Inventory Management System (IMS)

Demonstration

Agenda

Assumptions

System Architecture

Security Features

Environment Setup

Demonstration of Key Functionality

- Customer Role

- Clerk Role

- Admin Role

Q & A

Assumptions

➢Internal usage within a beauty shop group

➢Command-Line Interface (CLI) based application

➢Basic CRUD operations (Create, Read, Update, Delete)

➢Focus on security features

➢No public deployment or payment portal

➢No sensitive personal date will be stored

System Architecture

Follows Model-View-Controller (MVC) pattern

- Models (User, Product, Order)
- Controllers (Authentication, Product, Order)
- Service (UserService, ProductService, OrderService)
- CLI View for interactions (Appendix 01)

JSON-based persistence for data

Security Features

➢User Authentication

➢Role-Based Access Control (RBAC): Admin, Clerk, Customer

➢Password Hashing with bcrypt

➢Password Strength Validation

➢Flask-based validation Application Programming Interface (API) (Appendix 02)

➢Multi-Factor Authentication (MFA) Simulation

➢Account Lockout Mechanism

➢Lockout Timer

➢Logging of critical application events

Environment Setup

Python 3.9 or later

Libraries and Dependencies:
- bcrypt (password hashing)
- requests (HTTP requests for the validation API)
- Flask (used for the company validation API simulation)
- logging (for system logs)
- json (standard library for JSON read/write)
- re, time, datetime (standard libraries for regex validation, timers)
- pytest (for running automated unit and integration tests)
- flake8 (for style/linting checks)

Demonstration of Key Functionality
Customer Role

Menu	Action	Demonstration purpose	Appendices
Register as Customer	Register as new user	Password Hashing with bcrypt, Password Strength Validation, Flask-based Validation API	03
Login	Login with correct user credential	User Authentication, MFA simulation	04
Place Order	View available product, Create new order	RBAC, Functionality	05
View Order History	View order history	RBAC, Functionality	06

Demonstration of Key Functionality
Clerk Role

Menu	Action	Demonstration purpose	Appendices
Login	Login with correct user credential	User Authentication, MFA simulation	07
Manage Products			
• View All Products	View product list	RBAC, Functionality	08
• Add Product	Add new product	RBAC, Functionality	09
• Update Product Stock	Update product quantity	RBAC, Functionality	10
• Delete Product	Remove existing product	RBAC, Functionality	11
Login	Attempt multiple failed login 1. Automatically unlocked by Lockout Mechanism 2. Manual unlocked by Admin User	User Authentication, Account Lockout Mechanism, Lockout Timer	12, 13, 17

Demonstration of Key Functionality
Admin Role

Menu	Action	Demonstration purpose	Appendices
Login	Login as unregistered user	User Authentication	14
Login	Login with correct user credential	User Authentication, MFA simulation	15
Manage Users			
• View All Users	View user	RBAC, Functionality	16
• Unlock User Account	Unlock blocked user	RBAC, Functionality	17
• Add Clerk	Create new clerk user	Password Strength Validation	18
• Remove User	Remove existing user	RBAC, Functionality	19
View System Logs	View system log	Logging of critical application events	20
Logout	Select invalid option	Error Message	21, 22

Q & A

Thank you

Appendices

Appendix 01: Main Menu

Appendix 02: API

Appendices

Appendix 03: Register as new customer

```
=== Welcome to IMS ===
1. Login
2. Register as Customer        <---
3. Exit
Please select an option: 2

--- Customer Registration ---
Choose a username: customer1
Enter a password: Customer@1234
Enter your company ID: COMPANY456
Registration successful.            <---

=== Welcome to IMS ===
1. Login                    <---
2. Register as Customer
3. Exit
Please select an option: 1

--- Login ---
Username: customer1
Password: Customer@1234
Enter the MFA code sent to your registered device: 123456

Welcome, customer1!

--- Customer Menu ---
1. Place Order
2. View Order History
3. Logout
Please select an option:
```

Register with invalid Company ID

```
=== Welcome to IMS ===
1. Login
2. Register as Customer        <---
3. Exit
Please select an option: 2

--- Customer Registration ---
Choose a username: customer2
Enter a password: Customer@1234
Enter your company ID: test
Invalid company ID.         <---
```

