Operations Performed on a Directory

- To understand the requirements for a file structure, it is helpful to consider the types of operations that may be performed on the directory:

Two-Level Scheme

There is one directory for each user and a master directory

Master directory has an entry for each user directory providing address and access control information

Each user directory is a simple list of the files of that user

Names must be unique only within the collection of files of a single user

File system can easily enforce access restriction on directories

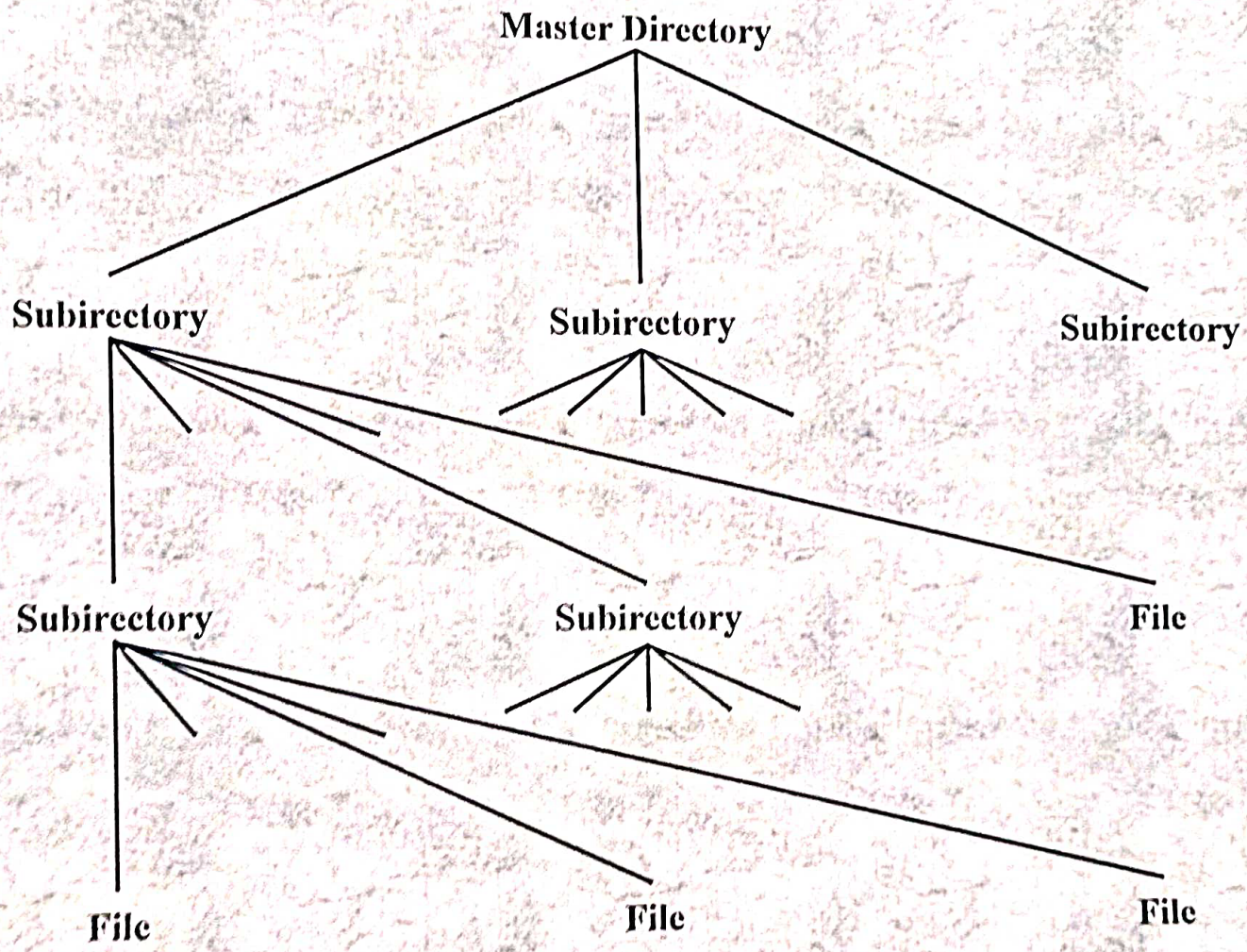


Figure 12.6 Tree-Structured Directory

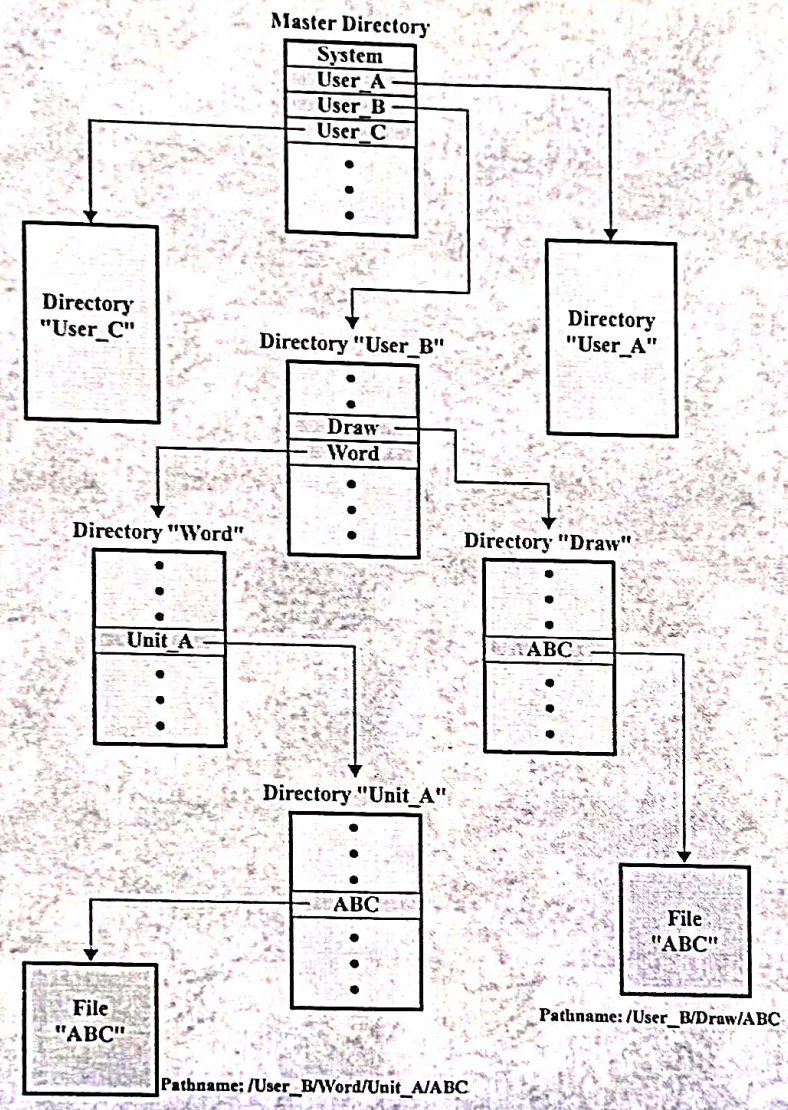
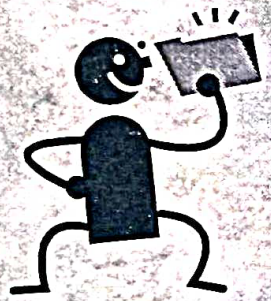


