

AKSHAYKUMAR PATIL

Senior Software Engineer — Platform Architecture, Distributed Systems & AI/Cloud Infrastructure

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PROFESSIONAL SUMMARY

Senior Software Engineer with **4.5+ years** of experience architecting distributed systems, multi-tenant SaaS platforms, and cloud infrastructure across **AWS, GCP, and Azure**. Proven track record architecting resilient, cost-effective distributed systems and scalable backend architectures—spanning **schema-isolated multi-tenancy** (serving **100,000+ active learners** at **<35ms p95 latency**), **event-driven microservices** (BullMQ/Redis processing **50,000+ daily jobs**), **enterprise data migrations to Azure** (Azure SQL, Azure Blob, normalized 3NF schemas, automated SQL reconciliation), and **NoSQL-to-SQL database migrations** (PostgreSQL 3NF, MongoDB). Hands-on engineer across **production AI systems** (LangGraph multi-agent DAGs, vector RAG with ChromaDB, Gemini LLM integrations, PyTorch signal modeling) and **cloud DevSecOps** (Docker, CI/CD pipelines, keyless GCP/AWS OIDC, NGINX). Skilled at optimizing AWS infrastructure costs through right-sizing, edge caching, and memory tuning while delivering **99.95% platform availability** and **90%+ on-time release cycles** across TypeScript, Python, Rust, SQL, and Go/Java.

TECHNICAL & ARCHITECTURAL CAPABILITIES

CORE LANGUAGES

TypeScript JavaScript (Node.js) Python Rust SQL PostgreSQL Azure SQL MySQL LibSQL Core Java C# (.NET) Bash

FRAMEWORKS & LIBS

Next.js 16/15 Fastify 5 NestJS 11 React 19 Express Drizzle ORM BullMQ Socket.io Prisma Tailwind CSS Jest / Vitest Playwright

SYSTEM ARCHITECTURE

Distributed Systems Design Modular Monoliths & Microservices Multi-Tenant SaaS (Schema Isolation) Event-Driven Architecture

CLOUD & INFRA

AWS (EC2, S3, RDS, Lambda Containers, SQS, SES) Azure (Azure SQL, Blob Storage) GCP (GCS, OIDC) Docker NGINX Cloudflare Edge

DATABASE & STORAGE

PostgreSQL (Connection Pooling, Drizzle ORM) MongoDB (Aggregations, Compound Indexes) Azure SQL Turso LibSQL Redis 7 (Pub/Sub, Rate Limiting)

S3 Tiering

AI, ML & AGENTIC

LangGraph Multi-Agent Workflows (Cyclic DAGs) ChromaDB Vector RAG Google Gemini (3.7 / 2.5 Flash) Model Context Protocol (MCP)

PyTorch Biosignal Models Tree-sitter AST

DATA PIPELINES & ETL

ETL Ingestion Pipelines Enterprise Data Migration to Azure Source-to-Target Data Mapping 3NF Normalization SQL Reconciliation & Audits pg_dump

DEVELOPER TOOLING

VS Code Extension API Chrome Extension API (Manifest V3) Monorepos (TurboRepo, pnpm) Commander.js CLI NPM Package Publishing

OpenTelemetry Tracing

DEVSECOPS

Keyless OIDC (GCP/AWS) AST Code Analysis GitHub Actions CI/CD Automated Git Mirroring & GCS DR Vaults Health Checks NGINX SSL

Blue-Green Releases

PROFESSIONAL EXPERIENCE

Wysbryx — Senior Software Engineer & Platform Architecture Lead

Oct 2025 - Present Remote

CORE STACK: TypeScript Node.js Next.js 16 PostgreSQL (Drizzle) AWS Lambda S3 Multipart BullMQ Redis 7 GCP OIDC Docker

