JUAN RAPHAEL DIAZ SIMÕES

SENIOR BACKEND / PLATFORM ENGINEER

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Backend and platform engineer with ten years of experience and a PhD in complex systems science. I value correctness and pragmatism. At Tlon I owned fleet health for thousands of stateful servers distributed across five Kubernetes clusters and their control plane, the automation that suspends and wakes them on demand, the network telemetry, and the observability that made failures diagnosable. Earlier I led a six-engineer team at a consultancy and made a production trading system up to 100× faster on a tenth of the memory.

EXPERIENCE

Tlon · **Senior Software Engineer** · Remote · San Francisco, USA · Jan 2023–Aug 2026

Core engineer on a hosting platform for Urbit pods running on multiple clusters. Owned fleet health and the control backend architecture, including automating updates, fleet size and memory usage optimization. Inherited constant breakage and little visibility; left behind a fleet that largely ran unattended.

- **Set up the infrastructure that cut fleet cost tenfold.** Built the automation that suspends idle instances and wakes them on user activity or meaningful network traffic, holding around 2,000 of 10,000 servers live at any moment. A pool of pre-booted instances kept signups fast despite boot times ranging from ten seconds to several minutes.
- **Replaced manual fleet maintenance with scheduled, self-retrying jobs.** Designed mass maintenance operations — ship updates, storage optimization, backup and recovery — as API routes driven by cronjobs, with retries and concurrency limits handled by a custom Haskell job runner. Fleet-wide updates went from a recurring source of incidents to a routine that ran mostly without intervention.
- **Cut failure diagnosis from hours of guesswork to a single trace lookup.** Propagated OpenTelemetry trace IDs from API requests through the job system into Kubernetes batch jobs, bringing traces, Prometheus metrics, and logs together for debugging in a single Grafana view.
- **Made per-peer network traffic visible across the entire fleet.** Wrote a Rust libpcap sidecar that parses the binary peer-to-peer protocol and exports per-peer traffic to Prometheus, to surface network activity and protocol anomalies; a companion tool maps the fleet's communication graph using Louvain community detection. Also optimized the Go DB awakener using caching techniques.
- **Built the invitation, MFA, and storage paths end to end.** Multi-factor authentication with TOTP and SMS, from database schema to frontend; invite pools with distribution policies, phone and email verification, rate limiting per policy, and anti-abuse; and an S3-compatible proxy giving every user quota-limited file storage with signed URLs.

Stack: Haskell, PostgreSQL, Kubernetes, Rust, Go, Nix, OpenTelemetry, Prometheus, Grafana, Helm, Terraform, Docker, Google Cloud, S3, GitHub Actions

Tweag · **Senior Software Engineer / Team Lead** · Remote · Paris, France · Sep 2018–Dec 2022

Three client engagements over four years — customs logistics, investment banking, and internal developer infrastructure — moving from senior engineer to team lead, alongside company-wide editorial and management responsibilities.

- **Led a six-engineer team for two years.** Elected by the team when the previous lead stepped down. Set technical direction on a customs-compliance platform for US importers, hired frontend engineers, ran the AWS and Terraform infrastructure, and managed the relationship with the client's owner.
- **Delivered a US Customs and Border Protection integration few competitors could offer.** Modelled a legacy fixed-width protocol from unstable specifications, drove the certification through to approval, and replaced manual re-entry into external software with submissions sent straight from the product.
- **Turned 10–20 minute trade views into near-instant loads** in an event-sourced equity-swap ledger at a major French bank. Developed a profiling method for large Haskell codebases that located the bottlenecks, reaching speedups of up to 100× and cutting memory use by an order of magnitude, then published the method as a company article. Migrated persistence off an unreliable store to fix slow startup.
- **Owned clarity and structure on roughly 200 engineering blog posts.** About one a week for four years. Ran the first editorial pass on each and routed technical review to engineers with the right expertise. Line-managed four engineers on career and conflicts; wrote multiple blog posts, including one of the most-read in the company's technical blog. Did most of the initial development of the reproducible notebook project now open-sourced as jupyenv.

Stack: Haskell, Nix, PostgreSQL, MongoDB, TypeScript, React, AWS, Terraform, event sourcing, performance profiling

TECHNICAL SKILLS

CORE	Haskell, Rust, Go, Python, TypeScript, JavaScript, SQL, Nix
PLATFORM	PostgreSQL, GitHub Actions, Kubernetes, Docker, Terraform, Google Cloud, AWS, MongoDB, S3
OBSERVABILITY	OpenTelemetry, Prometheus, Grafana, distributed tracing, libpcap
LEADERSHIP	Team lead, line management, technical editing, teaching, hiring, mentoring
LANGUAGES	Portuguese (native), English (fluent), French (fluent), Spanish (working), Russian (basic)

SELECTED OPEN SOURCE

WireCat · Haskell · Graphs · React
Exploration of multi-level effect systems as a way to support AI-assisted software development. Compiler plugin, library, CLI, and viewer for writing typed wiring diagrams as executable Haskell: one definition runs as code or renders as interactive graphs, effectively separating high-level views and low-level implementation. Submitted to ZuriHac 2026.

Micro-Macro · Rust · WebAssembly
Interactive explorer for microscopic Markov processes and the dynamics they induce on macroscopic observables, with graph editors, matrix and heatmap views, and a browser build. Comes together with a tutorial about hidden Markov chains.

LineageFlow · Haskell · Nix · OpenGL
Toolkit built during my PhD for reproducible spatio-temporal cell lineage analysis: many algorithms behind a single declarative interface, with 3D+time visualisation of results.

EDUCATION

PhD, Complex Systems Science · Université Paris-Saclay · France · 2017
"A mathematical approach to embryonic morphogenesis based on spatio-temporal cell lineages". Mathematical and computational framework for analysing cell movement in embryonic development, covering clustering, force estimation, and stochastic analysis. **Thesis (HAL)**

MSc, Complex Systems Science · École Polytechnique · France · 2013

BSc, Physics · University of São Paulo · Brazil · 2010

ADDITIONAL EXPERIENCE

Associate Professor · Tashkent State Dental Institute · Uzbekistan · 2020–2024
Taught biophysics, statistics, and bioinformatics to more than 100 students per semester while working full-time in engineering. Built three courses from scratch — lectures, practical exercises, and browser-based examinations — and published all of it online. Concurrently lectured physics at Turin Polytechnic University in Tashkent (2020–2021).

Research Engineer · École Polytechnique and CNRS · France · 2017–2018
Packaged LineageFlow for use at the BioEmergences laboratory. Built a WebGL viewer and algorithm runner for 2D and 3D trajectory data at INADILIC, focused on anomalous diffusion.

SELECTED PUBLICATIONS & WRITING

Locating performance bottlenecks in large Haskell codebases · Tweag · 2020

Code is engineering, types are science · Tweag · 2020

Brownian-like deviation of neighboring cells in zebrafish embryogenesis · Physical Biology · 2019

Cell trajectory clustering for identifying morphogenetic fields · ICPRAM · 2017