CC2511 Week 2: Lecture 2

“As soon as we started programming, we found to our surprise that it wasn't as easy to get programs right as we had thought. Debugging had to be discovered**. I can remember the exact instant when I realized that a large part of my life from then on was going to be spent in finding mistakes in my own programs**.”

-- Maurice Wilkes

Introduction to C

- You will learn the basics of the C programming language.
- C is extremely widely used:
  - Windows, Linux, Mac OS X, iOS, Android, etc all have their OS kernels written in C.
  - Embedded systems are almost exclusively programmed in either of C or assembly.

- Learning a new programming language syntax is unavoidably tedious. Please bear with me.

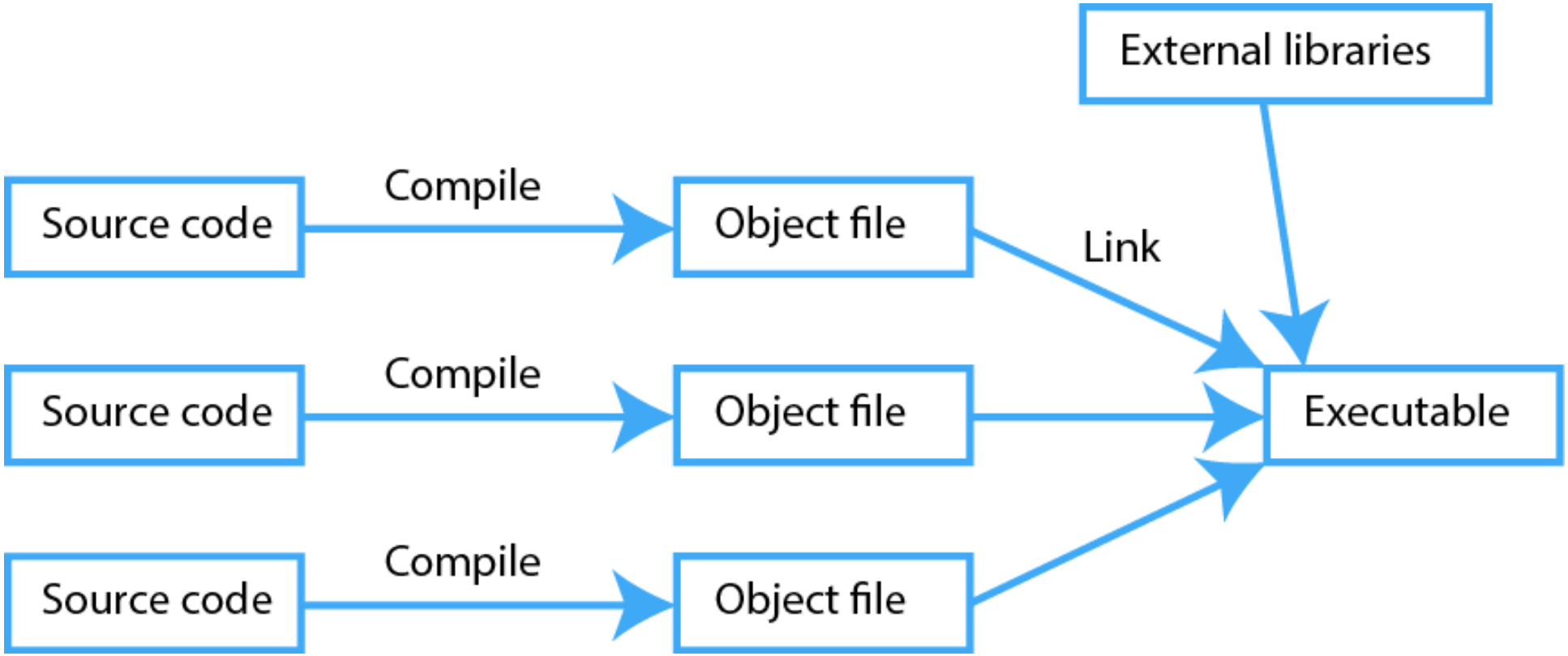
Compiling

- Unlike MATLAB, C code is **compiled.**
- **Compiling** is the process of converting the source code into executable machine code.
  - What is the machine code? It's the **op-codes** that instruct the CPU.
- The **compiler** is the program that does this conversion.
  - You're perhaps familiar with ".exe" files on Windows. These are the output of a compiler.

Compilers

- The set of assembly instructions and their corresponding op-codes are different from architecture to architecture.
- Therefore, the compiler is specific to a particular computer architecture.
- In practice a compiler often includes different “backends” that generate machine code for different architectures.

Compiling workflow



C concepts

- Coming from Matlab or Python or another programming language, you already know most of the concepts you need.
- C has variables, functions, if statements, while loops, etc …
- A few things that are likely to be new to you:
  - **Static typing** (i.e. being explicit about the data type of every variable).
  - **Pointers** (i.e. direct access to arbitrary locations in memory).

Static typing

- Recall that the data type indicates how a variable is interpreted, e.g. is it a number or a string?
- In Matlab and Python, the data type of a variable can change by assigning a different value to it.
  - The type belongs to the value and variables can hold any type.
- In C, the data type must be explicitly specified when the variable is created.
  - The type belongs to the variable. The variable cannot change its type.

C language reference

- Start on the C language reference.

Summary

- C code is compiled into object files that are linked together to produce the final program.
- Learn the C syntax on the reference sheet.