

ECE 271 – Microcomputer Architecture and Applications Lecture 1

Vince Weaver

`http://web.eece.maine.edu/~vweaver`

`vincent.weaver@maine.edu`

18 January 2022

ECE271

- Distribute syllabus
- No labs this week, they start next week (week of the 24th)
- Textbook: *Embedded Systems with ARM Cortex-M Microcontrollers in Assembly Language and C (3rd edition)* by Zhu



Lab Overview

- Meet in Kepware Lab (Barrows 225)
- Will have pre-lab that you must do in advance of lab
- Do lab during lab time. TAs will be there. Be sure to get checked off.
- Will involve coding.
- Bring laptop. Keil software. Free to Download and install (do have to enter annoying personal info first)



- Remarks on Windows/Microsoft
- Will post Linux directions if want to do with Linux, but be aware if you do the TAs might not be able to help much.
- Submitting the code: will use git, working on setup



STM32L4 Hardware

- STM32L496VG
- ARM Cortex-M4 core, 80MHz
- 128kB of SRAM (in two chunks)
- 1MB of flash
- floating point
- Low power modes
- Lots of I/O: USB, microphone, two LEDs, LCD panel, joystick, compass, D/A converter



Describe ARM Processors

- ARM history
 - UK Company
 - Acorn/Advanced RISC machine
 - Acorn, (6502 heritage)
- Who owns them now
 - Softbank
 - NVIDIA(?)



Computers

- What is a micro-computer?
- What is a computer?
 - Machine that processes information. Can do math really quickly.



Why care about Computers?

- They're everywhere
- People are bad at programming them
- Like really bad
- Security issues
- Buggy issues
- It is impossible to make good software? No, but it's hard and expensive and people don't bother doing it right unless they have to.
- In ECE we try to set you up with some good habits.



What's a computer made of?

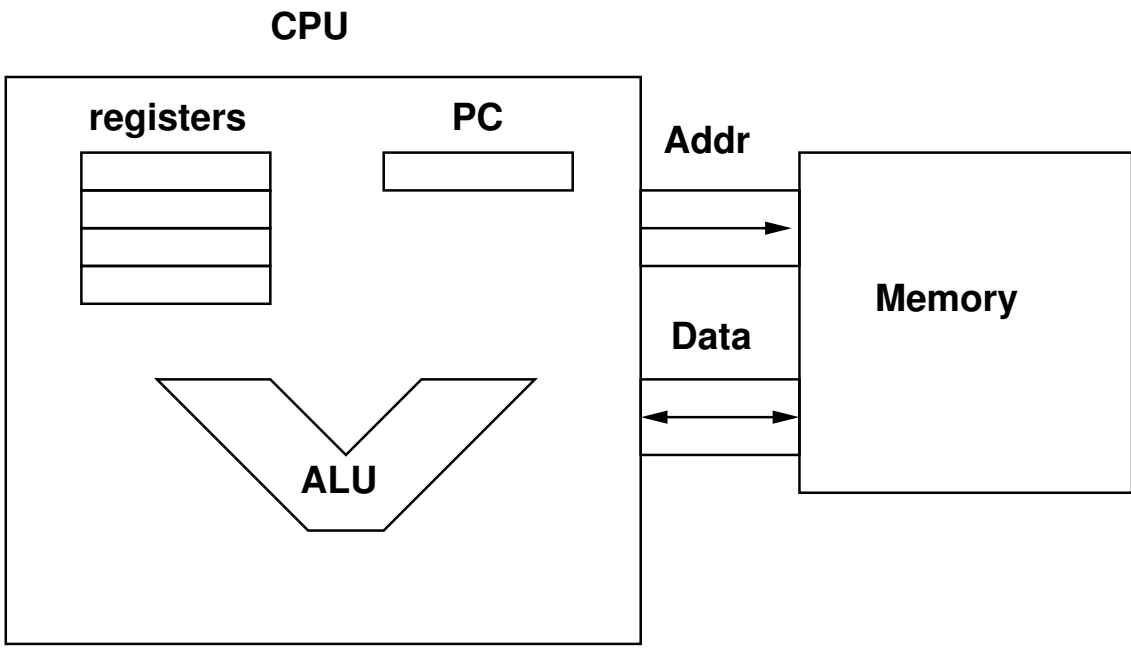
- Old days, switches: transistors (or relays, or vacuum tubes).
- Then out of 7400 series logic
- Then ASICs
- Now can fit an entire system on one chip. Makes it hard to visualize what is going on.



Diagram

- Program counter
- ALU
- Memory (program storage, and a scratchpad)
SRAM vs DRAM (flip-flops vs capacitors)
- I/O?





Compiling Code

- High level language (python, javascript?)
- Low-level language (C)
- Compiler converts C code to assembly
- Assembler converts assembly to machine code
- Linker puts machine code in right place, resolves symbols



STM Board

- Writing programs in IDE
- Uploading program to board



Cross Compiling

- Targeting a different machine than you are developing on
- Most likely your laptop is x86 (intel or amd)
- Board we are targeting is ARM



The C Language

- Why use C?
 - Low-level
 - Often used in embedded systems
- Why not use C?
 - Security
 - Dangerous
 - Too low-level



What's an Embedded system?

- Learn about them more if you take ECE471
- Computers are inside of everything these days
- Some of these uses are safety critical

