



CST 126 – LESSON 8

Creating and Changing Directories
Chapter 7

Overview

- ❑ Types of files
- ❑ File systems concepts
- ❑ Using directories to create order.
- ❑ Managing files in directories.
- ❑ Using pathnames to manage files in directories.
- ❑ Managing files from more than one directory.
- ❑ Moving and removing directories and their contents.

Types of Files

- ❑ Simple/ ordinary file
- ❑ Directory
- ❑ Symbolic (soft) link
- ❑ Special (device) files – block special files and character special files
- ❑ Named pipe (FIFO)
- ❑ Socket

Types of Files Simple, Ordinary Files

TABLE 7.1 Commonly Used Extensions for Some Applications

Extension	Contents of File
.bmp, .jpg, .jpeg, .gif	Graphics
.c	C Source code
.C, .cpp, .cc	C++ Source code
.java	Java source code
.html, .htm	File for a Web page
.o	Object code
.ps	Postscript code
.Z, .gz	Compressed

Types of Files (cont.)

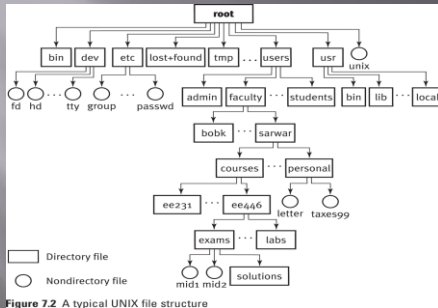
- ❑ Directories
- ❑ Link File
 - A Link File is created by the system when a symbolic link is created to an existing file.
- ❑ Special (Device) File
 - A special File is a means of accessing hardware devices, including the keyboard, hard disk, CD-ROM drive, tape drive and printer.
 - Character Special Files
 - Correspond to character-oriented devices (e.g., Keyboard)
 - Block Special Files
 - Correspond to block-oriented devices (e.g., a disk)
- ❑ Named Pipe (FIFO)
 - Tools that enable processes to communicate with each other

File System Concepts

Important things to understand:

- ❑ File System Organization
- ❑ Home and Present Working Directories
 - `$HOME`, `~`, `$home`
 - `pwd`, `..`
- ❑ Pathnames: Absolute and Relative
- ❑ Some Standard Directories and Files
 - Root directory (`/`), `/bin`, `/dev`, `/etc`, `/lib`...

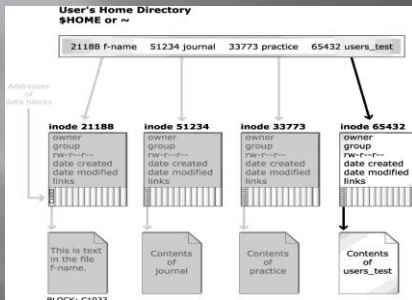
Unix Filesystem



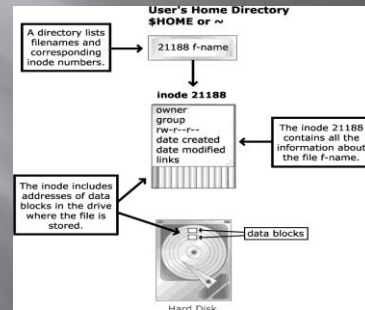
Using Directories to Create Order

- Formal definition: A file is a collection of information stored electronically on the hard drive of a system.
- An inode contains all the information about each file, including the location of the actual file on the storage disk.
- The "ls" command reads the names of the files listed in the current directory, and then outputs those names.
- Each file in the directory contains only the name of that file and a number that leads to the inode for that file.
- The "-i" option instructs ls to include the inodes in its output.
- Inodes are small pieces of memory created on the hard disk when it is formatted.

Using Directories to Create Order - Inodes



Using Directories to Create Order - Inodes



More Inode Infor

- The inode has a list of addresses of the block on the disk where the data that comprise the file is actually located.
- It addresses up to 13 data blocks on the hard drive.
- The first ten blocks addressed from the inode contains the actual file data.
- If a file is too large, additional blocks are allocated to fit the data.

The Home Directory

- The "pwd" command displays the path from root to the user's home directory.
- The /etc/passwd file holds the user's home directory path. (grep your entry in /etc/passwd)
- A file is created and listed in the current home directory by default.

Working with Directories

- ❑ The “mkdir” command is used for creating a new directory.
- ❑ Directories created in uppercase are listed first by the ls command.
- ❑ Each new directory created is called a subdirectory.
- ❑ The “cd” or “change directory” command instructs the shell to locate the directory listed as an argument.

Working with Directories

- ❑ The “pwd” command outputs the absolute path from the top of the file system (root or /) to the current directory.
- ❑ A path is a list of directory names separated by the / (slash) character.
- ❑ The topmost directory is called the root and is symbolized by the first forward slash (/) in the pathname.
- ❑ The cd command, without any directory name as an argument, returns to the home directory.
- ❑ The “-R” (recursive) option used with ls descends through each subdirectory in the directory tree.

Moving or Copying Files into a Subdirectory

- ❑ Moving a file or directory does not move the file electronically.
- ❑ The name and the inode number are erased from the current directory and are written in the subdirectory.
- ❑ When a file is copied, a second electronic version is created.
- ❑ The copied file does not have the same inode number as the original.
- ❑ The copied file has its own inode, permission, and data blocks containing the new files actual contents.

