Project Design Phase – II : **Technology Stack (Architecture & Stack)**

# Table-1: Application Components

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| --- | --- | --- | --- |
| S.No | Component | Description | Technology |
| 1 | User Interface | How user interacts with application e.g. Web UI, Mobile App, Chatbot etc. | HTML, CSS, JavaScript, Streamlit |
| 2 | Application Logic-1 | Logic for user registration, quiz creation, and dashboard logic | Python |
| 3 | Application Logic-2 | Speech-to-text conversion for oral quiz inputs | IBM Watson STT service |
| 4 | Application Logic-3 | Handling user queries via chatbot | IBM Watson Assistant |
| 5 | Database | Stores user data, quiz questions, scores, performance | MySQL / SQLite (local) |
| 6 | Cloud Database | Stores scalable user and quiz data on cloud | IBM Cloudant |
| 7 | File Storage | Stores performance reports and logs | IBM Cloud Object Storage / Local Filesystem |
| 8 | External API-1 | Optional use of contextual APIs for quiz relevance | IBM Weather API |
| 9 | External API-2 | Optional verification or profile fetch via Indian ID | Aadhar API |
| 10 | Machine Learning Model | Performance prediction and adaptive difficulty adjustment | Scikit-learn / TensorFlow |
| 11 | Infrastructure (Server / Cloud) | Deployed via local testing and scalable cloud environment | Local, IBM Cloud Foundry / Kubernetes |

# Table-2: Application Characteristics

|  |  |  |
| --- | --- | --- |
| S.No | Characteristics | Description / Technology Used |
| 1 | Open-Source Frameworks | Streamlit, Flask, Scikit-learn, TensorFlow (all Python-based) |
| 2 | Security Implementations | IAM roles, SHA-256 password hashing, HTTPS, OWASP Secure Headers |
| 3 | Scalable Architecture | Microservices & Modular 3-tier architecture using REST APIs and cloud functions |
| 4 | Availability | Cloud deployment with IBM Cloud Load Balancer and distributed microservices |
| 5 | Performance | Optimized quiz serving, Redis cache, pre-fetched user data, IBM CDN |

Technical Architecture

