PLANNING THE TECHNICAL FOUNDATION

Day 2 Activities:

Transitioning to Technical Planning.

Overview

This document outlines the technical plan for developing an e-commerce marketplace to empower small businesses and individuals by providing a platform to sell their products online. The technical planning follows the brainstorming from Hackathon Day1 and incorporates the recommendations from the Day 2 guidelines.

Key Technologies

- **Frontend: Next.js**
- **Content Management System (CMS): Sanity**
- **Order Tracking and Shipment: ShipEngine • Database: MongoDB (for authentication)**
- **Hosting and Deployment: Vercel (for frontend) and AWS (for backend)**
- **Payment Gateway: Stripe**

Technical Architecture

System Overview

1. Frontend (Next.js):

a. Client-side rendering for speed and responsiveness.

b. Server-side rendering for SEO and product page preloading.

c. Integration with Sanity CMS for dynamic content.

2. Backend:

a. REST APIs to manage users, products, orders, and delivery zones.

b. Handles business logic, data validation, and integration with external services.

3. Database (MongoDB):

a. NoSQL database to manage flexible and scalable data structures.

b. Collections for products, orders, customers, delivery zones, and user authentication.

4. CMS (Sanity):

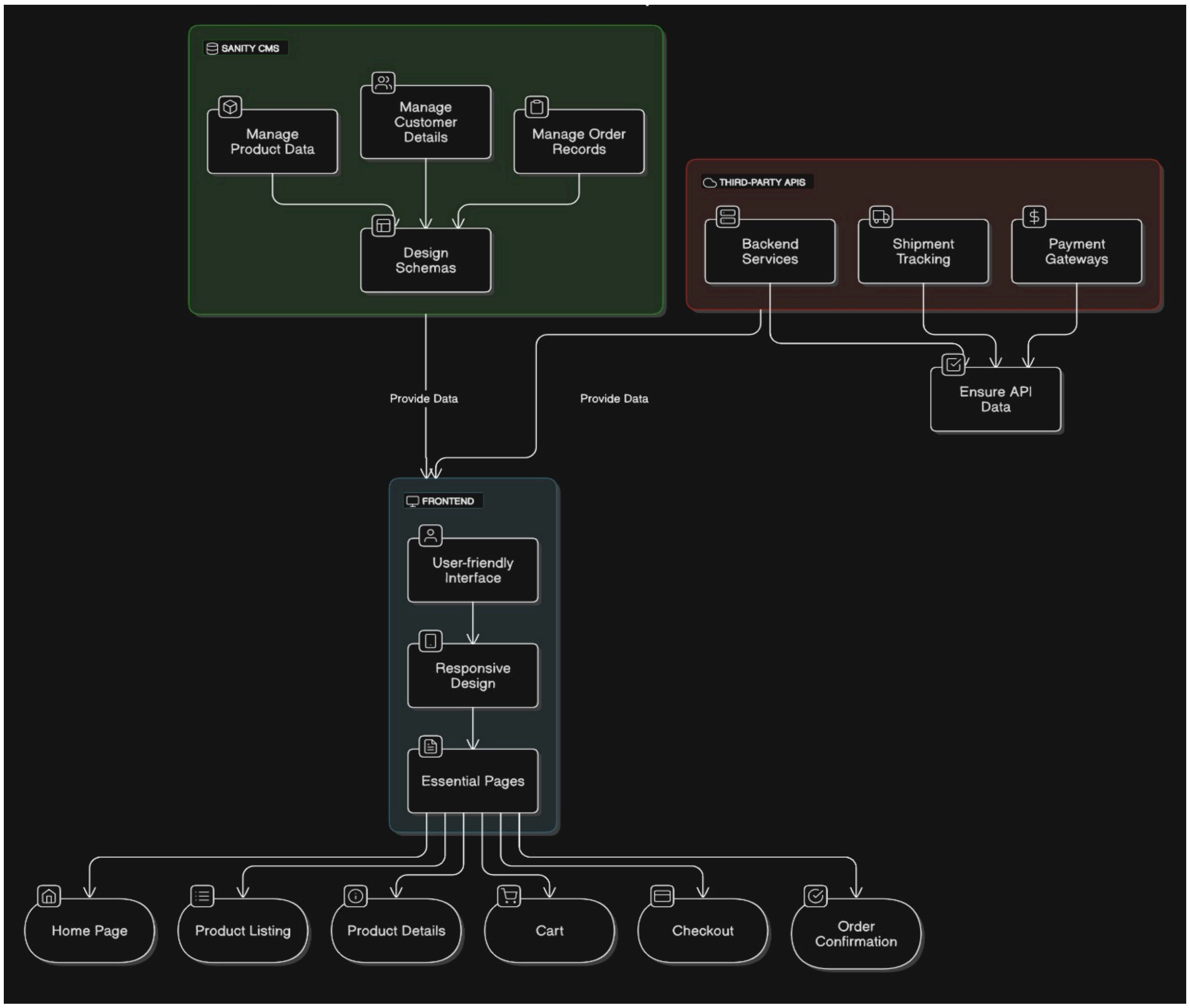
a. Manages dynamic content like banners, featured products, and blog posts.

