Marwadi University Marwadi Chandarana Group NAAC A+	**Marwadi University** **Faculty of Engineering & Technology** **Department of Information and Communication Technology**	
Subject: CP (01CT0715)	**Aim: System Design and Architecture**	
	Date:	**Enrollment No: 92200133036**

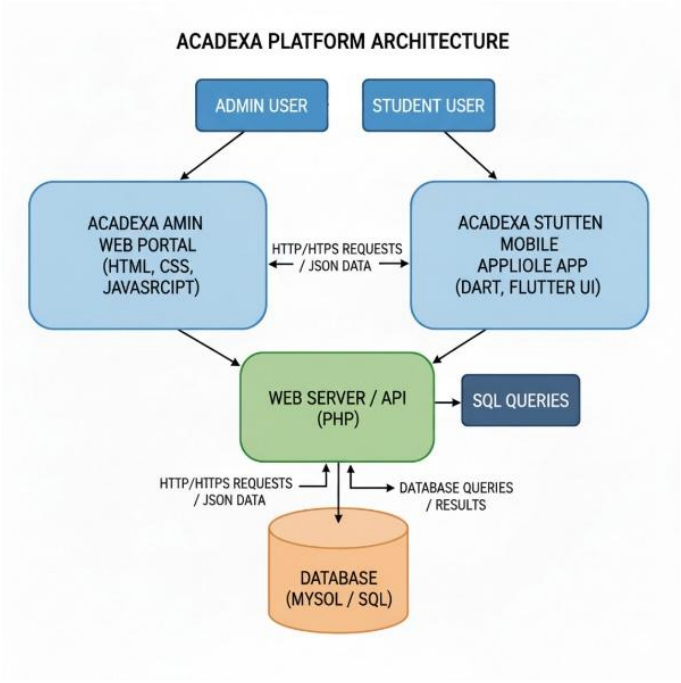
1. Introduction

The proposed system consists of two main components: a Web Application for administrators and a Mobile Application for students. The admin portal enables class creation, attendance management, inquiry handling, and reporting, while the student-facing mobile app allows learners to access attendance records, view inquiries, and receive notifications.

2. Modular Design

The system is divided into distinct modules, each serving a specific function:

1. **Admin Web Application (Frontend)**
   - Used by administrators for managing classes, students, and attendance.
   - Provides dashboards and reporting features.
2. **Student Mobile Application (Frontend)**
   - Built using Flutter for cross-platform support (Android & iOS).
   - Students can log in, view attendance, and track their marks and fees record.
3. **Backend Layer**
   - Handles business logic and API endpoints.
   - Processes admin requests and student queries.
4. **Database Layer**
   - Centralized SQL database storing class, student, inquiry, and attendance records.
   - Ensures data consistency across web and mobile platforms.
5. **Reporting & Analytics Module**
   - Generates charts and reports for inquiries, attendance, and student progress.



3. Technology Stack

1. **Frontend (Admin Web Application):**
   - **Technologies:** HTML, CSS, JavaScript.
   - **Reasoning:** Easy to maintain, widely supported, and efficient for dashboards.
2. **Frontend (Student Mobile App):**
   - **Technology:** Flutter.
   - **Reasoning:** Single codebase for Android and iOS, faster development, and strong UI capabilities.
3. **Backend Layer:**
   - **Technology:** PHP
   - **Reasoning:** Supports REST APIs, lightweight, handles concurrent requests efficiently.
4. **Database Layer:**
   - **Technology:** MySQL.
   - **Reasoning:** Relational structure fits student/class data, reliable for transactional queries, widely documented.
5. **Authentication:**
   - **Option 1:** Custom SQL-based authentication.
   - **Reasoning:** Ensures secure login and scalability with multiple user roles.

4. Scalability Plan

To accommodate growth in users and data, the system includes scalability strategies:

- **Application Layer Scaling:**
  Deploy backend as microservices, use load balancers, and support containerization (Docker, Kubernetes).
- **Database Scaling:**
  - Use replication to handle read-heavy loads.
  - Sharding to split large datasets.
  - Indexing and caching (Redis) to reduce query response times.
- **API Performance:**
  REST APIs designed stateless for easy scaling across multiple servers.
- **Reliability & Fault Tolerance:**
  - Regular backups and replication for disaster recovery.
  - Failover servers to ensure uptime.
- **Cost Considerations:**
  Begin with on-premise/local hosting (XAMPP) for development, then migrate to cloud when usage increases.

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5. Conclusion

The proposed architecture is **modular, robust, and scalable**. By separating the system into web, mobile, backend, and database layers, maintainability and reusability are ensured. The chosen technology stack (Flutter, Node.js/PHP, MySQL) is widely adopted and reliable for educational systems. Scalability planning with cloud deployment, caching, and database optimization addresses potential bottlenecks, ensuring the system can grow with future requirements.