CSCI 2021: Finale

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Last Updated:
Wed Dec 14 01:02:58 PM CST 2022

Logistics

Goals

- Final Exam Logistics
- Evaluations
- Review

P5: loadfunc.c Questions?

Memory Mapping ELF Files

Date	Event
Wed 14-Dec	Last Lecture, Review SRTs due by 1:25pm Review Lab P5 Due
Sun 18-Dec	Exit Survey Closes
Mon 19-Dec	08:00-10:00am Final Exam for 3:35pm Lec 010 01:30-03:30pm Final Exam for 1:25pm Lec 001

Final Exam Logistics

- Final Exam in person, normal lecture location
  - ~1.5 pages F/B Virtual Memory / Linking / Object Files / P5
  - ~1.5 page F/B Comprehensive Review
    (F/B = Front/Back)
- 2 hours to take Final Exam in person

Course Feedback

Course Exit Survey on Canvas

- Open on Canvas
- Open on Canvas, Due Sun 18-Dec
- 1 Engagement Point for Completing it

Official Student Rating of Teaching (SRTs)

- Official UMN Evals are done online this semester
- Available here: https://srt.umn.edu/blue
- **EVALUATE YOUR LECTURE SECTION: 001 or 010**
  Optionally evaluate lab section
- **Due** Wed 14-Dec by 1:25pm
- Response Rate $\geq 80\%$ in **both sections** $\rightarrow$ One Final Exam Question Revealed

What have we done?

C Programming

Lowest of the "high-level" languages, gives fairly direct control over capabilities of the machine at the expense of coding difficulty and ease of mistakes

Assembly Programming

Tied directly to what a processor can do, studied x86-64 specifically, exposes processor internals like registers, instructions, operand sizes, etc.

Computing Architecture

Basics of how CPUs + Memory are built, transistors/gates to do "work" and performance ramifications on code

Processing Systems/Environment

Programs exist in an environment including file formats for executables, specifics of loading, virtual memory system to catch errors/link libraries

Did I miss anything?

Further Coursework / Activities

- **CSCI 4061 Intro to Operating Systems**: Direct successor, required for CS majors, builds on 2021 content to develop the shape of an operating system.
- **CSCI 4203 Computer Architecture**: Develops hardware/software interface in more detail, study pipelines + superscalar features in more detail, examine multi-core systems
- **CSCI 5103 Operating Systems**: Study internal design issues associated with operating systems, handling hardware, tradeoffs on different approaches to management, theoretical algorithms around resource coordination.
- **CSCI 4271W Development of Secure Software Systems**: Focus on security issues, methods to circumvent OS/hardware protections and how ensure safety in programs, incorporating security features into system design.
- **Kernel Study Group (Student Group)**: Discusses development and internals of the Linux Kernel, stuff like the Page Table implementation

Survey Says ...

SRTs Response Rate

Lec	Responded	Invited	%Response 1:25pm
001	148	181	81%
010	80	93	86%

SUCCESS!

- Thanks to all that have responded; SRTs stay open until 11:59pm last day of classes