5. Order Tracking (ShipEngine):

a. Tracks orders in real time.

b. Manages shipment and delivery updates.

System Architecture



System Components and Workflow

1. User Signup/Login:

a. Input: User credentials (email, password).

b. Database: MongoDB for storing user data securely with hashed passwords.

c. API Endpoint: POST /register, POST /login, and

GET/verify-route for handling user authentication and verification.

d. Outcome: JWT token issued for session management.

2. Content Management (Sanity CMS):

a. Admin Role: Manages product listings, banners, and blog content.

b. API Integration: GROQ Qeries to fetch content dynamically for frontend.

c. Outcome: Content stored and updated in Sanity is rendered seamlessly on the
Next.js frontend.

3. Product Browsing and Checkout:

a. Frontend: Next.js provides server-side rendering for product pages.

b. Database: MongoDB stores product details (name, price, stock, description, sizes, etc.).

c. API Endpoint: GET /products for listing, GET /products/:id for details, and
POST/products to add products (admin/seller role only).

d. Outcome: Users browse, add products to cart, and proceed to checkout.

4. Order Management:

a. Database: MongoDB stores order data (customer ID, product ID, quantity, status).

b. API Endpoint: POST/orders to create orders (status defaults to "Pending").

c. Outcome: Order information processed and stored for tracking.

Note: Orders cannot be edited once created.

5. Shipment Tracking (ShipEngine):

a. Integration: ShipEngine API for real-time shipment tracking.

b. API Endpoint: GET /shipments/:orderId to fetch delivery status.

c. Outcome: Users receive real-time updates on their order delivery.

6. Payment Processing (Stripe, Jazz Cash, EasyPaisa, Kuickpay):

a. Integration: Secure payment processing with multiple gateways.

b. API Endpoint: Payment-related endpoints for handling transactions, including the Cash on Delivery (COD) option.

c. Outcome: Orders processed only after successful payment confirmation or COD selection

API Endpoints

User Management

- POST /api/auth/register: Register a new user.
- POST /api/auth/login: User login.
- GET /api/users/profile: Fetch user profile (requires authentication).
- PUT /api/users/update: Update user details.

Product Management

- GET /api/products: List all products.
- GET /api/products/:id: Fetch product details by ID
- POST /api/products: Add a new product (requires seller role).
- PUT /api/products/:id: Update product details (requires seller role).
- DELETE /api/products/:id: Delete a product (requires seller role).

Order Management

- POST /api/orders: Create a new order.
- GET /api/orders: List all orders for the authenticated user.
- GET /api/orders/:id: Fetch details of a specific order.

Category Management

- GET /api/categories: List all categories.
- POST /api/categories: Add a new category (requires admin role).
- PUT /api/categories/:id: Update category details (requires admin role).

• DELETE /api/categories/:id: Delete a category (requires admin role).

Payment Management

• POST /api/payments: Initiate a payment.

• GET /api/payments/status: Fetch payment status. Shipment Management

• POST /api/shipments: Create a new shipment.

• GET /api/shipments/track: Track shipment status.

Component Details and Interactions

• **Frontend (Next.js) :**

- Handles user interactions and renders data fetched via APIs.
- Communicates with the backend for authentication, product data, and order processing.

• **Backend APIs:**

- RESTful endpoints for CRUD operations on users, products, orders, and shipment data.

