

HOWTO for UNIX/Linux "permission anomaly"

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This document describes the "permission anomaly" on UNIX/Linux systems. That means, whether some operations on files are allowed or not depends on the directory permissions the file is located in and some of them depend on the file permissions itself.

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1) Introduction

The permission COMBINATION of a file and the directory it is located in, decides what operations are allowed on a file and which one's are not allowed.

* FILE PERMISSIONS decide about the right to do operations on the FILES CONTENT (e.g. read, copy, change, call as program)

* DIRECTORY PERMISSIONS decide about the right to do operations on the FILE NAMES located in the directory (e.g. create, rename, move, delete)

The simple example of a file located in a directory will be used to illustrate these rules by showing the operations allowed in 2 different cases (A) + (B) respectively:

```

      (A)                (B)
      rwx                r-x
      #=====#
      | Directory |
      #=====#
      |
      +-----+
      | File   |
      +-----+
  
```

File operation	References	(A)	(B)
Read/Open (more)	Content	yes	yes
Copy (cp)	Content	yes	no (*)
Overwrite/Save (>)	Content	no	yes
Edit (vi)	Content	no	yes
(Change=Read + Write)			
Delete content (>)	Content	no	yes
Touch (touch)	Name/Inode	yes	yes
Create hard link (ln)	Name/Inode	yes	no (*)
Create soft link (ln -s)	Name	yes	no (*)
Create (touch)	Name	yes	no
Rename (mv)	Name	yes	no
Move (mv)	Name	yes	no
Remove file (rm)	Name	yes	no
Execute (./FILE)	Permissions	no	no

(*) "yes" if target directory is a different one (with write permission set)

If a directory is not readable all file names to be accessed in it have to be known by heart (as directory content listing is impossible)!

2) Permission needed for certain tasks

	Command	Dir.	File
Change into directory	cd	- - x	- - -
List directory content	ls	r - x	- - -
List file info (inode)	ls -l	r - x	- - -
Touch file (inode)	touch	- - x	- - -
Read/Open file	more	- - x	r - -
Write/Save file (not create)	> FILE	- - x	- w -
Edit file (change)	vi	- - x	r w -
Copy file (from directory)	cp	- - x	r - -

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Copy file (into directory)	cp	- w x	r - -
Create file	> FILE	- w x	- - -
Rename file	mv	- w x	- - -
Move file	mv	- w x	- - -
Delete file	rm	- w x	- - -

Execute binary program	FILE	- - x	- - x
Execute shell script (A)	FILE	- - x	r - x
Execute shell script (B)	sh FILE	- - x	r - -
Create hard link to file	ln	- w x	- - -
Create soft link to file	ln -s	- w -	- - -

Change owner	chown	root	only
Change owner group	chgrp	owner	only
Change permissions	chmod	owner	only
Change attributes (date)	touch	owner	only

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