

# Notes API (Knowledge API) - FastAPI Architecture

The **Notes API (Knowledge API)** can also be implemented using **FastAPI** instead of Django. FastAPI is an asynchronous, modern Python web framework that offers high performance, automatic docs generation, and excellent developer productivity. This document summarizes the revised stack, features, and architecture when using FastAPI.

## ■ Core Features

- User Management with JWT authentication (using fastapi-users or custom logic).
- Notes Management: CRUD operations with SQLAlchemy ORM.
- Search functionality (Postgres full-text search, extensible to Elasticsearch).
- Sharing & Collaboration: user-to-user sharing, role-based permissions.
- Analytics endpoints for activity, usage, and tags.
- File handling via S3 presigned URLs.

## ■ Extra Features & System Design

- Async background tasks using Celery + Redis or FastAPI BackgroundTasks.
- Rate limiting with FastAPI middleware (slowapi).
- Caching with Redis.
- Cursor-based pagination with fastapi-pagination.
- API versioning and automatic docs (Swagger/OpenAPI built-in).

## ■ Tech Stack (FastAPI)

- Framework: FastAPI (async-first, modern Python).
- Database: PostgreSQL with SQLAlchemy + Alembic migrations.
- Async ORM: SQLModel or SQLAlchemy 2.0 with asyncio.
- Auth: JWT tokens (using fastapi-jwt-auth or fastapi-users).
- Async tasks: Celery + Redis or FastAPI BackgroundTasks.
- Containerization: Docker + Docker Compose.
- Code quality: pydantic, black, ruff, mypy, pytest.

## ■■ Cloud Infrastructure (AWS Example)

- EC2 Instances: Run FastAPI with Uvicorn/Gunicorn workers inside Docker containers. - Application Load Balancer: HTTPS termination and load balancing. - RDS (PostgreSQL): Managed database with Multi-AZ replication. - ElastiCache (Redis): For caching, sessions, and background jobs. - S3: File storage (attachments, backups) with presigned URLs. - CloudWatch & Prometheus: Monitoring and observability.

## ■ Future Extensions

- Elasticsearch for advanced search capabilities.
- Collaborative editing with WebSockets (FastAPI has native support).
- GraphQL endpoints with Strawberry/FastAPI integration.
- OAuth login with Google, GitHub, etc.
- Multi-tenant support for enterprise usage.
- CI/CD pipelines with GitHub Actions + AWS ECS/EKS.