Full-Stack Inventory Management System

Capstone Project Documentation
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1. Project Overview

Modern businesses require efficient inventory management to track stock in real-time, prevent shortages, reduce wastage, and optimize warehouse operations. Many small-to-medium enterprises still rely on outdated manual methods or fragmented tools, leading to operational inefficiencies, data discrepancies, and delayed decision-making. These challenges can result in increased operational costs, poor customer satisfaction, and lost business opportunities.

To address these issues, this project develops a **Full-Stack Inventory Management System** that provides a centralized, automated, and intelligent solution for managing inventory efficiently. The system is designed to streamline inventory operations, improve accuracy, and provide actionable insights for better decision-making.

This project develops a **Full-Stack Inventory Management System** that enables:

- **Real-time product tracking**: Monitor inventory levels instantly.
- **Role-based access control**: Secure and customized user permissions.
- **Seamless user interactions**: Intuitive and responsive UI/UX.
- **Cloud deployment for scalability**: Accessible from anywhere, supporting multiple users.

Tech Stack:

Layer	Technology
Frontend	React.js
Backend	.NET Core Web API
Database	SQL Server / PostgreSQL
Authentication	JWT (JSON Web Token)
State Management	Redux
Deployment	Azure / AWS

2. User Personas

Persona	Role	Responsibilities
Admin	Full control	Manage users, assign roles, oversee inventory analytics, generate reports
Manager	Medium control	Add/update/delete product records, monitor stock levels, receive notifications
Staff	Limited control	View available stock, update stock movements, maintain inventory accuracy

3. User Stories

Admin:

- Create and manage user roles for secure access.
- Generate reports to analyze stock movement trends.

Manager:

- Add, update, and remove product details to maintain accuracy.
- Receive notifications when stock reaches a low threshold for timely reordering.

Staff:

- View inventory details for efficient stock management.
- Update stock movements to ensure real-time accuracy.

4. Key Features

1. **CRUD Operations**: Full create, read, update, delete functionality for products and inventory records.
2. **Full-Stack Architecture**: React frontend with .NET Core backend for scalable and maintainable development.
3. **JWT Authentication**: Secure access to resources with token-based authentication.
4. **Role-Based Access Control**: Custom permissions for Admin, Manager, and Staff.

5. **Redux State Management**: Efficient state handling and data consistency across the frontend.
6. **Cloud Deployment**: Hosted on Azure/AWS for high availability and scalability.
7. **Responsive UI/UX**: Modern design ensures accessibility on desktops, tablets, and mobiles.

Endpoint	Method	Description	Sample Request
/api/auth/login	POST	Authenticates user & returns JWT	{ "username": "admin", "password": "admin123" }
/api/products	GET	Retrieves all products	N/A
/api/products/{id}	GET	Retrieves product by ID	N/A
/api/products	POST	Adds new product	{ "name": "Laptop", "quantity": 10, "price": 1200 }
/api/products/{id}	PUT	Updates product details	{ "quantity": 15 }
/api/products/{id}	DELETE	Removes a product	N/A

5. API Endpoints & Testing

Testing Scenarios:

- Verify successful login and JWT token generation.
- Perform CRUD operations for products and inventory.
- Validate role-based access restrictions for each user type.
- Ensure notifications trigger for low-stock items.
- Validate API responses and error handling.

6. Project Directory Structure

```
Inventory-Management-System/
├── backend/ # .NET Core API
│   ├── Controllers/ # API controllers
│   ├── Models/ # Database models
│   ├── Services/ # Business logic services
│   ├── Data/ # Database context
│   ├── Middleware/ # JWT authentication logic
│   ├── Program.cs # Entry point
│
├── frontend/ # React Frontend
│   ├── src/
│   │   ├── components/ # UI Components
│   │   ├── pages/ # Screens
│   │   ├── store/ # Redux store
│   │   ├── services/ # API Calls
│   │   ├── App.js # Main app component
│   │   ├── index.js # Entry point
│   ├── package.json # Frontend dependencies
│
├── tests/ # API & UI tests
├── README.md # Documentation
├── docker-compose.yml # Dockerized deployment
```

7. Setup Instructions

Backend Setup

1. Navigate to the backend folder.
2. Configure the database connection in appsettings.json.
3. Apply migrations:

```
dotnet ef database update
```

4. Run the API:

```
dotnet run
```

Frontend Setup

1. Navigate to the frontend folder.
2. Install dependencies:

```
npm install
```

3. Start the React app:

```
npm start
```

Docker Deployment (Optional)

