Zig Compiler and build system

START HERE

`zig init`
Scaffold a package

`zig run <file.zig>`
Run one file

`zig build`
Build the project

`zig test <file.zig>`
Test one file

`zig build run`
Build and run

`zig fmt <path>`
Format source

`zig build test`
Run the tests

`zig build -Doptimize=ReleaseFast`
Optimized build

build.zig build script → **declares** → **Steps** install, run, test → **build** → **Artifacts** exe, lib, tests → **installs to** → **zig-out/** bin, lib

CONCEPTS

zig is one binary: compiler, build system, formatter, test runner and a drop-in C/C++ cross compiler.

Build output goes to zig-out/ and the cache to .zig-cache/; both are safe to delete and belong in .gitignore.

Zig is pre-1.0: build.zig APIs and some flags change between releases, so check zig version first.

PROJECT

`zig init`
Scaffold build.zig, build.zig.zon and src/

`zig init --minimal`
Only write a stub build.zig and .zon

`zig version`
Print the compiler version

`zig env`
Show lib, std and cache directories

`zig fetch --save <url>`
Add a dependency to build.zig.zon

`zig fetch --save=<name> <url>`
Add it under a chosen name

`zig build --fetch`
Download all dependencies and exit

BUILD SYSTEM

`zig build`
Run the default install step

`zig build run`
Build and run the executable

`zig build run -- <args>`
Pass arguments to the program
Everything after -- goes to your program, not to the build system.

`zig build test`
Run the project's test step

`zig build -l`
List the available steps

BUILD SYSTEM (cont.)

`zig build --help`
Show all options, including project -D ones

`zig build <step>`
Run a custom step from build.zig

`zig build --summary all`
Show every step, not just failures

`zig build -p <dir>`
Install into <dir> instead of zig-out

`zig build --watch`
Rebuild when sources change

`zig build -j<N>`
Limit concurrent jobs

`zig build -D<name>=<value>`
Set a project option

`zig build -fincremental`
Use incremental compilation

OPTIMIZE AND TARGET

`zig build -Doptimize=Debug`
Default: safety checks on, no optimization

`zig build -Doptimize=ReleaseSafe`
Optimized, keeps safety checks

`zig build -Doptimize=ReleaseFast`
Fastest code, safety checks off

`zig build -Doptimize=ReleaseSmall`
Smallest binary

`zig build --release=fast`
Pick a release mode (fast, safe, small)

`zig build -Dtarget=<triple>`
Cross compile the whole project

`zig build -Dtarget=x86_64-windows`
Example: Windows 64-bit

`zig build -Dcpu=<features>`
Tune CPU features

`zig targets`
List supported targets and CPUs

SINGLE FILES

`zig run <file.zig>`
Compile and run a file

`zig run <file.zig> -- <args>`
Run with program arguments

`zig build-exe <file.zig>`
Compile an executable

`zig build-lib <file.zig>`
Compile a static library

`zig build-obj <file.zig>`
Compile an object file

`zig build-exe <file.zig> -O ReleaseFast`
Set the optimization mode

`zig build-exe <file.zig> -target <triple>`
Cross compile one file

`zig build-exe <file.zig> -femit-bin=<path>`
Choose the output path

`zig build-exe <file.zig> -lc`
Link libc

`zig build-exe <file.zig> -l<lib>`
Link a system library

`zig build-exe <file.zig> -I<dir>`
Add an include directory

`zig build-exe <file.zig> -fstrip`
Strip debug info

TEST AND FORMAT

`zig test <file.zig>`
Run the tests in a file

`zig test <file.zig> --test-filter <text>`
Run only matching tests

`zig test <file.zig> --test-no-exec`
Compile the test binary, don't run

`zig test <file.zig> -femit-bin=<path>`
Keep the test binary

`zig fmt <path>`
Format files or directories in place

TEST AND FORMAT (cont.)

`zig fmt --check <path>`
List unformatted files, change nothing

`zig fmt --stdin`
Format stdin to stdout

`zig ast-check <file.zig>`
Report syntax errors without compiling

C AND C++ TOOLCHAIN

`zig cc <file.c> -o <out>`
Compile C with the bundled clang

`zig c++ <file.cpp> -o <out>`
Compile C++

`zig cc -target <triple> <file.c>`
Cross compile C

`zig cc -target x86_64-linux-musl <file.c>`
Example: static Linux binary

`zig translate-c <file.h>`
Convert C to Zig on stdout

`zig ar rcs <lib.a> <objs>`
Make a static archive

`zig objcopy <in> <out>`
Copy or strip executables and objects

`CC="zig cc" make`
Use zig as the C compiler in a make build

RECIPES

Static Linux binary from any host

```
zig build -Dtarget=x86_64-linux-musl -Doptimize=ReleaseSafe
file zig-out/bin/<name>
```

Cross compile a C file for Windows

```
zig cc -target x86_64-windows-gnu hello.c -o hello.exe
```

Add a dependency

```
zig fetch --save <url>
# then in build.zig:
b.dependency("<name>", .{})
```

CI checks

```
zig fmt --check .
zig build test --summary all
```