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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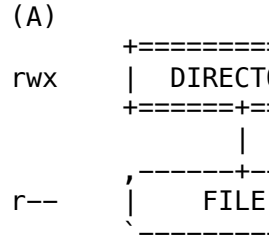
1) Introduction

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 FILE CONTENT (e.g. read, copy, change, call as program)

* DIRECTORY PERMISSIONS decide about the right to do operations on FILE NAME 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):



					NECESSARY	
FILE OPERATION	COMMAND	ACCESSES	(A)	(B)	DIR	FILE
Read/Open	more	Content	yes	yes	--x	r--
Copy	cp	Content	yes	(yes)	--x	r--
Overwrite/Save	>	Content	--	yes	--x	-w-
Edit = Change (Read + Write)	vi	Content	--	yes	--x	rw-
Delete content	>	Content	--	yes	--x	-w-
Print content	lpr	Content	yes	yes	--x	r--
Touch (file there)	touch	Name/Inode	yes	yes	--x	---
Create hard link	ln	Name/Inode	yes	(yes)	-wx	---
Create soft link	ln -s	Name	yes	(yes)	-wx	---
Create (file miss)	touch	Name	yes	--	-wx	---
Rename	mv	Name	yes	--	-wx	---
Move	mv	Name	yes	--	-wx	---
Remove file	rm	Name	yes	--	-wx	---
Execute	./FILE	Permissions	--	--	--x	r-x

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  +-------------------+---------+-----------+-------+-------+----------+
    DIR   = Directory
    FILE  = File
    (yes) = If target directory is a different one (with write permission!)
```

HINT: If a directory is not readable (permission "r" missing) a FILENAME to be accessed in it has to be known by heart (as a directory content listing via "ls" is impossible then)!

2) Permission needed for certain tasks

	COMMAND	DIR.	FILE	REFER
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
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

REFER = N)ame, C)ontent, M)etadata

HINT: If a directory is not readable (permission "r" missing) a FILENAME to be accessed in it has to be known by heart (as a directory content listing via "ls" is impossible then)!