

# SULTAN MAHMUD

## Backend Engineer

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### PROFESSIONAL SUMMARY

Backend Engineer specializing in **distributed systems** and high-performance **microservices architecture**. Proven track record of delivering production-grade solutions with measurable impact: **53% reduction** in database overhead, **sub-10ms API latency**, and **95% read-write traffic optimization**. Expert in end-to-end development lifecycle from architecture design to automated **AWS deployments** using Infrastructure as Code. Demonstrated expertise in observability engineering with **OpenTelemetry**, **context propagation**, and **distributed tracing**. Technical writer with published articles on system design and distributed systems architecture.

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### EXPERIENCE

#### BACKEND ENGINEER (Freelance/Contract) | Remote

August 2024 - Present

Providing architecture and development expertise for scalable backend systems and cloud-native applications.

- Architected and delivered 5 production systems across **e-commerce** (2 projects), **FinTech** (1), and **SaaS platforms** (2), managing infrastructure serving 5,000+ combined users with 99.9% uptime using **Python (FastAPI, Django)** and **AWS**.
- Engineered high-concurrency API systems sustaining **1,000+ concurrent** users with **sub-10ms API latency** through Redis caching (**95% hit rate**), **async Python** patterns, and **connection pooling optimization**.
- Implemented **fault-tolerant systems** through strategic implementation of **Redis clustering**, **database replication**, and **automated failover mechanisms**, ensuring **high availability** and **data resilience**.
- Owned full SDLC from architecture design to production deployment: automated infrastructure provisioning of **11+ EC2 instances** across **multi-AZ VPC** using **Pulumi (IaC)** and **Ansible** configuration management, reducing deployment time from 4 hours to 15 minutes with zero-downtime releases via **GitHub Actions CI/CD**.

#### BACKEND DEVELOPER | Cooking Station, Dhaka

June 2024 - August 2024

- Streamlined operations for **200+ users** by designing **role-based admin dashboard** with **real-time meal analytics**, reducing manual subscription **management overhead**
- **Eliminated 40% of manual effort** in account management through **automated balance updates** and **error-prevention systems**
- Built production-ready meal scheduling system using **cron jobs** with configurable time boundaries and daily user listing functionality

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### NOTABLE PROJECTS

#### ULTRA-FAST URL SHORTENER MICROSERVICE | FastAPI Redis PostgreSQL K3s AWS Ansible Opentelemetry

**Challenge:** Design distributed URL shortener with independent service scaling and sub-10ms redirects.

**Impact:** Reduced database load by 53% through connection pooling, achieved cache-first architecture with sub-second response times

#### Technical Achievements:

- **Architected microservices** separating redirect service (read-heavy, **95% traffic**) from create service (write-heavy) with independent scaling capability and service-specific resource allocation
- **Implemented** Redis-first caching with MongoDB fallback and Nginx proxy routing, targeting **sub-10ms** redirect latency
- **Optimized PostgreSQL operations** using atomic key acquisition with **SELECT FOR UPDATE SKIP LOCKED** for race-free distributed key allocation and parameterized bulk inserts
- Implemented **PgBouncer connection pooling**, **circuit breakers**, and **retry mechanisms** ensuring fault tolerance and **53% reduction** in database connection overhead
- Deployed production **K3s cluster** on **AWS** using **Pulumi IaC** and **Ansible** with path-based **Nginx** routing, per-service rate limiting, and **CI/CD** pipeline via **GitHub Actions**
- Implemented **comprehensive observability** with **OpenTelemetry** for distributed tracing and context propagation integrated with **Tempo** for trace storage and **Grafana** for visualization, enabling sub-second debugging of cross-service requests

**Challenge:** Build scalable video streaming with adaptive quality.

**Impact:** 60-80% file size reduction maintaining 85-90% quality, supporting 4K processing

#### Technical Achievements:

- **Architected async video pipeline** processing 10GB+ files using **Celery/Redis** with **FFMPEG** transcoding
  - **Implemented DASH streaming protocol** enabling **real-time quality adaptation** for optimal user experience
  - **Built secure AWS infrastructure** with **S3** integration, automated deployment via **Pulumi IaC** and **Ansible**
  - **Established CI/CD pipeline** with **GitHub Actions** for zero-downtime deployments
  - **Designed RESTful API** with Swagger documentation, rate limiting, and **JWT authentication**
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#### TECHNICAL SKILLS

- **LANGUAGE & FRAMEWORKS:** Python, Golang, JavaScript, **FastAPI**, Django, DjangoREST
  - **CLOUD & INFRASTRUCTURE:** AWS(EC2, S3, VPC), **Docker**, Kubernetes(K3s), Pulumi, Ansible
  - **DEVOPS & CI/CD:** GitHub Actions, Docker Compose, Nginx, Load Balancing
  - **ARCHITECTURE & DESIGN:** Microservices, Distributed Systems, High Availability, Fault Tolerance, Load Balancing, Caching Strategies, Database Optimization
  - **DATABASE & CACHING:** PostgreSQL, Redis, MongoDB, SQLAlchemy, PgBouncer (Connection Pooling), Alembic (Migrations)
  - **API DEVELOPMENT:** Swagger/OpenAPI, RESTful API, Authentication (JWT), Rate Limiting, CORS
  - **MESSAGE QUEUING & ASYNC:** Celery(Worker, Beat, Flower), Redis, RabbitMQ, Async/Await
  - **OBSERVABILITY & MONITORING:** OpenTelemetry (Distributed Tracing), Grafana, Tempo
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#### EDUCATION

##### BACHELOR OF SCIENCE IN COMPUTER SCIENCE & ENGINEERING

Daffodil International University, Dhaka

September 2017 - December 2022

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#### EXTRACURRICULAR ACTIVITIES

##### DATA STRUCTURES & ALGORITHMS PROBLEM SOLVING

- Successfully Solved **500+ Data Structures & Algorithms** Problems On Platforms Like **BeeCrowd**(<https://www.beecrowd.com.br/judge/en/profile/133479>), **LightOJ**(<https://lightoj.com/user/kaziiriad/>), **HackerRank**(<https://www.hackerrank.com/kaziiriad/>), **LeetCode**(<https://leetcode.com/kaziiriad/>).

##### WRITING & BLOGGING

- Published Technical Article On **Medium**: <https://medium.com/@kazisultanmahmud/>
- Maintain A Dedicated Blog On **Quora**(<https://bn.quora.com/profile/Kazi-Sultan-Mahmud-Riad>), Offering Insights And Solutions To Inquiries Spanning Technology, Culinary Arts, And Health In Bengali. Accumulated **Readership** Nearing **200,000** With Nearly **200 Followers**.

##### CONTENT CREATION ON YOUTUBE

- Founded And Managed The Youtube Channel "**I.T. Darshonik**" Producing Over **40 Instructional Videos** In Bengali, Aimed At Bridging The Language Gap In Tech Education.
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#### HONORS & AWARDS

- **DIU TAKE-OFF PROGRAMMING CONTEST, FALL '17**
- **DIU TAKE-OFF PROGRAMMING CONTEST, SPRING '18** (Ranked 6th Out Of 300 Participants)
- **DIU INTRA-UNIVERSITY PROGRAMMING CONTEST, FALL '21**