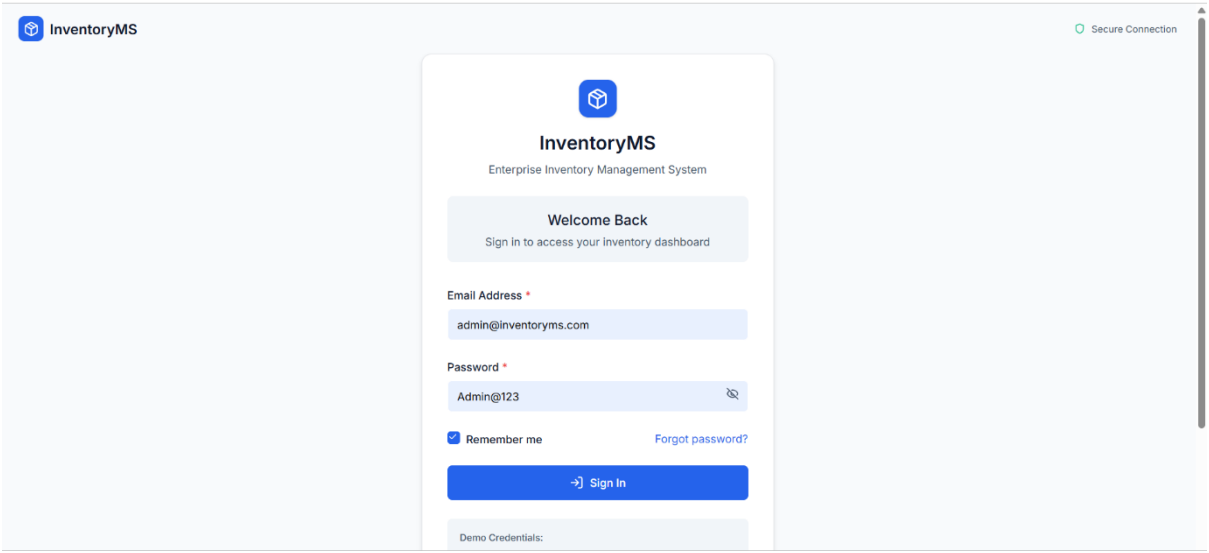
1. Ensure Docker is installed.
2. Run the container:

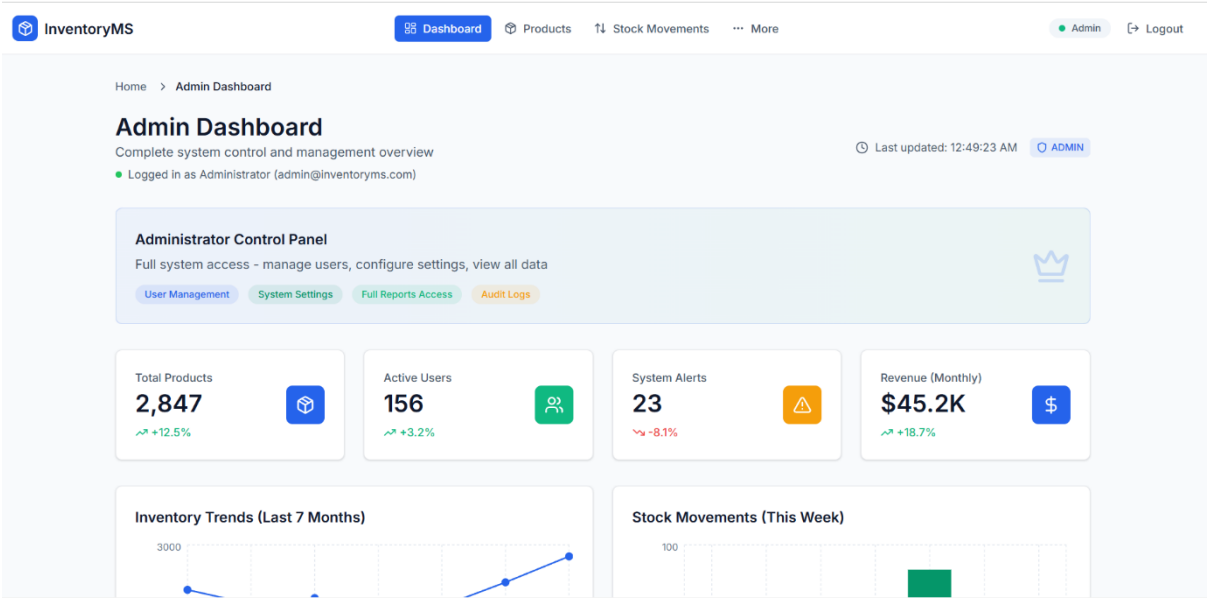
```
docker-compose up --build
```

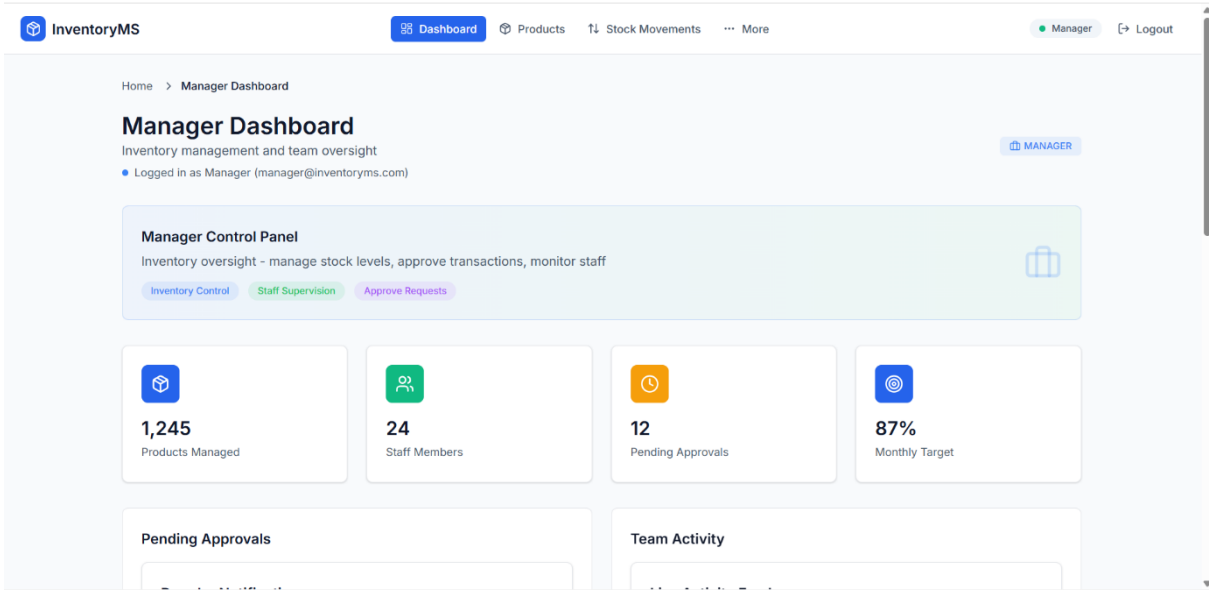
8. Authentication & Role-Based Access

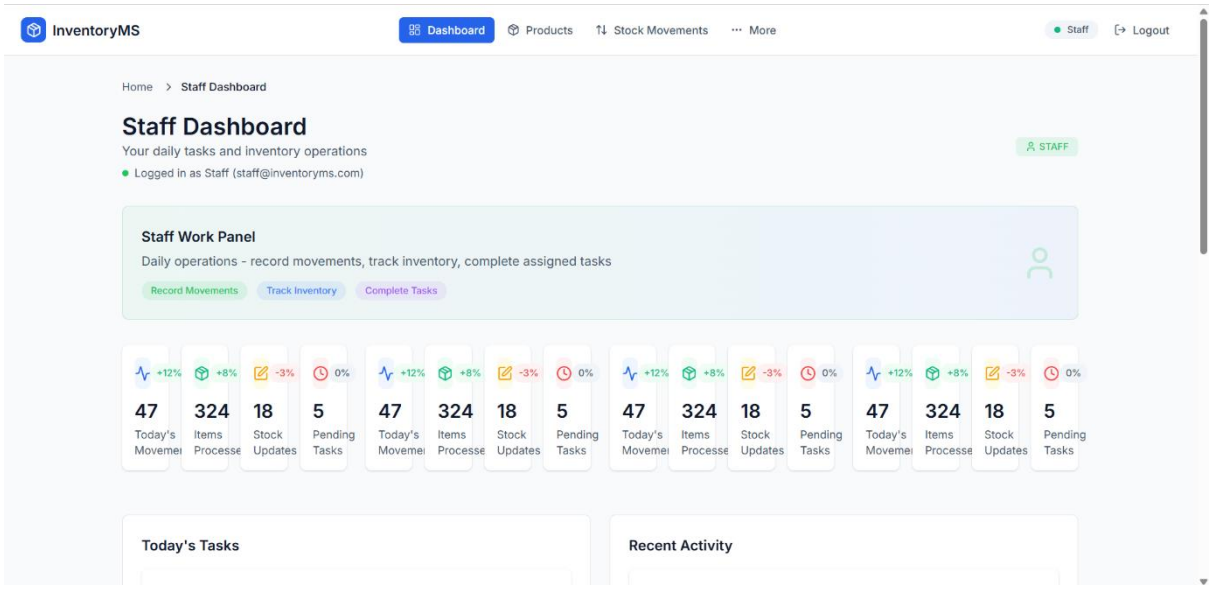
- **JWT Tokens** secure all API endpoints.
- **Role-Based Permissions:**
  - **Admin:** Full access to all modules.
  - **Manager:** Can manage products and monitor stock.
  - **Staff:** Read-only access to inventory.