Figure 12.7 Example of Tree-Structured Directory

File Sharing



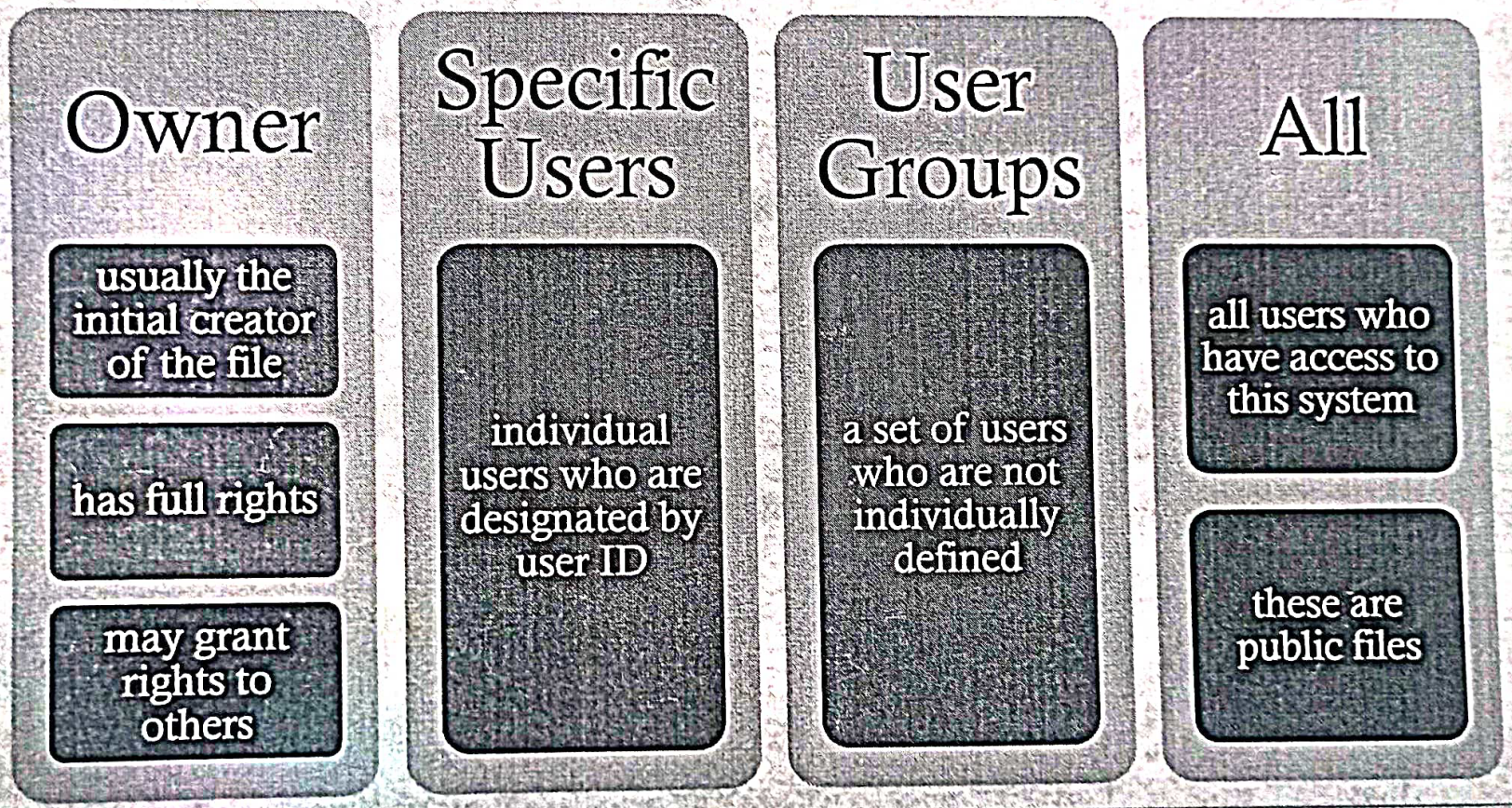
Two issues arise when allowing files to be shared among a number of users:

- access rights
- management of simultaneous access

Access Rights

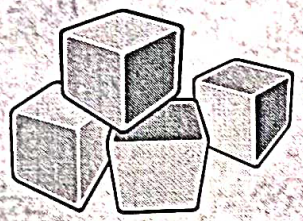
- *None*
  - the user would not be allowed to read the user directory that includes the file
- *Knowledge*
  - the user can determine that the file exists and who its owner is and can then petition the owner for additional access rights
- *Execution*
  - the user can load and execute a program but cannot copy it
- *Reading*
  - the user can read the file for any purpose, including copying and execution
- *Appending*
  - the user can add data to the file but cannot modify or delete any of the file's contents
- *Updating*
  - the user can modify, delete, and add to the file's data
- *Changing protection*
  - the user can change the access rights granted to other users
- *Deletion*
  - the user can delete the file from the file system

