

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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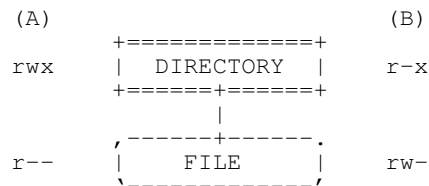
1) Introduction

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 is used to illustrate these rules by showing the operations allowed in 2 different cases (A) + (B):



File operation	References	(A)	(B)
Read/Open (more)	Content	yes	yes
Copy (cp)	Content	yes	-- (*)
Overwrite/Save (>)	Content	--	yes
Edit = Change (vi)	Content	--	yes
(Read + Write)			
Delete content (>)	Content	--	yes
Print content (lpr)	Content	yes	yes
Touch (touch)	Name/Inode	yes	yes
Create hard link (ln)	Name/Inode	yes	-- (*)
Create soft link (ln -s)	Name	yes	-- (*)
Create (touch)	Name	yes	--
Rename (mv)	Name	yes	--
Move (mv)	Name	yes	--
Remove file (rm)	Name	yes	--
Execute (./FILE)	Permissions	--	--

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

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

2) Permission needed for certain tasks

Command	Dir.	File	Type
Change into directory	cd	- - x	- - -
List directory content	ls	r - -	- - - N
List file info (inode)	ls -l	r - x	- - - N M
Touch file (inode)	touch	- - x	- - - N M

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Read/Open file	more	- - x	r - -	N C	
Write/Save file (not create)	> FILE	- - x	- w -	N C M	
Edit file (change)	vi	- - x	r w -	N C	
Copy file (from directory)	cp	- - x	r - -	N C	
Print file (inode)	lpr	- - x	r - -	N C	
+-----+-----+-----+-----+-----+					
Copy file (into directory)	cp	- w x	r - -	N C M	
Create file	> FILE	- w x	- - -	N C M	
Rename file	mv	- w x	- - -	N	
Move file	mv	- w x	- - -	N	
Delete file	rm	- w x	- - -	N M	
+-----+-----+-----+-----+-----+					
Execute binary program	FILE	- - x	- - x	N C	
Execute shell script (A)	FILE	- - x	r - x	N C	
Execute shell script (B)	sh FILE	- - x	r - -	N C	
Create hard link to file	ln	- w x	- - -	N M	
Create soft link to file	ln -s	- w -	- - -	N	
Use soft link to file		- - x	- - -	N	
+-----+-----+-----+-----+-----+					
Change owner	chown	root only		M	
Change owner group	chgrp	owner only		M	
Change permissions	chmod	owner only		M	
Change attributes (date)	touch	owner only		M	
+-----+-----+-----+-----+-----+					

Typ = N)ame C)ontent M)etadata

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)!