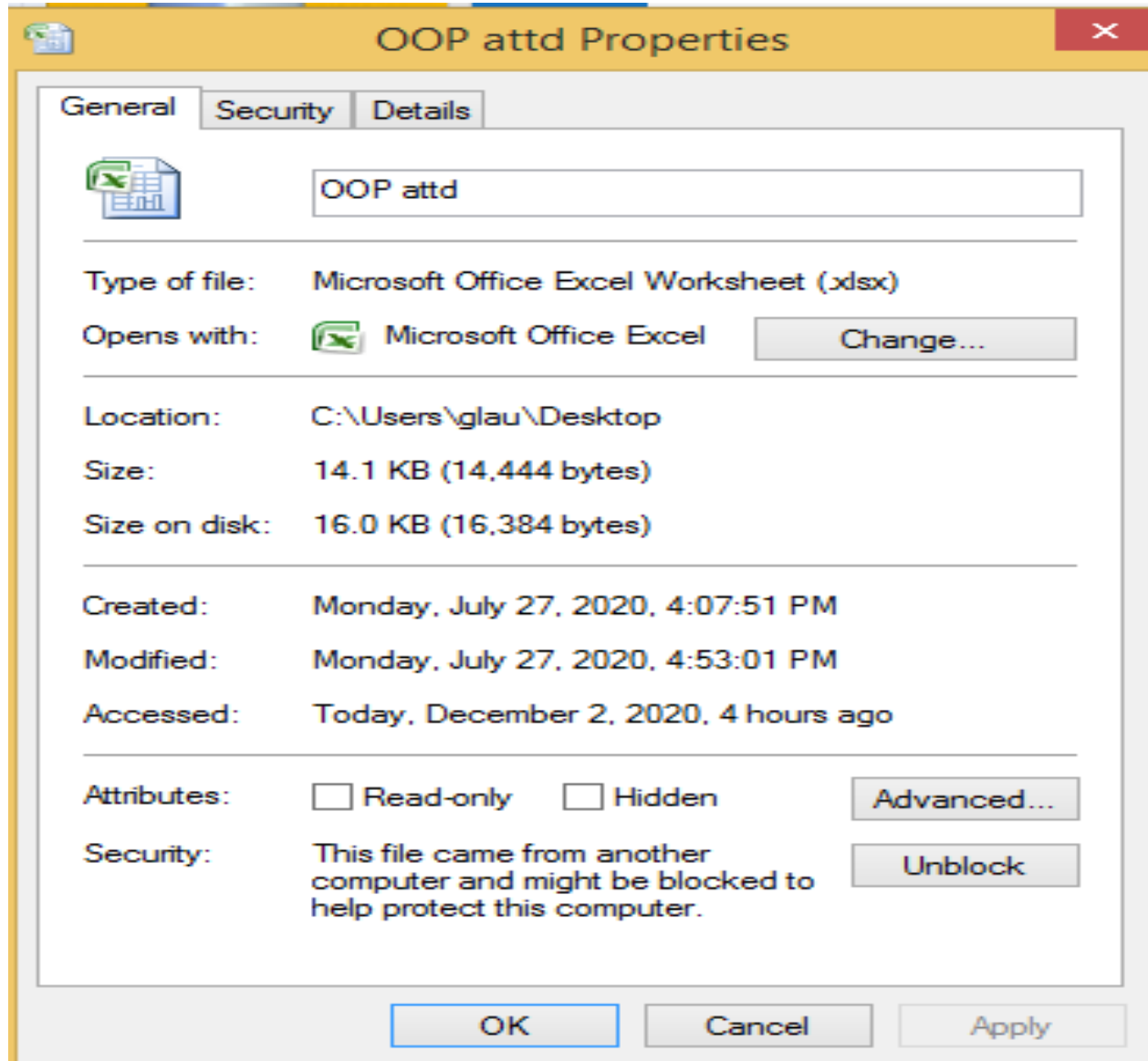
File Concept

- A file is a named collection of related information that is recorded on secondary storage such as magnetic disks, magnetic tapes and optical disks.
- In general, a file is a sequence of bits, bytes, lines or records whose meaning is defined by the files creator and user.
- Contiguous logical address space
- Types:
 - Data
 - numeric
 - character
 - binary
 - Program
- Contents defined by file's creator
 - Many types
 - Consider **text file, source file, executable file**

