How to Write a Compiler

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Planning

- The best and complete way to learn to write a compiler is to
  - take a compiler course for the “theory”,
  - read the code of a compiler, and then
  - write a compiler by yourself.

- The planning stage:
  - Source language issues:
    - The size of the language.
    - Will the language evolve?
  - Target language issues:
    - Instruction set.
    - Registers.
    - Fancy instructions.
  - Performance criteria:
    - Changes come from the hardware development.
    - Portability.
    - Error correction: for both expert and novice users.
    - Optimization.
Developing

- Find an existing language and adapt it for your needs.
- If you read some UNIX C (respectively PASCAL) compiler, they are written in C (respectively, PASCAL).
  - This is called **bootstrapping**.
  - How can this be possible and how was the first compiler compiled?
  - Usual strategy:
    - Find an existing compiler (could be an assembly language).
    - Write a simple compiler for a fairly restricted subset of language.
    - For example in PASCAL, does not allow ARRAY, RECORD, POINTER.
    - Call this a **restricted language**.
    - Write in the restricted language a compiler, that handles advanced features.
    - Another example: C and C++.
Developing environment

Developing environment:
- Use UNIX “make” to management a project.
- Use lexical analyzer (LEX) and compiler-compiler (YACC) to simplify your task.
- Use “profile” to determine the bottleneck of implementation.

Testing and maintenance:
- Must generate correct code.
- Regression tests:
  - Maintain a series of tests of which must be passed after.
  - Re-pass the suite of tests once a revision is done to the compiler.
- Documentation.

A crucial element in being able to maintain a compiler is good programming style and documentation.