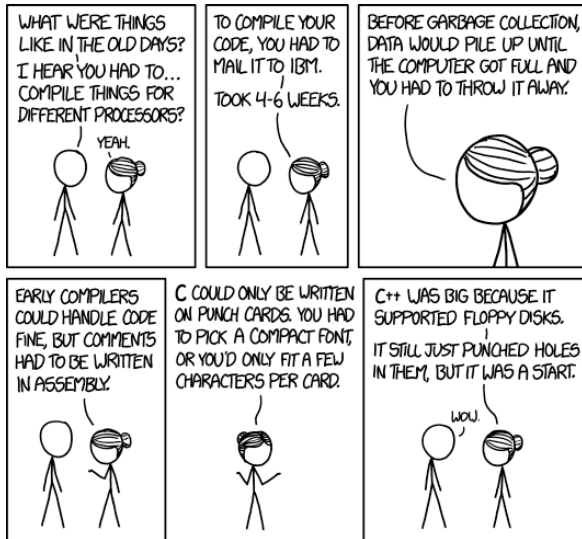


# Lecture 7: Performance

Wednesday, January 23, 2019 9:29 AM

## Outline

- Lab 1 feedback and announcements
- What makes a system good?
- Iron law
- Single cycle CPU performance



What debugging support

- error messages bad

What documentation is missing?

- better docs on errors
- better docs on coreIO
  - ↳ do it
- how to use non CSIF machines
  - ↳ move up to clone
- better docs on switch/is or when/otherwise and defaults

## Schedule

- we're ahead! → I updated schedule
- Today! performance chapter 1
- Tomorrow! Lab 2 more single cycle
- Friday! more perf + pipelining intro ← practice test
- Monday! finish perf
- wed : review
- Thurs! midterm 1

Justin has written problems

## How to measure "goodness" of a system?

Throughput → # of insts per time  
latency → delay for single instruction  
Area / # transistors  
Power consumption

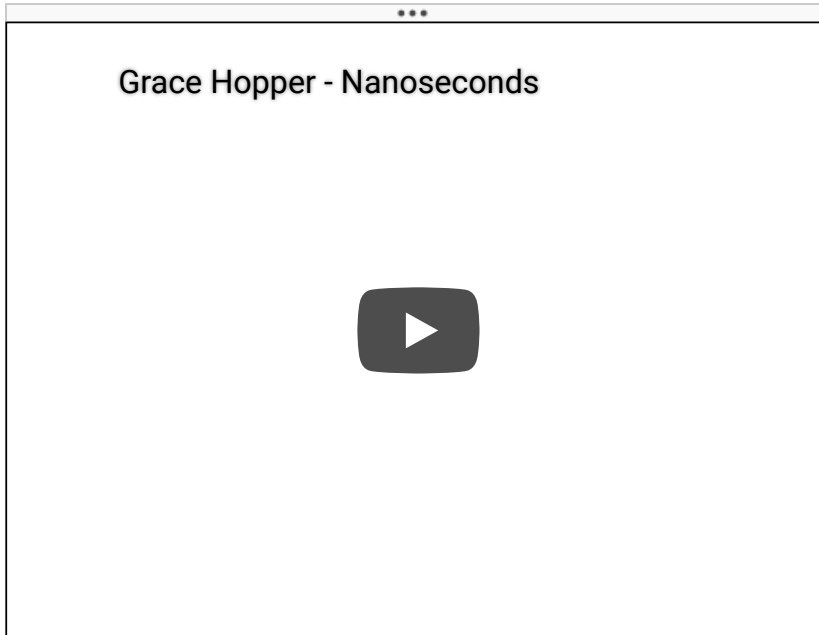
Average memory access time (AMAT)  
Accuracy  
Security  
generality ↔ specificity

Benchmarks can be used to measure systems

COST  
per instruction

## Physics

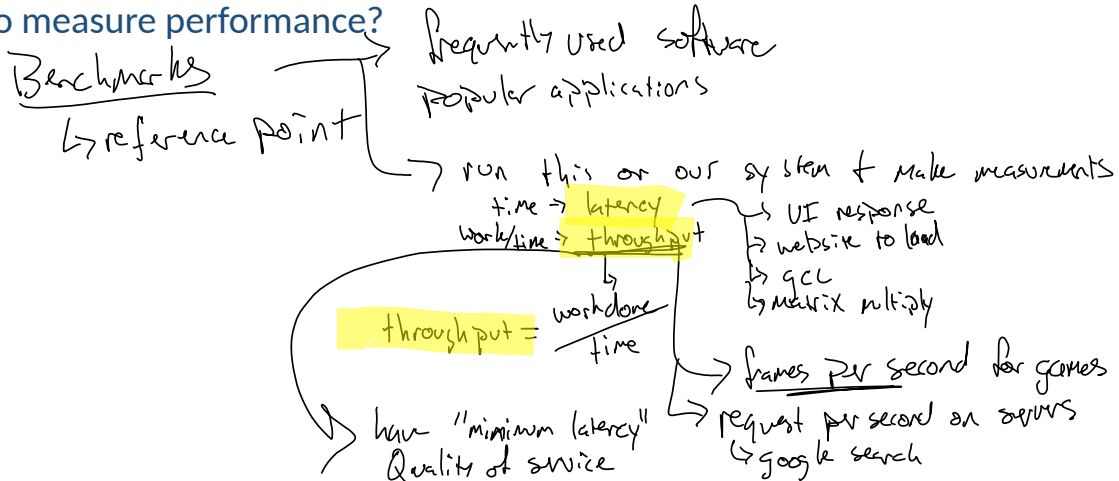
### Grace Hopper - Nanoseconds



<https://youtu.be/JEpsKnWZrJ8>

↳ key w. computer architecture

### How to measure performance?



Good benchmark?

★ relevant → fps for fortnite  
browser javascript  
↳ machine learning workload

SPEC benchmark suite  
↳ hard to generalize

"prediction"  
↳ really hard

How do we quantify performance of DINO CPU?

Iron law of  
performance

~~frequency~~  
↳ seconds  
cycle

↳ technology  
micro-arch

cycles per  
instruction

micro architecture

(single cycle)

DINO CPU

CPI = 1

# of instructions  
for application

ISA / compiler

= time to run  
application

Single Cycle CPU  
performance