File Attributes

- **Name** – only information kept in human-readable form
- **Identifier** – Along with the name, Each File has its own extension which identifies the type of the file. For example, a text file has the extension **.txt**, A video file can have the extension **.mp4**.
- **Type** – needed for systems that support different types
- **Location** – pointer to file location on device
- **Size** – current file size
- **Protection** – controls who can do reading, writing, executing
- **Time, date, and user identification** – data for protection, security, and usage monitoring
- Information about files are kept in the directory structure, which is maintained on the disk

File Info Window on Windows



File Operations

- File is an **abstract data type**
- **Create**
- **Write** – at **write pointer** location
- **Read** – at **read pointer** location
- **Reposition within file** - **seek**
- **Delete**
- **Truncate**
- ***Open(F_i)*** – search the directory structure on disk for entry F_i , and move the content of entry to memory
- ***Close (F_i)*** – move the content of entry F_i in memory to directory structure on disk

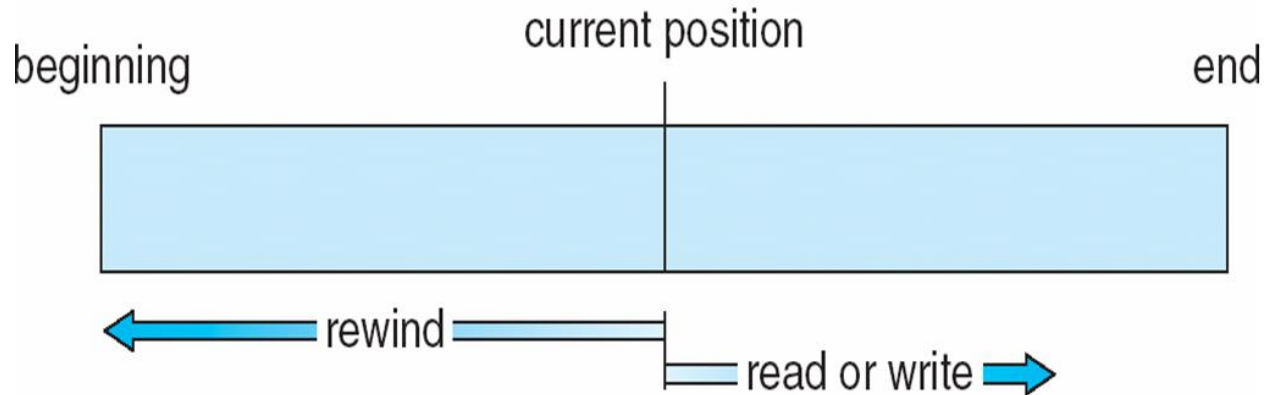
File Types – Name, Extension

file type	usual extension	function
executable	exe, com, bin or none	ready-to-run machine-language program
object	obj, o	compiled, machine language, not linked
source code	c, cc, java, pas, asm, a	source code in various languages
batch	bat, sh	commands to the command interpreter
text	txt, doc	textual data, documents
word processor	wp, tex, rtf, doc	various word-processor formats
library	lib, a, so, dll	libraries of routines for programmers
print or view	ps, pdf, jpg	ASCII or binary file in a format for printing or viewing
archive	arc, zip, tar	related files grouped into one file, sometimes compressed, for archiving or storage
multimedia	mpeg, mov, rm, mp3, avi	binary file containing audio or A/V information

Access Methods

- Sequential access
- Direct/Random access
- Indexed sequential access

Sequential-access File



A sequential access is that in which the records are accessed in some sequence, i.e., the information in the file is processed in order, one record after the other.

This access method is the most primitive one.

Example: Compilers usually access files in this fashion.

Direct/Random access

Random access file organization provides, accessing the records directly.

Each record has its own address on the file with by the help of which it can be directly accessed for reading or writing.

The records need not be in any sequence within the file and they need not be in adjacent locations on the storage medium.

