**Smart E-commerce Platform**

### ***General Description***

BuySmart is an e-commerce platform that provides personalized product recommendations using machine learning algorithms. With a robust and flexible architecture, the platform enables a personalized experience for users and enhanced control for administrators. The architecture and technologies used are designed to ensure scalability and ease of maintenance in the long term.

***Backend Features***

1. **Clean Architecture**

* **Layered Structure**: The project is organized into four main layers: Domain (for core business logic), Application (for business rules and validations), Infrastructure (for data persistence and access), and Presentation (for API controllers).
* **Benefits**: Clean Architecture facilitates clear separation of responsibilities, ensuring easier testing and maintenance.

1. **CQRS (Command and Query Responsibility Segregation)**

* **Separation of Commands and Queries**: CQRS is implemented to separate data manipulation from data retrieval, allowing for the independent scaling of each part.
* **Complexity and Performance**: CQRS helps handle complex business logic, improving performance by optimizing each operation.

1. **Mediator Pattern with MediatR**

* **Centralized Command and Query Handling**: Using MediatR, the platform manages commands and queries through a central mediator, reducing direct dependencies between components.
* **Extensibility**: This approach allows for greater extensibility, making it easy to add new commands and queries without affecting other parts of the application.

1. **Data Persistence with PostgreSQL**

* **Relational Database for Data Storage**: PostgreSQL is used to manage data related to products, users, and orders.
* **Scalability and Integrity**: PostgreSQL ensures transactional integrity and supports high data volumes, offering stable performance.

1. **Repository Pattern**

* **Abstract Data Access**: The Repository Pattern abstracts data manipulation to facilitate database implementation changes if necessary.
* **Easier Maintenance and Testing**: The Repository approach enables testing independently of the database and increases application flexibility.

1. **Consistent Result Handling with Result Pattern**

* **Consistent Error and Response Management**: The Result Pattern is used to return operation results consistently, indicating success or failure.
* **Clarity and Control**: This ensures operations either succeed or fail, providing clearer error handling and response management.

1. **Authentication and Authorization with JWT**

* **Secure Access**: Authentication and authorization are implemented with JSON Web Tokens (JWT) to ensure secure user access.
* **Control and Personalization**: Tokens allow a personalized experience for each user and provide clear control over resource access.

1. **Machine Learning Module for Recommendations**

* **Recommendation System:** Machine learning algorithms analyze user behavior to provide personalized recommendations.
* **Enhancing User Experience**: This module suggests relevant products based on each user’s preferences and purchase history, increasing conversion rates.

***Frontend Features***

1. **Frontend with Angular and Angular Material**

* **User-Friendly and Responsive Interface:** Using Angular Material helps create a modern, intuitive interface, ensuring a consistent experience across devices.
* **Componentization and Reusability**: Angular allows componentization, so UI elements can be easily reused and adapted, saving development time.

1. **Main User Interface Features**

* **Authentication and Authorization**: The login and registration forms are intuitive, and users receive immediate feedback in case of errors.
* **Product View**: Pages that display product details, including recommendations based on interests and shopping history.
* **Shopping Cart and Checkout**: An optimized flow for adding products to the cart and completing orders.
* **User Profile and Order History**: Each user can view their profile and shopping history.
* **Business** can create and list products for sale directly on the platform.
* **Writing and reading reviews**: Users can leave reviews and ratings for purchased products, helping others make informed decisions.

***Testing and Code Coverage***

1. **Unit and Integration Testing**

* **Unit Testing**: Backend and frontend components will be tested using NSubstitute for dependency mocking and isolation, ensuring each functionality works correctly.
* **Integration Testing**: Integration tests ensure that components and services work well together and that interactions between modules are correct and efficient.

1. **Code Coverage**

* **80% Coverage Target**: We ensure at least 80% of the code is covered by tests for both the backend and frontend. This goal ensures high code quality and facilitates quick identification of potential issues.

***Potential Features to Add***

1. **Preference Management & Wishlist**

* **Save preferences** (product categories, brands, price ranges).
* **Wishlist** for future purchases; recommendations based on wishlist items.

1. **Custom Notifications & Alerts**

* **Price drop alerts** for wishlist items and favorite categories.
* **Stock notifications** for out-of-stock products.

1. **Social Media Integration**

* **Share products** on social media for feedback or affiliate links.
* **Social logins** for simpler authentication.

1. **Gamified Personalized Recommendations**

* **Earn points and rewards** for activities like reviews or new purchases.
* **Badges and levels** with exclusive benefits (e.g., discounts).

1. **Chatbot and Live Chat Support**

* **Chatbot** for FAQs (products, orders, payments).
* **Live chat** for real-time, personalized support.

1. **Order History and Tracking**

* **Real-time order tracking** through integrated courier services.
* **Reorder suggestions** based on previous purchases**.**

1. **Post-Purchase Feedback**

* **Satisfaction surveys** to improve service quality.
* **Reward loyal users** based on feedback.

***Conclusion***

BuySmart is designed to provide a complete e-commerce experience, focused on user needs and personalized through machine learning. The architecture and technologies used offer a balance between performance and flexibility, enabling scalability as the business grows.