COP 3402 Systems Software

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People

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About Me

- New assistant professor this academic year
- Research interests
  - Software engineering
    - Analyzing configurable systems
  - Program analysis for security
    - Side-channel attacks
  - Blockchain smart contracts
    - Concurrency and safety
- Teaching interests
  - Programming languages
  - Program analysis
  - Systems

Research meetings:
Fridays 3pm
HEC-356

Overview

- **What is systems software?**
- **Why Study it?**
- **Syllabus**
  - **https://github.com/cop3402fall18/syllabus**
- **Demo**

What is Systems Software?

Systems Software is the set of programs that

1. **support the operation of a computing machine**
2. **create an environment to run application software efficiently, and**
3. **simplify the programming process.**

Systems software can be classified in two groups:

1.- Software to create a program development environment

- Text editor
- Compiler
- Assembler
- Linker
- Debugger (low-level)

2.- Software to create a run-time environment

- Operating system
- Loader
- Dynamic Linker
- Program libraries

Systems Software: Program Development Environment

Text editor:	**Software that permits the creation and editing of text files (i.e. application programs).**
Compiler:	**Translates programs written in a high level language to machine code(assembly Language).**
Assembler:	**Translates programs written in assembly language to object code(binary).**
Static Linker:	**Combines and resolves references between object programs and creates the executable code.**
Debugger (low-level)	**It is used to debug executable programs and their related object code and source program.**

Systems Software: Run-Time Environment

Loader: Loads an executable code and starts its execution.

Libraries:

Precompiled programs that create a set of functions for use by other programs.

Dynamic Linker:

Loads and links shared libraries at run-time

Operating system:

An event driven program that make an abstraction of the computer system. The operating system handles all resources efficiently, creates an environment for application programs to run, and provides a friendly interface between the user and the computer system.

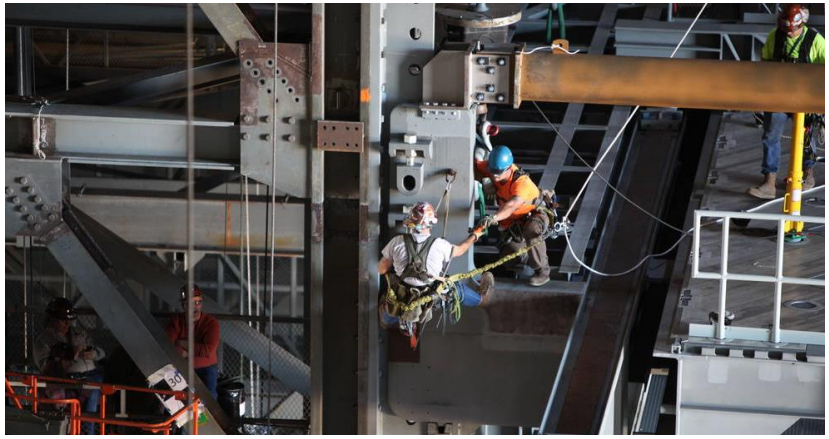
Why Study Systems Software?