The Direct Access is mostly required in the case of database systems

Simulation of Sequential Access on Direct-access File

sequential access	implementation for direct access
<i>reset</i>	<i>cp</i> = 0;
<i>read next</i>	<i>read cp</i> ; <i>cp</i> = <i>cp</i> + 1;
<i>write next</i>	<i>write cp</i> ; <i>cp</i> = <i>cp</i> + 1;

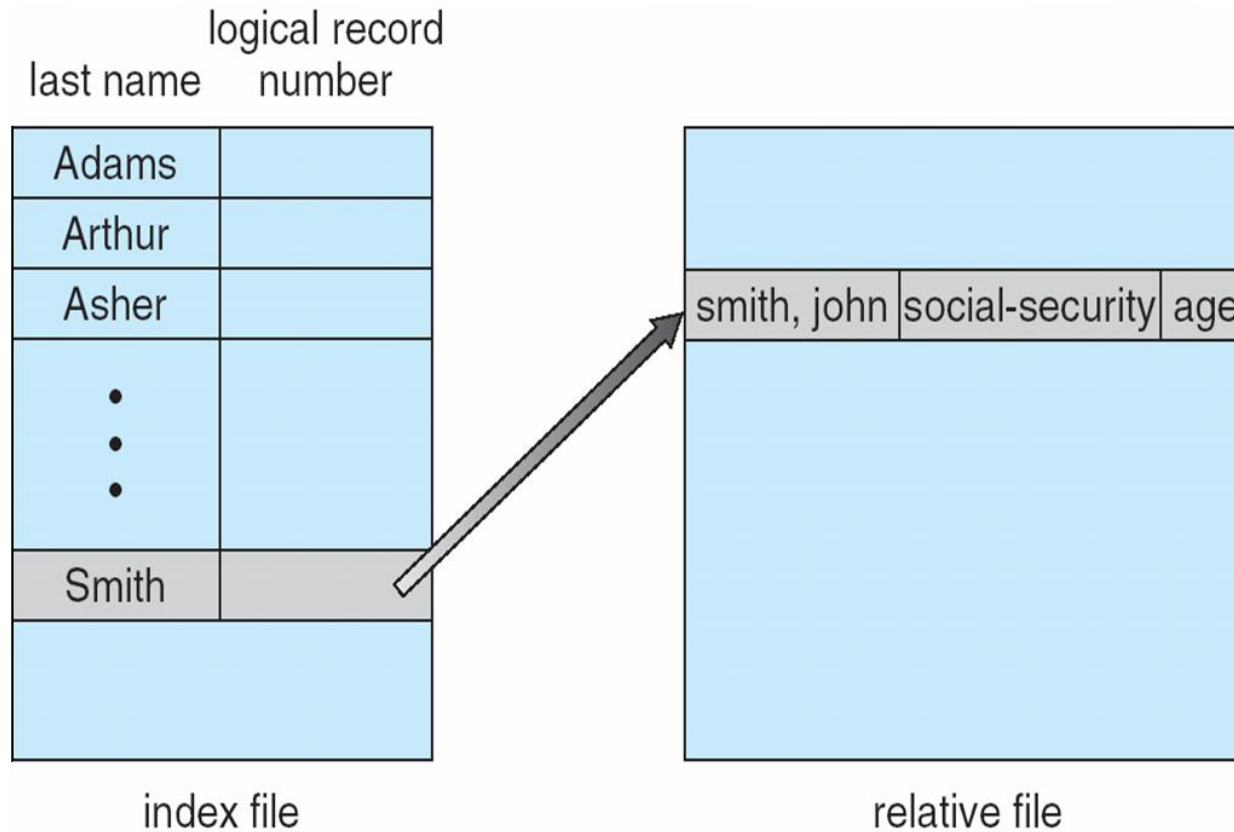
Other Access Methods

- General involve creation of an **index** for the file
- Keep index in memory for fast determination of location of data to be operated on
- A particular record can be accessed by its index.
- The index is nothing but the address of a record in the file.