Appendices

Appendix 03 (Cont.) API response

```
C:\Program Files (x86)\Micros      ×      +   ⌄                                    —   □   ×

 * Serving Flask app 'company_validation_api'
 * Debug mode: off
WARNING: This is a development server. Do not use it in a production deployment. Use a production WSGI server instead.
 * Running on http://127.0.0.1:5000
Press CTRL+C to quit
127.0.0.1 - - [13/Jan/2025 22:00:37] "GET /validate_company?company_id=COMPANY456 HTTP/1.1" 200 -
127.0.0.1 - - [13/Jan/2025 22:02:08] "GET /validate_company?company_id=test HTTP/1.1" 404 -
```

Appendix 04: Login as customer

```
=== Welcome to IMS ===
1. Login              ←
2. Register as Customer
3. Exit
Please select an option: 1

--- Login ---
Username: customer
Password: Customer@1234
Enter the MFA code sent to your registered device: 123456

Welcome, customer!

--- Customer Menu ---
1. Place Order
2. View Order History
3. Logout
Please select an option: |
```

Appendices

Appendix 05: Place Order

```
--- Customer Menu ---
1. Place Order          ⬅
2. View Order History
3. Logout
Please select an option: 1

--- Place Order ---
Available Products:
ID: 1, Name: Shampoo, Price: 9.99, Stock: 99
ID: 2, Name: Conditioner, Price: 8.99, Stock: 80
ID: 3, Name: Hair Gel, Price: 5.99, Stock: 150
ID: 4, Name: Hair Spray, Price: 6.99, Stock: 120
ID: 5, Name: Hair Serum, Price: 15.99, Stock: 200
ID: 6, Name: test, Price: 1.0, Stock: 1
Enter product ID to add to cart (or 'done' to finish): 1
Enter quantity: 1
Enter product ID to add to cart (or 'done' to finish): 2
Enter quantity: 2
Enter product ID to add to cart (or 'done' to finish): done

The statement will be sent to your Company
Order placed successfully.          ⬅
```

No product selected

```
--- Customer Menu ---
1. Place Order          ⬅
2. View Order History
3. Logout
Please select an option: 1
                                    Available stock adjusted
                                    after previous order
--- Place Order ---
Available Products:
ID: 1, Name: Shampoo, Price: 9.99, Stock: 98     ⬅
ID: 2, Name: Conditioner, Price: 8.99, Stock: 78 }
ID: 3, Name: Hair Gel, Price: 5.99, Stock: 150
ID: 4, Name: Hair Spray, Price: 6.99, Stock: 120
ID: 5, Name: Hair Serum, Price: 15.99, Stock: 200
ID: 6, Name: test, Price: 1.0, Stock: 1
Enter product ID to add to cart (or 'done' to finish): done

The statement will be sent to your Company
No items selected.          ⬅
```

Appendices

Appendix 06: View Order History

```
--- Customer Menu ---
1. Place Order
2. View Order History    <---
3. Logout
Please select an option: 2

--- Order History ---
Order ID: dbb9731c-2b7f-499c-a579-0f8e388fb2e5, Date: 2025-01-05 11:37:52, Total Price: 16.98
Product: Shampoo, Quantity: 1, Price: 9.99
Product: Hair Spray, Quantity: 1, Price: 6.99
Order ID: aeb82ea7-cd4a-496d-af2d-acc3f9d8c6cc, Date: 2025-01-12 12:25:19, Total Price: 1.0
Product: test, Quantity: 1, Price: 1.0
Order ID: 64eb1f68-9404-4f6f-a665-ac7a45bf49d4, Date: 2025-01-13 22:12:49, Total Price: 27.97
Product: Shampoo, Quantity: 1, Price: 9.99
Product: Conditioner, Quantity: 2, Price: 8.99
```

Appendices

Appendix 07: Login as Clerk

```
=== Welcome to IMS ===
1. Login                    ⬅
2. Register as Customer
3. Exit
Please select an option: 1

--- Login ---
Username: clerk
Password: Clerk@1234
Enter the MFA code sent to your registered device: 123456

Welcome, clerk!

--- Clerk Menu ---
1. Manage Products
2. Logout
Please select an option: |
```

