**TechMart – Gadgets Galore**

**Overview**

**TechMart: Gadgets Galore** is an e-commerce platform specializing in electronics, including **smartphones, laptops, and accessories**. The service enables detailed product modeling with attributes tailored for gadgets, dynamic bundle deals, advanced filtering by specifications, and warranty management to cater to the electronics market.

**Core Functionalities**

1. **Category Management**
   * Maintain hierarchical categories such as **Smartphones**, **Laptops**, and **Accessories**.
   * Provide subcategories for filtering and browsing (e.g., Smartphones > 5G Smartphones).
2. **Product Type Management**
   * Define **Product Types** for reusable attribute templates (e.g., attributes like RAM, Storage, and Screen Size for laptops).
   * Specify warranties and technical specifications for products.
3. **Product Management**
   * Create and manage products with brand, model, and specifications.
   * Associate products with one or more **bundles** for combined purchases.
4. **Product Variant Management**
   * Handle variants with attributes like **color, RAM, and storage** for gadgets.
   * Each variant must have a **unique SKU** for inventory tracking.
5. **Bundle Management**
   * Enable creation of **bundle deals** such as a laptop, mouse, and backpack at a discounted price.
   * Support automatic discount calculations for bundles.
6. **Advanced Filtering and Search**
   * Allow filtering by **specifications** such as **processor type, screen size, RAM**, and **price range**.
   * Provide sorting options based on popularity, rating, and price.
7. **Warranty Management**
   * Manage warranty durations and conditions for all products.
   * Provide options for extended warranties at additional costs.

**Entity Relationships**

| **Entity** | **Relationships** |
| --- | --- |
| **Category** | One-to-Many: A category can have multiple subcategories, and products belong to one category. |
| **ProductType** | One-to-Many: A product type defines attributes for multiple products. |
| **Product** | One-to-Many: A product can have multiple variants, and belongs to one category and one product type. |
| **ProductVariant** | Many-to-One: A product variant belongs to one product. |
| **Bundle** | Many-to-Many: A bundle can include multiple products, and a product can belong to multiple bundles. |

**Entity Descriptions**

**1. Category**

* Represents a hierarchical structure for browsing products.
* **Attributes**:
  + id: Unique identifier.
  + name: Category name (e.g., Smartphones, Laptops).
  + parentCategory: Reference to the parent category for hierarchy.
  + description: Description of the category.

**2. ProductType**

* Defines a template for products with reusable attributes.
* **Attributes**:
  + id: Unique identifier.
  + name: Name of the product type (e.g., Laptop, Smartphone).
  + attributes: List of attributes (e.g., RAM, Storage, Processor, Screen Size).

**3. Product**

* Represents a specific product linked to a category and product type.
* **Attributes**:
  + id: Unique identifier.
  + name: Product name (e.g., MacBook Pro 16").
  + price: Base price of the product.
  + brand: Brand name (e.g., Apple).
  + description: Product description.
  + categoryId: Reference to the category.
  + productTypeId: Reference to the product type.
  + warranty: Default warranty period.

**4. ProductVariant**

* Represents specific variations of a product (e.g., different RAM or storage options).
* **Attributes**:
  + id: Unique identifier.
  + sku: Unique SKU for the variant.
  + variantAttributes: Attributes specific to the variant (e.g., RAM: 16GB, Storage: 512GB).
  + stock: Stock quantity for the variant.
  + additionalPrice: Price adjustment for this variant.

**5. Bundle**

* Represents a collection of products sold together at a discounted price.
* **Attributes**:
  + id: Unique identifier.
  + name: Bundle name (e.g., "Laptop Starter Pack").
  + products: List of products in the bundle.
  + bundlePrice: Discounted price for the bundle.

**API Requirements**

**1. Category Management**

**1.1 Create Category**

* **Endpoint**: POST /categories
* **Request Body**:

json

Copy code

{

"name": "Smartphones",

"parentCategoryId": null,

"description": "All types of smartphones."

}

* **Response**:

json

Copy code

{

"id": 1,

"name": "Smartphones",

"parentCategoryId": null,

"description": "All types of smartphones."

}

**1.2 Get All Categories**

* **Endpoint**: GET /categories
* **Response**:

json

Copy code

[

{

"id": 1,

"name": "Smartphones",

"subcategories": [

{

"id": 2,

"name": "5G Smartphones",

"subcategories": []

}

]

},

{

"id": 3,

"name": "Laptops",

"subcategories": []

}

]

**2. Product Type Management**

**2.1 Create Product Type**

* **Endpoint**: POST /product-types
* **Request Body**:

json

Copy code

{

"name": "Laptop",

"attributes": [

{ "name": "Processor", "type": "Text" },

{ "name": "RAM", "type": "Enum", "allowedValues": ["8GB", "16GB", "32GB"] },

{ "name": "Storage", "type": "Enum", "allowedValues": ["256GB", "512GB", "1TB"] },

{ "name": "Screen Size", "type": "Text" },

{ "name": "Warranty", "type": "Number" }

]

}

**3. Product Management**

**3.1 Create Product**

* **Endpoint**: POST /products
* **Request Body**:

json

Copy code

{

"name": "MacBook Pro 16",

"categoryId": 3,

"productTypeId": 1,

"price": 2000.00,

"brand": "Apple",

"description": "The latest MacBook Pro with M2 chip.",

"warranty": 12,

"variants": [

{

"variantAttributes": { "RAM": "16GB", "Storage": "512GB" },

"stock": 10,

"additionalPrice": 0,

"sku": "MBP16-16GB-512GB"

},

{

"variantAttributes": { "RAM": "32GB", "Storage": "1TB" },

"stock": 5,

"additionalPrice": 500,

"sku": "MBP16-32GB-1TB"

}

]

}

**4. Bundle Management**

**4.1 Create Bundle**

* **Endpoint**: POST /bundles
* **Request Body**:

json

Copy code

{

"name": "Laptop Starter Pack",

"products": [3, 4, 5],

"bundlePrice": 2200.00

}

* **Response**:

json

Copy code

{

"id": 101,

"name": "Laptop Starter Pack",

"products": [

{ "id": 3, "name": "MacBook Pro 16" },

{ "id": 4, "name": "Wireless Mouse" },

{ "id": 5, "name": "Backpack" }

],

"bundlePrice": 2200.00

}