- Multi-Tenant Architecture & Schema Isolation (Wysbryx LMS):** Architected multi-tenant platform for white-label semiconductor education with a 3-tier hierarchy (Root → Enterprise Client → Sub-Tenant); implemented Next.js reverse-proxy middleware and AsyncLocalStorage executing dynamic SET LOCAL search_path = tenant_{slug} in PostgreSQL via Drizzle ORM, with a sibling database registry (public.tenants) routing enterprise tenants across multi-region RDS instances, isolating **100,000+ users** with zero cross-tenant data leakage, **<35ms p95 query latency**, and **99.95% uptime**.
- Resilient Video Chunk Ingestion & Secure Streaming Pipeline:** Architected large-file lecture delivery pipeline utilizing browser-driven **64MB multipart chunking** and **S3 presigned URLs**, eliminating application server byte-routing and memory exhaustion; built asynchronous **BullMQ** processing workers verifying SHA-256 chunk checksums and metadata before activating assets; delivered **10-minute ephemeral signed GET URLs** with byte-range progressive seeking (**<1.5s TTFF**) and a 15-second heartbeat telemetry beacon tracking learner progress against course completion rules, protected by a fail-open Redis circuit breaker with **99.95% stream playback reliability**.
- Curriculum State Machine & Batch Ingestion:** Built state machine engine managing hierarchical course unlocking (Course → Module → Lesson) based on prerequisite completion DAGs and admin batch overrides; engineered transactional admissions pipeline handling student records, identity document uploads to S3, and batch CSV ingestion into **normalized 3NF relational tables** with rollback safety, processing **50,000+ records per batch** with automated row-count reconciliation and zero record drops.
- Hierarchical RBAC & Proctored Exam Engine:** Refactored authorization using the **Strategy Pattern**, consolidating **950+ scattered permission checks** into **12 canonical roles** across 3 enforcement tiers where child institutes cannot bypass root security policies; integrated proctored exam engine (proctored-exam-engine) with **WebGL2 60 FPS face-tracking**, multi-screen detection, and client-side **AES-GCM encrypted audit payloads** with **<20ms client telemetry latency**.
- Workforce Operations Platform Delivery (TimeTrackPro):** Designed and launched production workforce management SaaS on **Next.js 16 (Turbopack)**, **Neon Serverless PostgreSQL**, NextAuth v5, and AWS SES; implemented automated holiday accrual inheritance engines, stateful manager approval workflows (reducing manual verification cycles by **85%**), and zero-downtime database migration routines.
- Serverless Cloud Infrastructure & DevSecOps (AWS / SST / OIDC):** Modernized production stack to serverless Next.js on **AWS Lambda behind CloudFront** using SST; replaced costly GitHub Actions cron runners with **AWS EventBridge** (saving **730 billed pipeline min/month**); engineered zero-trust CI/CD pipelines with JIT EC2 security group authorization via AWS IAM OIDC and built automated daily multi-cloud repository backup vaults to Google Cloud Storage (**GCS DR Vault**) using **GCP Workload Identity Federation**.

Mockat (Wysbryx Client Engagement) — Lead Modernization & Cloud Infrastructure Engineer

Jan 2026 - Jun 2026 Remote

CORE STACK: PostgreSQL 3NF Drizzle ORM AWS EC2 (NGINX) Docker Jitsi WebRTC OpenReplay Cloudflare SSR SEO

- Database Modernization & Domain Decoupling (Mockat V2):** Led modernization of legacy Hasura/GraphQL backend into a modular **PostgreSQL 3NF architecture** using Drizzle ORM; decoupled **20+ business modules** (assessments, subscriptions, CMS, rulesets), enforced strict foreign-key integrity, and eliminated N+1 query bottlenecks, reducing database query latency by **40%**.
- Database Packaging & Bootstrap Automation (pg_dump Setup):** Built containerized database migration tool packaging **2GB production database dumps (pg_dump)** into Docker images; automated EC2 restore scripts, automated row-count reconciliation checks (**100% table row parity**), and cut developer staging environment bootstrap time from **4 hours to <5 minutes**.
- Real-Time Video Architecture & Telemetry:** Integrated **Jitsi React SDK video conferencing** into assessment workflows, building room lifecycle management and WebRTC connection recovery with **<150ms ICE reconnection**; integrated **OpenReplay** session recording and error telemetry to diagnose client-side network dropouts in real time, reducing support escalation tickets by **60%**.
- SEO Migration Architecture:** Preserved organic traffic and SEO ranking across **632 sitemap URLs** during DNS migration by implementing server-side rendered (SSR) canonical meta tags, OpenGraph previews, and structured JSON-LD schemas, achieving **100% crawl index parity** without search ranking degradation.
- Cost-Effective AWS Infrastructure & Zero-Downtime Releases:** Configured AWS EC2 hosting with NGINX reverse proxy, SSL termination, and automated GitHub Actions blue-green deployments; resolved Node.js OOM crashes on cost-effective t3 instances by provisioning **4GB EBS swapfiles**, setting V8 heap limits (-max-old-space-size=3072), and configuring Cloudflare edge caching, saving **\$1,200+/year** in AWS infrastructure costs.

