chmod and chown File permissions

CONCEPTS

Mode digits are sums per class: r=4, w=2, x=1. 640 means owner rw-, group r--, others ---.

Special bits setuid 4, setgid 2, sticky 1

Owner (u) first digit

Group (g) second digit

Others (o) third digit

Octal digit

Digit	Bits	Meaning
7	rwx	read, write, execute
6	rw-	read, write
5	r-x	read, execute
4	r--	read only
0	---	nothing

On directories, r lists names, w creates or deletes entries, x lets you enter and access items by name.

chown normally needs root. chmod works only for the file owner or root.

OCTAL MODES

chmod 644 *<file>*
rw for owner, r for rest

chmod 755 *<file>*
rwx for owner, rx for rest

chmod 600 *<file>*
Private to owner

chmod 700 *<dir>*
Private directory

chmod 664 *<file>*
Group-writable file

chmod 775 *<dir>*
Group-writable directory

SYMBOLIC MODES

chmod +x *<file>*
Add execute (per umask)

chmod a+x *<file>*
Add execute for everyone

chmod u+x *<file>*
Add execute for owner

chmod g+w *<file>*
Let group write

SYMBOLIC MODES (cont.)

chmod o-rwx *<file>*
Remove all access for others

chmod u=rw,go=r *<file>*
Set classes exactly

chmod g=u *<file>*
Copy owner perms to group

chmod u+x,g-w *<file>*
Several changes, comma-separated

chmod a-x *<file>*
Remove execute for all

RECURSIVE CHANGES

chmod -R *<mode> <dir>*
Recurse into a directory

chmod -R a+rX *<dir>*
Read all, x only on dirs

chmod -R u=rwX,go=rX *<dir>*
Sane tree permissions

find *<dir>* **-type d -exec chmod 755 {} +**
Dirs only

find *<dir>* **-type f -exec chmod 644 {} +**
Files only

SPECIAL BITS

chmod u+s *<file>*
Setuid: run as file owner

chmod g+s *<dir>*
Setgid dir: new files keep group

chmod +t *<dir>*
Sticky: only owners may delete

READING AND COPYING MODES

ls -l *<path>*
Long listing with mode

ls -ld *<dir>*
Mode of the dir itself

stat -c '%a %U:%G %n' *<file>*
Octal mode and owner

chmod --reference=*<ref>* *<file>*
Copy mode from another file

chmod -c *<mode> <file>*
Report only real changes

CHOWN

chown *<user> <file>*
Change owner

chown *<user>*:*<group> <file>*
Change owner and group

chown :*<group> <file>*
Change group only

chown *<user>*: *<file>*
Owner and their login group

chown -R *<user>*:*<group> <dir>*
Recursive ownership

chown --reference=*<ref> <file>*
Copy owner from another file

chgrp *<group> <file>*
Change group (no chown needed)

sudo chown -R $USER: *<dir>*
Reclaim files made by root

UMASK

umask
Show current mask

umask -S
Show mask symbolically

umask 022
New files 644, dirs 755

umask 077
New files private to you

umask removes bits from 666 for files and 777 for dirs. It only affects files created later by that shell and its children.

RECIPES

Web content tree

```
find /srv/www -type d -exec chmod 755 {} +
find /srv/www -type f -exec chmod 644 {} +
chown -R www-data:www-data /srv/www
```

Shared team directory

```
sudo chgrp -R team /srv/shared
sudo chmod -R g+rwX /srv/shared
sudo chmod g+s /srv/shared
# new files now inherit group team
```

Lock down SSH keys

```
chmod 700 ~/.ssh
chmod 600 ~/.ssh/id_ed25519
~/.ssh/authorized_keys
chmod 644 ~/.ssh/id_ed25519.pub
```