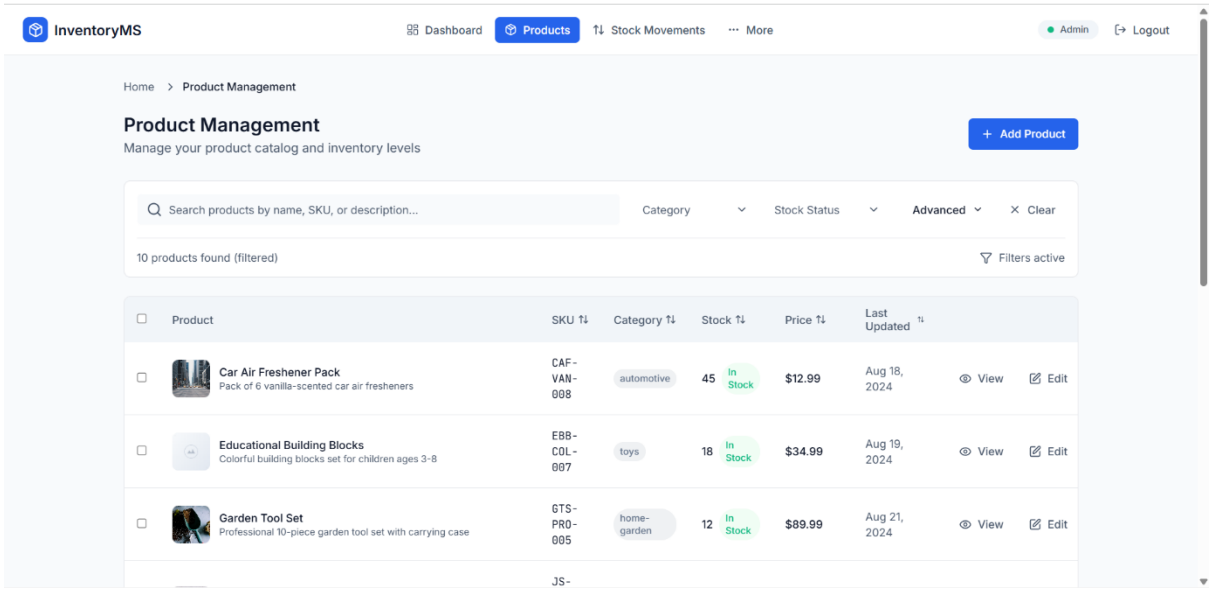
9. Sample Screenshots

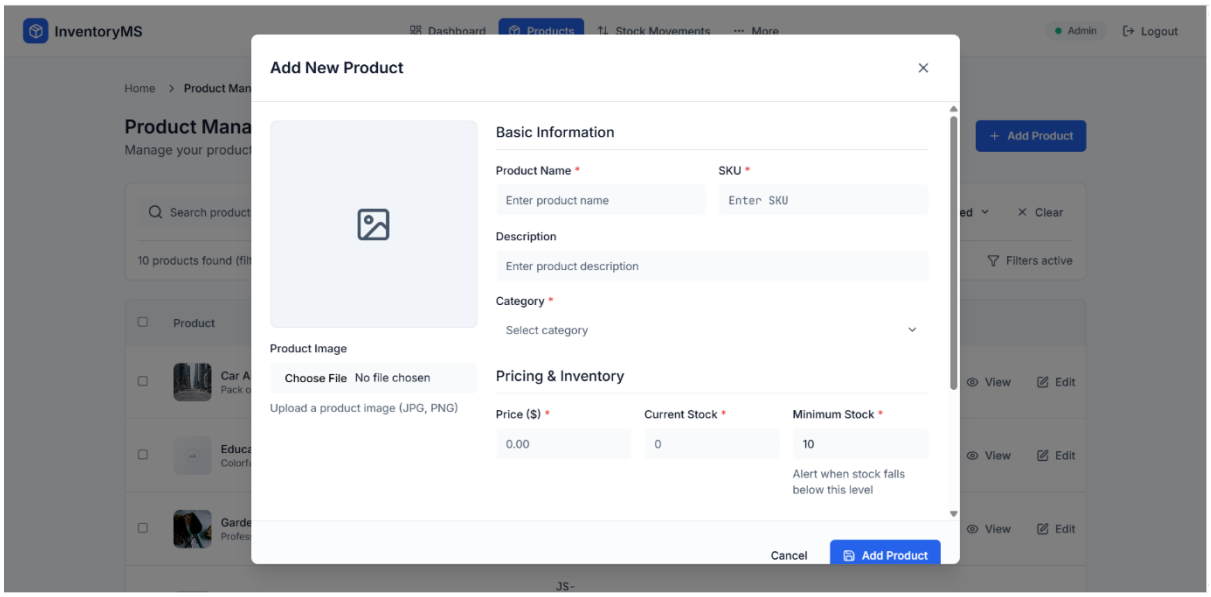


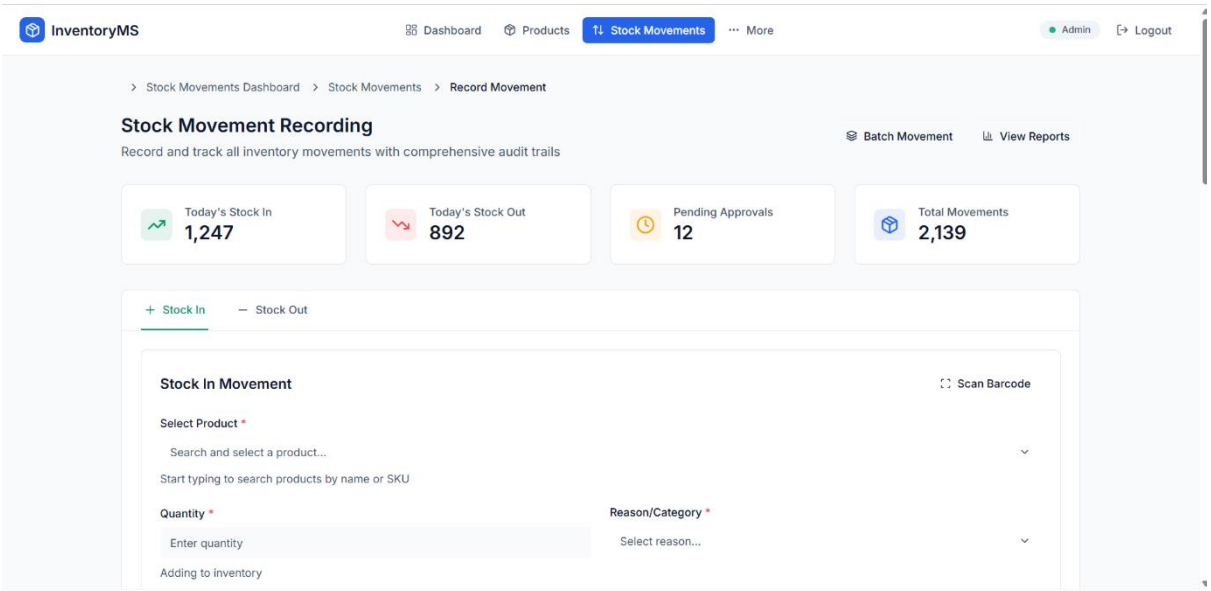


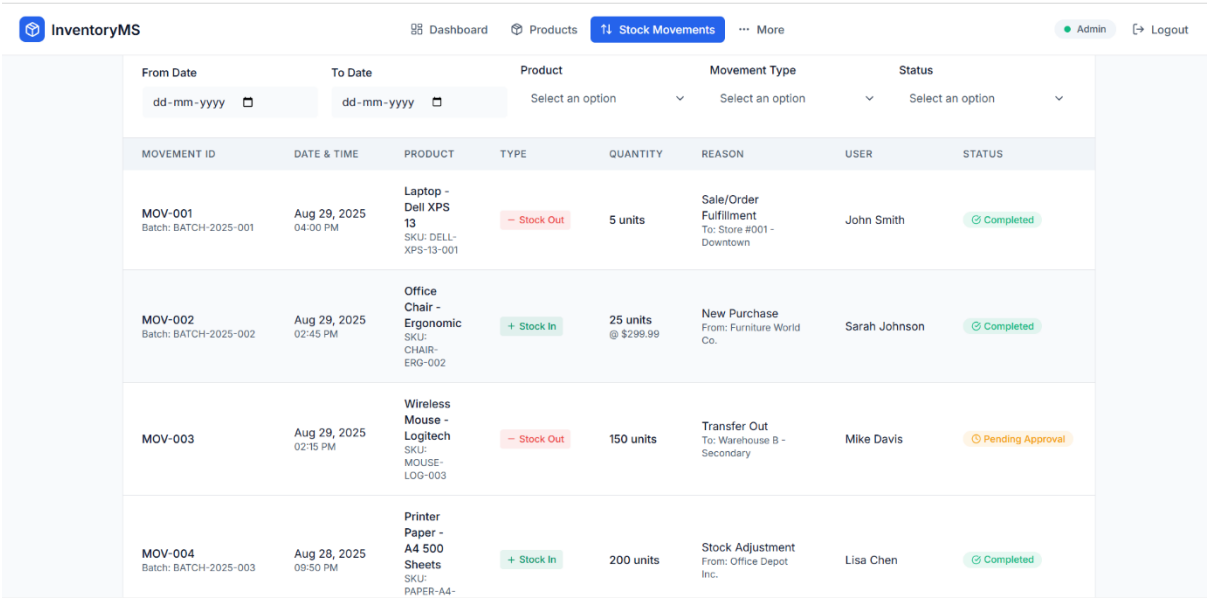

InventoryMS
Dashboard
Products
Stock Movements
More
Manager
Logout
Home
Manager Dashboard
Manager Dashboard
Inventory management and team oversight
Logged in as Manager (manager@inventoryms.com)
