

AI编译器系列

GCC编译过程和原理



ZOMI



BUILDING A BETTER CONNECTED WORLD

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About 关于本内容

I. 传统编译器

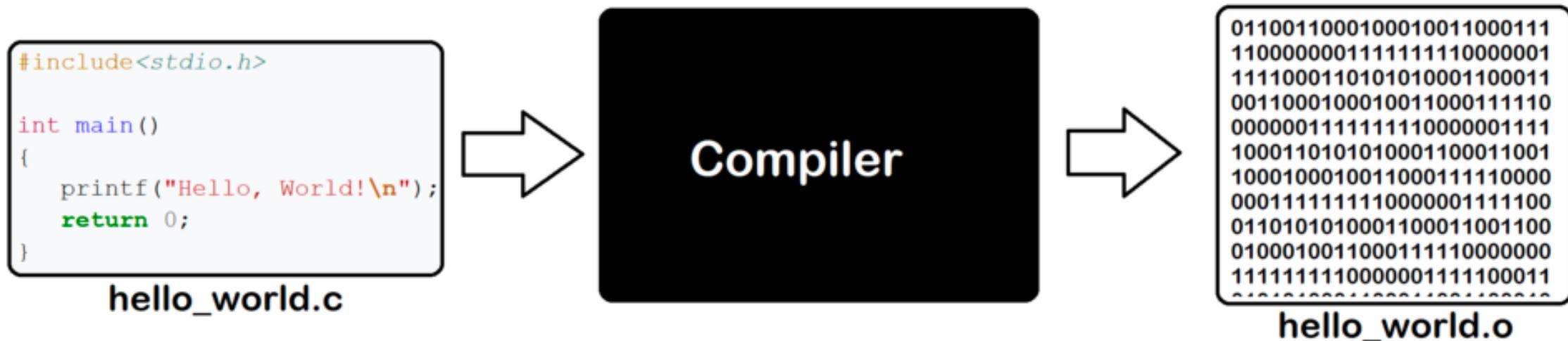
- History of Compiler - 编译器的发展
- **GCC process and principle – GCC 编译过程和原理**
- LLVM/Clang process and principle – LLVM 编译过程和原理

2. AI编译器

- History of AI Compiler – AI编译器的发展
- Base Common architecture – AI编译器的通用架构
- Different and challenge of the future – 与传统编译器的区别，未来的挑战与思考

What is Compiler 编译器是什么

- In computing, a compiler is a computer program that translates computer code written in one programming language into another language. The name "compiler" is primarily used for programs that translate source code from a high-level programming language to a lower level language to create an executable program.



GNU Compiler Collection, GCC



RMS

Richard M. Stallman



GNU's Not Unix!

GNU



GNU Compiler Collection
(GNU C Compiler)

GNU Compiler Collection, GCC

- first released in 1987 by Richard Stallman, GCC 1.0 was named the GNU C Compiler since it only handled the C programming language.
- The GNU Compiler Collection (GCC) is an optimizing compiler produced by the GNU Project supporting various programming languages, hardware architectures and operating systems.

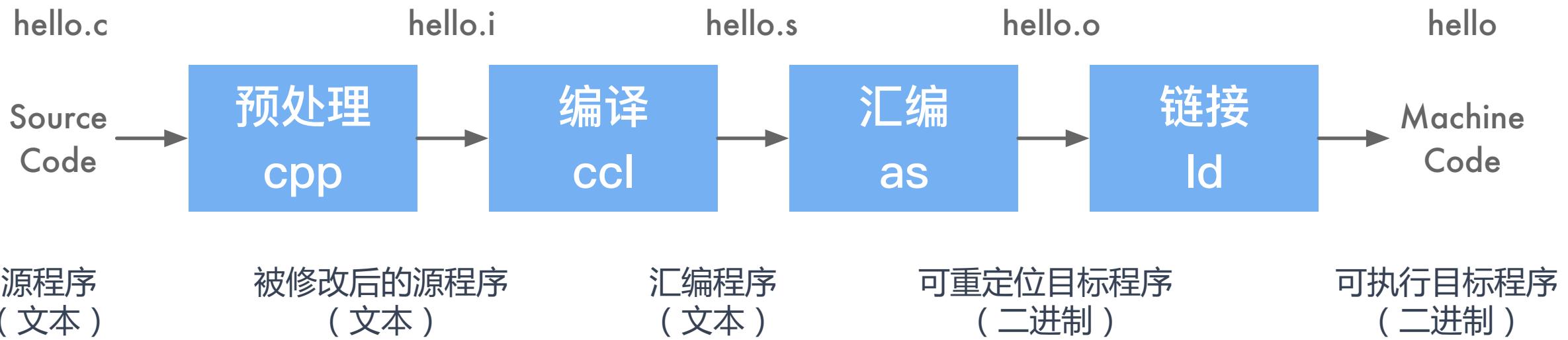


GCC Main Feature

- GCC是一个可移植的编译器，支持多种硬件平台；
- GCC不仅仅是本地编译器，它还能跨平台交叉编译；
- GCC有多种语言前端，用于解析不同的语言；
- GCC模块化设计，可加入新语言和新CPU架构支持；
- GCC是开源自由软件，可免费使用。

