ESSENTIALS OF RED HAT LINUX

Session 6

File System Basics

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Objectives

- Explain the commands used for manipulating files
- Explain the wildcard characters with file operations
- Explain the concept of file system
- Explain the process to manage files and directories at the command-line interface

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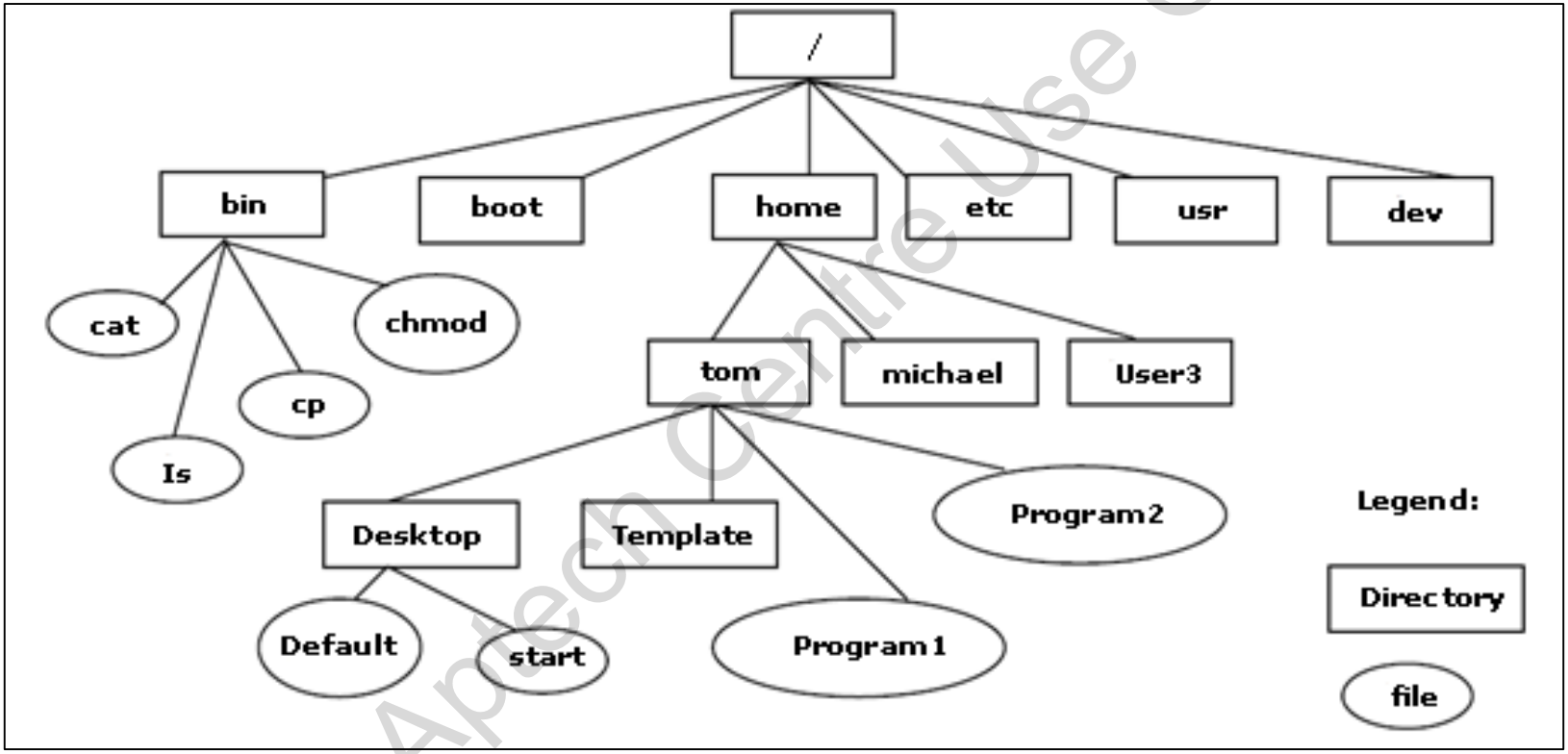
Working with File System [1-2]



Linux File Hierarchy Structure

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Working with File System [2-2]

- The files are stored under one main directory, / (root).
- The directory, /, is divided into subdirectories.
- In each directory, files containing related data are stored.
- The administrator of the Linux system can place all the home directories of the users under the /home directory.
- A file in the file system hierarchy is referred by its path name.
- File name and different directory names contained in the path are separated by the / symbol.

