# Ninja Fast build executor

## CONCEPTS

Ninja is a fast executor, not a build language: a generator such as CMake or Meson writes build.ninja for you.

**CMakeLists / meson.build** you write
↓ `cmake / meson setup`
**build.ninja** generated
↓ `ninja`
**Outputs** only what is stale

Ninja skips the work when outputs are newer than their inputs and the recorded command is unchanged.

Do not hand-edit generated build.ninja; change the generator input and it regenerates itself.

## BUILDING

**`ninja`**
Build the default targets

**`ninja`** *`<target>`*
Build only the named target(s)

**`ninja -C`** *`<dir>`*
Change to a directory first

**`ninja -j`** *`<N>`*
Run N jobs in parallel

**`ninja -n`**
Dry run, do not execute

**`ninja -v`**
Show full command lines

**`ninja -k`** *`<N>`*
Keep going until N jobs fail

**`ninja -f`** *`<file>`*
Use another build file

**`ninja -l`** *`<N>`*
Hold back at load average above N

**`ninja --quiet`**
Hide progress, show command output

**`ninja --version`**
Print the Ninja version

**`ninja -h`**
Show help and options

## INSPECTING THE GRAPH

**`ninja -t targets all`**
List every target and its rule

**`ninja -t targets rule`** *`<rule>`*
List targets built by a rule

**`ninja -t targets depth`** *`<n>`*
List targets down to a depth

**`ninja -t commands`** *`<target>`*
Print commands to rebuild a target

**`ninja -t query`** *`<path>`*
Show a file's inputs and outputs

**`ninja -t inputs`** *`<target>`*
List all inputs of a target

**`ninja -t graph`** *`<target>`*
Emit a Graphviz dot file

**`ninja -t rules`**
List all rules

**`ninja -t deps`** *`<target>`*
Show deps recorded from depfiles

**`ninja -t missingdeps`**
Find missing generated-file deps

**`ninja -t browse`** *`<target>`*
Browse the graph in a browser

## CLEANING AND TOOLING

**`ninja -t clean`**
Remove all built files

**`ninja -t clean`** *`<target>`*
Clean one target and its deps

**`ninja -t clean -r`** *`<rule>`*
Clean outputs of a rule

**`ninja -t compdb`** *`<rule>`* **`...`**
Dump compile_commands.json

## DEBUGGING AND ENV

**`ninja -d explain`**
Say why each command reruns

**`ninja -d stats`**
Print operation counts and timing

**`NINJA_STATUS="[%f/%t %e] " ninja`**
Customize progress line

**`ninja -j1 -v`**
Serial verbose build to find a failure

## WRITING BUILD.NINJA

**`rule`** *`<name>`*
Declare a rule with a command

**`command = cc -c $in -o $out`**
Rule command using $in and $out

**`build`** *`<out>`***`:`** *`<rule>`* *`<in>`*
Declare a build edge

**`build`** *`<out>`***`:`** *`<rule>`* *`<in>`* **`|`** *`<dep>`*
Add an implicit dependency

**`build`** *`<out>`***`:`** *`<rule>`* *`<in>`* **`||`** *`<dep>`*
Add an order-only dependency

**`default`** *`<target>`*
Set what a bare ninja builds

**`build`** *`<name>`***`: phony`** *`<targets>`*
Alias for other targets

**`depfile = $out.d`**
Read header deps from a depfile

**`deps = gcc`**
Store depfile deps in the deps log

**`description = CC $out`**
Short text shown while building

**`pool`** *`<name>`*
Declare a pool, set depth to cap jobs

## RECIPES

### Minimal hand-written build

```
rule cc
  command = cc -c $in -o $out
  depfile = $out.d
  deps = gcc
  description = CC $out
rule link
  command = cc $in -o $out
build main.o: cc main.c
build app: link main.o
default app
```

### Meson or CMake out-of-tree

```
meson setup build && ninja -C
build
# or
cmake -G Ninja -S . -B build
ninja -C build
```

### Compilation database for clangd

```
ninja -C build -t compdb cc cxx >
compile_commands.json
```

### Find why it rebuilds

```
ninja -d explain -n
ninja -t query <path>
```