lsof List open files

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.

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

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

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

lsof -R
Add parent PID (PPID) column

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

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

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

lsof +D *<dir>*
Open files in a dir tree

FIND BY USER AND FILE (cont.)

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

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 -nP -i
No DNS or port-name lookups

lsof -U
Unix domain sockets

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

OUTPUT CONTROL

lsof -t *<selectors>*
PIDs only, no header

lsof -s
Show file size

lsof -F pcn
Machine-readable fields

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

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

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
```