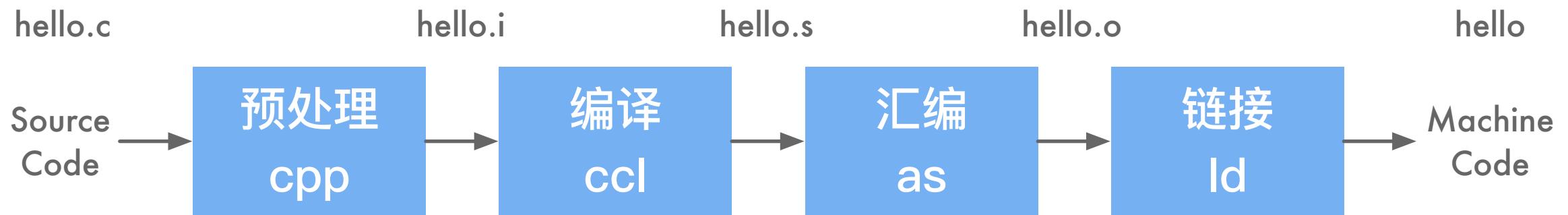


GCC Compile Process



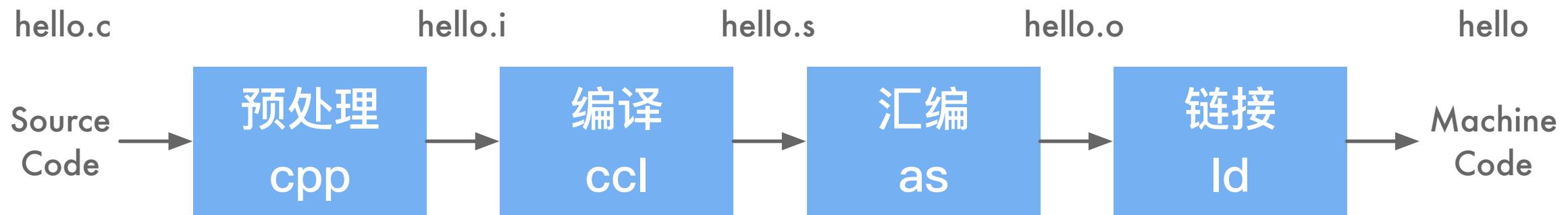
GCC Compile Process

- **预处理 (Pre-Processing)**：包括宏定义，文件包含，条件编译三部分。预处理过程读入源代码，检查包含预处理指令的语句和宏定义，并对其进行响应和替换。预处理过程还会删除程序中的注释和多余空白字符。最后会生成 .i 文件。