Know your tools

Be a better programmer

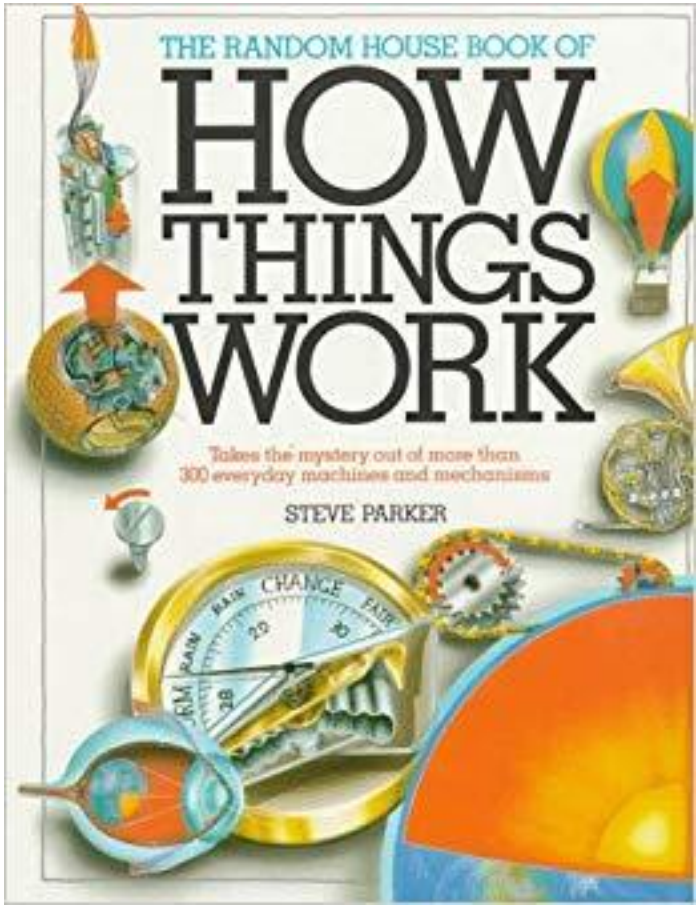
Satisfy curiosity

Know Your Tools



Be a Better Programmer

Satisfy Curiosity



This Course

Compilers
Virtual machines
Intro to operating systems