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Linux File Hierarchy Structure

Some of the directories under the / directory are:

/bin	• Stores many utilities of Linux which are commands in the Linux system • Utilities are in the binary format
/dev	• Stores all the device-related files for the system
/etc	• Stores system-related data that has to be referred by the users and the system
/lib	• Stores libraries of data for the compilers installed on the system
/home	• Contains all the Home directories of users
/usr	• Stores the operating systems files, that are not involved in the boot process
/var	• Stores the information related to different utilities of Linux

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Types of Files [1-2]

The different types of files in RHEL are:

Ordinary files	• Created by a user • Includes all data files, program files, and executable files
Directory files	• Created automatically when a user includes the *mkdir* command • Stores directory related information
Archiving files	• Archiving is when users store a group of files in one file
Compressed files	• Compressed file data storage reduces the size of the files as compared to their actual sizes
Special files	• System files used by RHEL associated with I/O devices • Cannot be modified by users

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Types of Files [2-2]

The different types of special files are:

- Character Device Files
- Block Device Files
- Hard Links
- Symbolic Links
- Sockets
- Named Pipes

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Manipulating Files: Creating a File

- A new file is created using the *vi* or *vim* editors.
- Command to create a new file using the *vi* editor:

```
vi testfile.txt
```

- The *touch* command is used to create a blank file.

  Syntax:

```
touch [options] [filenames]
```

- Executing the *touch* command on an existing file changes the timestamp of the file to the current time.

Change the access or modification time of the file using:

- -a: Changes the access time to the current time
- -m: Changes the modification time to the current time

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Manipulating Files: Copying Files [1-2]

- The *cp* command duplicates the contents of the source file into a target file.

  Syntax:

  `cp [options] <source file/s><destination directory/file>`

  Where,

  the argument, <*source file/s*>, specifies a single file or multiple files to copy

  the argument, <*destination directory*>, specifies the location where users have to copy the file.

  the argument, <*destination file*>, specifies the name of the copy of the file,

  <*source file/s*>. Users can specify either of the two arguments, <*destination directory*> or <*destination file*>

- The command copies the contents of a file data1 to a new file data2:

```
cp data1 data2
```

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Manipulating Files: Copying Files [2-2]

The common options used with the `cp` command are:

Option	Function
-i	Prompts before overwriting a file or directory
-l	Creates a link to the file instead of copying it
-s	Creates a symbolic link
-v	Explains the process in detail

Options with the `cp` Command

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Manipulating Files: Removing Files

- The *rm* command is used to delete files or directories.

  Syntax:

  `rm [options] file/s`

  where,

  the argument, file/s specifies the name of one or more files to be deleted.

- Common options with the *rm* command are:

Option	Function
-i	Prompts before removing a file or directory
-f	Removes a file by force. It ignores the nonexistence of a file. The command does not flag an error if the file does not exist
-r or *-R*	Deletes recursively. It deletes a directory along with its subdirectories
-v	Explains the process in detail

Options with the `rm` Command

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Manipulating Files: Moving and Renaming Files

- The *mv* command is used to move a file or directory from one location to another or to change the name of a file or directory.

  Syntax:

  `mv [option] <source> <destination>`

  where,

  - The argument, source, specifies the directory or file that users require to move.
  - The argument, destination, specifies the location where the file or directory is to be moved.
  - The argument, file/s, specifies the name of one or more files to be deleted.

- Common options with the *mv* command are:

Option	Function
-f	Does not prompt before overwriting a file or directory
-I	Prompts before overwriting at the destination location
-v	Explains the process in detail

Options with the `mv` Command

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Inserting and Manipulating Text

- Users can insert or add text in the existing file using the vi editor. The following table lists the commands used to insert, add, and replace text in a file.

