strace Syscall tracer

START HERE

`strace <cmd>`
Trace a command

`strace -e trace=%file <cmd>`
Only file syscalls

`strace -f <cmd>`
Include child processes

`strace -c <cmd>`
Summary table only

`strace -p <pid>`
Attach to a running process

`strace -tt -T <cmd>`
Timestamps and durations

`strace -o <file> <cmd>`
Write trace to a file

`strace -s 200 <cmd>`
Show longer strings

Your program traced process → `syscall` → **strace** ptrace stops it, logs → `resume` → **Kernel** does the work

CONCEPTS

strace prints every system call a process makes: name, arguments, return value. Output goes to stderr.

Read lines as name(args) = result; failures end in -1 plus an errno such as ENOENT.

Tracing slows the target a lot. Use filters and avoid it on busy production processes.

RUN AND ATTACH

`strace <cmd> [args]`
Trace a new command

`strace -p <pid>`
Attach to a running process
Often needs root or ptrace permission (see kernel.yama.ptrace_scope)

`strace -f <cmd>`
Follow forks, clones and threads

`strace -p <pid> -p <pid2>`
Attach to several processes

`strace -o <file> <cmd>`
Write the trace to a file

`strace -A -o <file> <cmd>`
Append to the output file

`strace -ff -o <prefix> <cmd>`
One output file per process
Files are named <prefix>.<pid>; cannot be combined with -c

`strace -E <VAR>=<val> <cmd>`
Set an environment variable for the command

`strace -u <user> <cmd>`
Run the command as another user

`strace -b execve <cmd>`
Detach once the program calls execve

`strace -D <cmd>`
Hide strace from the target's process tree

`strace --seccomp-bpf -f <cmd>`
Stop only at traced syscalls (faster)
No effect without -f or with -p; best with a -e trace= filter

FILTER SYSCALLS

`strace -e trace=<name>,<name> <cmd>`
Only these syscalls

`strace -e trace=%file <cmd>`
Syscalls taking a file name

`strace -e trace=%network <cmd>`
Network syscalls

`strace -e trace=%process <cmd>`
Fork, exec and exit

`strace -e trace=%desc <cmd>`
File descriptor syscalls

`strace -e trace=%memory <cmd>`
Memory mapping syscalls

`strace -e trace=%signal <cmd>`
Signal syscalls

`strace -e trace=!<name> <cmd>`
Exclude a syscall
Quote the ! in an interactive shell to avoid history expansion

`strace -e trace=/<regex> <cmd>`
Syscalls matching a regex

`strace -P <path> <cmd>`
Only calls touching this path

`strace -e trace-fd=<n> <cmd>`
Only calls on this descriptor

`strace -e signal=<SIG> <cmd>`
Only show these signals

`strace -Z <cmd>`
Show only failed calls

`strace -z <cmd>`
Show only successful calls

OUTPUT FORMAT

`strace -s <n> <cmd>`
Print strings up to n bytes
Default is 32, which truncates most data

`strace -y <cmd>`
Show paths for file descriptors

OUTPUT FORMAT (cont.)

`strace -yy <cmd>`
Also show socket addresses and devices

`strace -v <cmd>`
Print full structures, no abbreviation

`strace -x <cmd>`
Hex for non-ASCII strings

`strace -e write=<fd> <cmd>`
Hex dump of data written to fd

`strace -e read=<fd> <cmd>`
Hex dump of data read from fd

`strace -k <cmd>`
Stack trace after each syscall
Needs strace built with stack-trace support

`strace -N <cmd>`
Print argument names

`strace -n <cmd>`
Print syscall numbers

`strace -Y <cmd>`
Show command names next to PIDs

`strace -q <cmd>`
Hide attach and exit notices

`strace --color=always <cmd>`
Colorize output

TIMING AND STATISTICS

`strace -c <cmd>`
Per-syscall summary instead of a trace

`strace -C <cmd>`
Summary plus the normal trace

`strace -c -S calls <cmd>`
Sort the summary by call count

`strace -c -S <field> <cmd>`
Sort by time, errors, avg-time or name

`strace -T <cmd>`
Show time spent in each syscall

`strace -tt <cmd>`
Wall-clock time with microseconds

`strace -ttt <cmd>`
Unix epoch time with microseconds

TIMING AND STATISTICS (cont.)

`strace -r <cmd>`
Time since the previous syscall

`strace -w -c <cmd>`
Summarize wall-clock instead of CPU time

TAMPERING

`strace --fault=<call>:error=<ERRNO> <cmd>`
Make a syscall fail
Without error= it returns ENOSYS

`strace --inject=<call>:error=<ERRNO>:when=<n> <cmd>`
Fail only the nth call

`strace --inject=<call>:delay_enter=<time> <cmd>`
Delay a syscall

`strace --inject=<call>:retval=<n> <cmd>`
Force a return value

`strace --kill-on-exit <cmd>`
Kill the target if strace dies
Not usable with -p

RECIPES

Why does it fail to start?

```
# which files does it look for, and what is missing?
strace -f -e trace=%file -Z -o trace.txt <cmd>
grep ENOENT trace.txt
```

Where is the time going?

```
strace -c -f -o summary.txt <cmd>
# then slow single calls
strace -f -tt -T -o trace.txt <cmd>
```

Debug a hung process

```
# last call shows what it waits on
sudo strace -f -tt -p <pid>
# connect/poll on fd? map it to a socket
sudo strace -yy -e trace=%network -p <pid>
```

See what config files are read

```
strace -f -e trace=openat -y -o trace.txt <cmd>
grep -v ENOENT trace.txt | grep -E 'conf|\.ini|\.yml'
```