Project Design Phase

Solution Architecture

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Team ID : LTVIP2025TMID33417

Project Name : Personalized Learning with Generative AI and LMS Integration

Solution Architecture Overview:

This architecture outlines a Personalized Learning System that integrates Generative AI with existing LMS platforms. The system delivers adaptive content, quizzes, and learning recommendations in real time. It minimizes manual content creation for educators while improving learner engagement through AI-driven personalization.

Architecture Components:

Component Description

User Interface Web and mobile LMS dashboards where learners access personalized content and assessments. Educators can review progress and manage AI recommendations.

Input Module Collects learner data such as quiz results, learning pace, content interactions, and preferences. Data is captured via LMS activity logs and feedback forms.

Preprocessing Layer Cleans and structures user data for AI processing. This includes anonymizing data, normalizing learning metrics, and mapping content interaction patterns.

Generative AI Engine Uses Large Language Models (LLMs) to generate personalized quizzes, content summaries, learning path adjustments, and interactive simulations. Can be fine-tuned for specific subjects or languages.

Adaptive Learning Model Analyzes learner profiles and dynamically adjusts content difficulty, sequencing, and delivery mode (text, video, interactive tasks).

Database Stores learner profiles, AI-generated content, assessments, and progress data. Supports both local storage (MySQL/PostgreSQL) and cloud databases (AWS RDS, Azure SQL).

Result Viewer & Feedback Loop Displays AI-generated content to learners. Collects real-time feedback to refine personalization. Educators can view learning analytics dashboards.

APIs & Integration Layer Connects with popular LMS platforms (Moodle, Blackboard, Canvas, etc.) via LTI or REST APIs to enable seamless integration.

Optional Cloud Sync Syncs learning analytics and AI model updates with cloud platforms for centralized management and insights (AWS, IBM Cloud, Azure).

Deployment Options:

**Cloud-based Deployment**: For large institutions needing scalability and remote access.

**On-Premise/Edge Deployment**: For schools or enterprises with data privacy concerns or limited internet connectivity.

**Hybrid Deployment**: Combines local data processing with cloud-based AI model updates.

*Example – Solution Architecture Diagram*

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| User Interface |

| (Web/Mobile LMS UI)|

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| Input Module |

| (Learner Data In) |

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| Preprocessing |

| (Data Cleaning & |

| Normalization) |

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| Generative AI | <-----> | Adaptive Model |

| (Quiz/Content Gen)| | (Personalization|

+-------------------+ | Engine) |

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| Database |

| (Profiles, Content)|

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| Result Viewer & |

| Feedback Loop |

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| APIs & LMS |

| Integration Layer |

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Technology Stack Examples:

Component Technology

Generative AI OpenAI GPT, Llama, Gemini, Azure OpenAI

LMS Integration LTI Standard, REST APIs

Data Storage PostgreSQL, AWS RDS, Azure SQL

Cloud Platforms AWS, Azure, IBM Cloud

Deployment Docker, Kubernetes, Edge Devices for local processing