Indexed sequential access

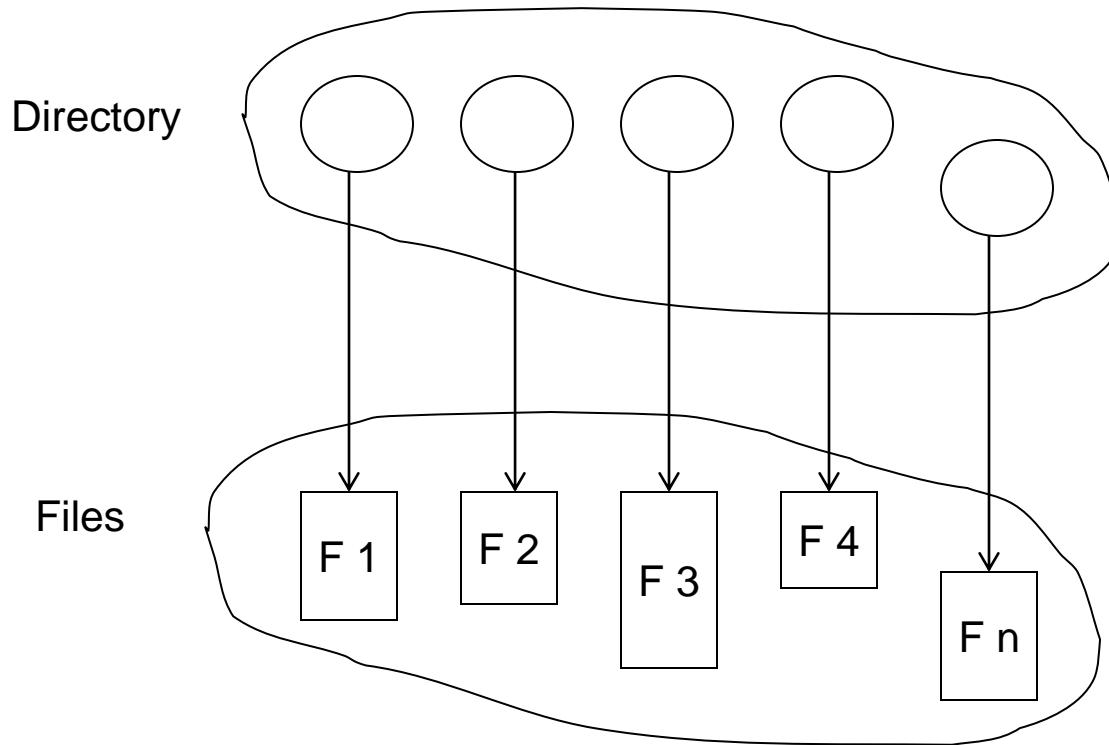
This mechanism is built up on base of sequential access.
An index is created for each file which contains pointers to various blocks.
Index is searched sequentially and its pointer is used to access the file directly.