MANAGER
Manager Control Panel
Inventory oversight - manage stock levels, approve transactions, monitor staff
Inventory Control
Staff Supervision
Approve Requests
1,245
Products Managed
24
Staff Members
12
Pending Approvals
87%
Monthly Target
Pending Approvals
Team Activity

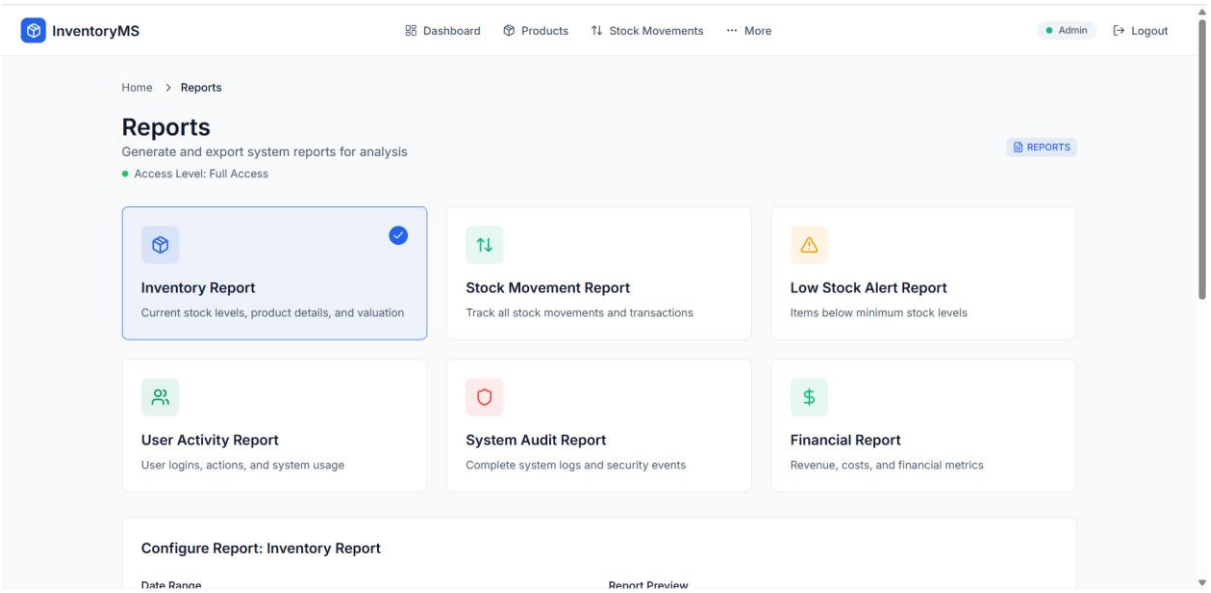

InventoryMS
Dashboard
Products
Stock Movements
More
Staff
Logout
Home
Staff Dashboard
Staff Dashboard
Your daily tasks and inventory operations
Logged in as Staff (staff@inventoryms.com)
STAFF
Staff Work Panel
Daily operations - record movements, track inventory, complete assigned tasks
Record Movements
Track Inventory
Complete Tasks
+12%
+8%
-3%
0%
47
Today's Movemer
324
Items Processe
18
Stock Updates
5
Pending Tasks
Today's Tasks
Recent Activity

