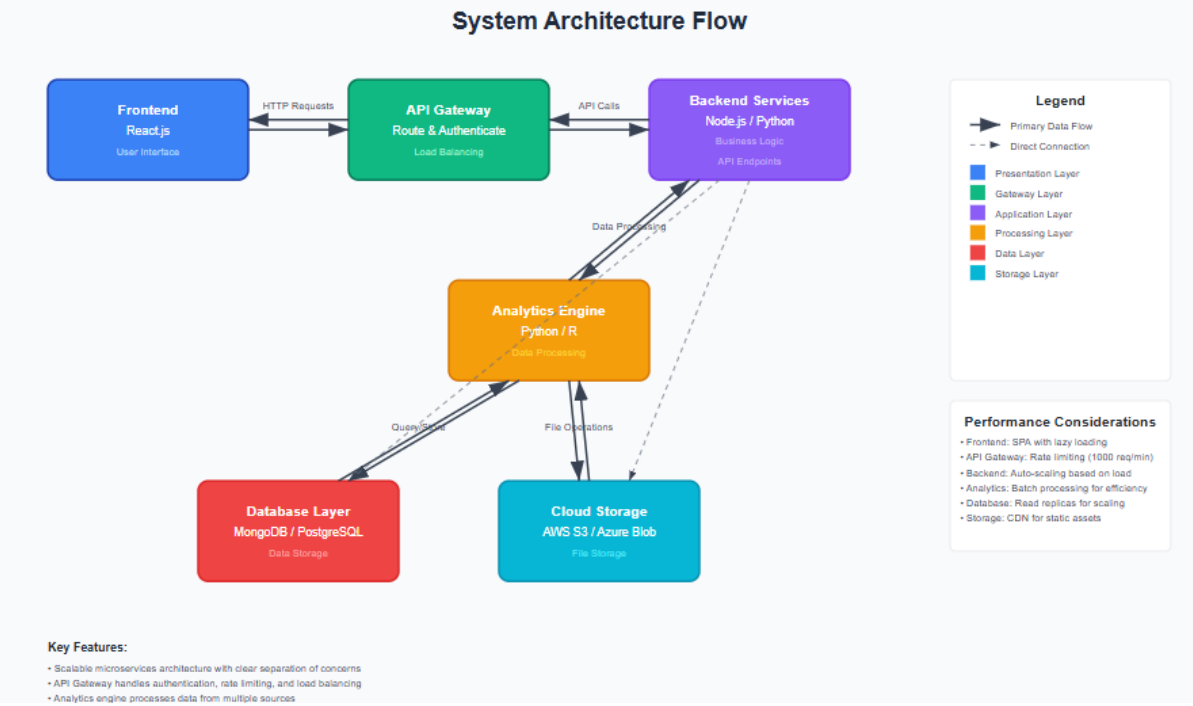
Project Design Phase-II
Technology Stack (Architecture & Stack)

Date	26 June 2025
Team ID	LTVIP2025TMID50379
Project Name	Visualization tool for electric vehicle charge and range analysis
Maximum Marks	4 Marks

Technical Architecture:



Example: PDF Intelligence Processing Pipeline

Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	Interactive dashboard for EV data visualization, responsive web application with real-time charts	React.js, HTML5, CSS3, Tailwind CSS, Recharts Library
2.	Application Logic-1	User authentication, session management, and authorization services	Node.js with Express.js, JWT tokens, bcrypt
3.	Application Logic-2	Data processing engine for CSV/Excel parsing and validation	Python with Pandas, NumPy, Papa Parse
4.	Application Logic-3	Analytics engine for statistical analysis and machine learning insights	Python with Scikit-learn, TensorFlow, R
5.	Database	Primary database for user data, processed datasets, and analytics results	PostgreSQL for structured data, MongoDB for flexible schemas

6.	Cloud Database	Managed database services with automatic scaling and backup	AWS RDS (PostgreSQL), MongoDB Atlas
7.	File Storage	Secure storage for uploaded datasets, generated reports, and cached visualizations	AWS S3, Azure Blob Storage, CDN integration
8.	External API-1	Government EV data APIs for real-time market information	Ministry of Road Transport APIs, NITI Aayog Data
9.	External API-2	Geographic and mapping services for location-based analysis	Google Maps API, OpenStreetMap API
10.	Machine Learning Model	Predictive models for EV market trends, range optimization, and efficiency analysis	Regression models, Time series forecasting, Clustering algorithms
11.	Infrastructure (Server / Cloud)	**Local Configuration:** Docker containers, Node.js server, PostgreSQL database **Cloud Configuration:** AWS EC2/ECS, Load Balancer, Auto-scaling groups	Docker, Kubernetes, AWS/Azure, Nginx, CI/CD pipelines

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Utilizing community-driven frameworks for rapid development and cost efficiency	React.js, Node.js, Express.js, PostgreSQL, Python libraries (Pandas, NumPy)
2.	Security Implementations	Multi-layered security with encryption, access controls, and data protection	JWT authentication, bcrypt password hashing, HTTPS/TLS, OWASP security guidelines, CORS protection
3.	Scalable Architecture	Microservices architecture with horizontal scaling capabilities and load distribution	Docker containerization, Kubernetes orchestration, API Gateway pattern, Database sharding
4.	Availability	High availability design with redundancy and failover mechanisms	Load balancers (AWS ALB), Multi-AZ deployment, Database replication, CDN (CloudFront)
5.	Performance	Optimized for fast data processing and real-time visualization rendering	Redis caching, Database indexing, Lazy loading, Code splitting, Compression algorithms