**Project Design Phase**

**Solution Architecture**

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| Date | 26 June 2025 |
| Team ID | LTVIP2025TMID52193 |
| Project Name | Cosmetic Insights : Navigating Cosmetics Trends and Consumer Insights with Tableau |
| Maximum Marks | 4 Marks |

**Solution Architecture:**

**1. User Interface Layer**

* Platforms:
  + Web (React.js)
  + Mobile (Flutter or React Native for future expansion)
* Features:
  + Interactive dashboards (embedded Tableau views)
  + Filters for product categories, regions, timeframes
  + User login/profile for saved views and preferences
  + Export/share insights functionality
* Interaction:
* RESTful API calls to backend services for data queries and user management
* Tableau JavaScript API for embedding and interaction

**2. Application Layer**

* Backend Framework:
  + Node.js / Django (for API orchestration and business logic)
* Microservices:
* Trend Analysis Service: Aggregates and analyzes product and market trends
* Sentiment & Review Service: Processes customer feedback and social media sentiment
* User Management & Authentication: Handles login, roles, and preferences
* Data Aggregation Service: Interfaces with external APIs and internal data sources

**3. Data Layer**

* Databases:
  + Relational: PostgreSQL for user data, dashboard configurations
  + NoSQL: MongoDB for unstructured data like reviews and social media content
* External APIs:
* Social Media APIs (Instagram, TikTok, Twitter)
* E-commerce APIs (Amazon, Sephora, Nykaa)
* Public datasets (Statista, census data, beauty trend reports)

**4. Analytics & Intelligence**

* Tools:
  + Tableau for data visualization and dashboarding
* ML Models:
  + Trend forecasting (e.g., ingredient popularity)
  + Customer segmentation and clustering
  + Sentiment analysis using NLP (spaCy, NLTK, or Hugging Face)
* ETL Pipeline:
* Apache Airflow for scheduled data ingestion, transformation, and loading into the warehouse

**5. Infrastructure Layer**

* Cloud Provider:
  + AWS / Azure / Google Cloud Platform
* Components:
* Load Balancer (AWS ELB / Azure Front Door)
* Auto-scaling groups for microservices
* CDN (Cloudflare or AWS CloudFront)
* CI/CD (GitHub Actions / Jenkins)
* Containerization (Docker + Kubernetes for orchestration)

**6. Security & Compliance**

* Security Protocols:
  + HTTPS, OAuth 2.0, JWT for secure access
  + IAM roles and RBAC for data access control
  + Data encryption at rest (AES-256) and in transit (TLS 1.2+)
* Compliance:
* GDPR, CCPA, and other regional data privacy regulations
* Audit logging and user consent tracking