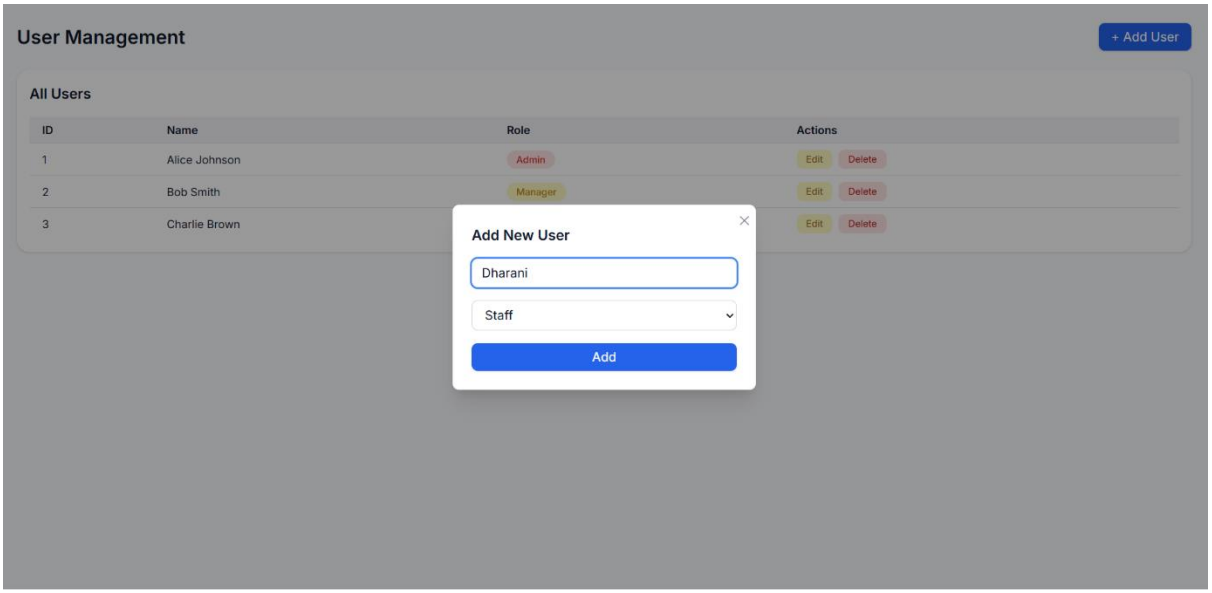

InventoryMS
Dashboard
Products
Stock Movements
More
Admin
Logout
Home > Product Management
Product Management
Manage your product catalog and inventory levels
+ Add Product
Search products by name, SKU, or description...
Category
Stock Status
Advanced
Clear
10 products found (filtered)
Filters active
Product
SKU
Category
Stock
Price
Last Updated
Car Air Freshener Pack
Pack of 6 vanilla-scented car air fresheners
CAF-VAN-008
automotive
45
In Stock
$12.99
Aug 18, 2024
View
Edit
Educational Building Blocks
Colorful building blocks set for children ages 3-8
EBB-COL-007
toys
18
In Stock
$34.99
Aug 19, 2024
View
Edit
Garden Tool Set
Professional 10-piece garden tool set with carrying case
GTS-PRO-005
home-garden
12
In Stock
$89.99
Aug 21, 2024
View
Edit