Example of Index and Relative Files

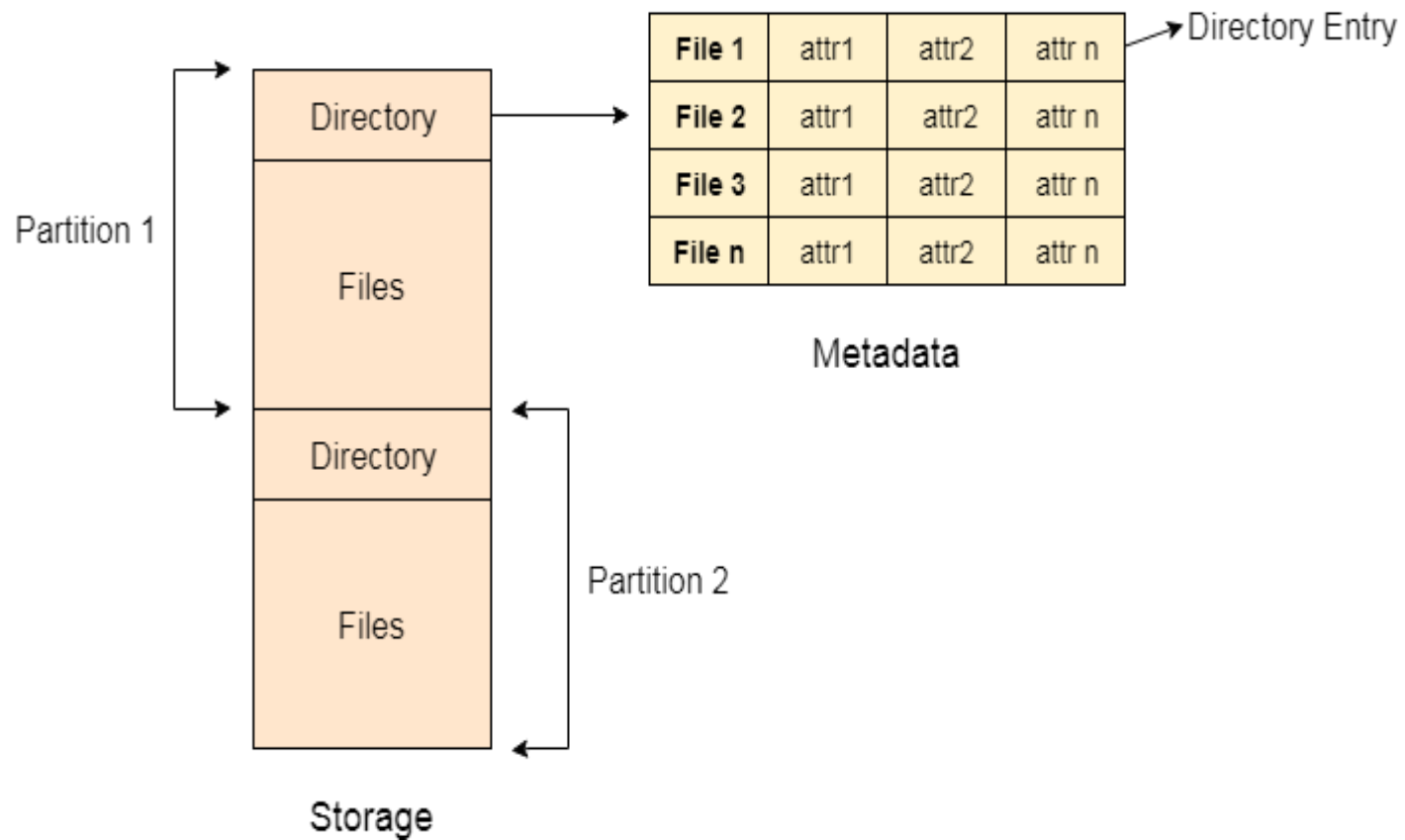


Directory Structure

- A collection of nodes containing information about all files



Both the directory structure and the files reside on disk



Operations Performed on Directory

- Search for a file
- Create a file
- Delete a file
- List a directory
- Rename a file
- Traverse the file system

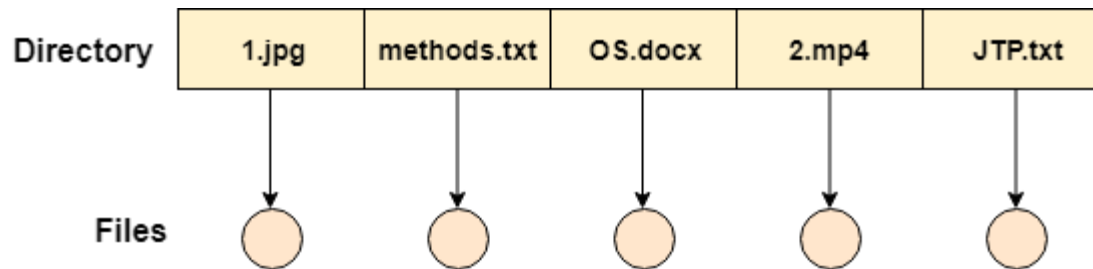
Directory Organization

The directory is organized logically to obtain

- Efficiency – locating a file quickly
- Naming – convenient to users
 - Two users can have same name for different files
 - The same file can have several different names
- Grouping – logical grouping of files by properties, (e.g., all Java programs, all games, ...)

Single-Level Directory

- A single directory for all users
- implementation is very simple.
- If the sizes of the files are very small then the searching becomes faster.
- File creation, searching, deletion is very simple since we have only one directory.



