Emilien Breton

PROJECTS

Atto-8 Microcomputer
A MINIMALIST 8-BIT MICROCOMPUTER WITH STACK-BASED MICROPROCESSOR *Rust • C • Assembly*
- Designed ecosystem of hardware and software from logic gates upward, including instruction set architecture, from-scratch assembler and cross-platform emulator, totaling over 20 000 SLOC and 750 hours of work.
- Wrote various demos in Assembly running natively on microcomputer — memory monitor • sprite editor • Tetris clone • native assembler • postfix notation calculator.
- Built microcomputer in hardware using discrete 74HC-series logic chips on breadboards.

Atto-8 C Compiler
A RUDIMENTARY C99 COMPILER FOR THE ATTO-8 MICROARCHITECTURE *Rust • C • Assembly*
- Building C99 compiler from sctatch in Rust targeting Atto-8 Assembly language, consisting of preprocessor, parser, typechecker, optimizer and code generator.
- Implemented dead code elimination, constant folding and strength reduction resulting in average of 20% increase in execution speed and 10% reduction in binary size.
- Developed extensive C standard library, including heap allocator supporting malloc and free, string handling functions such as strlen and memcpy and input/output routines including printf supporting conversion specifiers %d, %u, %x, %c, %s and %p.

LTRE Regex Engine
A FAST REGULAR EXPRESSION LIBRARY WRITTEN IN C99 *C*
- Built regex engine in C99 which compiles regular expressions down to deterministic finite automata to match input strings in linear time without backtracking.
- Wrote extensive test suite of over 100 tests to ensure end-to-end correctness of engine.
- Developed grep-like tool supporting flags -v, -x, -i, -n and -c as real-world stress test for engine.

DBLess Password Manager
A HASH-BASED, DATABASE-LESS PASSWORD MANAGER *C • Python*
- Devised custom hash procedure based on SHA-256 in Python which deterministically generates passwords on demand without requiring encryption or password storage.
- Reimplemented password generation algorithm in C along with SHA-256 routines as per FIPS PUB 180-4 for use as interactive CLI tool.

VOLUNTEERING

Hack the Hill Hackathon
DEVELOPMENT MANAGER — DEVELOPMENT TEAM *Ottawa | November 2022 — Present*
- Leading development of open-source participant tracker built with Next.js and Prisma, used by over 1000 hackers and 50 organizers throughout hackathon.
- Built and maintained internal sporsorship payment portal powered by Stripe and React.js in collaboration with sponsorship team, enabling processing of over 20 000$.

uOttawa Computer Science Club
CLUB EXECUTIVE *University of Ottawa | June 2022 — Present*
- Building community of over 1000 computer science students at the University of Ottawa.
- Collaborated executive board to brainstorm, organize and schedule a dozen events by designing marketing material with Figma and hosting workshops for over 100 students.

EXPERIENCE

Zeptile Software
SOFTWARE ENGINEER — WEB3 *Remote | October 2022 — October 2023*
- Implemented various smart contracts in Solidity as per specification and ensured 100% test coverage through Chai and Hardhat.

EDUCATION

University of Ottawa
BSC WITH HONOURS IN COMPUTER SCIENCE *September 2021 — Present*
- Admission scholarship — 95%+ average. *November 2020*

SKILLS

Languages

Rust • C • Python • JavaScript

Development Tools

NixOS • Neovim • Fish Shell • Git

Other Technologies

React • Node.js • HTML • CSS • JSON • YAML • Markdown • LaTeX • Lua • x86 Assembly • C++ • Bash • GDB • Linux • Arduino • VS Code • Figma • Notion • Docker • Cloudflare • GitHub

Spoken Languages

- French *Native*
- English *Native*
- Spanish *Intermediate*
- Russian *Elementary*

Other Interests

Electronics • Robotics • CAD • 3D Printing • Finance • Mathematics • Drone Building • Music • Bouldering

CONTACT

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