
Jess Sullivan

Senior Full-Stack & Systems Engineer · 8+ years

Full-Stack & Product · DevSecOps · ML / Computer Vision · Compilers & HPC · Kernel & Security Research

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github.com/jesssullivan (74+ stars, long-standing FOSS contributor) · transscendsurvival.org · [LinkedIn](#)

Senior full-stack and systems engineer with 8+ years building software across TypeScript/SvelteKit, Python, Go, C++, Rust, Zig, Chapel, Haskell, and Nix-first infrastructure. Current Bates work spans enterprise authentication, SAML/LTI/Shibboleth, secret management, ACME certificate automation, OpenTelemetry, GitLab AutoDevOps, OpenTofu, RKE2/Rancher, legacy modernization, and 24/7 CVE response. Earlier work shipped Merlin Sound ID and its tooling/demos for fine-grained audio classification used by millions. FOSS and client work spans Apache Solr, rspamd, Postfix, Chapel-lang, GDAL/OGR, Klipper, Marlin, KeePassXC, nixpkgs, xCaddy/libdns, the Svelte/Skeleton ecosystem, ShikiJS, Rocky Linux real-time (PREEMPT_RT) kernel lanes, Zig capability libraries, GIS, and maker tooling. Comfortable moving between user-facing product surfaces, infrastructure, ML tooling, and low-level debugging.

Always building: Hey! I am *always* hacking, learning, building, reading, and tinkering. Day in, day out, this is what I do. For a more up-to-date view into what I am up to whenever you are reading this document, I invite you to explore my blog at transscendsurvival.org and recent commits on github.com/Jesssullivan.

Product / Applied ML

SvelteKit, React
Python/TensorFlow, Flask
Fine-grained classification
WASM inference, WebGPU
OAuth/TOTP/RBAC, SAML/LTI
ML annotation & MLOps tooling

Security & Systems

Static analysis: clang-tidy, scan-build
Sanitizers: ASan, UBSan
Dynamic instr: Frida, Ghidra, ILSpy
Fuzzing: AFL++, QuickChpl, cargo-fuzz
CVE backporting (kernel, PREEMPT_RT)
PCIe / NVMe / USB internals

Languages & Runtimes

C / C++ (8+ yrs), Rust, Zig
Chapel, Haskell, Futhark
Python, Go, R/Rcpp
Objective-C/Swift, TypeScript
Vala (Budgie DE), Bash
OS internals, ABI / FFI surfaces

Build / CI / Infra

LLVM+Clang, GCC, Make, CMake
Bazel, autoconf, OpenTofu
GitLab CI, GitHub Actions
Podman/OCI, Docker, RKE2
Nix flakes, FPM, multi-arch RPM
OTel, Tempo, SOPS+age, ACME

Selected Systems, Compilers & Applied R&D Work

Compiler & toolchain —

- **Chapel-lang (LLVM-21 backend)** — [committer to the Chapel Mason registry](#) and downstream consumer of Chapel's LLVM-based code-generation pipeline. Proficient in Chapel's LLVM 21 lowering, locale-aware codegen, and GASNet `ofi/ucx` substrates. Author of [QuickChpl](#) — a property-based fuzzing and test harness for Chapel with QuickCheck-style shrinking over distributed code paths.
- **Merlin Sound ID (Clang/LLVM toolchain)** — production iOS audio classifier shipped to millions of users; Objective-C, Swift, Python/TensorFlow training, FFT.js WASM front-end; `libclang`, `dsymutil`, cross-compilation matrices (role detail in §2).

FOSS & Public Production work (committer, contributor, operator) —

- **Klipper (C, committer)** — MCU-side firmware and host-side message bus across ARM/AVR HALs, Python↔C interop, and the deterministic-timing real-time event loop; resonance-cancellation tuning and piezo + ADXL345 sensor-fusion algorithm work at the toolhead.
- **KeePassXC (C++, committer)** — ongoing security bug fixes and contributions to the macOS build and test coverage.
- **rspamd (C, C++, Lua, committer)** — mail-content security at scale; work across rspamd's event loop, libucl config tree, Lua FFI bridge, and the C-level fuzzy/Bayes hash subsystems.
- **Budgie DE (C, Vala, collaborator)** — Vala panel applets for Rocky Linux and ARM64; X11 windowing-stack work for headless and QEMU-based systems.
- **GDAL (C++)** — four years of production work in the GDAL/OGR codebase for GIS and remote-sensing contracts (NPS, NBRC, GPRED): custom drivers, vector/raster pipelines, R bindings via `Rcpp`, KML/CSV/SHP conversion at scale.
- **FFT.js (Cooley–Tukey FFT implementation, committer)** — shipped inside Merlin Sound ID; in active use by thousands of ornithologists today.

Kernel & low-level security research —

- **Rocky linux-xr & PREEMPT_RT lane** — carry XR-display patches and a Dirty Frag CVE backport set: **CVE-2026-31431** (`algif_aead Copy-Fail`), **CVE-2026-43284** (Dirty Frag / `xfrm-esp`, CVSS 8.8), and **CVE-2026-43500** (Dirty Frag / `RxRPC`) backported into 6.1.y ahead of public disclosure as C patches against upstream LTS. The `6.1.y-rt` (PREEMPT_RT) sub-lane received additional locking-context audits for `raw_spinlock_t` vs. `spinlock_t` regressions surfaced by the backport set.
- **NVMe XRAM injection paper (2026)** — [first-of-its-kind recovery](#) of firmware write-protected NVMe SSDs by injecting NVMe Submission Queue entries into the ASMedia ASM2362 bridge's internal XRAM via vendor SCSI commands, bypassing the bridge's opcode whitelist; end-to-end C, Zig, and inline assembly with PCIe TLP doorbell signaling.
- **Reverse-engineering surface** — [GhidraScript](#), [Frida](#), [ILSpy](#), MITRE [Caldera](#); firmware RE on the [hiberpower-ntfs](#) stack; `r2/rizin`, `angr`, `AFL++` corpus management, and `ASan/UBSan`-instrumented harnesses.
- **Zig capability libraries with C ABIs** — author of [zig-crypto](#), [zig-notify](#), [zig-keychain](#), and [zig-ctap2](#) — C-ABI surfaces with cross-platform builds and hand-written FFI test harnesses.

