Scalable Multi-Agent LLMOps System

Leveraging Groq LPU, Tavily Search, LangGraph, FastAPI, Streamlit, SonarQube, Jenkins, and AWS Cloud Deployment

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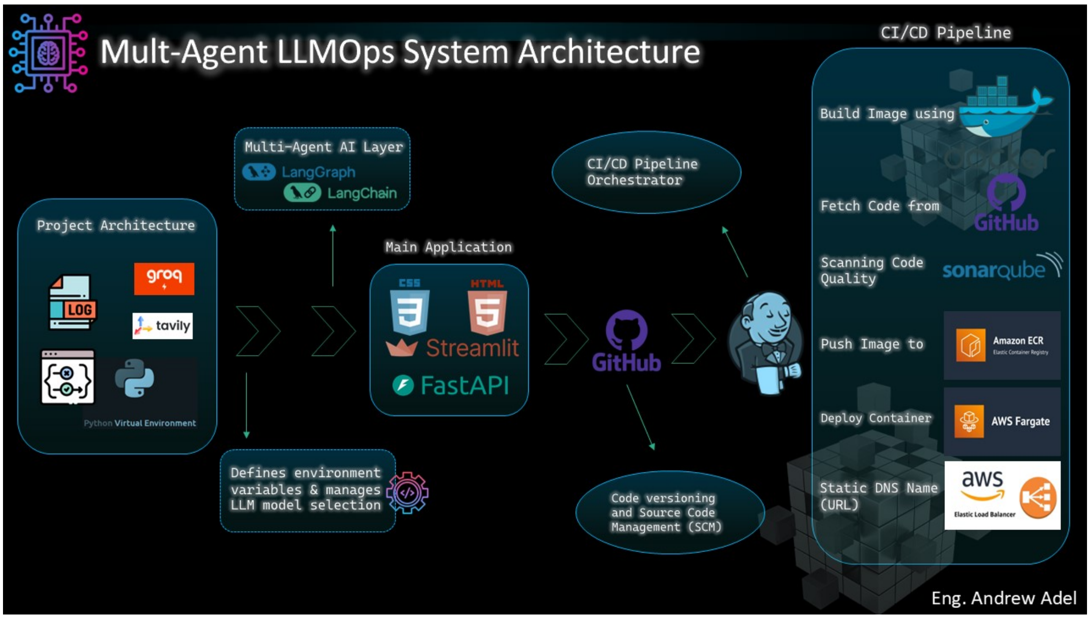
Overview

This project is a production-ready Multi-Agent LLMOps System designed for scalable, automated AI agent deployment and management. It integrates **Groq LPU** for high-speed inference, **Tavily Search** for real-time web reasoning, and **LangGraph** for multi-agent orchestration — all powered by **FastAPI**, **Streamlit**, and a complete **CI/CD pipeline** with **Jenkins**, **SonarQube**, and **AWS Fargate**.

System Architecture



Workflow Summary

1. Agent Development & Core Logic

- Multi-agent orchestration via **LangGraph**.
- Agents perform reasoning and data retrieval using **Tavily API**.
- **Groq LPU** delivers lightning-fast inference and model execution.

2. Service & Interface Layer

- **Backend:** FastAPI exposes RESTful and streaming endpoints.
- **Frontend:** Streamlit dashboard provides real-time interaction and monitoring.

3. CI/CD & Deployment

- Jenkins automates build and deploy pipelines.
- SonarQube ensures code quality with bug and vulnerability scanning.
- Docker containers are built and pushed to AWS ECR.
- AWS Fargate runs the containers serverlessly.
- AWS Load Balancer manages traffic and scalability.

Tech Stack

Category	**Technology**	**Description**
LLM Inference	Groq LPU	Low-latency model inference
Web Search	Tavily API	Real-time knowledge augmentation
Agent Framework	LangGraph + LangChain	Multi-agent orchestration
Backend	FastAPI	High-performance asynchronous API
Frontend	Streamlit	Interactive web dashboard
CI/CD	Jenkins	Continuous integration and delivery
Code Quality	SonarQube	Static code analysis
Containerization	Docker	Environment consistency
Cloud Deployment	AWS ECR + Fargate + Load Balancer	Scalable serverless deployment

Setup Instructions

1. Clone Repository

```
git clone https://github.com/andrew-adel-labib/Scalable-Multi-Agent-LLMOps-System-wit
cd Scalable-Multi-Agent-LLMOps-System-with-Groq-Tavily-LangGraph-FastAPI-Streamlit-CI
```

2. Install Dependencies

```
pip install -r requirements.txt
```

3. Run Application

```
python app/main.py
```

4. Build Docker Image

```
docker build -t multi-agent-llmops .
docker run -p 8000:8000 multi-agent-llmops
```

5. Deploy via Jenkins → AWS

- Fetch latest code from GitHub
- Run SonarQube quality scan
- Build and tag Docker image
- Push image to AWS ECR
- Deploy on AWS Fargate
- Integrate with AWS Load Balancer

Monitoring & Reporting

SonarQube Dashboard: http://172.25.167.174:9000/dashboard?id=Multi-Agent-LLMOps Reports on bugs, code smells, vulnerabilities, and maintainability.

Example Use Cases

- Multi-agent web research and summarization
- Code generation and validation with Groq inference
- Knowledge-augmented reasoning using Tavily API
- Automated LLMOps pipelines with CI/CD and quality gates