Accessing a File in a Subdirectory – Step by Step

To access a file in a subdirectory:

- Locate the inode number of the file.
- Check the permissions on the directory.
- Get the directory’s address from the inode.
- Identify the inode associated with the file.
- Read the files from the data blocks.

Using Parent Directory Names

- ❑ A single dot is used for referring to the current directory.
- ❑ In a directory, the .. (dot-dot) is the listing for its parent directory.
- ❑ The parent directory is the directory located one level above the current directory.
- ❑ The parent directory lists the current directory’s name and inode.
- ❑ The . and .. are the two listings that get created when a new directory is created.

Examining the Full Path from Root to Directories and Files

- ❑ A user can specify a directory’s location with the full path from the top of the file system.
- ❑ The full path starting at root identifies a file explicitly.
- ❑ The pathname for every file describes a particular file uniquely and absolutely.
- ❑ The full pathname to a file is called its absolute pathname.

Explicitly Accessing a User's Home Directory

- ❑ The "ls ~" command lists all filenames listed in the home directory.
- ❑ The C shell and all shells define the tilde (~) as the path to the user's home directory.
- ❑ The shell replaces the tilde (~) with the value of the path to the user's home directory.
- ❑ The shell replaces the tilde (~) in any command line with the absolute path from root to the user's home directory.

Managing Files from More Than One Directory

- ❑ A listing for a file in a directory is a link to the file.
- ❑ The ls -l command at the start lists the number of data blocks used by files and directories in the current directory.
- ❑ In a long listing entry, or record, the information for each file or directory is divided into seven fields.
- ❑ The second field in each entry of a file indicates the number of directories where the object is listed.

Field Designations for File Listings (ls -l)

TABLE 7.3 Summary of the Output of the ls -l Command (fields are listed left to right)

Field	Meaning
First letter of first field	File type: <ul style="list-style-type: none"> - ordinary file l block special file c character special file d directory l link p named pipe (FIFO) s socket
Remaining letters of first field	Access permissions for owner, group, and others
Second field	Number of links
Third field	Owner's login name
Fourth field	Owner's group name (can also be a number)
Fifth field	File size in bytes
Sixth, seventh, and eighth field	Date and time of last modification
Ninth field	File name

```
$ ls -l
drwxr-x--- 2 sarwar faculty 512 Apr 23 09:37 courses
drwxr----- 1 sarwar faculty 12 May 01 13:22 memos
drwxr----- 1 sarwar faculty 163 May 05 23:13 personal
```

Managing Files from More Than One Directory

Linking files:

- The "ln" command can be used for linking a file to the current directory.
- The index card of each file keeps track of the number of directories that list it.
- Each instance of the file listed in a directory is one link.
- Removing a file removes it from the directory listing.

Managing Files from More Than One Directory

Linking files (continued):

- The ln utility can be used to link multiple files at a time.
- The "ls -il" command lists the current files with link count and inodes.
- The "-s" option to ln creates a file in the current directory that contains information required to locate the linked file.

Managing Files from More Than One Directory

Using symbolic links:

- A symbolic link is a small file in a directory on one file system partition that points to the correct file system and the correct inode for the linked file.
- In the long listing of the symbolic link, the initial character is an "l" for directories and files.
- Create link by executing the ln command. (ex. ln -s /common/oct5w testlink)
- An arrow and path at the end of the listing displays the actual directory where the link points.

Example Link Listing

```

sserverdelta.edu - PuTTY
ls -al test*
-rw-r--r-- 1 donaldsouthwell instructor 38 May 15 22:28 test
-rw-r--r-- 1 donaldsouthwell instructor 26 May 23 10:22 test-file1
-rw-r--r-- 1 donaldsouthwell instructor 20 May 23 10:23 test-file2
-rw-r--r-- 1 donaldsouthwell instructor 59 May 23 10:24 test_fileout
-rw-r--r-- 1 donaldsouthwell instructor 143 May 23 10:33 test-g
-rw-r--r-- 1 donaldsouthwell instructor 42 May 14 10:46 test_link
lrwxrwxrwx 1 donaldsouthwell instructor 13 Jun  3 22:03 testLink -> /common/oc
15w
-rw-r--r-- 1 donaldsouthwell instructor 29 May 14 10:58 test_list
-rw-r--r-- 1 donaldsouthwell instructor 108 May 23 10:53 test-sor
-rw-r--r-- 1 donaldsouthwell instructor 43 May 23 11:05 test-u

```

Moving and Removing Directories and their Contents

- ❑ Renaming a directory only changes the name of the directory, the inode number and its location remains unchanged.
- ❑ A directory can also be moved from a different location in the hierachal file structure without affecting the child contents of the directory.
- ❑ The "rmdir" command is used for removing an empty directory.
- ❑ The "-r" option instructs the rm command to recursively remove file.

Summary

- ❑ Files reside in one or more data blocks on the hard drive.
- ❑ Each file in a directory is assigned a unique inode.
- ❑ A directory is a special kind of file with very specific contents, namely the names of files and directories, each with its associated inode number.
- ❑ The passwd file holds the location of a user's home directory.

Summary

- ❑ The mkdir command is used for creating remote directories.
- ❑ The tilde (~) is interpreted as the user's home directory.
- ❑ The name .. (dot-dot) is interpreted as the parent directory.
- ❑ Users can create links to files in other directories to enhance flexibility in file access.