lsof List open files

START HERE

`lsof -i :<port>`
Who uses this port?

`lsof -t -i :<port>`
PIDs only

`lsof -iTCP -sTCP:LISTEN -nP`
List listeners

`lsof +L1`
Deleted, still open

`lsof -p <pid>`
Files of a process

`lsof -u <user>`
Files of a user

`lsof <file>`
Who has it open?

`lsof +D <dir>`
Open files under dir

Selectors -i -p -u -c names → `OR (or AND with -a)` → **Matching files** every open file → `-t / -F / columns` → **Output** table, PIDs, fields

CONCEPTS

On Unix everything is a file: regular files, directories, pipes, sockets and devices all show up. Run as root to see other users' processes.

Selection options are ORed by default, so lsof -u me -i lists both. Add -a to require all of them.

Always add -nP when scripting or debugging: it skips slow DNS and service-name lookups.

FIND BY PROCESS

`lsof -p <pid>`
Open files of a process

`lsof -p <pid1>,<pid2>`
Several processes

`lsof -p ^<pid>`
Everything except a process
Negation applies first, even with -a.

`lsof -c <prefix>`
Processes by command-name prefix

`lsof -c /<regex>/i`
Command name by regex

`lsof -c ^<prefix>`
Exclude a command

`lsof -g <pgid>`
By process group ID

FIND BY PROCESS (cont.)

`lsof -R`
Add parent PID (PPID) column

`lsof -d cwd -a -p <pid>`
Working directory of a process

`lsof -d txt -a -p <pid>`
Executable and libraries

FIND BY USER AND FILE

`lsof -u <user>`
Files opened by a user

`lsof -u ^<user>`
Everyone except a user

`lsof <file>`
Processes holding a file open

`lsof <mountpoint>`
Processes using a filesystem
Use this before umount reports 'target is busy'.

`lsof +d <dir>`
Open files directly in a dir

`lsof +D <dir>`
Open files in a dir tree
Recursive and slow on big trees.

`lsof -d <fds>`
Select by descriptor (0-2, cwd, mem)

`lsof -d ^mem,^txt -p <pid>`
Skip libraries and binary

`lsof -N`
Only NFS files

FIND BY USER AND FILE (cont.)

`lsof -a -u <user> -d ^mem`
AND selectors together

NETWORK

`lsof -i`
All network files

`lsof -i :<port>`
Who uses a port

`lsof -i TCP:<port>`
Restrict to TCP port

`lsof -i :<p1>-<p2>`
Port range

`lsof -i :<p1>,<p2>`
Port list

`lsof -i @<host>`
Connections to a host

`lsof -i <4|6>`
IPv4 or IPv6 only

`lsof -iTCP -sTCP:LISTEN`
Listening TCP sockets

`lsof -iTCP -sTCP:ESTABLISHED`
Established connections

`lsof -iUDP`
UDP sockets

`lsof -i -s TCP:^LISTEN`
Exclude a TCP state

`lsof -nP -i`
No DNS or port-name lookups

NETWORK (cont.)

`lsof -U`
Unix domain sockets

`lsof -a -U -c <cmd>`
Unix sockets of one command

`lsof -i -a -p <pid>`
Network files of one process

OUTPUT CONTROL

`lsof -t <selectors>`
PIDs only, no header
Implies -w, so warnings are hidden.

`lsof -l`
Show UIDs instead of names

`lsof -H`
Human-readable sizes

`lsof -o`
Show file offset

`lsof -s`
Show file size

`lsof -F pcn`
Machine-readable fields
-F? lists the field letters; add -F0 for NUL-separated output.

`lsof -w`
Suppress warnings

`lsof +c 0`
Full command names

`lsof -r <secs>`
Repeat forever

OUTPUT CONTROL (cont.)

`lsof +r <secs>`
Repeat until no files match

`lsof +L1`
Unlinked (deleted) but open files

`lsof +L`
Show link counts

`lsof -V`
Report selectors that matched nothing

`lsof -v`
Version info

READING THE TABLE

Common FD values

FD	Meaning
`cwd`	Current directory
`txt`	Program binary
`mem`	Memory-mapped file or library
`rtd`	Root directory
`3u`	Descriptor 3, open read and write
`4r / 5w`	Read-only / write-only
`DEL`	Mapped file deleted

TYPE column

TYPE	Meaning
`REG`	Regular file
`DIR`	Directory
`CHR`	Character device
`FIFO / PIPE`	Pipe
`unix`	Unix domain socket
`IPv4 / IPv6`	Network socket

READING THE TABLE (cont.)

A '(deleted)' suffix on NAME means the file was removed but a process still holds it, so its disk space is not freed.

Without sudo, lsof only shows your own processes and may exit 1 with no output; that does not always mean nothing is open.

RECIPES

Free a busy port

```
# find the PID, then stop it
lsof -t -i :8080
kill $(lsof -t -i :8080)
```

Show what is listening

```
sudo lsof -iTCP -sTCP:LISTEN -nP
# only one command (nginx here)
sudo lsof -nP -i -a -c nginx
```

Reclaim space of deleted files

```
sudo lsof +L1 | grep -i deleted
# Linux only: empties the file under a live process, so be sure
sudo truncate -s 0 /proc/<pid>/fd/<fd>
```

Watch connections live

```
lsof -nP -i -a -p <pid> -r 2
# unmount blocked?
lsof /mnt/usb
```