Rust & modern systems —

- **Rust SIMD** — portable-SIMD and `std::simd` for fine-grained classification kernels feeding WASM inference pipelines.

- **Rust systems work** — in-progress encrypted sync filesystem (Linux FUSE + macOS FileProvider) anchored on XChaCha20-Poly1305 + Argon2id, FastCDC content-defined chunking, BLAKE3 hashing, zstd compression, and NATS JetStream-backed fleet sync; Git-safe restore proofing across CLI / daemon / TUI surfaces.

Recent Public Contributions & PRs —

ShikiJS textmate-grammars-themes
Futhark
xCaddy & libdns

svelte-superforms
cmux
charmbracelet/crush

numtide/nix-vm-test
nixpkgs

Professional Experience

Systems Analyst (DevSecOps) @ Bates College

(2024–Present)

Build and maintain enterprise systems supporting staff, faculty, and the technical ILS team. 24/7 on-call for CVE triage and mitigation; lead IaC and dev-CI parity college-wide.

- Built a property-based orchestrator and instrumentation harness for 1980s-era degree-management C in **Haskell** + **Python** (QuickCheck PBT, Cabal, FPM-packaged, podman-compose dev parity, GitLab AutoDevOps); turned an unautomatable legacy codebase into a verifiable, traceable, k8s-friendly workload.
- Overhauled and automated the event-management lifecycle (**C#**, **Go**, **Ansible**); led horizontally-scalable **Apache Solr** adoption across multiple public/private indexing applications.
- Built internal ACME-first certificate-management and DNS libraries; led SAML / Shibboleth / LTI integrations; drove enterprise secret management with **KeePassXC** inside a declarative Ansible workflow alongside firewalld, fail2ban, and OTEL / LGTM / Tempo telemetry.

Computer Vision Software Engineer @ Macaulay Library, Cornell Lab of Ornithology

(2019–2021)

Developed & launched **Merlin Sound ID**, a production fine-grained audio classification system used by millions worldwide. Stack: Objective-C + Swift (iOS), Python/TensorFlow (training), FFT.js (WASM front-end). Led R&D on internal ML annotation tooling, model-evaluation web APIs, and end-to-end MLOps pipelines (Flask, TypeScript, React, Vue, Docker, BitBucket CI); built real-time inference demos in React Native and Swift; coordinated with the Visipedia / iNaturalist community on fine-grained classification benchmarks.

Fabrication Laboratory Manager @ Cornell CALS Landscape Architecture (DLA Makerspace)

(2021–2022)

Developed and taught rapid-fabrication curricula. Built C++ tiler / slicer tools with my teaching assistants; ran the team's GitHub & Linear project tracking.

Full-Stack Contracting & FOSS (concurrent throughout)

(2017–Present)

Independent contractor; active upstream contributor and committer (see also §1 for systems depth).

- **Other FOSS / community engagement:** Apache Foundation, Ligo, Joplin, Skeleton UI, **ggplot2**, and the Rocky Enterprise Linux Foundation. Public PR set called out as bullets in §1.
- **Adaptive Motorsport** (2018): control hardware and a USB-HID stack in C++ — STM32 debounce/PWM ISRs with a host-side configuration utility.
- **Web GIS** for the National Park Service, Foundation for Healthy Communities, GPRED, NBRC; presented at 2019 AAG Annual Meeting, Washington DC. **Fine-grained classification** R&D with MushroomObserver.org & Visipedia.
- **Independent applied-systems R&D** (2024–present) — agent orchestration for semi-autonomous infrastructure lifecycle management; source-available where appropriate.

Community, Publications & Talks

Community — Ongoing engagement with the **Rocky Enterprise Linux Foundation** (Rocky 10 platform, real-time (PREEMPT_RT) kernel lanes, and downstream CVE backport practice). *First Fellow*, D&M Makerspace, Plymouth State University (2017–2020); taught *Advanced GIS Programming* and coordinated the regional COVID-19 PPE manufacturing response with the NH hospital system. *Membership Chair & 3D Printing Captain*, Ithaca Generator (2020–2022).

Publications —

Sullivan, J. (2026). *Recovering Write-Protected NVMe SSDs Through USB-Bridge XRAM Injection: Bypassing the ASMedia ASM2362 Firmware Opcode Whitelist*. transscendsurvival.org/papers/recovery-paper.pdf.

Reitsma, L.R., Burns, C., & **Sullivan, J.** (2019). *Poecile atricapillus* (Black-capped Chickadee) Feeding *Catharus guttatus* (Hermit Thrush) Nestlings. *Northeastern Naturalist*, 26(2). doi:10.1656/045.026.0213

Sullivan, J. (2019). *Web GIS: Telling Stories & Solving Problems*. *Association of American Geographers Annual Meeting*, Washington, DC.

Ten or more professional references (academic, defense-adjacent, FOSS, and industry) available on request.
