PLANNING THE TECHNICAL FOUNDATION HACKATHON DAY 2

Technical Planning Documentation

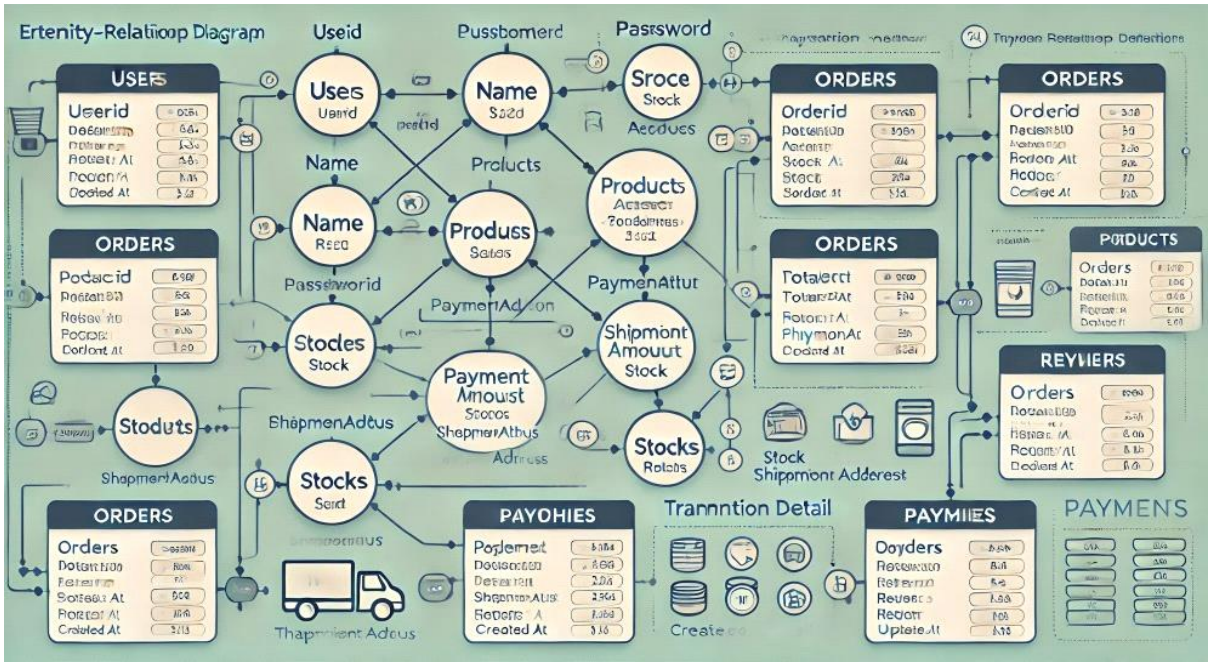
Overview

This document presents the technical strategy for developing an E-Commerce Marketplace designed to empower small businesses and individuals by providing a robust platform for online product sales. The plan builds upon the ideas generated during Hackathon Day 1 and integrates the key recommendations outlined in 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.

6. Authentication (MongoDB):

a. MongoDB stores user credentials securely.

b. Passwords encrypted with hashing algorithms (e.g., bcrypt).

7. Deployment:

a. Frontend deployed on Vercel.

b. Backend deployed on AWS Lambda with serverless 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 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 (require 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):

o Handles user interactions and renders data fetched via APIs.

o Communicates with the backend for authentication, product data, and order

processing.

• Backend APIs:

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

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

• Database (MongoDB):

o Stores user, product, and order data.

o Provides scalable and flexible schema designs for rapid iteration.

• Sanity CMS:

o 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).

OR

Relationships Between Models

User - Products:

One-to-Many: A user (seller) can list multiple products.

User - Orders:

One-to-Many: A customer can place multiple orders.

Product - Orders:

Many-to-Many: An order can have multiple products, and a product can be part of multiple orders.

Category - Products:

One-to-Many: A category can have multiple products.

Order - Payments:

One-to-One: An order can have only one payment.

Data Models and Relationships

1. Users

{

"userId": "ObjectId",

"name": "string",

"email": "string",

"password": "string (hashed)",

"role": "enum (customer/seller/admin)",

“products”: “array of objects”,

“orders”: “array of objects”,

"address": "array of objects",

"paymentMethods": "array of objects",

"createdAt": "date",

"updatedAt": "date"

}

2. Products

{

"productId": "ObjectId",

"name": "string",

"description": "string",

"price": "number",

"category": "ObjectId (ref: Category)",

"images": "array of strings (Cloudinary URLs)",

"sellerId": "ObjectId (ref: Users)",

"stock": "number",

"rating": "number",

```
    "reviews": "array of objects",
    "createdAt": "date",
    "updatedAt": "date"
}
```

3. Orders

```
{
    "orderId": "ObjectId",
    "customerId": "ObjectId (ref: Users)",
    "products": [
        {
            "productId": "ObjectId (ref: Products)",
            "quantity": "number"
        }
    ],
    "totalAmount": "number",
    "paymentStatus": "enum (pending/paid/failed)",
    "shipmentStatus": "enum (processing/shipped/delivered)",
    "shippingAddress": "object",
    "createdAt": "date",
    "updatedAt": "date"
}
```

4. Categories

```
{
    "categoryId": "ObjectId",
```

```
    "name": "string",
    "description": "string",
    "parentCategory": "ObjectId (self-referential)",
    "createdAt": "date",
    "updatedAt": "date"
}
```


5. Payments


```
{
    "paymentId": "ObjectId",
    "orderId": "ObjectId (ref: Orders)",
    "paymentMethod": "enum (stripe/easypaisa/jazzcash)",
    "amount": "number",
    "status": "enum (success/failed/pending)",
    "transactionDetails": "object",
    "createdAt": "date",
    "updatedAt": "date"
}
```


Integration Details

Sanity CMS

- **Used to manage dynamic content such as:**

o Homepage banners.

o Category highlights.

o Blog posts for marketing.