Option	Function
a	Appends text after the current cursor position
A	Appends text at the end of the current line
i	Inserts text
I	Inserts text at beginning of the current line
o	Inserts a blank line below the current line and allows to append text
O	Inserts a blank line above the current line and allows to append text
rx	Replaces the current character with character x
Rtext	Replaces characters with the specified text (until Esc key is pressed). This command activates the replace mode instead of the append mode

Options with the `mv` Command

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Changing and Yanking/Cutting the Text

- In RHEL, commands help change, yank, and paste the yanked text.
- The table lists the commands to change and yank the text.

Option	Function
cw	Changes a word
cc	Changes a complete line
j	Joins lines
U	Restores the last change
X	Deletes a character before the current cursor position
u	Undoes the last change
.(dot)	Repeats the last change
Yy	Copies and yanks/cuts the current line into the buffer
Nyy or yNy	Copies and yanks/cuts the current and the other lines into the buffer
P	Places the yanked text after the current cursor position. This command is similar to the paste operation in Windows

Commands to Change and Yank the Text

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Commands Used in `vi` Editor [1-6]

- Various types of commands are used in *vi* editor:

Commonly used commands

Cursor movement commands

Insert and replace commands

Delete and modify commands

Commands to copy and paste lines

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Commands Used in `vi` Editor [2-6]

The following table displays the commonly used commands in *vi*.

Command	Action
H	Moves cursor to previous character
L	Moves cursor to next character
K	Moves cursor up one line
J	Moves cursor down one line
X	Deletes character at current cursor
dd	Deletes line
:e!	Undoes unsaved work
:wq+ENTER	Saves all changes and quit
:W+ENTER	Saves the file
:q!+ENTER	Quits without saving changes
:e <filename>+ENTER	Opens the specified file
:w <filename>+ENTER	Writes to a different file
:w! <filename>+ENTER	Forces write to another file
:! <commandname>+ENTER	Executes a shell command

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Commands Used in `vi` Editor [3-6]

- The table displays the basic cursor movement commands in vi.

Command	Action
Ctrl+d or D	Moves to the last line on the screen
Ctrl+u or U	Scrolls up half screen
Ctrl+F	Moves one page forward
Ctrl+B	Moves one page backward
nG	Moves to line number n
0 (zero)	Moves to the beginning of the line
$	Moves to the end of the line
H	Moves to the first line on the screen
M	Moves to the middle line on the screen
L	Moves to the last line on the screen
Z+Enter	Makes the current line the first line on the screen
z-.	Makes the current line the last line on the screen

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Commands Used in `vi` Editor [4-6]

- The table displays the basic insert and replace commands in vi.

Command	Action
a	Appends after current character
A	Appends at the end of line
i	Inserts before the current character
I	Inserts at the beginning of line
o	Inserts blank line below and allows insertion
O	Inserts blank line above and allows insertion
Rx	Replaces current character with character x
H	Moves to the first line on the screen
M	Moves to the middle line on the screen
L	Moves to the last line on the screen
Z+Enter	Makes the current line the first line on the screen
z-.	Makes the current line the last line on the screen

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Commands Used in `vi` Editor [5-6]

- The table displays the basic deletion and modification commands.

Command	Action
dw	Appends after current character
dd	Appends at the end of line
cw	Inserts before the current character
cc	Inserts at the beginning of line
X	Inserts blank line below and allows insertion
I	Inserts blank line above and allows insertion
u	Replaces current character with character x
U	Moves to the first line on the screen
.(dot)	Moves to the middle line on the screen

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Commands Used in `vi` Editor [6-6]

- The table displays the basic commands to copy and paste lines.

Command	Action
yy	Copies the current line
nyy	Copies n lines from the current line
p	Places the copied line after current cursor position
P	Places the copied line before the current cursor position

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Getting Started with gedit Editor [1-2]

- A text editor, used in the Gnome desktop environment.
- To open gedit, go to **Applications → Accessories → gedit** text editor.
- The figure displays the Readme tab of gedit editor.

