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Graded Assignment

Question 3

1. There was no important_data.txt file in the root and could not create the file in the root directory so I created it in home directory to simulate the question
   Steps
   i.   Created the file
   ii.   Created hard link using the ln command and verified both files point to the same inode using the ls command with -i flag

2. Create a symbolic link to important_data.txt
   Steps
   Create symbolic link suing ln with -s flag and checked the permission and inode number with the ls -li command

3. Display all hard links to the important_data.txt file including their full paths
   Steps
   i.   Searched the filesystem for hard links using the command find with a -samefile flag

4. Retrieve detailed information about the important_data.txt file such as its size, owner, group and permissions
   Steps
   i.   Used the stat command to view output of file size, owner, group , permissions and timestamps

5. Display the disk space usage of the filesystem where important_data.txt file is located. Provide information about the available space used and the filesystem features
   Steps
   i.   Used df command with the -hT flag

```
File  Edit  View  Terminal  Tabs  Help
coder@ba7cba181fff:~$ df -hT ~/important_data.txt
Filesystem                                                       Type  Size  Used Avail Us
e% Mounted on
dockerPool/0ff388a7c41ebd4e354e5b5999ab51f42c55022aaf876cbdd19ba62fbd486c7a zfs    13G  3.7G  9.3G   2
9% /
coder@ba7cba181fff:~$
```

6. Extract and display the information about the superblock of the filesystem where the important_data_txt file resides. Include details such as the block size and filesystem features

```
coder@ba7cba181fff:~$ df -T ~/important_data.txt
Filesystem                                                       Type 1K-blocks      Used Av
ailable Use% Mounted on
dockerPool/0ff388a7c41ebd4e354e5b5999ab51f42c55022aaf876cbdd19ba62fbd486c7a zfs  13574272 3840512
9733760  29% /
coder@ba7cba181fff:~$
```

7. In the root directory create a subdirectory named backup and move the important_data.txt fole into it. check the inode number of the file after relocation
   I cannot create a subdirectory in the root
   Creating in my home directory to simulate.

```
File  Edit  View  Terminal  Tabs  Help
coder@ba7cba181fff:~$ sudo mkdir /backup
sudo: unable to change to root gid: Operation not permitted
sudo: unable to initialize policy plugin
coder@ba7cba181fff:~$ mkdir ~/backup
coder@ba7cba181fff:~$ ls
backup       Desktop.save              important_data.txt   package.json       Videos
backups      dest_dir                  important_notes.txt  package-lock.json  wm.log
coursera     Documents                 install              Pictures           wm_startup.sh
data         Downloads                 Music                Public             workspace
Desktop      important_data_hl.txt     node_modules         quarterly_reports  wrapper_process.sh
Desktop-ro   important_data_sl.txt     noVNC                Templates
coder@ba7cba181fff:~$ mv ~/important_data.txt ~/backup/
coder@ba7cba181fff:~$ ls -li ~/backup/important_data.txt
232336 -rw-r--r-- 2 coder coder 0 Dec 29 14:04 /home/coder/backup/important_data.txt
coder@ba7cba181fff:~$
```

8. Create a new symbolic link in your home directory, pointing to the important_data.txt in the new location within the backup directory. Confirm that the link is still valid
   Steps
   i.   Used the ln with -s command and -l command

```
File  Edit  View  Terminal  Tabs  Help
coder@ba7cba181fff:~$ ln -s ~/backup/important_data.txt ~/important_data_softlink.txt
coder@ba7cba181fff:~$ ls -l ~/important_data_softlink.txt
lrwxrwxrwx 1 coder coder 37 Dec 29 14:39 /home/coder/important_data_softlink.txt -> /home/coder/backu
p/important_data.txt
coder@ba7cba181fff:~$ █
```

9. Explain why hard links cannot span across different filesystems using the understanding of inodes and superblocks

   Hard links cannot span different filesystems because they work by creating multiple directory entries that point to the same inode and inodes are local to a single filesystem as defined by the superblock. Each file system manages own inode table and cannot understand inodes belonging o another file system because there is no shared inode space across filesystems.

10. Suppose you need to backup the important_data.txt file. Describe a strategy you would use to create a backup file while preserving the links integrity and ensuring efficient disk usage

    To backup efficiently I would use link aware backup tool with the –link 0 dist. option. This preserves the hard link and symbolic links and avoids duplicating unchanged data by reusing hard link in incremental back.