• Integrated with ShipEngine and multiple payment gateways for third-party functionality.

• **Database (MongoDB):**

- Stores user, product, and order data.
- Provides scalable and flexible schema designs for rapid iteration.

• **Sanity CMS:**

- Manages dynamic content, ensuring marketing and product information stays up-to-date.

Data Schema Updates

Users:

• **user_id:** Unique identifier for the user.

• **username:** user's full name.

• **email:** User's email address.

• **password_hash:** Encrypted password.

- **role:** role of the user (admin, seller, customer).
- **order_ids:** List of IDs referencing the user’s orders.
- **product_ids:** List of IDs referencing products added by the user (if seller).

Products:

- **product_id:** Unique identifier for the product.
- **name:** Name of the product.
- **price:** Rental cost per day/hour.
- **stock:** Availability status of the product.
- **description:** Detailed description of the product.
- **image_url:** URL of the product image.
- **sizes (optional):** Available sizes for the product.
- **user_id (mandatory):** ID of the seller who listed the product.

Orders:

- **order_id:** Unique identifier for the order.
- **customer_id:** Reference to the customer placing the order.
- **product_id:** Reference to the rented product.
- **quantity:** Number of products rented.
- **status:** Current status (e.g., Pending, Confirmed, Completed).
- **order_date:** Timestamp of when the order was placed.

Delivery Zones:

- **zone_id:** Unique identifier for the delivery zone.
- **zone_name:** Name of the delivery area.
- **coverage_area:** Geographic coverage of the delivery zone.

- **drivers:** List of drivers assigned to the zone.

Sellers:

- **seller_id:** Unique identifier for the seller.
- **name:** Full name of the seller.
- **email:** Email address of the seller.
- **products:** List of product IDs listed by the seller.
- **delivery_zones:** List of delivery zones managed by the seller.

Relationships

1. User and Orders:

a. One user can have multiple orders (One-to-Many relationship).

2. User and Products:

a. One user can list multiple products (One-to-Many relationship).

3. Orders and Products:

a. One order can include multiple products, and each product can be part of multiple orders (Many-to-Many relationship).

4. Seller and Products:

a. One seller can list multiple products (One-to-Many relationship).

5. Seller and Delivery Zones:

a. One seller can manage multiple delivery zones, and one delivery zone can have multiple sellers (Many-to-Many relationship).

6. Payments and Orders:

a. Each payment is associated with exactly one order (One-to-One relationship).

7. Delivery Zones and Drivers:

a. One delivery zone can include multiple drivers (One-to-Many relationship).

Integration Details

Sanity CMS

- Used to manage dynamic content such as:
  - Homepage banners.
  - Category highlights.
  - Blog posts for marketing.
- Sanity's GROQ Query API will be used to fetch content dynamically.

ShipEngine

- **API used to:**
  - Generate shipping labels.
  - Track shipments.
  - Provide real-time delivery updates.

Stripe Integration

- Used for:
  - Processing payments securely.
  - Managing subscriptions (if applicable).
  - Handling refunds and payment disputes.

Deployment Plan

Frontend (Next.js)

- **Hosting:** Vercel.
- **CI/CD:** Automatically deploy changes from the GitHub repository.

Backend

- **Hosting:** AWS Lambda with serverless architecture.
- **Scaling:** Automatic scaling based on traffic.

Database (MongoDB)

- **Hosting:** MongoDB Atlas.
- **Backups:** Automated daily backups.
- **Scaling:** Horizontal scaling for handling high traffic.

Security Considerations

1. Data Encryption:

a. Use HTTPS for all communications.

b. Encrypt sensitive user data (e.g., passwords).

2. Authentication and Authorization:

a. MongoDB stores and validates credentials securely.

b. Role-based access control for admin and users.

3. Payment Security:

a. Use PCI-compliant Stripe APIs for payment processing.

4. API Security:

a. Rate-limiting to prevent abuse.

b. Input validation to avoid SQL injection and XSS.

Monitoring and Maintenance

1. Monitoring Tools:

a. New Relic for application performance.

b. CloudWatch for serverless logs.

2. Error Tracking:

a. Sentry for real-time error tracking and debugging.

3. Maintenance:

a. Weekly database maintenance and optimization.

b. Regular updates for dependencies to fix vulnerabilities.