Building (Python) with Bazel

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Blaze to Bazel

Simple example

Hello world example

```
$ ls
BUILD
greeting.cc
greeting.hh
hello.cc
Makefile
```

greeting.cc

```
#include <iostream>
void greet(std::string name)
{
   std::cout << "Hello, " << name << ".\n";
}
```

greeting.hh

```
#pragma once

#include <string>

void greet(std::string);
```

hello.cc

```
#include "greeting.hh"

int main() {
   greet("Benjamin");
}
```

Makefile

```
libgreeting.a: greeting.cc
    g++ -c -o greeting.o $<
    ar rcs $@ greeting.o
hello: libgreeting.a greeting.hh hello.cc
    g++ -static hello.cc -L. -lgreeting -o $@
```

Trying it out

```
$ make hello
g++ -c -o greeting.o greeting.cc
ar rcs libgreeting.a greeting.o
g++ -static hello.cc -L. -lgreeting -o hello
$ ./hello
Hello, Benjamin.
```

BUILD

```
cc_library(
    name = "greeting_lib",
    srcs = ["greeting.cc"],
    hdrs = ["greeting.hh"],
)
...
```

BUILD (continued)

```
cc_binary(
    name = "hello",
    srcs = ["hello.cc"],
    deps = [":greeting_lib"],
)
```

Trying it out with Bazel

```
$ bazel build hello
INFO: Found 1 target...
Target //hello up-to-date:
  bazel-bin/hello
INFO: Elapsed time: 0.365s, Critical Path: 0.09s
$ bazel-bin/hello
Hello, Benjamin.
```

Makefile

```
libgreeting.a: greeting.cc
    g++ -c -o greeting.o $<
    ar rcs $@ greeting.o
hello: libgreeting.a greeting.hh hello.cc
    g++ -static hello.cc -L. -lgreeting -o $@
```

Trying it out

```
$ make hello

make: `hello' is up to date.

$ ./hello

Hello, Benjamin.
```

BUILD

```
cc_binary(
    name = "hello",
    srcs = ["hello.cc"],
    deps = [":greeting_lib"],
)
```

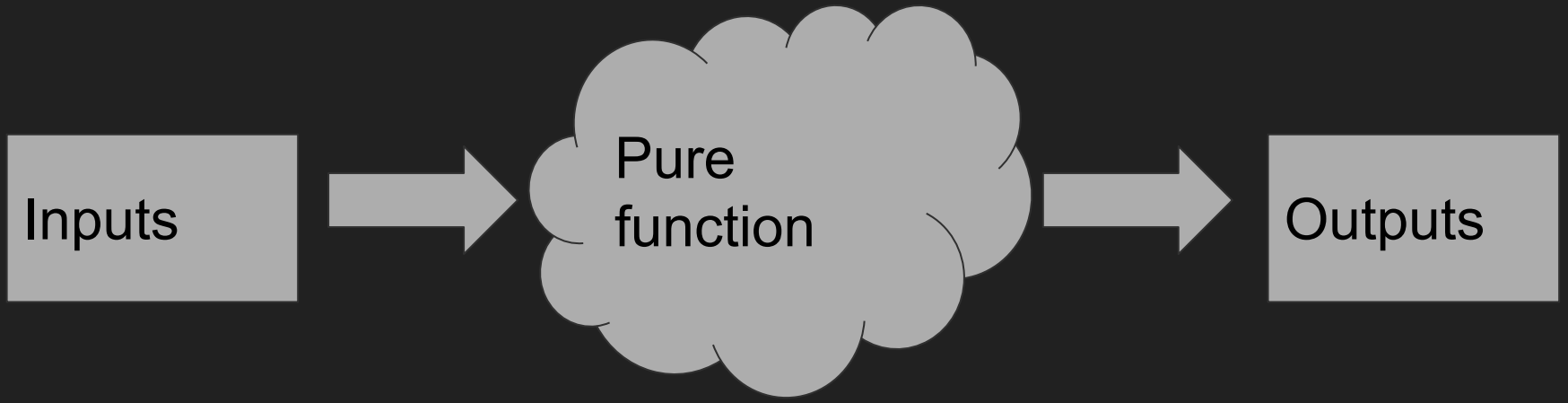
Bazel with missing dep

```
$ bazel build hello

INFO: Found 1 target...

ERROR: BUILD:1:1: undeclared inclusion(s) in rule
'//hello':

this rule is missing dependency declarations for
the following files included by 'hello.cc':

  'greeting.hh'.

Target //hello failed to build
```

