Presentation Layer

Technical tools : HTML/CSS/Javascript

Learner Interface

- Adaptive Dashboard - self centered dashboard, score widget, learning path)
- Learning Content
- Assessment/ Quiz interface
- Test Results/Rewards
- Profile
- Settings

Admin Interface

- Content management
- User & Course management
- Assessment Generation (optional)
- User Progress Reports
- Active users
- Leaderboard of users progress
- Content Performance visualization

Guardian Interface

- Guardian Dashboard
- Performance Analytics
- Sentiment analysis feedback
- Alert System

Application Layer

Technical tools : Java (Spring Boot)

User & Course Management

- Handles Logins and Registrations and role checks.
- Assigning courses and domains to learner.
- Handling user profile updates and Guardian linkage

Learning Content

- Fetch content (Text, Videos, PDFs based on preferred format and difficulty.

Adaptive Learning

- Calculates scores for a user/topics based on logs.
- Recommend the next best piece of content or assessment for the user.
- Calculate the self-centric rank for the dashboard leaderboard.

Assessment & Evaluation

- Sends structured prompt to the external AI Service Client (using Web Client) to generate tests.
- Instantly scores MCQs and send subjective answers to the AI service for semantic grading.
- Saves final test results and generates progress logs.

Guardian Module

- Calls Adaptive learning class and assessment class to compile the specific dashboards and analytics required by Guardians.
- Alerts such as student score drop below certain score or leaderboard updating or student absence.

Data Access Layer

Technical tools : Spring Data MongoDB, MongoDB Java Driver, Domain Entity

User & Management

- CRUD operations on User Documents
- Finding users by email for login
- Finding linked Learners for a Guardian.

Learning Content

- CRUD operations on Content documents.
- Finding content by Topic tag and difficulty.

Adaptive & Progress

- Saving all interaction records.
- Querying detailed logs by user id, topic and timestamp (KT algorithm).

Assessment Evaluation

- Saving and retrieving generated Assessment documents.
- Saving final test result document after submission.