# ccache Compiler cache

**START HERE**

`ccache gcc -c <file.c>`
Compile through the cache

`CCACHE_DISABLE=1 make`
Bypass the cache for one run

`ccache -s`
Show hit and miss statistics

`CMAKE_C_COMPILER_LAUNCHER`
CMake: set to ccache

`ccache -z`
Zero the statistics

`ccache -M <size>`
Set the cache size limit

`ccache -C`
Clear the whole cache

`ccache -p`
Show effective config and origins

## CONCEPTS

ccache hashes the preprocessed source, compiler and flags. On a hit it returns the stored object file instead of compiling. Run a build twice and compare 'ccache -s' to see it working.

**ccache gcc ...** hash inputs
↓ lookup
**Cache** hit: copy object
↓ miss
**Real compiler** store result

Each compile is a lookup keyed by source, flags and compiler

### Config precedence (highest first)

| Source | Example |
|---|---|
| `Command line` | ccache max_size=1G gcc ... |
| `Environment` | CCACHE_MAXSIZE=1G |
| `Directory config` | ccache.conf up the tree |
| `Cache config` | $CCACHE_DIR/ccache.conf |
| `System config` | /etc/ccache.conf |

## RUNNING IT

`ccache <compiler> <args>`
Prefix a compiler command

`ln -s $(which ccache) ~/bin/gcc`
Masquerade as the compiler

*The link directory must come before the real compiler in PATH. Repeat for g++, cc, c++, clang.*

`make CC='ccache gcc'`
Pass the prefix to make

## RUNNING IT (cont.)

`CC="ccache gcc" ./configure`
Use it with autotools

`CMAKE_C_COMPILER_LAUNCHER`
Set to ccache via -D (also CXX)

`ccache -V`
Print the version

`ccache --help`
List all options

`ccache <KEY>=<value> gcc ...`
Set one config option for this call

## STATISTICS

`ccache -s`
Show summary of hits and misses

`ccache -s -v`
Show more detailed statistics

`ccache -s -vv`
Show even more detail

`ccache -z`
Zero the statistics counters

`ccache -x`
Show compression statistics

`ccache --print-stats`
Machine-readable counters

`ccache --print-stats --format json`
Counters as JSON

`ccache --show-log-stats`
Counters from the stats log

## CACHE MANAGEMENT

`ccache -M <size>`
Set maximum cache size (default GiB)

`ccache -M 0`
Remove the size limit

`ccache -F <num>`
Set maximum number of files

`ccache -c`
Clean up to the configured limits

`ccache -C`
Clear all cached files, keep config

`ccache -X <level>`
Recompress the cache at a Zstandard level

`ccache -X uncompressed`
Store the cache uncompressed

`ccache --evict-older-than <age>d`
Drop entries unused for N days

`ccache --evict-namespace <ns>`
Drop entries of one namespace

`ccache -d <dir> -s`
Operate on another cache directory

## CONFIGURATION

`ccache -p`
Show effective config and its origin

## CONFIGURATION (cont.)

`ccache -k <key>`
Print one config value

`ccache -o <key>=<value>`
Write a config option to the file

`ccache --config-path <file>`
Use another config file

`CCACHE_DIR=<dir>`
Cache location

`CCACHE_MAXSIZE=<size>`
Cache size limit (default 5GiB)

`CCACHE_DISABLE=1`
Bypass ccache entirely

*Any set value counts as true, even an empty one. Use CCACHE_NODISABLE or unset the variable to re-enable.*

`CCACHE_CONFIGPATH=<file>`
Only read this config file

`CCACHE_COMPRESS=1`
Compress cached files (on by default)

`CCACHE_COMPRESSLEVEL=<n>`
Zstandard level for new entries

`CCACHE_NAMESPACE=<name>`
Partition the cache logically

`CCACHE_UMASK=<octal>`
Permissions for shared caches

`CCACHE_STATS=0`
Stop counting statistics

## HIT RATE AND CORRECTNESS

`CCACHE_BASEDIR=<dir>`
Rewrite absolute paths under dir

*Needed when the same source is built from different checkout paths.*

`CCACHE_SLOPPINESS=<list>`
Relax checks to get more hits

`CCACHE_SLOPPINESS=time_macros`
Ignore __DATE__ and __TIME__

`CCACHE_SLOPPINESS=pch_defines`
Allow precompiled headers

`CCACHE_COMPILERCHECK=content`
Hash compiler binary contents

`CCACHE_COMPILERCHECK=<command>`
Hash the output of a command

`CCACHE_NODIRECT=1`
Disable direct mode

`CCACHE_DEPEND=1`
Use depend mode (compiler writes deps)

`CCACHE_IGNOREOPTIONS=<opts>`
Ignore options when hashing

`CCACHE_RECACHE=1`
Ignore existing results and overwrite

`CCACHE_READONLY=1`
Read from the cache, do not add

`CCACHE_PATH=<dirs>`
Where to find the real compiler

## DEBUGGING AND SHARING

`CCACHE_LOGFILE=<file>`
Log every decision to a file

`CCACHE_DEBUG=1`
Write per-object debug files

`CCACHE_REMOTE_STORAGE=<url>`
Add a remote cache backend

## RECIPES

### Trial: measure the speedup

```
ccache -z
make clean && make -j8
make clean && make -j8
ccache -s   # second build
should be mostly hits
```

### Transparent via symlinks

```
mkdir -p ~/ccbin
for c in gcc g++ cc c++; do ln
-sf $(which ccache) ~/ccbin/$c;
done
export PATH=$HOME/ccbin:$PATH
gcc --version   # now routed
through ccache
```

### CMake project with ccache

```
L=CMAKE_C_COMPILER_LAUNCHER=
ccache
X=CMAKE_CXX_COMPILER_LAUNCHER=
ccache
cmake -B build -G Ninja -D$L -
D$X
cmake --build build && ccache -
s
```

### Why is it missing?

```
export CCACHE_LOGFILE=/tmp/
ccache.log
make clean && make
grep -iE 'miss|result' /tmp/
ccache.log | head
ccache -p | grep -E
'sloppiness|base_dir'
```