Davis Index — Full Stack Engineer

May 2024 – Aug 2025 | Remote (USA)

CORE STACK: Python PostgreSQL Azure SQL Azure Blob MongoDB ETL Pipelines ORY Kratos SSO AWS EC2 / S3 Next.js 14

- **Hybrid MongoDB & PostgreSQL Market Data Architecture:** Architected dual-database data layer handling high-frequency market intelligence ticks; ingested streaming commodity feeds into **MongoDB** using compound indexes and optimized aggregation pipelines (`$facet`, `$lookup`), while periodically transforming and syncing normalized financial price records into **PostgreSQL** for relational reporting, cutting query latency by **45%** across **50,000+ daily records**.
- **Enterprise Data Migration & Azure Archival Pipeline:** Architected repeatable multi-stage ETL migration pipelines staging raw enterprise extracts and transforming complex historical entities (effective-dated records, organizational hierarchies, compensation history) into normalized 3NF schemas in **Azure SQL Database**, with binary attachments offloaded to **Azure Blob Storage**; authored **automated SQL reconciliation audits** validating source-to-target row counts, referential integrity, and checksum parity, guaranteeing **100% data fidelity** with zero record drops across **100,000+ synchronized records**.
- **Enterprise SSO & Identity Federation:** Integrated centralized identity infrastructure using Next.js 14 and **ORY Kratos**; implemented OAuth2/OIDC flows, stateless JWT session verification, and custom role-based middleware securing access across **50,000+ enterprise directory records** with **<10ms token validation latency**.
- **Frontend Architecture & AWS Cloud CI/CD Automation:** Decomposed monolithic React application into modular domain components accelerating feature release velocity by **35%**; built end-to-end GitHub Actions deployment pipelines targeting AWS EC2, S3, and CloudFront with automated linting and unit test gates, reducing production release deployment times by **70%** (from 25 min to **7.5 min**).

SELECTED FLAGSHIP ENGINEERING SYSTEMS (DEV-TO-DEPLOY AI, SYSTEMS & DATA)

01 MorphDB — Universal Database Abstraction Layer (NoSQL to SQL Engine)

TypeScript Node.js Visitor Pattern 15 NPM Packages

- Architected and published a **15-package modular NPM ecosystem** (`@morphdb/*`) and CLI tool (`morphdb`) enabling applications to hot-swap between **MongoDB (NoSQL)** and **SQL databases (PostgreSQL, SQLite, Azure SQL)** with zero application code changes; implemented **Adapter and Visitor Design Patterns** for AST query translation with OpenTelemetry tracing (**<4ms overhead**) and automated row-count reconciliation.

02 AegisGuard AI — Autonomous DevSecOps & AI Code Review Platform

Fastify 5 Next.js 15 Gemini 3.7 Flash AWS ECS Fargate

- Architected microservices-based DevSecOps platform analyzing GitHub pull requests for security vulnerabilities, API regressions, and exposed secrets via in-memory AST syntax graphs and **Google Gemini 3.7 Flash**; engineered BullMQ background queues, HMAC webhook verification (**<50ms response**), Redis rate limiters, and automated status gates on **AWS ECS Fargate** (**51/51 automated tests passing**, 99.9% reliability).

03 AI-Ops Assistant — Dev-to-Deploy Multi-Agent AI Studio

Python 3.12 LangGraph DAGs ChromaDB Vector RAG AWS Lambda ECR

- Engineered dev-to-deploy multi-agent studio orchestrating stateful workflows (**Researcher** → **Writer** → **Reviewer**) using **LangGraph cyclic DAGs**, semantic search with **ChromaDB vector RAG**, and containerized FastAPI on **AWS Lambda (Python 3.12 ECR)** with EdgeTTS audio synthesis; implemented checkpointed memory stores and schema validation reducing draft synthesis latency to **<1.2s p90** across **13 passing test suites**.