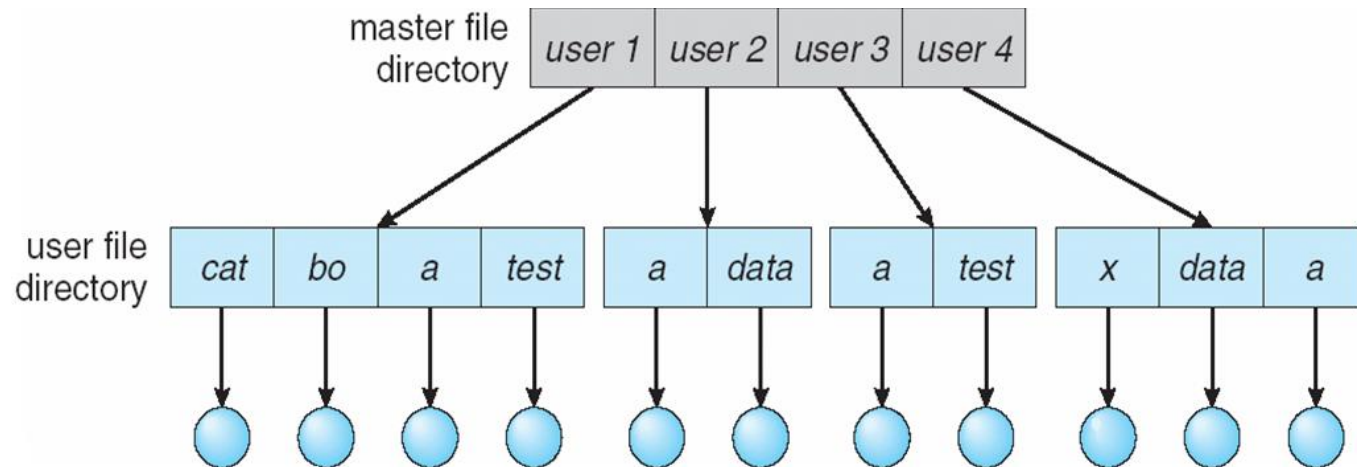
Single Level Directory

Disadvantages

- We cannot have two files with the same name.
- The directory may be very big therefore searching for a file may take so much time.
- Protection cannot be implemented for multiple users.
- There are no ways to group same kind of files.
- 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

- Separate directory for each user



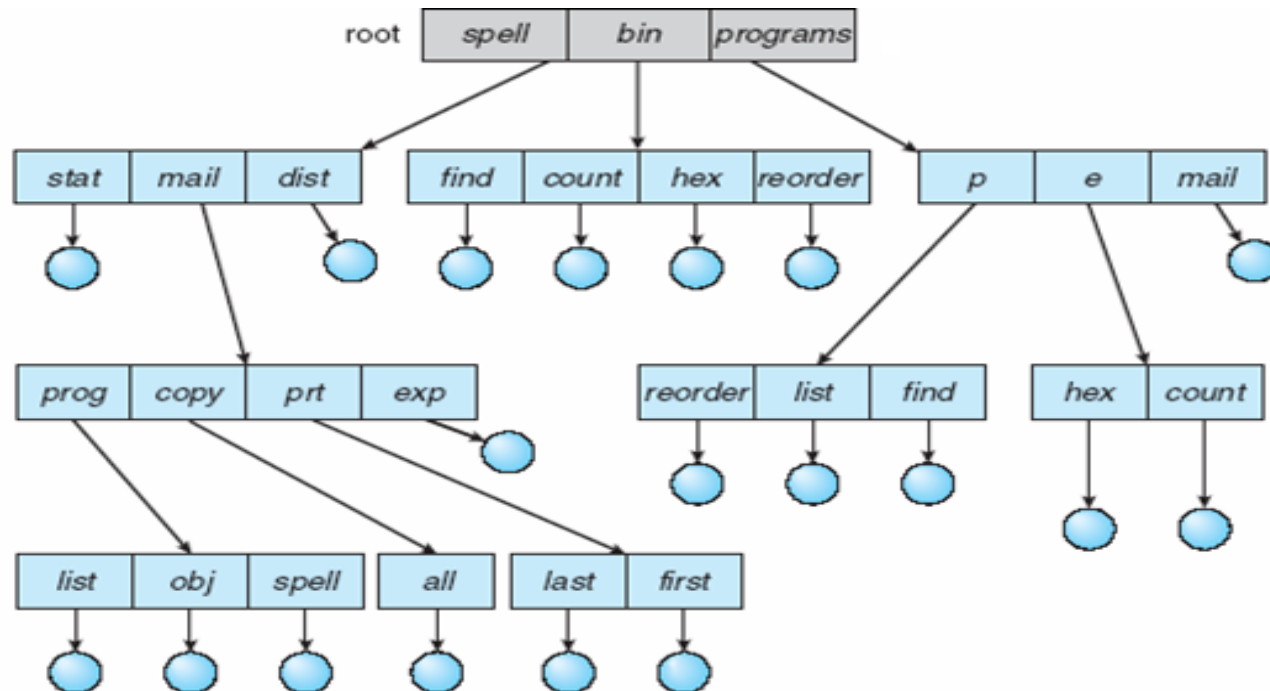
- n Path name
- n Can have the same file name for different user
- n Efficient searching
- n No grouping capability

