

## Project Design Phase-II Technology Stack (Architecture & Stack)

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|---------------|---|
| Date          | 27 June2025   |
| Team ID       | LTVIP2025TMID32116  |
| Project Name  | EduTutor AI: Personalized Learning with Generative AI and LMS Integration |
| Maximum Marks | 4 Marks   |

### Technical Architecture:

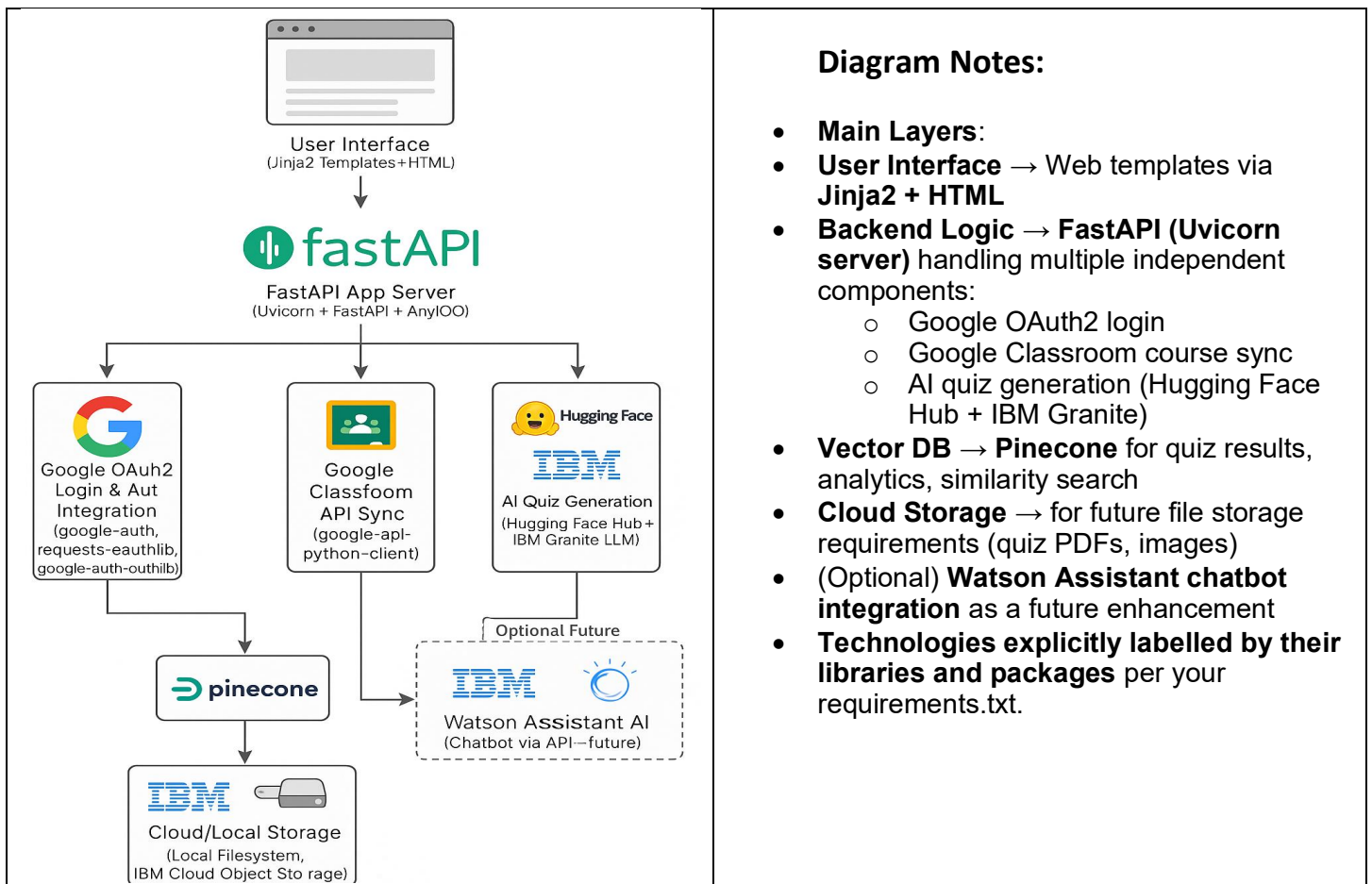


Table 1: System Components:

| S. No | Component                       | Description  | Technology   |
|-------|---------------------------------|--|--|
| 1.    | User Interface                  | Web UI where students and educators interact with the platform           | <b>HTML, CSS, Jinja2 Templates</b> (via FastAPI templates/)    |
| 2.    | Application Logic-1             | Business logic for user registration, login, quiz management, dashboards | Python (FastAPI, Uvicorn, AnyIO, HTTPX)                        |
| 3.    | Application Logic-2             | AI quiz generation and adaptive diagnostic assessment                    | Huggingface Hub, IBM Watsonx Granite LLM (via API client)      |
| 4.    | Application Logic-3             | AI chatbot assistant for support   | (Optional extension — if integrating IBM Watson Assistant)     |
| 5.    | Database                        | Local / cloud-hosted database for user data, quiz results, analytics     | Pinecone (vector database via pinecone-client)                 |
| 6.    | Cloud Database                  | Cloud-hosted document storage database for persistent data               | aws  |
| 7.    | File Storage                    | Storing OAuth secrets, logs, generated quiz PDFs etc.                    | Local Filesystem   |
| 8.    | External API-1                  | Integration with Google Classroom for syncing course data                | google-api-python-client, google-auth, google-auth-oauthlib    |
| 9.    | External API-2                  | Google OAuth2 for secure user login                                      | google-auth, google-auth-oauthlib, requests-oauthlib           |
| 10.   | Machine Learning Model          | Adaptive quiz generation and diagnostic assessments                      | IBM Granite LLM via Huggingface Hub API                        |
| 11.   | Infrastructure (Server / Cloud) | Application deployment environment                                       | Local: Uvicorn ASGI server / Future: Docker & Kubernetes ready |

Table-2: Application Characteristics:

| S.No | Characteristics        | Description                     | Technology                |
|------|------------------------|---------------------------------|---------------------------|
| 1.   | Open-Source Frameworks | FastAPI for backend, Jinja2 for | FastAPI, Uvicorn, Jinja2, |

|    |                          |  |   |
|----|--------------------------|--|---|
|    |                          | templates, Uvicorn for ASGI server, HuggingFace Hub client, Pinecone                                       | Huggingface Hub, Pinecone-client                                    |
| 2. | Security Implementations | Google OAuth 2.0, HTTPS, JWT session handling, environment-secured secrets via .env, OAuth client JSON     | google-auth, google-auth-oauthlib, python-dotenv, requests-oauthlib |
| 3. | Scalable Architecture    | Microservices-ready modular structure, API-first architecture via FastAPI, external AI and DB services     | FastAPI Microservices, Pinecone Cloud, Huggingface Hub API          |
| 4. | Availability             | Uvicorn with multi-worker support, scalable via Docker or Kubernetes deployment options                    | Uvicorn, Docker, Kubernetes (planned)                               |
| 5. | Performance              | Async API handling with FastAPI, Uvicorn workers, HTTPX for async external requests, caching options ready | FastAPI Async, Uvicorn, HTTPX, AnyIO, optional Redis                |



User Interface  
(Jinja2 Templates+HTML)



FastAPI App Server  
(Uvicorn + FastAPI + AnyIO)



Google OAuth2  
Login & Auth  
Integration  
(google-auth,  
requests-oauthlib,  
google-auth-oauthlib)



Google  
Classroom  
API Sync  
(google-api-  
python-client)



Hugging Face



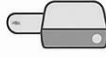
AI Quiz Generation  
(Hugging Face Hub +  
IBM Granite LLM)



Optional Future



Watson Assistant AI  
(Chatbot via API—future)



Cloud/Local Storage  
(Local Filesystem,  
IBM Cloud Object Storage)