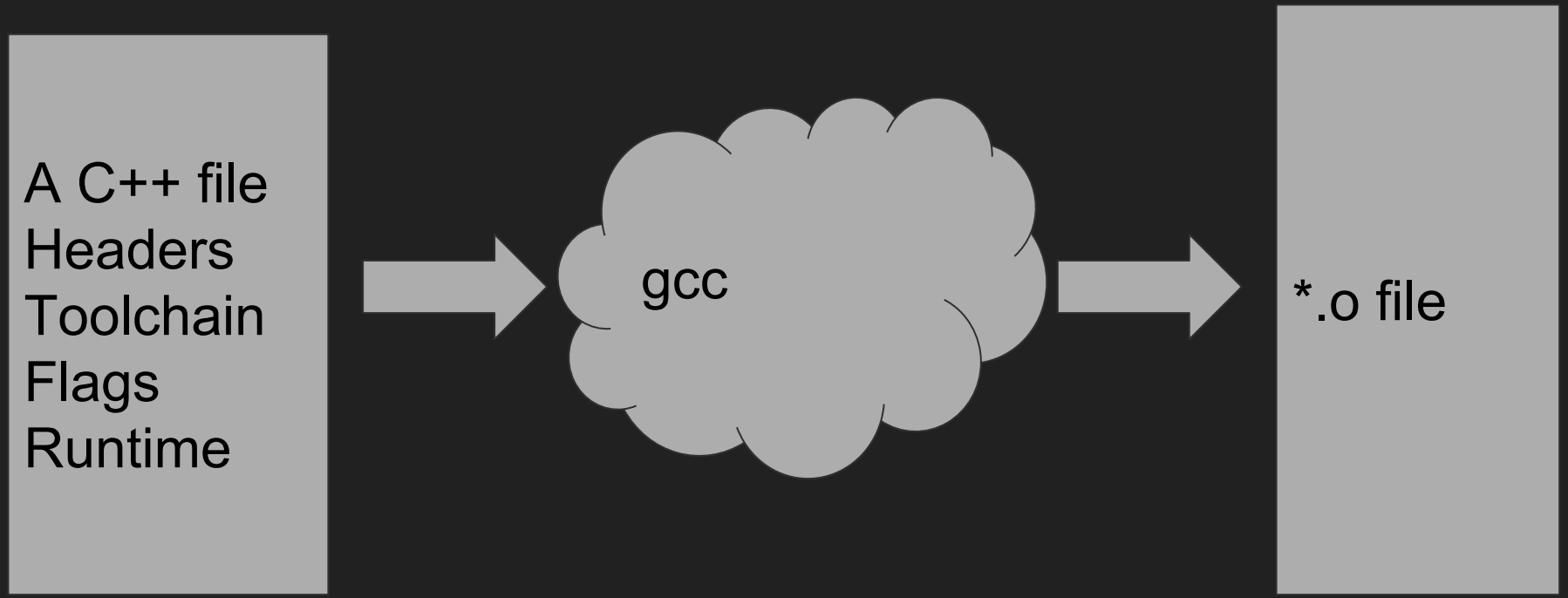
`make(1)` problems

- Based on modified times
- No verification of dependencies
- Not scalable for large projects
- Unqueryable

The ideal build step according to Bazel



C++ building



Why hermeticity?

- Perfect incrementality
- “Change pruning”
- Distributed building and caching
- Reproducible builds across dev/test/production
- Discover dependency bugs

Python example

Hello world example for Python

```
$ ls
BUILD
greeting.py
hello.py
```

greeting.py

```
def greet(name):
    print("Hello, {}.".format(name))
```

hello.py

```
from greeting import greet
greet("Benjamin")
```

BUILD

```
py_library(
    name = 'greeting',
    srcs = ['greeting.py'],
)
...
```

BUILD (continued)

```
py_binary(
    name = 'hello',
    main = 'hello.py',
    srcs = ['hello.py'],
    deps = [':greeting'],
)
```

Trying it out with Bazel

```
$ bazel build hello

$ bazel-bin/hello

Hello, Benjamin.
```

Structure of the Bazel package

```
$ ls bazel-bin

hello

hello.runfiles

$ ls bazel-bin/hello.runfiles

greeting.py

hello.py

hello
```

bazel query

bazel query

```
$ bazel query 'deps(hello)'
greeting
greeting.py
hello.py
$ bazel query 'kind("source file", deps(hello))'
greeting.py
hello.py
```

Fancy bazel queries

```
kind("cc_library", deps(kind(".*_test", foo/...))
except deps(foo_bin))
```

```
somepath(foo/..., //bar/baz:all)
```

Bazel limitations

- Existing build processes are rarely hermetic
- Most useful when everything uses it
- Doesn’t completely work on Windows (yet)
- Have to build dependency checking for Python
- Python developers don’t like “building”

Questions?

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