Advanced PL topics

Build a compiler
Build a virtual machine

Syllabus

https://github.com/cop3402spring19/syllabus

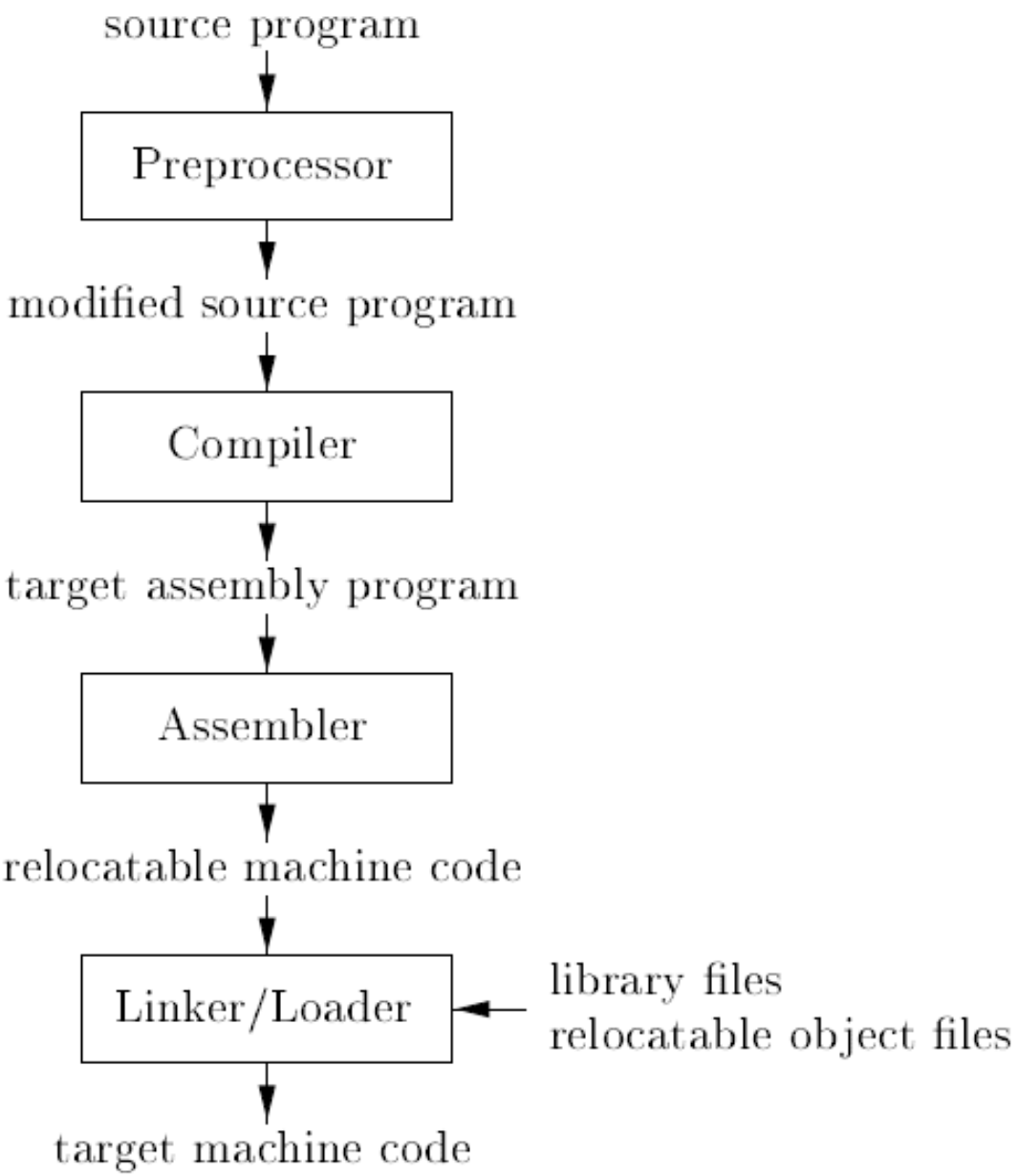


Figure 1.5: A language-processing system

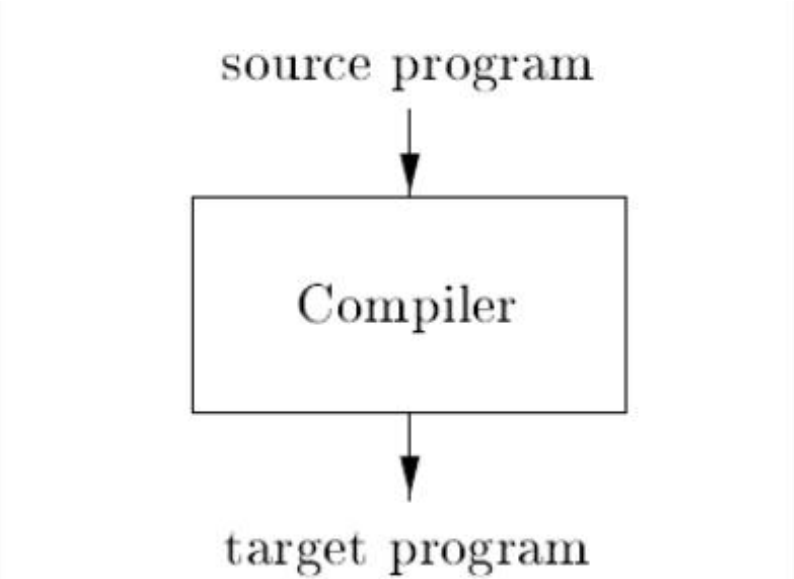