User Access Rights



Record Blocking

- Blocks are the unit of I/O with secondary storage
  - for I/O to be performed records must be organized as blocks



- Given the size of a block, three methods of blocking can be used:

1) **Fixed-Length Blocking** – fixed-length records are used, and an integral number of records are stored in a block

   Internal fragmentation – unused space at the end of each block

2) **Variable-Length Spanned Blocking** – variable-length records are used and are packed into blocks with no unused space

3) **Variable-Length Unspanned Blocking** – variable-length records are used, but spanning is not employed

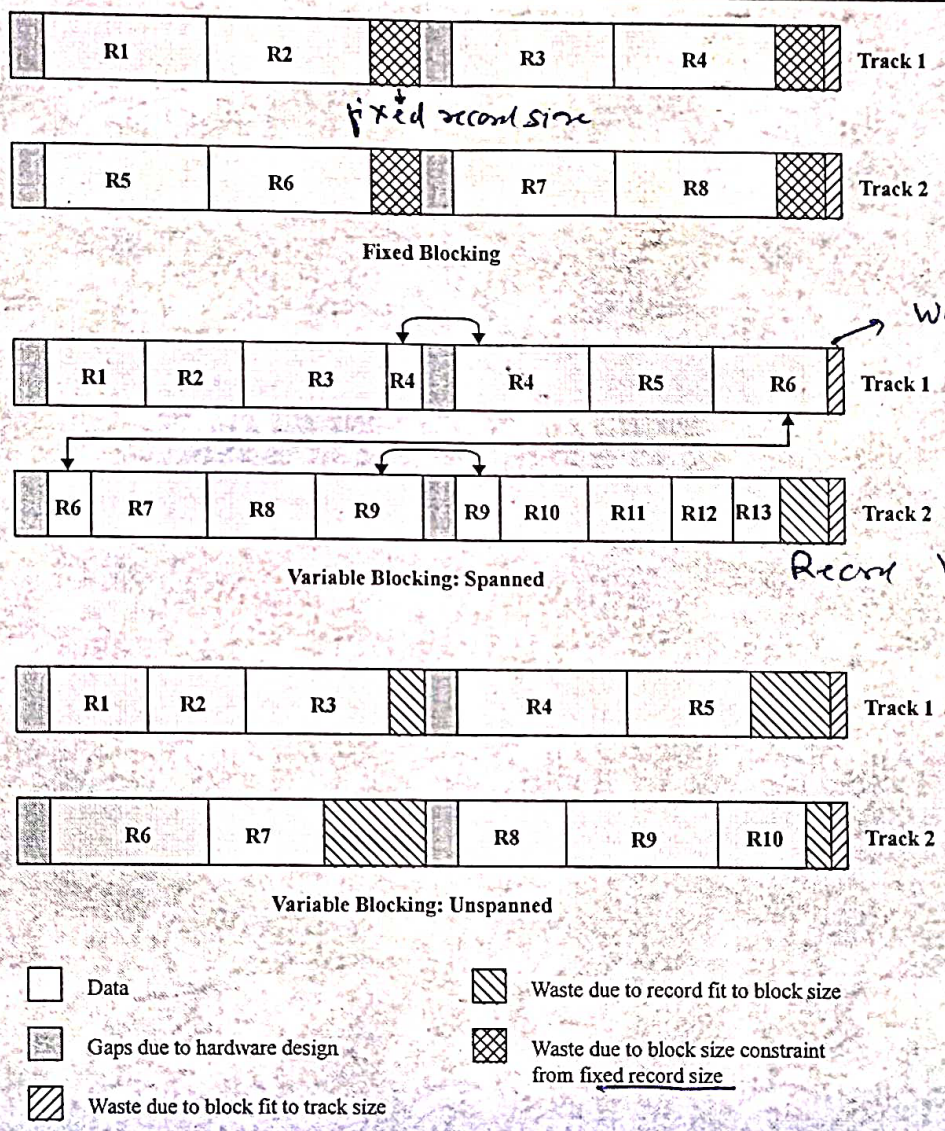


Figure 12.8 Record Blocking Methods [WIED87]