

# C Compiling and More!

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Why C

# Compilers vs Interpreters

## Interpreters

- ▶ Bash, Python, Ruby
- ▶ Interpreter runs and follows the instructions
- ▶ The interpreter is generally compiled
- ▶ Advantages: advanced languages, lot of features, easy development

## Compilers

- ▶ C/C++, Fortran, Haskell, Rust, (GCC / LLVM)
- ▶ Translates one language to another
- ▶ Often self compiling (needs bootstrapping)
- ▶ Advantages: fast, deterministic, more static analysis

# C compiling steps

## cpp C Pre-Processor

- ▶ Text based macros (#include, #define)

## cc C Compiler

- ▶ Translates C to Assembly
- ▶ Register allocation
- ▶ Memory layout (structs/unions)
- ▶ Function calling conventions

## as Assembler

- ▶ Translates Assembly to object code
- ▶ Handles labels, addresses, and mnemonics

## ld Linker

- ▶ Combines object files
- ▶ Resolves symbols and relocations

# Executable formats

**ELF** Executable and linking formats (Linux)

**COFF** Common Object File Format (Unix)

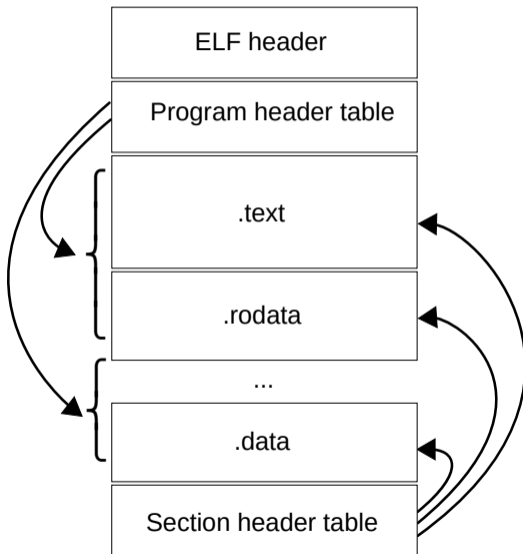
**PE** Portable Executable (Windows, EFI)

**Mach-O** Mach Object (Mac OSX)

*There are also DWARFs...*

*"Debugging With Attributed Record Formats"*

# Executable formats



# Dynamic vs static

- ▶ Static linking
- ▶ Dynamic linking
- ▶ Modules
- ▶ System calls

# C is for CC

## Running CC manually

- ▶ Compiling manually...
- ▶ Works for very small program.
- ▶ `cc hello.c`
- ▶ `gcc -Wall -o hello hello.c`

## Scripting

- ▶ Why not just write a script for this?
- ▶ Dependency tracking, parallel execution.



# Make

- ▶ Generic dependency tracker.
- ▶ Except GNU Make, which has tons of dumb rules.
- ▶ Configured with `-DOPTION` or `config.mk`

# autotools

## Overview

- ▶ Designed to be "portable".
- ▶ Good support for configuration.
- ▶ Handles all the weird corner cases.
- ▶ Nobody likes it but everybody uses it.

## Usage

- ▶ `./autogen.sh`
- ▶ `./configure --help`
- ▶ `make`
- ▶ `make install`

# kconfig

- ▶ Started out in the Linux kernel.
- ▶ Even better support for configuration.
- ▶ Provides nice menu interfaces.

## others

- ▶ cmake
- ▶ scons
- ▶ bazel
- ▶ ant
- ▶ maven
- ▶ gradle