Aaron Barlow

865.804.6746 | abarlow505@gmail.com | github.com/aroswift | aaronbarlow.dev

Experience

Oak Ridge National Laboratory

HPC Software Engineer, National Center for Computational Sciences | Jun 2020–Present | Oak Ridge, TN

- Developed privacy-preserving federated learning at exascale on Frontier (TOP500 #2), enabling cross-institution healthcare data training on AMD GPUs. Integrated NVFLARE with ROCm/MI250X and PyTorch, produced HIP-compatible builds, and implemented Slurm integration with mTLS inside secure enclaves. Validated multi-node training rounds previously unachievable on Frontier, now utilized for building privacy-preserving medical foundation models.
- Optimized the directories endpoint by replacing Jbuilder with a JSON:API serializer and explicit Redis caching for hot read paths, reducing response time from 272s to 178–206 ms on cached hits (≈1320× improvement) and improving first-hit performance from 298.5s to 246.8s (–17%). Eliminated view-rendering costs (252s to 0ms) and reduced ActiveRecord time (19.2s to 8.8ms). Stabilized fleet-wide polling and removed timeouts during cluster syncs.
- Managed and scaled myOLCF, a researcher self-service and monitoring platform used by approximately 4,000 users across 1,000+ projects, achieving 99.9%+ availability. Delivered 12 FY2025 releases governing access, allocation, and policy across open, moderate, and secure enclaves.
- Built the Smart Facility metrics platform (backend in Crystal/Amber) to ingest compute, data, I/O, and efficiency metrics. Designed pre-aggregated dashboards delivering 100k-record views with low latency and serving 50k time-series points in 87 ms. Benchmarked 10.4k requests/sec per CPU core (96 µs/req) for simple JSON. Shifted heavy computation to background jobs and index tables. Utilized by lab leadership to guide next-generation procurements and benchmark domains, flagging inefficient Slurm jobs.
- Unified day-to-day operations across 27 HPC clusters, including Frontier, via a central policy-as-code service. Automated project provisioning, access control, and scheduler policy across SLURM/LSF enclaves, serving as backbone software for a $700M+ compute fleet and mixed open-to-secure environments.
- Standardized GitOps delivery with Kustomize and Argo CD on Kubernetes (GitLab runners), enabling declarative configurations, drift correction, and one-click rollbacks across environments.
- Accelerated build, startup, and test cycles by migrating to Vite and optimizing CI processes. Reduced build times from 2 minutes to 9 seconds (–92%), startup times from 30 seconds to <200 ms (–99%), and test durations from 90 seconds to 6 seconds (–93%), significantly cutting developer idle time and speeding up review cycles.

Bank of America

ML Engineer Intern, Consumer, Small Business & Wealth Tech | Jun–Aug 2019 | Los Angeles, CA

- Built an NLP entity-extraction pipeline achieving 96% F1 score, supporting $20M+ annual automation savings for 100M+ documents.

Oak Ridge National Laboratory

Software Developer Intern, National Center for Computational Sciences | May 2015–May 2019 | Oak Ridge, TN

- Year-round development of HPC services, applications, and BI tools; shipped production features across internal portals. Automated supercomputer-access communications via a policy-aware email system and built a WordPress/REST plugin to sync and display HPC metrics on olcf.ornl.gov, improving data freshness and reducing manual update toil.

Skills

- **Languages / Backend:** Ruby, Python, Go, TypeScript, SQL, Bash, Rails, FastAPI/Flask, gRPC, REST, Redis, Postgres
- **Infra / ML / Agentic:** Docker, Kubernetes, Kustomize, Argo CD, Slurm, CI/CD, Prometheus/Grafana, OpenTelemetry, ROCm, Vault · NVFLARE, PyTorch (ROCm), HIP · Multi-agent orchestration (CrewAI), autonomous pipelines

Education

East Tennessee State University
Bachelor of Science, Computer Science | Dean's List | GPA 3.94/4.00 | May 2020
Activities: ACM President (2019–2020); Ethical Hacking VP (2018–2019)

Selected Projects

- **Automatic podcast creation.** 192 episodes, 1.8k downloads, 50+ hours listened; Claude Sonnet scripts → ElevenLabs TTS → Spreaker auto-publish.
- **Automatic e-commerce creation.** 152 products, 57k+ views; $0.31 per product; GPT orchestration + Flux Pro images → Printful/Etsy/Redbubble auto-publish.
- **Project Cadenza (agentic music + video).** 150 videos published; pipeline creates artists/albums, lyrics → song (Suno/Udio), mastering, thumbnails, YouTube upload/scheduling; ISRC/metadata prep.

Professional Activities

- **Talks:** CUG 2025 — "Employing a Software-Driven Approach to Scalable HPC System Management."; NLIT 2024 — "Employing DevOps in HPC Operational Management."
- **Community:** ORNL Pathways to Computing Workshop Chair (2022–present); PEARC Student Program Committee Chair (2021–present)