Final Exam Question

See Video Discussion

Practice Final

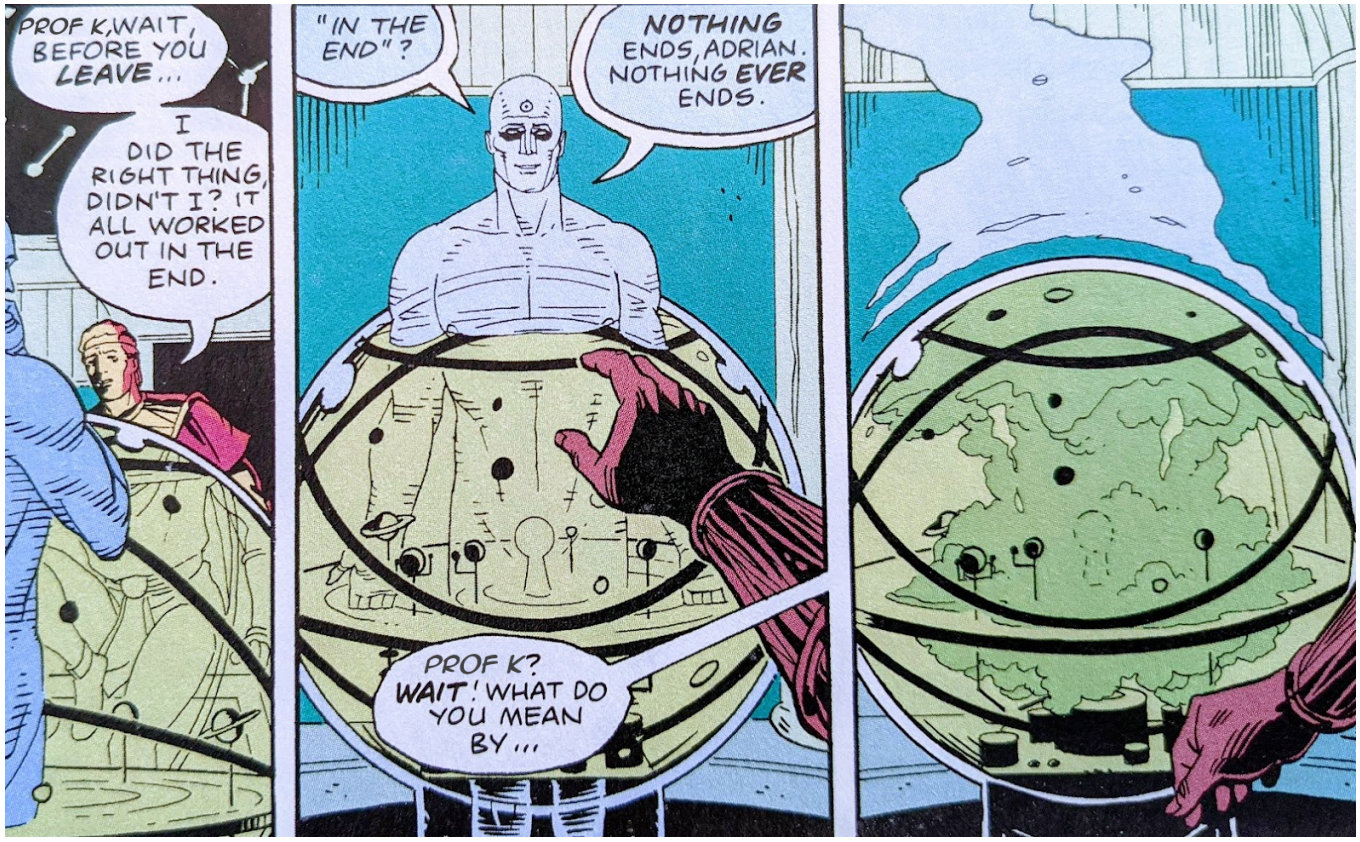
- Take a few minutes to look this over on your own then together
- Kauffman will answer a few questions on it and post solutions later today

Winter Practice

Students often ask what they could do during a break to keep up their computing skills. Here are a few ideas.

- READ: The Art of Unix Programming by Eric S. Raymond
  Fantastic philosophical and pragmatic discussion of how to build systems that work especially in the Unix environment. (free online)
- COMPLETE: If you didn't finish a project in this course or another, take some time to do so.
- EXTEND: If you use VS Code, Write an Extension for it that does something interesting. This will teach you MUCH about modern software development
- BUILD: Buy an Arduino Microcontroller ($10) and get a "Blinky" routine to run; it's C code! Makes a great stocking stuffer!
- REST: Take some time away from the screen for fun. Recharging is as important for people as for phones. Play outside. See some people in person. Breathe.

Nothing Ever Ends



- What you learned will come up again showing whether you learned it well the first time or need another pass.
- Some of it will change in the future and make you feel old.
- Expect this and stay determined.

Conclusion

It's been a hell of a semester.
I'm proud of all of you.
Keep up the good work.
Stay safe. Happy Hacking.