Tree-Structured Directories

In Tree structured directory system, any directory entry can either be a file or sub directory.

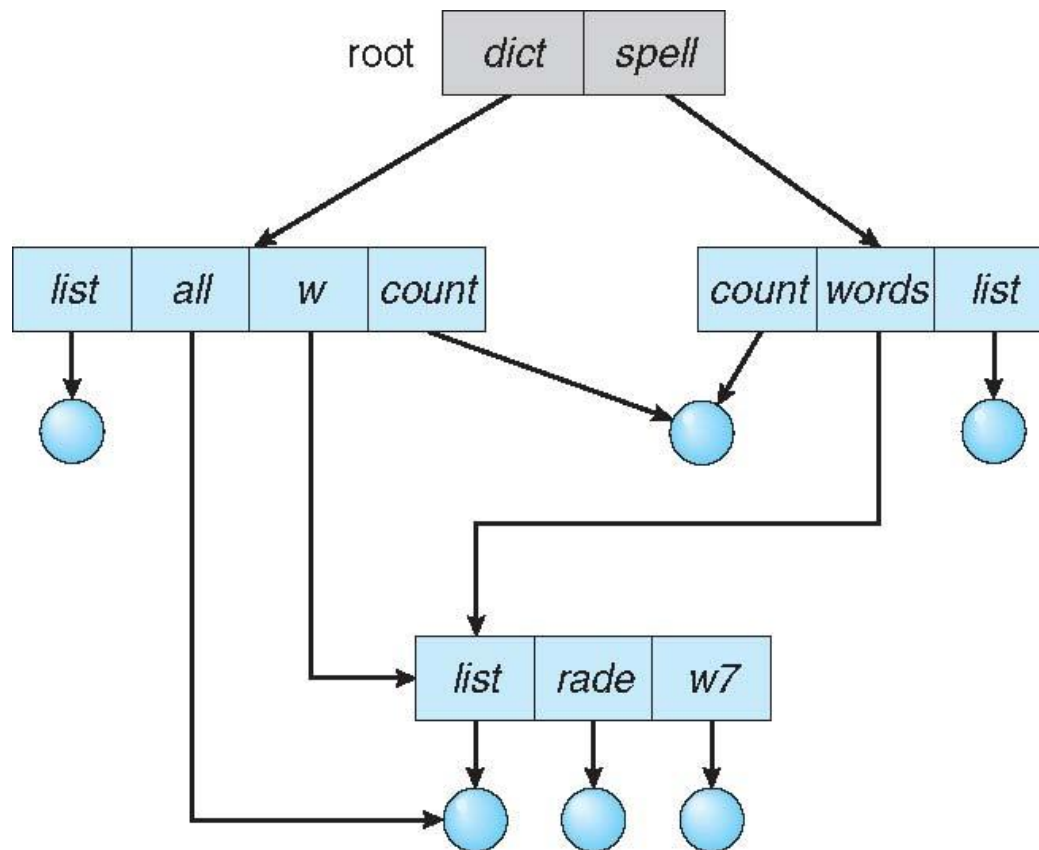
Tree structured directory system overcomes the drawbacks of two level directory system.

The similar kind of files can now be grouped in one directory.



Acyclic-Graph Directories

- In this system, two or more directory entry can point to the same file or sub directory.



- Thank You.