

Project Design Phase Solution Architecture

Date	19-may-2025 To 30- June- 2025
Team ID	LTVIP2025TMID49768
Project Name	ShopSmart: Your Digital Grocery Store Experience
Maximum Marks	4 Marks

Solution Architecture:

The solution architecture for ShopSmart, an online smart- cart grocery platform, starts with multi- channel user interfaces built as a responsive React web app and a Flutter mobile app. All client requests first pass through a CloudFront CDN and an API Gateway that handles routing, rate limiting, and authentication via JWT/OAuth 2.0.

Behind the gateway, a set of stateless microservices—deployed in Docker containers on Kubernetes—manage core domains:

- Catalog Service (product, pricing, inventory)
- Cart & Checkout Service (shopping cart persistence, promotions, coupons)
- Order Service (order orchestration and status tracking)
- Payment Service (PCI- compliant integration with Stripe/Razorpay)
- User Service (profiles, addresses, preferences)
- Recommendation Service (AI/ML model for personalized suggestions)
- Notification Service (email/SMS/push via Twilio & Firebase)

Data is stored in a polyglot persistence layer: a PostgreSQL cluster for transactional data, Redis for session/cache, and Elasticsearch for product search. Inventory updates from partner stores feed into Kafka topics that fan- out to Catalog and Recommendation services in real time.

Orders are dispatched via an Integration Layer that exposes REST/GraphQL endpoints to third- party delivery partners (Dunzo/Swiggy, etc.). Event sourcing through Kafka ensures eventual consistency and auditability across services. Real- time dashboards (Grafana + Prometheus) monitor KPIs such as cart- to- checkout conversion, stockouts, and latency.

All services are packaged into CI/CD pipelines (GitHub Actions → ArgoCD) with automated testing and blue- green deployments to minimize downtime. The platform is container- agnostic, allowing horizontal scaling across regions to support peak demand.

Example – Solution Architecture Diagram:

[Insert layered diagram showing: UI → CDN/API Gateway → Microservices (Catalog, Cart, Order, Payment, User, Recommendation, Notification) → Databases (PostgreSQL, Redis, Elasticsearch) → Message Bus (Kafka) → External Delivery APIs]

