A WEB-BASED SYSTEM PROGRAMMING LEARNING ENVIRONMENT ECE UNDERGRADUATE RESEARCH SYMPOSIUM SPRING 2015

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SYSTEM PROGRAMMING

- An operating system is a piece of software to manage a computer's resources and provide support for common functions such as accessing peripherals
- System programming refers to writing code that takes advantage of operating system support for programmers to provide users and other programmers useful interfaces for accessing the hardware and other resources
- Traditionally performed and taught using the C language

TEACHING OF SYSTEM PROGRAMMING: COURSE MATERIAL

- Core part of most undergraduate computer engineering/science courses
- Teaching to beginners is primarily limited to University classrooms
- Wide gap between classroom learning and practical assignments. For example in CS 241 (System programming) course at Illinois, most students are using C for the first time. However, the first assignment gets started with relatively advanced concepts students are expected to learn C and navigate "trivial" programming issues by themselves.
- Need C tutorials, short video lectures, bite-sized challenges/exercises

TEACHING OF SYSTEM PROGRAMMING: DEVELOPMENT ENVIRONMENTS

- Students are usually required to setup a complicated development environment
- Either compatible hardware and software required, or virtual machines used
- Setup can be daunting for learners
- Not viable for modern large scale online courses (such as MOOCs)
- Natural solution is to deliver the programming environment in the web browser
 - Simple
 - Scalable
 - Consistent

BROWSER-BASED PROGRAMMING ENVIRONMENTS

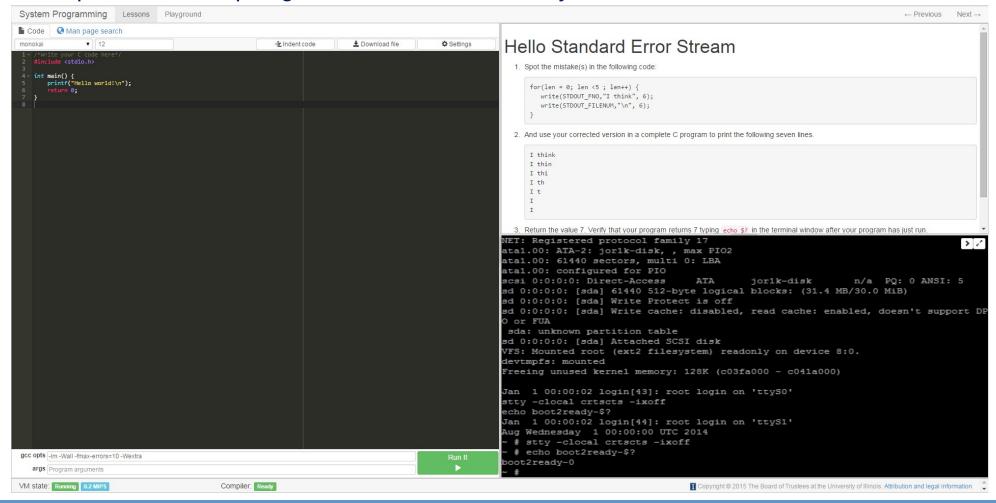
- Many in-browser programming and learning environments
- Almost all of them teach scripting/web languages
- Usually rely on a server infrastructure for compiling and running user programs
 - Hard to scale
 - Prone to security concerns
- Prior to this project, no viable implementation for system programming

THE PROJECT

- A C programming environment running in the browser
- Purely client code, no compilation or running in the server
- A full-fledged Linux virtual machine in JavaScript
- Short lecture videos
- Simple challenges and exercises
- Quick access to manuals and documentation
- Complements in-class learning

TRY IT OUT!

- Live: http://cs-education.github.io/sys/
- Open source: https://github.com/cs-education/sysbuild





PROJECT TIMELINE

- Started out as an experiment in Summer 2014
- CS 241 Fall 2014 students start using it
- Took on as research project in Fall 2014
- Project becomes part of the Department of Computer Science's Senior project class
- Senior project team of 7 students start working on the project

RESULTS AND FUTURE

- Used by 400+ CS 241 students in Spring 2015 and Fall 2014 semesters
- To be built into a full fledged course for introduction to system programming
- Part of CS Senior project, so future senior project batch of students will continue growing the platform
- Envisioned to be the go-to platform for teaching system programming at Universities and online course
- Illinois as a leading brand for system programming instruction

THANK YOU!

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Q & A