Readme Tab of gedit Editor

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Getting Started with `gedit` Editor [2-2]

- The gedit editor provides a variety of features:
  - Options to highlight configurable syntax for various languages
  - Options to Undo/Redo
  - Access to editing files from remote locations
  - Options on file reverting
  - Support for print and print preview options
  - Support for clipboard options, such as cut, copy and paste
  - Options to search and replace text
  - Options to go to a specific line
  - Option for auto indentation
  - Option for wrapping text
  - Option to display line numbers
  - Option to highlight current line
  - Option to backup files
  - Configure fonts and colors

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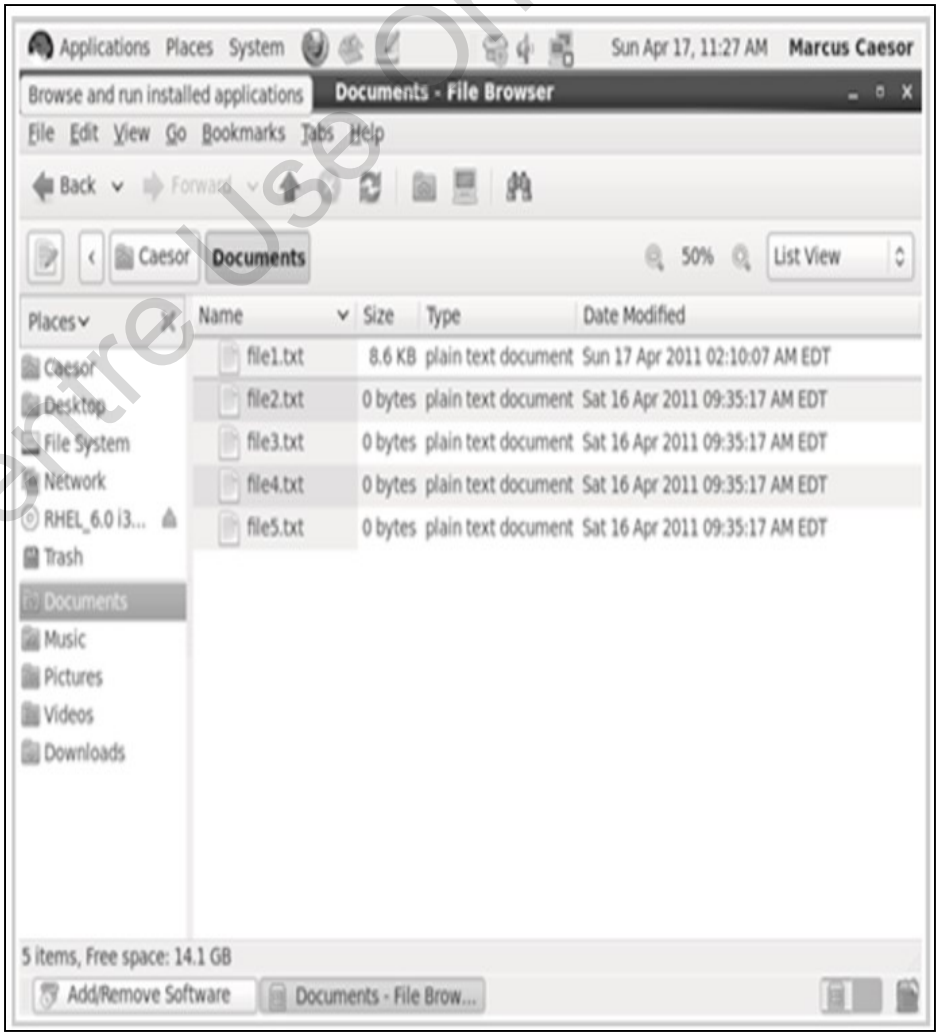
Managing Files with Nautilus

- A multipurpose tool included in RHEL.
- Multiple file management activities can be performed using this tool.
- Provides a graphical user interface similar to Windows Explorer to manage files.
- Drag and drop, copy, move, or perform other regular operations on files without executing any commands.
- The figure shows a typical file browser window provided by the Nautilus.