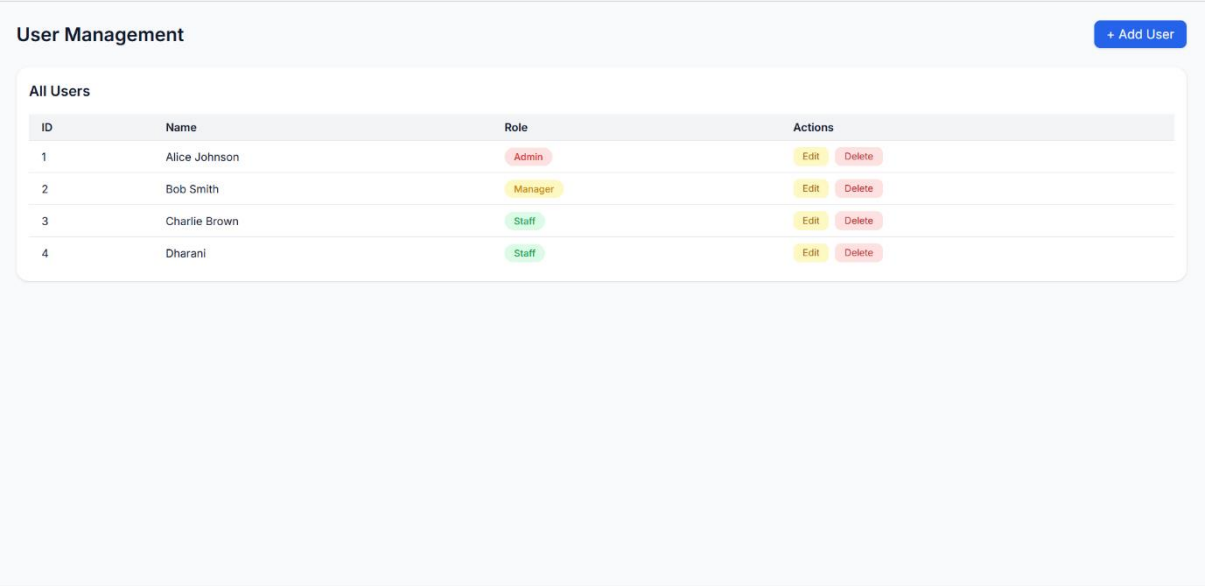

InventoryMS
Add New Product
Basic Information
Product Name *
Enter product name
SKU *
Enter SKU
Description
Enter product description
Category *
Select category
Product Image
Choose File
No file chosen
Upload a product image (JPG, PNG)
Pricing & Inventory
Price ($) *
0.00
Current Stock *
0
Minimum Stock *
10
Alert when stock falls below this level
Cancel
Add Product


InventoryMS
Dashboard
Products
Stock Movements
More
Admin
Logout
Stock Movements Dashboard
Stock Movements
Record Movement
Stock Movement Recording
Record and track all inventory movements with comprehensive audit trails
Batch Movement
View Reports
Today's Stock In
1,247
Today's Stock Out
892
Pending Approvals
12
Total Movements
2,139
Stock In
Stock Out
Stock In Movement
Scan Barcode
Select Product *
Search and select a product...
Start typing to search products by name or SKU
Quantity *
Enter quantity
Adding to inventory
Reason/Category *
Select reason...


InventoryMS
Dashboard
Products
Stock Movements
More
Admin
Logout
From Date
dd-mm-yyyy
To Date
dd-mm-yyyy
Product
Select an option
Movement Type
Select an option
Status
Select an option
MOVEMENT ID
DATE & TIME
PRODUCT
TYPE
QUANTITY
REASON
USER
STATUS
MOV-001
Batch: BATCH-2025-001
Aug 29, 2025
04:00 PM
Laptop - Dell XPS 13
SKU: DELL-XPS-13-001
Stock Out
5 units
Sale/Order Fulfillment
To: Store #001 - Downtown
John Smith
Completed
MOV-002
Batch: BATCH-2025-002
Aug 29, 2025
02:45 PM
Office Chair - Ergonomic
SKU: CHAIR-ERG-002
Stock In
25 units
@ $299.99
New Purchase
From: Furniture World Co.
Sarah Johnson
Completed
MOV-003
Aug 29, 2025
02:15 PM
Wireless Mouse - Logitech
SKU: MOUSE-LOG-003
Stock Out
150 units
Transfer Out
To: Warehouse B - Secondary
Mike Davis
Pending Approval
MOV-004
Batch: BATCH-2025-003
Aug 28, 2025
09:50 PM
Printer Paper - A4 500 Sheets
SKU: PAPER-A4-
Stock In
200 units
Stock Adjustment
From: Office Depot Inc.
Lisa Chen
Completed


InventoryMS
Dashboard
Products
Stock Movements
More
Admin
Logout
Home > Reports
Reports
Generate and export system reports for analysis
Access Level: Full Access
REPORTS
Inventory Report
Current stock levels, product details, and valuation
Stock Movement Report
Track all stock movements and transactions
Low Stock Alert Report
Items below minimum stock levels
User Activity Report
User logins, actions, and system usage
System Audit Report
Complete system logs and security events
Financial Report
Revenue, costs, and financial metrics
Configure Report: Inventory Report
Date Range
Report Preview


User Management
+ Add User
All Users
ID
Name
Role
Actions
1
Alice Johnson
Admin
Edit
Delete
2
Bob Smith
Manager
Edit
Delete
3
Charlie Brown
Edit
Delete
Add New User
Dharani
Staff
Add



10. Test Cases

Functional Tests:

- Admin can create, update, and delete users.
- Manager can perform CRUD operations on products.
- Staff can view inventory but cannot delete products.

API Tests:

- Login API returns JWT correctly.
- GET /products returns all products.
- POST /products creates new products and validates input.
- PUT /products/{id} updates stock quantity accurately.
- DELETE /products/{id} removes the product as expected.

11. GitHub Repository

Commit Guidelines: Use meaningful commit messages such as:

- "Added JWT authentication middleware"
- "Implemented product CRUD functionality"
- "Integrated Redux state management"

12. Additional Enhancements & Future Scope

- **Reporting Module:** Advanced analytics and dashboards for stock movement.
- **Notifications:** Email/SMS alerts for low stock or critical updates.
- **Barcode Integration:** Automate stock entries using barcode scanners.
- **Mobile App Extension:** Extend the system to mobile devices for field staff.
- **Third-Party Integrations:** Integration with ERP systems or e-commerce platforms.