Owen Shepherd

About

Expert compiler & high-performance systems engineer.
Experienced technical leader.

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Experience

.txt - Staff Compiler Research Engineer

.txt - Technical Lead

September 2024 - present

Regex engine

Implemented our in-house, industrial-strength regex engine from scratch. This supports non-mainstream features, such as complement, intersection, `multiple-of`, and compiles regex exponentially faster than the rust regex crate.

As an example, the regex crate compiles `(a|b)*a(a|b){14}` to a minimal DFA in **43s**, and the library I developed compiles it in **26ms**, so **1653x faster**.

Pangram - A universal grammar converter

Implemented our universal grammar conversion tool, which is a micropass transpiler, supporting many middle-end optimization and transformation passes.

It has frontends for:

- Lark
- GBNF
- JSON Schemas
- Tree Sitter
- XGrammar structural tags

Backends for:

- Lex/YACC
- Lark
- GBNF
- Regex
- Railroad Diagrams
- LALR(1) Parser

As well as these optimization/transformation passes:

- Inlining
- Simplification
- Rule Deduplication
- Tree Pruning
- EBNF → BNF
- Grammar → regex
- Wordlevel → bytelevel

JSON Schema support

We convert JSON schemas to grammars. This is non-trivial (in fact, it's an ongoing area of academic research), because modern JSON schemas are sets of constraints, which all interact with each other in different, and sometimes surprising, ways. Solving this requires constraint propagation. I ended up writing two separate IRs to represent JSON Schemas specifically, as well as four transformation passes, before spitting out an EBNF-IR (the middle-end IR of Pangram, above).

I spearheaded this work, leading a small team of capable compiler engineers.

Rust

Tiko Energy Solutions - Consultant SE

June 2022 - present

Implemented core components of our Virtual Power Plant, as well as our next generation of smart home controllers.

Our VPP controlled hundreds of thousands of devices avross France, with which we stabilized the energy grid on behalf of the government, by tweaking the consumption, rather than the production, of electricity.

This really was cutting-edge stuff, as far as the energy sector is concerned.

Haskell, Nix,

Symmetry Investments - Consultant SE

May 2021 - June 2022

Working on the compiler for an internal programming language called SIL.
Wrote a tail call elimination pass, which removed recursion limits.

Implemented a declarative spreadsheet-like language, in the language whose compiler I was working on above. Instead of working spacially, with cells, this declarative language used structured data. The visual layout, and data access patterns were tree-shaped, instead of laid out on a grid, and data could be accessed via semantic labels, for example `traders.owen.books.2025.gains`.
This was an order of magnitude more safe and pleasant than spreadsheets.

Dlang

HubSpot - Senior Software Engineer
HubSpot - Fullstack Software Engineer

May 2020 - April 2021
May 2018 - December 2019

Implemented DSLs to describes and execute data aggregation, transformation, diffing, and syncing, in the best language for writing such DSLs, Haskell.

Led the development of a new HubSpot product offering, the Advocacy hub.

Haskell, Nix, k8s, docker, scylla, redis React.js, Redux, Ramda, Java, MySQL

Obsidian Systems LLC - Consultant SE

December 2019 - April 2020

Developed Haskell web frameworks and state management systems, based on Functional Reactive Programming principles, typechecked from database to frontend. The power and weirdness of this paradigm can be experienced, in the project tutorial.

Haskell, Nix, Scala, Akka

Personal work

- [Blog] {n} times faster than C - featured on: Hacker News, r/rust, lobste.rs
- [Blog] Speeding up tree-sitter-haskell 50x - featured on: Haskell Weekly, lobste.rs
- [Blog] Quantifying pass-by-value overhead - featured on: Hacker News, lobste.rs

- [PR] Sped up tree-sitter-haskell 45x
- [PR] Generalize compensated summation algorithms to work over the RealFloat typeclass
- [PR] Response Bucketing Added the ability for language server requests to be executed atomically

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See all my public PRs

Projects

The Piq Programming Language

Piq is a statically-typed, type-inferred, compiled programming language, written in C99.

C

smolgraph

An extremely small (<4k), but featureful, mmmmmmmmusw multi-line-graph library.

JS

SimFin financial data client

Haskell client for the SimFin financial data API. Includes accurate haskell types for all free and paid endpoints.

Haskell

The Phage Programming Language

A functional, homoiconic, expressive, metaprogrammable programming language.

Haskell

Try Lambda

Lambda calculus step-by-step simplifier REPL.

Bison, C, JS

Select.Pink

A pedagogical game where you use CSS selectors to make progress.

HTML, CSS, JS

Conway's Game of Life GBA

An implementation of Conway's Game of Life for Gameboy Advance, implemented in C on bare-metal.

C

pandoc-builder-monadic

A DSL for creating pandoc ASTs with do-notation

C

unansi

Strip out ANSI control sequences

Haskell

See more projects on Github or my website