



Low Level Design Document

Introduction

This Low Level Design (LLD) document outlines the implementation details for **ShopEase - E-commerce Product Catalog**. The project aims to deliver a responsive, user-friendly product catalog with filtering, sorting, and dynamic product card rendering using React, advanced CSS, and Tailwind.

1. System Components

Component	Description	Key Responsibilities
App	Root component	Layout, routing, state management
ProductCatalog	Main catalog view	Fetch/display products, manage UI
ProductCard	Individual product display	Render product info, handle actions
FilterBar	Filtering controls	Update filter state
SortDropdown	Sorting controls	Update sort state
Loader/Error	Loading/error feedback	Show loading/error states

2. Class/Interface Overview

Component/Class	Key Props/State	Main Methods/Handlers	Relationships
ProductCatalog	products , filters , sort	handleFilterChange , handleSort	Parent to ProductCard , FilterBar , SortDropdown
ProductCard	product	onClick (view/add to cart)	Child of ProductCatalog
FilterBar	filters , onChange	handleInputChange	Child of ProductCatalog
SortDropdown	sort , onChange	handleSortChange	Child of ProductCatalog

Example Interface:

```
interface Product {  
  id: string;  
  name: string;  
  price: number;  
  imageUrl: string;  
  category: string;  
  rating: number;  
}
```



```
    inStock: boolean;  
  }
```

3. Data Structure Overview

Model	Fields
Product	id, name, price, imageUrl, category, rating, inStock
Filter	category[], priceRange, inStockOnly, minRating
Sort	field (e.g., price, rating), order (asc/desc)

4. Algorithms / Logic

Product Filtering & Sorting Flow:

```
// Pseudocode  
filtered = products  
  .filter(p => matchesFilters(p, filters))  
  .sort((a, b) => compare(a, b, sort));
```

- `matchesFilters` checks category, price, stock, rating.
- `compare` sorts by selected field/order.

UI Update Flow:

- On filter/sort change: update state → re-render product list.

5. Error Handling

Scenario	Handling Approach
Product fetch failure	Show error message, retry option
No products found	Show "No products found" message
Invalid filter/sort input	Ignore input, show validation feedback
Image load error	Show placeholder image

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