Figure 1.1: A compiler

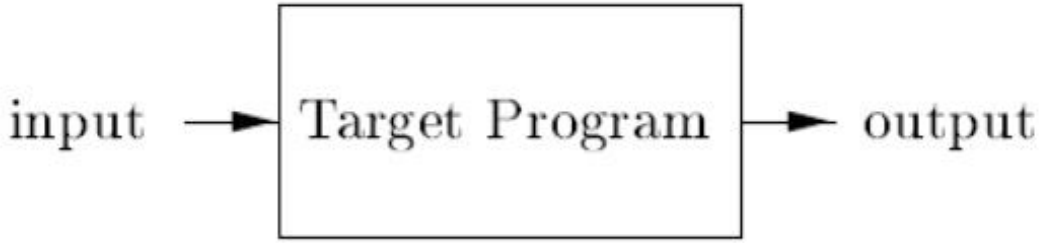


Figure 1.2: Running the target program

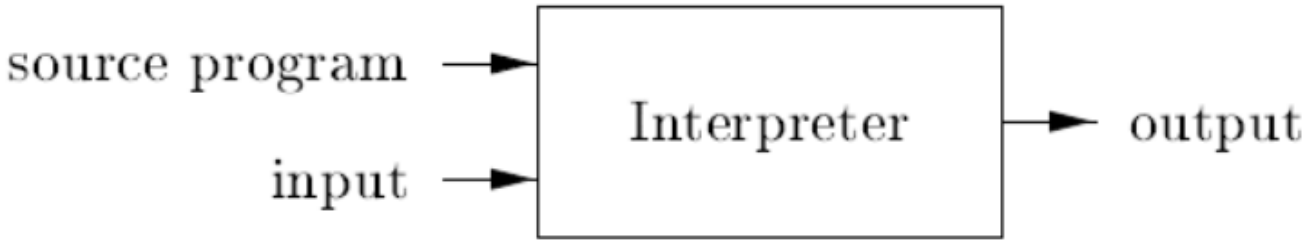


Figure 1.3: An interpreter

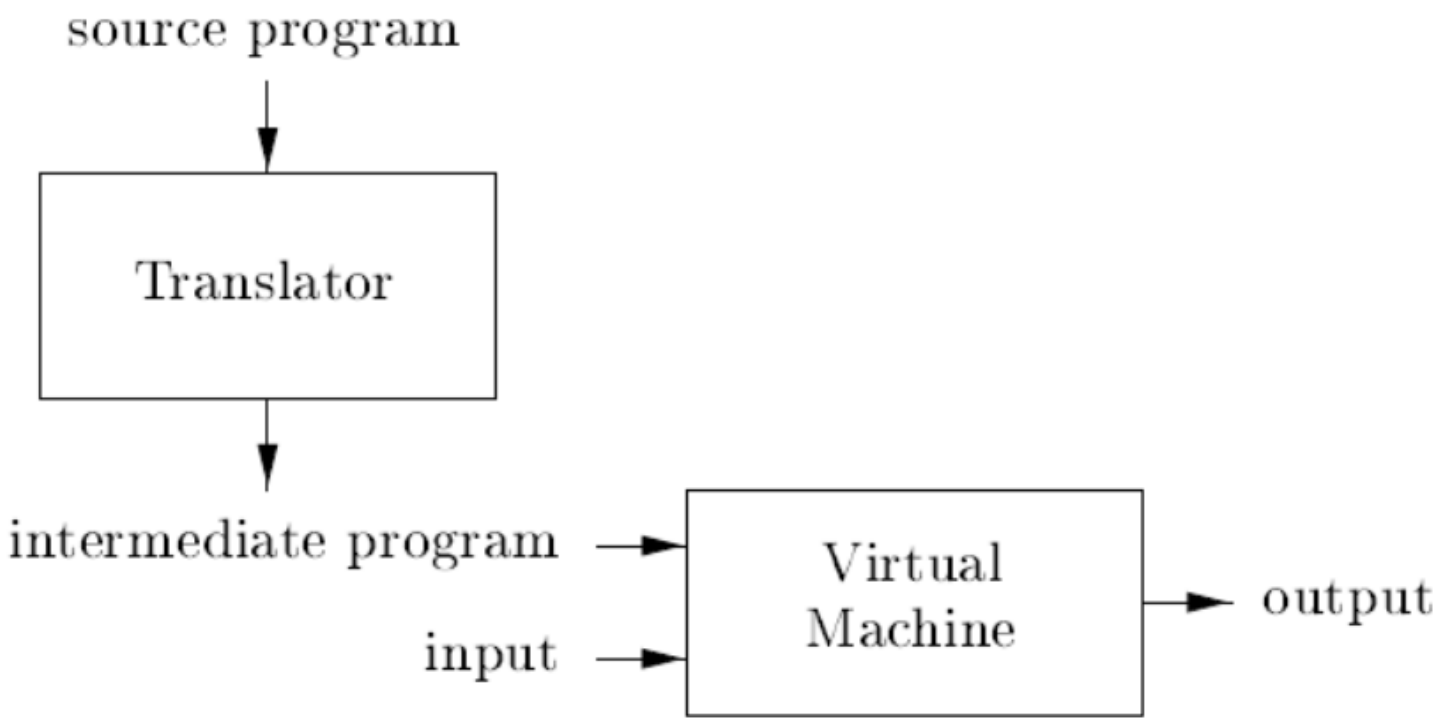


