ccache Compiler cache

START HERE

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

`ccache` **`-C`**
Clear the whole cache

`ccache` **`-s`**
Show hit and miss statistics

`ccache` **`-p`**
Show effective config and origins

`ccache` **`-z`**
Zero the statistics

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

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

`CMAKE_C_COMPILER_LAUNCHER`
CMake: set to ccache

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

`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

STATISTICS (cont.)

`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

`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)

CONFIGURATION (cont.)

`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_EXTRAFILES=`*`<files>`*
Hash extra files into the key

`CCACHE_RECACHE=1`
Ignore existing results and overwrite

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

`CCACHE_COMMENTS=1`
Keep comments when hashing

`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_DEBUGDIR=`*`<dir>`*
Directory for the debug files

`CCACHE_STATSLOG=`*`<file>`*
Collect per-build statistics

`ccache` **`--inspect`** *`<file>`*
Show a result or manifest file

`ccache` **`--extract-result`** *`<file>`*
Unpack stored files from a result

`ccache` **`--hash-file`** *`<file>`*
Print a BLAKE3 hash of a file

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

`CCACHE_REMOTE_ONLY=1`
Use only the remote storage

`CCACHE_RESHARE=1`
Push local hits to remote storage

`CCACHE_FILECLONE=1`
Use reflinks instead of copies

`CCACHE_HARDLINK=1`
Hard-link objects from the cache

Shared inodes: editing or touching an object also changes the cached copy.

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'
```