Hard Link vs Soft Link in Linux

In Linux, hard links and soft (symbolic) links allow multiple references to a file.

Understanding their differences is important for efficient file management, backup strategies, and filesystem operations.

This document, prepared by Ekansh Gupta, illustrates their concepts with explanations, examples, and diagrams.

Key Differences at a Glance

Hard Link:

- Points directly to the file's inode
- Same inode as original file
- All hard links are equal; no "main" file
- File deleted only when all hard links are removed
- Cannot link to directories
- Cannot cross filesystem boundaries

Soft Link (Symbolic Link):

- Points to the filename, not the inode
- Different inode from original
- Breaks if the target file is deleted
- Can link to directories
- Can cross filesystem boundaries

Terminal Examples

```
# Create a file
$ echo "Linux links demo" > original.txt
```

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```
# Create a hard link
$ ln original.txt hardlink.txt

# Create a soft link
$ ln -s original.txt softlink.txt

# Check inode numbers
$ ls -li original.txt hardlink.txt softlink.txt
```

Step-by-Step Behavior

1. You create 'original.txt' with some text.

2. You make a hard link: 'hardlink.txt' now shares the same data.

3. You make a soft link: 'softlink.txt' points to the filename 'original.txt'.

4. If you delete 'original.txt':

   - 'hardlink.txt' still works.

   - 'softlink.txt' becomes a broken shortcut.

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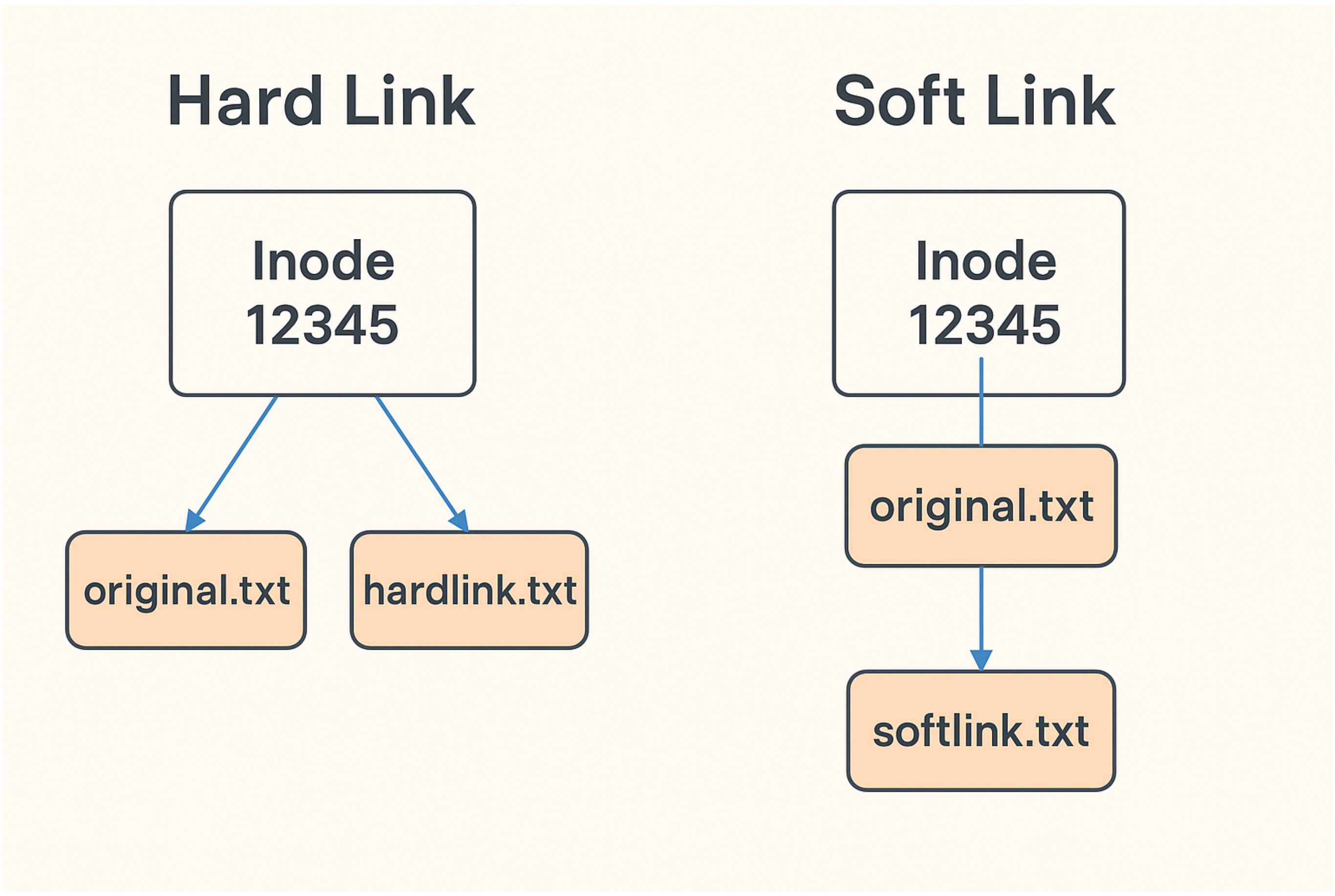
Visual Explanation



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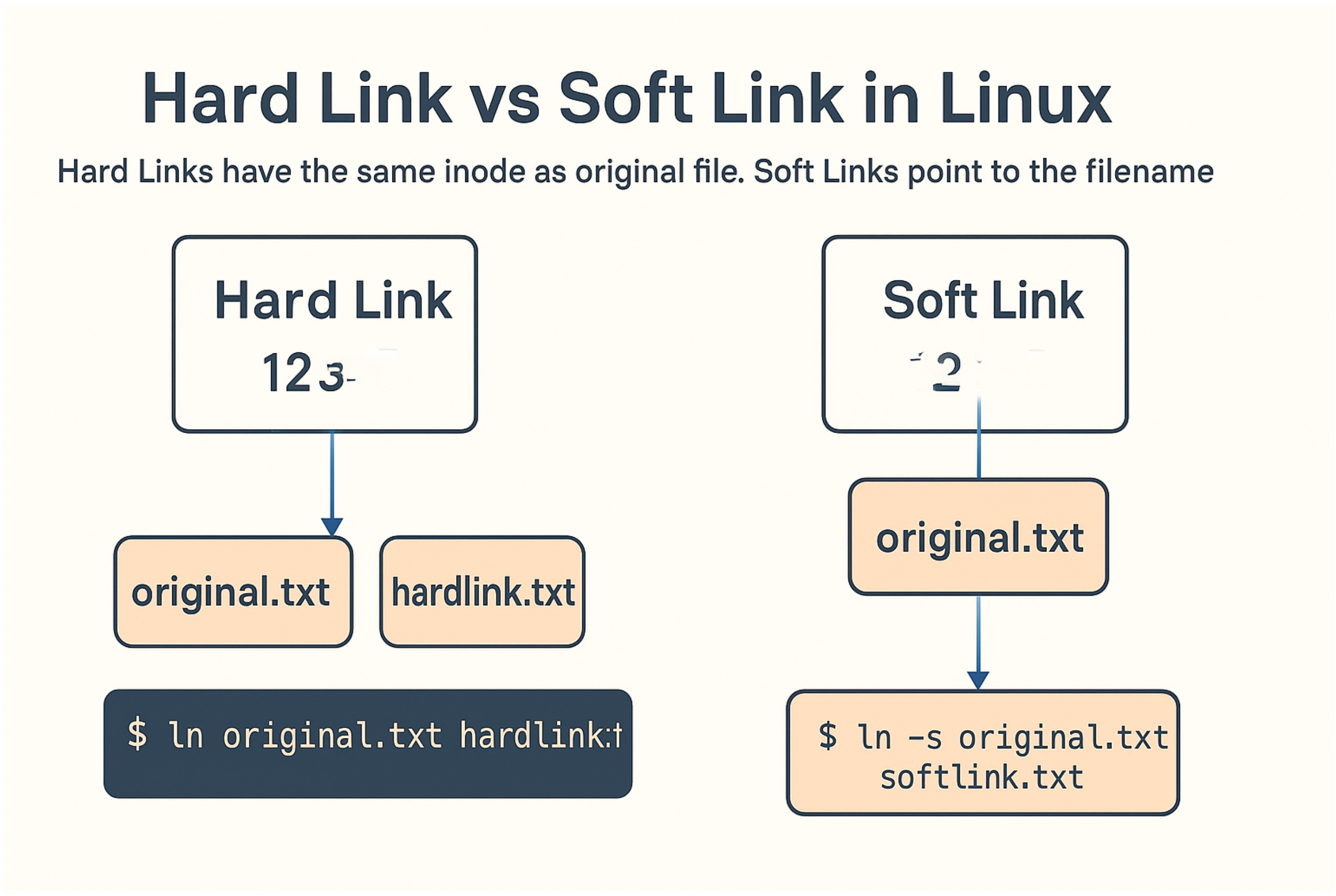
Hard Link vs Soft Link in Linux
Hard Links have the same inode as original file. Soft Links point to the filename
Hard Link
123
Soft Link
2
original.txt
hardlink.txt
original.txt

```
$ ln original.txt hardlink.t
```

```
$ ln -s original.txt
softlink.txt
```

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Author

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Purpose: Educational and reference use for Linux filesystem learners.