Figure 1.4: A hybrid compiler

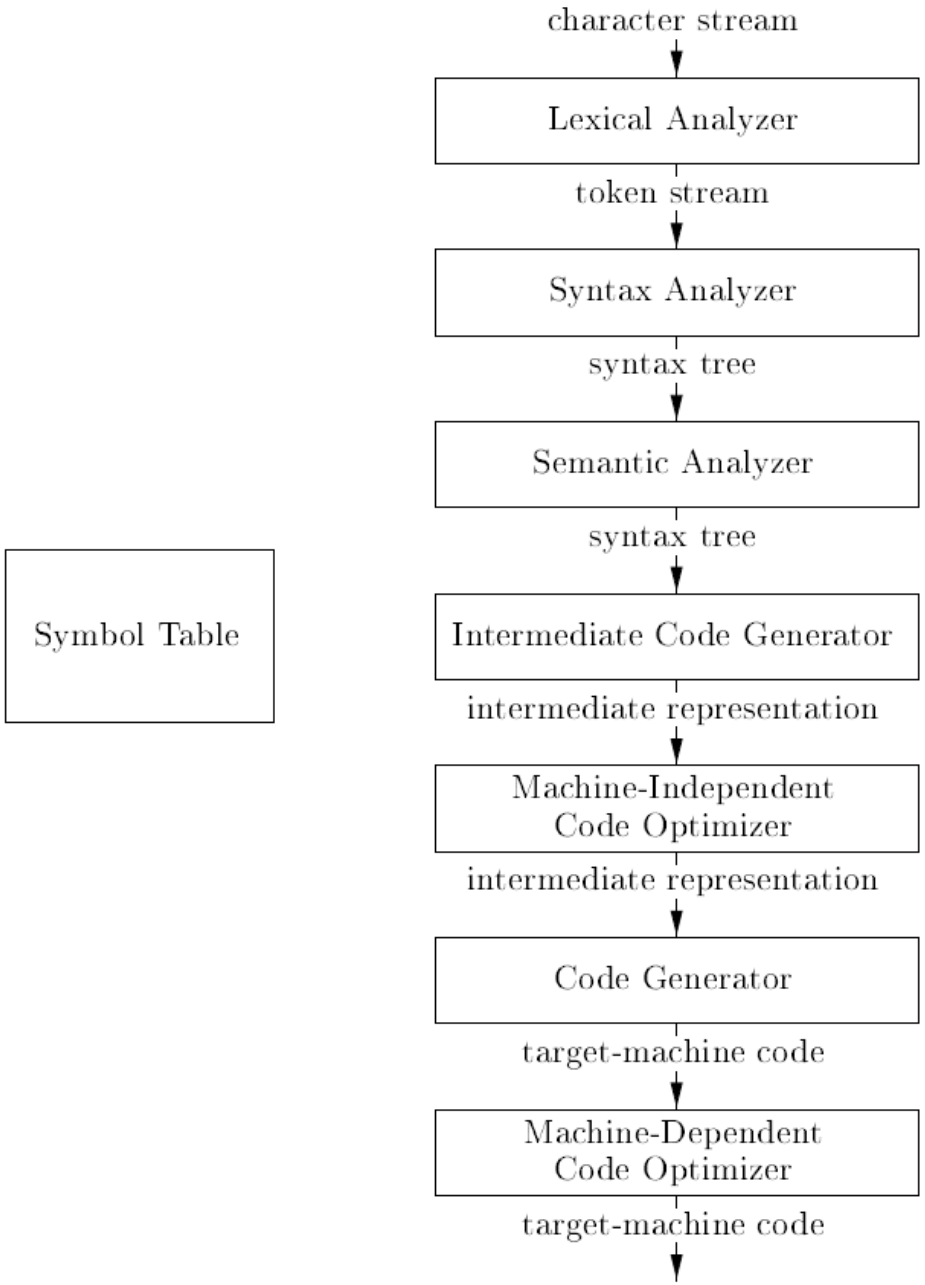


Figure 1.6: Phases of a compiler

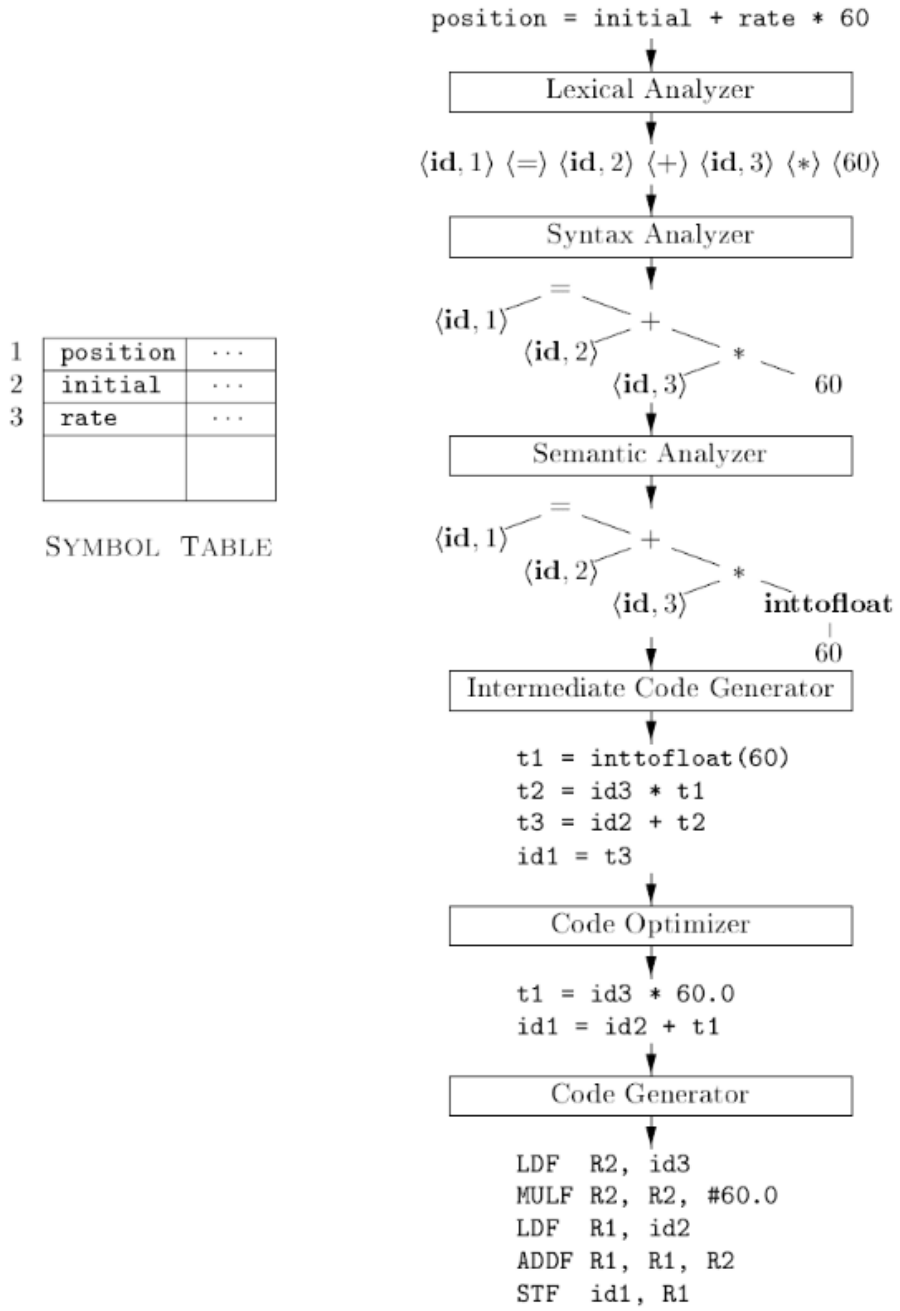


Figure 1.7: Translation of an assignment statement

DEMO

Discussion

What systems software have you used?

What system tools make you curious about how they work?

What's your comfort with building substantial C programs?

What are you expectations? What do you hope to discover and achieve in this class?