

Ross Brunton

bruntonross@protonmail.com | github.com/RossBrunton | rossbrunton.scot

West Lothian, Scotland

Software engineer with an interest and experience in systems and low level programming with a history of compiler development. Has improved GPU offloading support in LLVM as part of a SYCL toolchain. Skilled at being given a complex problem, breaking it down and building a clean, performant solution.

Skills

Expertise: Compiler Development, GPU Programming, OpenCL, SYCL, Linux

Tools: Git, GDB, CMake, LLVM, Jira, ffmpeg, Django

Languages: C, C++, Rust, Nix, Python, JavaScript, PHP, Shell Scripting

Experience

Senior Software Engineer

Mar 2022 - Sep 2025

Codeplay Software Ltd

Edinburgh, Scotland

- **LLVM Liboffload:** A library to allow platform-agnostic access to GPU accelerator devices using a library that interfaces with, among others, CUDA and AMDGPU devices.
 - Designed to fully replace an existing offloading library in LLVM, was able to design the interface from scratch whilst also re-using existing internals.
 - Worked on the core runtime, defining and implementing new API entry points and features.
 - Developed an intermediate layer that acted as an offload backend that translates the liboffload API to calls to Codeplay's Unified Runtime API.
 - Achieved over 90% pass rate against the core parts of Unified Runtime's test suite.
 - Collaborated with external engineers (such as those from AMD) in order to define a specification suitable for all parties involved.
- **Unified Runtime:** Part of Intel's OneAPI project that acts as an intermediate layer between the SYCL runtime and device runtimes.
 - Our team were code owners of the OpenCL plugin, testing framework and specification.
 - Worked with the CUDA, HIP and OneAPI interfaces through debugging and diagnosing issues raised by other teams working on those specific plugins.

Staff Software Engineer

Aug 2019 - Feb 2022

Codeplay Software Ltd

Edinburgh, Scotland

- **OneAPI Construction Kit:** Codeplay's platform independent OpenCL platform.
 - Was involved in bugfixing, triaging issues and managing CI of the core library as part of our team's role as code owners.
 - Added support for the "shared" Unified Shared Memory type.
- **Address Space Inference Engine:** An optimization pass as part of Codeplay's ComputeCpp SYCL implementation.
 - Acted as code owner for this component, discussing and deciding on how best to implement it.
 - Implemented LLVM passes to "infer" the correct address space annotations on pointers with the aim to improve performance of generated code.
 - Wrote significant internal documentation about how the passes were implemented.
 - Wrote an public-facing blog post for Codeplay's website detailing the technical and management challenges faced while working on the project. This is available at <https://rossbrunton.scot/asp.html>

- **ComputeCpp**: Codeplay's flagship SYCL implementation.
 - Contributed features and bugfixes to the compiler component that extracts device-specific code to be loaded at runtime later.
 - Added a "kernel inspector" tool that would dump measured compiler metrics into a machine parsable file.
 - Improved tooling for splitting device code into multiple files each containing specific number of kernels. This required working with Clang's frontend to emit calls to specific tools.

Software Engineer

Codeplay Software Ltd

Nov 2017 - Jul 2019

Edinburgh, Scotland

- **SYCLBlas**: A math library on top of SYCL.
 - Added support for a "scratchpad" temporary memory region to various BLAS functions.
- **C Compiler**: An LLVM-based C toolchain for a streaming processor.
 - This mostly involved working with the final stages of the LLVM codegen, lowering LLVM IR to bitcode consumable by a proprietary toolchain.
 - Came up with novel designs to port C constructs to the CPU's novel architecture.
 - Was heavily involved in design discussions, both internally and with the client.

Industrial Placement

Exterity Ltd

Jul 2016 - Dec 2016

Fife, Scotland

- **MP4 Support**: Added MP4 support to an embedded multimedia device.
 - Used the ffmpeg to extract video and audio frames from an MP4 container file.
 - Worked with the device's C API to send it to a hardware decoder to be displayed on a screen.

Heriot-Watt Internship

Heriot-Watt University

Summer 2014

Edinburgh, Scotland

- **Web Tutoring Platform**: Similar to Codecademy where lecturers could create exercises for students.
 - Was implemented as a Python Django web backend with a vanilla JavaScript frontend.
 - Student code was written in the R language, and ran in a sandbox on the Linux webserver.

Education

Heriot-Watt University

MEng | Software Engineering, with Distinction

2012 - 2017

Edinburgh, Scotland

- Built a web application written in JavaScript that displayed links between academic materials in the form of connected nodes. This was developed to a specification discussed and created with my supervisor.
- Acted as an advisor to students doing their third year project, providing my coding expertise.
- Wrote a Django server backend as part of a web application for managing financial stock portfolios as part of a group project. Worked with APIs for pulling stock information and also provided an API for teammates to call on the JavaScript client side. This project received a runner up award for best group project.

Interests & Personal Projects

- **Game Development**: Explores various game development engines, most recently Rust and Bevy.
- **OS Development**: Created two "hobby" x86 operating systems, one in C++ and one in Rust.
- **Retro Hardware**: Created a Mega Drive emulator in JavaScript and enjoy learning about how they overcame technical challenges in the past.
- **Web Development**: Have made multiple websites using the Django Python web framework.
- **Selfhosting**: Operates a NixOS Linux server hosting several services for personal use such as Nextcloud, Forgejo and a Matrix homeserver.