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Redirecting I/O Channels to Files

Redirection changes the assignments for the:

- Standard input
- Output
- Error

- Using redirection, the input to a command can be taken from a file other than the keyboard.
  - The output of a command or the error can be written to a disk file or printed.

The three types of redirection are:

- Input Redirection
- Output Redirection
- Error Redirection

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Input Redirection

- The example illustrates the use of input redirection:

```
cat< test1
```

- The cat command takes each line of the file ‘test1’ as input and displays it on the screen.
- It is possible to specify that the standard input comes from a disk file.
- The preceding command can be written using the file descriptor that is as:

```
$ cat 0< test1
```

- Useful in scenarios where users do not require the input for any command to be entered with a keyboard.

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Output Redirection

- The example illustrates the usage of output redirection:

```
cat test1 > out_test
```

- The output of the cat command is written to a disk file 'out_test'.
- In output redirection:
  - The file to which the output is redirected is first created on the disk as an empty file and then the output is sent to this file.
  - If the file already exists, its contents are deleted before the output is written to it.

The command appends the output to the existing file, out_test:

- `cat test1 >> out_test`

The preceding commands can be written using the file descriptor as:

- `cat test1 1> out_test`
- `cat test1 1>>out_test`

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Error Redirection

- The example illustrates the usage of error redirection:

```
cat test_2 2> error-mesg
```

- The file ‘test_2’ does not exist in the current directory.

When a user tries to execute this command, Linux generates an error message because the execution is unsuccessful.

- This error message is written to the file, error-mesg, instead of displaying it on the screen (the standard error file).

In output redirection, error redirection first creates the file to which the error messages are redirected and then writes the error output to the file.

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Handling Files Using Wildcard Characters with File Operations [1-2]

- The shell offers the feature to perform an operation on a set of files without specifying the names of all the files on which the operation is to be performed.
  - Interprets these special characters as a specific pattern of characters.
  - Compares all the file names under the directory specified in the command to find the file names that match the pattern.
  - The command is executed on the files with names that match the pattern.

Option	Description
?	Matches exactly one character

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Handling Files Using Wildcard Characters with File Operations [2-2]

The * Wildcard	• Interpreted as a string of none, one, or more characters.
The ? Wildcard	• Matches exactly one occurrence of any character.
The [ ] Wildcard	• Can be used to restrict the characters to be matched.

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Searching Files [1-3]

- RHEL allows users to search documents:
  - *find Command*
  - *locate Command*

The `find` Command

- Allows users to use various parameters to make searches efficient and accurate.
- Locate files on a RHEL system.
- Use different parameters to filter and locate files.

  Syntax:

  find*<location><options><file_name>*
- Use to search files based on its size.
- Search files based on the last accessed time.
- Search files based on the last modified time.

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Searching Files [2-3]

The `locate` Command

- Use the locate command to find any files on which they have read permissions.
- The ***l*** command maintains a list of files on the system in a database called /var/lib/mlocate/mlocate.db.

  Syntax:

  ```
  locate<file_name>
  ```
- The `locate` command result returns all the files with the <file_name> pattern in their names and their complete path.
- To search for a file with exact name, use the -b option.
- The command returns files with the <file_name> as their name:

  ```
  locate -b <file_name>
  ```

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Searching Files [3-3]

- To search for files created immediately or files that are less than a day old, execute the *updatedb* command manually before executing the `locate` command to search for files.

  Syntax:

  ```
  updatedb
  ```

Users:
• Must have root privileges to execute the updatedb command. • Can also use the GNOME search tool to search files in GUI mode. • Can invoke this tool using the command: `gnome-search-tool&`

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Summary

- All the files are stored on the disk under one main directory, / (root). The different types of files are ordinary files, directory files, and special files. There are various commands used in Red Hat Linux to manage files at the command line, such as cat, more, less, and file. There are also various editors to manage files, such as vi and gedit.

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