CS 24

Introduction to Computing Systems

Introduction: Perspectives on Computing Systems

Outline

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Two Important Perspectives

The Programmer's Perspective

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You are a "system's person" and you want to understand how your entire computer works by building the pieces one by one.

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Poll (M2)

Which perspective(s) do you feel are most applicable to you?

a The Programmer's Perspective
b The System Builder's Perspective
c Both
d Neither

CS 24 Works From Both Perspectives

For The Programmer

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- a small compiler

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- a memory allocator
- a garbage collector

CS 24 Prepares You For Future Systems Courses

Computer Architecture	Graphics	Databases
Parallel Computing	Networks	Distributed Systems
Operating Systems	Compilers	Security

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- I think **security** is cool. So, we'll spend some time thinking about the "security mindset" and how to break things.
- I think **real-world software** is cool. So, we'll spend some time re-writing core pieces of the system.

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- Lie 5: Your computer runs all your programs at the same time

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- you know data structures at the level of CS 2

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- The Pre-Test takes no more than **eleven hours** to complete

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- course staff will hold an **obscene** number of office hours
- Prof. Blank's "door" is always open

Aside: What this course is NOT

Aside: What this course is **NOT**

- This is **not** a C course

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- This is **not** a C course

- This is **not** an EE course

Aside: What this course is **NOT**

- This is **not** a C course
- This is **not** an EE course
- This is **not** a hardware course

Grading

Grading Breakdown

- pretest $= 5\%$
- projects $=$ varying percentages
- lecturcises $= 30\%$
- final $= 10\%$

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- We will not accept projects late due to misuse of `git`.
- If you do not get any credit on the coding portion, you will not get any credit on the written portion.

Regrade Requests

To maintain consistency, all regrade requests should go directly to Prof. Blank via e-mail. Do not attempt to contact TAs about grading questions.

Some Changes From CS 2/3...

- Office Hours!
  - OH are now in ANB 106 (which is called $(\text{CS})^2$ for Computer Science Collaboration Support).
  - OH The schedule has also changed a bit–we've removed office hours from days that were unpopulated and started them earlier at 3pm!
  - $(\text{CS})^2$ is a **new** dedicated space for undergraduates taking CS courses! If it's not in use for a course, you can just walk in and use it as a collaboration space! It has power, monitors to connect to, chargers, and dry-erase tables!
- Lecturcises! tl;dr: Some of the exercises in lecture will now be turned in (later in the week). See syllabus for full details.

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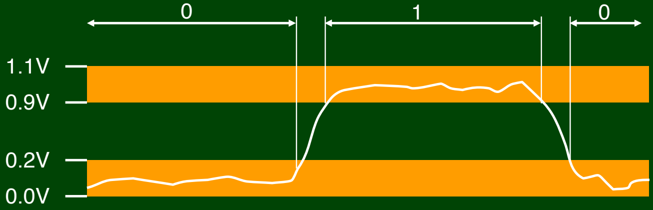
- Easy to store with bistable elements
- Reliably transmitted on noisy and inaccurate wires



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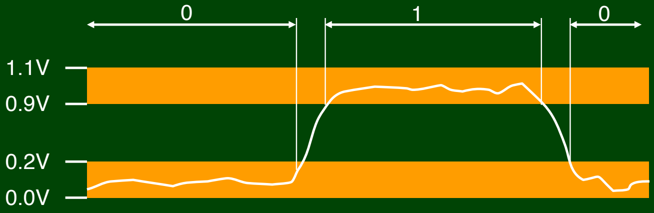

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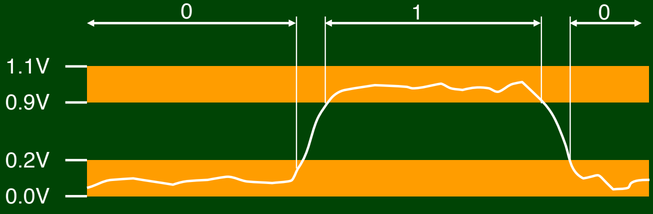

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Computers are made entirely of circuits acting only on bits. **Everything** is represented as a series of bits.

Binary as Numbers

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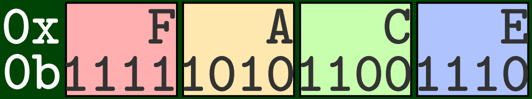
It quickly becomes annoying to use binary, because there are so many digits to express even small numbers. So, we often write things (numbers, addresses, instructions) in **base 16**.

Hexadecimal

Base 16 is called **hexadecimal** and it uses the symbols $\{0,1,2,3,4,5,6,7,8,9,A,B,C,D,E,F\}$, where A through F represent 10 through 15.



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Note that 4 bits / hex digit (why?)

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Poll

What is $(1337)_{10}$ in hexadecimal?

Data Representation

What does "`0xe282ac`" mean?

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It’s an integer (14844588)...right?

Strings

Or is it an ASCII string?

Letter	Base-10	Binary
A	65	01000001
B	66	01000010
D	?	?
a	97	?
_	?	01011111
!	33	?

â‚¬

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Or a unicode code point (€)?

Color

Or a color?

Instructions

Or x86-64 instructions?

```
0:  e2 82                       loop   -124
2:  ac                          lodsb
```

Which Computer Systems?

In this course, we will limit our discussions in the following ways:

- We will only cover the **x86-64** architecture (not ARM or RISC-V)
- We will assume we're working with **Linux**
- Our case studies will be limited to the **Intel Nehalem** microarchitecture

We have a reference machine set up which you should use for **all of the projects**. The Pre-Test includes a section on getting this environment set up.

If you do not use `labradoodle`, we are not responsible for according deductions in your grades.