• Sanity's GROQ Query API will be used to fetch content dynamically.

ShipEngine

• API used to:

o Generate shipping labels.

o Track shipments.

o Provide real-time delivery updates.

Stripe Integration

• Used for:

o Processing payments securely.

o Managing subscriptions (if applicable).

o 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.

Timeline

1. Day 3:

a. Set up Next.js project structure.

b. Configure Sanity CMS.

c. Implement user authentication.

2. Day 4, 5:

a. Develop product listing and detail pages.

b. Integrate ShipEngine for order tracking.

c. Build backend APIs for orders and products.

3. Day 6:

a. Finalize payment gateway integration.

b. Implement delivery zones management.

c. Test and optimize API performance.

4. Day 7:

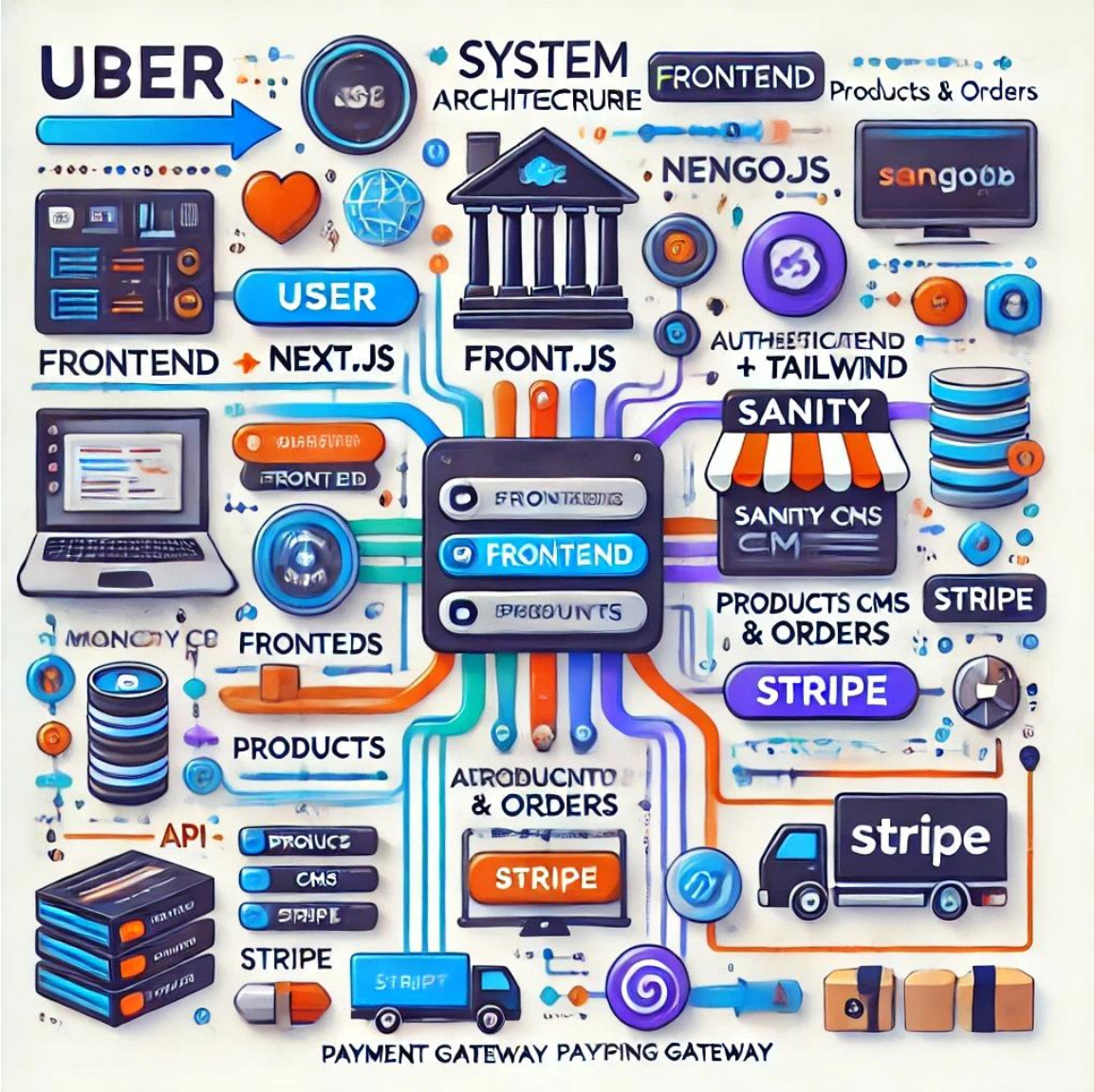
a. Perform end-to-end testing.

b. Deploy the application.

c. Monitor performance and fix any post-deployment issues.

Conclusion

This technical plan ensures a robust foundation for the marketplace, leveraging modern technologies to deliver a seamless and scalable platform for small businesses and customers alike.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SYSTEM
ARCHITECRURE
FRONTEND
Products & Orders
NENGOJS
sangoob
USER
FRONTEND
NEXT.JS
FRONT.JS
AUTHENTICATEND
+ TAILWIND
SANITY
SANITY CMS
FRONTEND
PRODUCTS CMS
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