04 Mivo — Real-Time Multimodal Communication Platform (Live AI Translation)

NestJS 11 WebSockets/WebRTC Gemini 2.5 Flash Redis 7

- Designed **Three-Plane High-Level Architecture (Signaling, Media, Data)** in NestJS 11 and Redis 7 supporting 5 room modes without tearing down user connections; integrated **Google Gemini 2.5 Flash** for live multilingual chat translation with optimized WebRTC SDP negotiation and Redis pub/sub message routing, achieving **sub-85ms audio broadcast latency** across **22 passing test suites**.

05 Knovra — Codebase Intelligence Engine in Rust & Model Context Protocol (MCP)

Rust Tree-sitter AST SQLite / pgvector @knovra/mcp

- Built high-performance code intelligence engine in **Rust** using Tree-sitter AST parsing, generating symbol hierarchies and call graphs in **<200ms** with token-budget compression (**65%+ token reduction** for LLM prompts); engineered deterministic incremental indexing cache serving real-time symbol definitions to AI agents and published official Model Context Protocol (`@knovra/mcp`) server backed by SQLite and pgvector.

06 RepoAtlas & OmniControl — AST Visualizer & Vision AI (VS Code Ecosystem)

VS Code API Chrome MV3 MediaPipe Vision AI 22 Packages

- Authored official `repo-atlas-vscode` (`^1.80.0`) and `omnicontrol-vscode` (`^1.85.0`) extensions with **22 published packages**; implemented AST dependency graph parsers with 13 visual export engines (Mermaid, SVG, JSON), sandboxed IPC rendering **5,000+ dependency nodes** at 60 FPS, and Chrome MV3 Offscreen WebGL MediaPipe vision AI for **60 FPS real-time hand-gesture navigation**.

07 CardioAI — Acoustic Biosignal ML Perception & Clinical Decision Support

PyTorch DSP (Butterworth) ONNX Runtime Wasm Edge AI

- Engineered deep learning perception pipeline in **PyTorch** for phonocardiogram (PCG) acoustic classification across **10,000+ biosignal recordings**, implementing 4th-order Butterworth bandpass filtering (20–2000Hz) and discrete wavelet transforms (DWT); exported quantized models to **ONNX Runtime WebAssembly** for zero-latency client-side inference (**<12ms per cardiac cycle**), achieving **92% diagnostic sensitivity**.

CORE COMPUTER SCIENCE FOUNDATION, TOPICS & SUBJECTS

	Advanced Data Structures & Algorithms	Database Management Systems (DBMS / 3NF & ACID)
CURRICULAR CS SUBJECTS	Operating Systems & Concurrency	Computer Networks (TCP/IP, HTTP/3, TLS)
	Object-Oriented Analysis & Design (OOAD)	
	Distributed Systems Design	Schema Isolation & Multi-Tenancy
ARCHITECTURE & DESIGN	Event-Driven Microservices	
	Design Patterns (Adapter, Strategy, State Machine)	Distributed Caching & Redlock
	Database Partitioning & Read Replicas	
	Keyless Workload Identity (OIDC)	Zero-Trust Principle of Least Privilege
SECURITY & RELIABILITY	Automated Git Mirroring & GCS DR Vaults	Test-Driven Development (TDD / Jest & Vitest)
	Blue-Green Deployment Automation	

PROFESSIONAL FOUNDATION & EARLY CAREER PROGRESSION

Software Engineer Trainee — Crio.Do

Oct 2023 – May 2024

Full-stack MERN (MongoDB schema modeling & aggregations, Express, React, Node.js), SQL migrations, Jest/Mocha (**85%+ coverage**)

Software Engineer — Mindstack Software

Jun 2023 – Oct 2023

React Native, biometric authentication, REST/GraphQL query response tuning (**30% latency cut**)

Software Development Trainee — USM IT Academy

Sep 2022 – Jun 2023

ASP.NET Core (C#) MVC booking platform, SQL Server / MySQL relational schema design, Java Spring Boot REST microservices

EDUCATION & CREDENTIALS

Post Graduate Diploma in Advanced Computing (PG-DAC) — C-DAC Mumbai

2022 – 2023

Bachelor of Engineering (B.E.), Mechanical Engineering — University of Mumbai

2016 – 2020

Full Stack Developer Professional Certification — Crio.Do

2024

Languages: English (Professional Proficiency), Hindi (Native), Marathi (Native), Kannada (Native)

Navi Mumbai, India