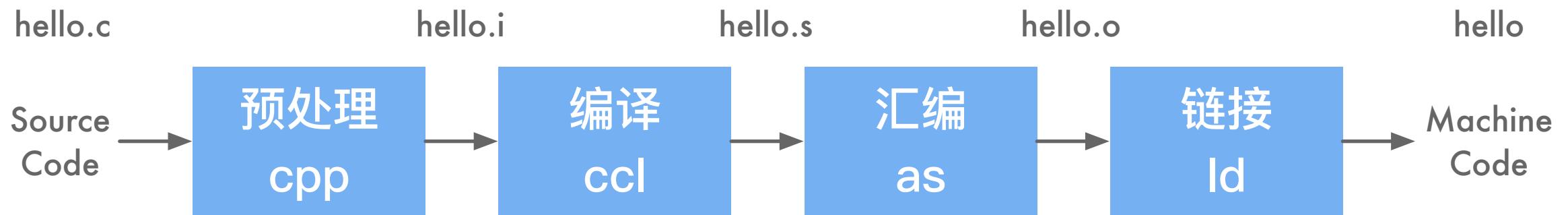
GCC Compile Process

- **编译器 (Compiling)** : 编译器会将预处理完的 .i 文件进行一些列的语法分析，并优化后生成对应的汇编代码。会生成 .s 文件。



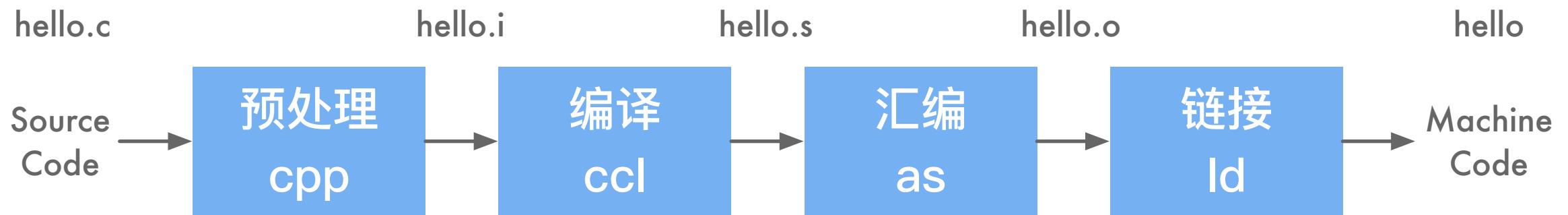
GCC Compile Process

- 汇编器（ Assembling ）：汇编器会将编译器生成的 .s 汇编程序汇编为机器语言或指令，也就是可以机器可以执行的二进制程序。会生成 .o 文件。

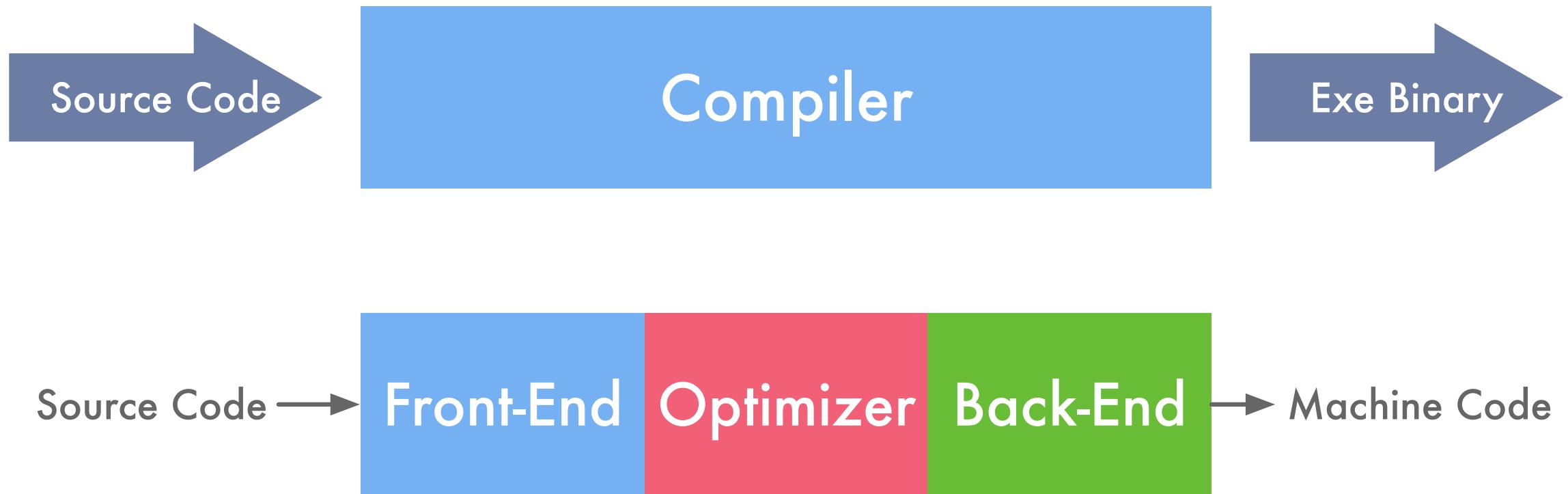


GCC Compile Process

- **链接器（Linking）**：链接器会来链接程序运行的所需要的目标文件，以及依赖的库文件，最后生成可执行文件，以二进制形式存储在磁盘中。



Compiler basic constitution 编译器基本构成



Advantage

1. 支持 JAVA/ADA/FORTRAN
2. GCC 支持更多平台
3. GCC 更流行，广泛使用，支持完备
4. GCC 基于 C，不需要 C++ 编译器即可编译

Shortcoming

1. GCC 代码耦合度高，很难独立，如集成到专用 IDE 上，模块化方式来调用 GCC 难；
2. GCC 被构建成单一静态编译器，使得难以被作为 API 并集成到其他工具中；
3. 从1987年发展到2022年35年，越是后期的版本，代码质量越差；
4. gcc大约有1500万行代码，是现存最大的自由程序之一；



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THANK YOU

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