Appendix 08: View Product

```
--- Clerk Menu ---
1. Manage Products          ⬅
2. Logout
Please select an option: 1

--- Manage Products ---
1. View All Products        ⬅
2. Add Product
3. Update Product Stock
4. Delete Product
5. Back to Previous Menu
Please select an option: 1

--- All Products ---
ID: 1, Name: Shampoo, Category: Hair Care, Price: 9.99, Stock: 98
ID: 2, Name: Conditioner, Category: Hair Care, Price: 8.99, Stock: 78
ID: 3, Name: Hair Gel, Category: Hair Styling, Price: 5.99, Stock: 150
ID: 4, Name: Hair Spray, Category: Hair Styling, Price: 6.99, Stock: 120
ID: 5, Name: Hair Serum, Category: Hair Care, Price: 15.99, Stock: 200
ID: 6, Name: test, Category: test, Price: 1.0, Stock: 1
```

Appendices

Appendix 09: Add existing product

```
--- Manage Products ---
1. View All Products
2. Add Product          <---
3. Update Product Stock
4. Delete Product
5. Back to Previous Menu
Please select an option: 2

--- Add Product ---
Enter product ID: 1
Enter product name: test
Enter product category: test
Enter product price (numeric only): 1
Enter stock quantity (integer only): 1
Product with ID '1' already exists.   <---
```

Add new product

```
--- Manage Products ---
1. View All Products
2. Add Product          <---
3. Update Product Stock
4. Delete Product
5. Back to Previous Menu
Please select an option: 2

--- Add Product ---
Enter product ID: 6   <---
Enter product name: new product
Enter product category: test cat
Enter product price (numeric only): 1.99
Enter stock quantity (integer only): 10
Product 'new product' added successfully.

--- Manage Products ---
1. View All Products
2. Add Product
3. Update Product Stock
4. Delete Product
5. Back to Previous Menu
Please select an option: 1

--- All Products ---
ID: 1, Name: Shampoo, Category: Hair Care, Price: 9.99, Stock: 98
ID: 2, Name: Conditioner, Category: Hair Care, Price: 8.99, Stock: 80
ID: 3, Name: Hair Gel, Category: Hair Styling, Price: 5.99, Stock: 150
ID: 4, Name: Hair Spray, Category: Hair Styling, Price: 6.99, Stock: 120
ID: 5, Name: Hair Serum, Category: Hair Care, Price: 15.99, Stock: 200
ID: 6, Name: new product, Category: test cat, Price: 1.99, Stock: 10   <---
```

Appendices

Appendix 10: Update Product Stock

```
--- All Products ---
ID: 1, Name: Shampoo, Category: Hair Care, Price: 9.99, Stock: 98    <---
ID: 2, Name: Conditioner, Category: Hair Care, Price: 8.99, Stock: 80
ID: 3, Name: Hair Gel, Category: Hair Styling, Price: 5.99, Stock: 150
ID: 4, Name: Hair Spray, Category: Hair Styling, Price: 6.99, Stock: 120
ID: 5, Name: Hair Serum, Category: Hair Care, Price: 15.99, Stock: 200
ID: 6, Name: new product, Category: test cat, Price: 1.99, Stock: 10

--- Manage Products ---
1. View All Products
2. Add Product
3. Update Product Stock    <---
4. Delete Product
5. Back to Previous Menu
Please select an option: 3

--- Update Product Stock ---
Enter product ID: 1                      <---
Enter new stock quantity: 100

--- Manage Products ---
1. View All Products
2. Add Product
3. Update Product Stock
4. Delete Product
5. Back to Previous Menu
Please select an option: 1

--- All Products ---
ID: 1, Name: Shampoo, Category: Hair Care, Price: 9.99, Stock: 100   <---
ID: 2, Name: Conditioner, Category: Hair Care, Price: 8.99, Stock: 80
ID: 3, Name: Hair Gel, Category: Hair Styling, Price: 5.99, Stock: 150
ID: 4, Name: Hair Spray, Category: Hair Styling, Price: 6.99, Stock: 120
ID: 5, Name: Hair Serum, Category: Hair Care, Price: 15.99, Stock: 200
ID: 6, Name: new product, Category: test cat, Price: 1.99, Stock: 10
```

Appendix 11: Delete Product

```
--- All Products ---
ID: 1, Name: Shampoo, Category: Hair Care, Price: 9.99, Stock: 100
ID: 2, Name: Conditioner, Category: Hair Care, Price: 8.99, Stock: 80
ID: 3, Name: Hair Gel, Category: Hair Styling, Price: 5.99, Stock: 150
ID: 4, Name: Hair Spray, Category: Hair Styling, Price: 6.99, Stock: 120
ID: 5, Name: Hair Serum, Category: Hair Care, Price: 15.99, Stock: 200
ID: 6, Name: new product, Category: test cat, Price: 1.99, Stock: 10   <---

--- Manage Products ---
1. View All Products
2. Add Product
3. Update Product Stock
4. Delete Product              <---
5. Back to Previous Menu
Please select an option: 4

--- Delete Product ---
Enter product ID to delete: 6                <---
Product with ID '6' deleted successfully.

--- Manage Products ---
1. View All Products
2. Add Product
3. Update Product Stock
4. Delete Product
5. Back to Previous Menu
Please select an option: 1

--- All Products ---
ID: 1, Name: Shampoo, Category: Hair Care, Price: 9.99, Stock: 100
ID: 2, Name: Conditioner, Category: Hair Care, Price: 8.99, Stock: 80
ID: 3, Name: Hair Gel, Category: Hair Styling, Price: 5.99, Stock: 150
ID: 4, Name: Hair Spray, Category: Hair Styling, Price: 6.99, Stock: 120
ID: 5, Name: Hair Serum, Category: Hair Care, Price: 15.99, Stock: 200
                                                             <---
```

Appendices

Appendix 12: Failed Login Attempt

```
=== Welcome to IMS ===
1. Login              ⬅
2. Register as Customer
3. Exit
Please select an option: 1

--- Login ---
Username: clerk1         Failed login attempt 1
Password: test1
Invalid username or password. You have 2 attempt(s) remaining.
Login failed.

=== Welcome to IMS ===
1. Login
2. Register as Customer
3. Exit
Please select an option: 1

--- Login ---
Username: clerk1         Failed login attempt 2
Password: test2
Invalid username or password. You have 1 attempt(s) remaining.
Login failed.

=== Welcome to IMS ===
1. Login
2. Register as Customer
3. Exit
Please select an option: 1

--- Login ---
Username: clerk1      Failed login attempt 3
Password: test3
Account locked due to multiple failed attempts. Please try again after 5 minutes.  ⬅
Login failed.
```

Appendix 13: Automatically Unlocked

```
=== Welcome to IMS ===
1. Login
2. Register as Customer
3. Exit
Please select an option: 1

--- Login ---
Username: clerk1
Password: Clerk@1234
Account is locked. Please try again after 0 minute(s) and 5 second(s).  ⬅
Login failed.

=== Welcome to IMS ===
1. Login
2. Register as Customer
3. Exit
Please select an option: 1

--- Login ---
Username: clerk1
Password: Clerk@1234
Enter the MFA code sent to your registered device: 123456

Welcome, clerk1!              ⬅

--- Clerk Menu ---
1. Manage Products
2. Logout
Please select an option: |
```

Appendices

Appendix 14: Login as Unregistered user

```
=== Welcome to IMS ===
1. Login                    <---
2. Register as Customer
3. Exit
Please select an option: 1

--- Login ---
Username: test
Password: test
Invalid username or password.  <---
Login failed.
```

Appendix 15: Login as Admin

```
=== Welcome to IMS ===
1. Login                    <---
2. Register as Customer
3. Exit
Please select an option: 1

--- Login ---
Username: admin
Password: Admin@1234
Enter the MFA code sent to your registered device: 123456

Welcome, admin!

--- Admin Menu ---
1. Manage Users
2. Manage Products
3. View System Logs
4. Logout
Please select an option: 1
```

Appendices

Appendix 16: View User

```
--- Admin Menu ---
1. Manage Users          ⬅
2. Manage Products
3. View System Logs
4. Logout
Please select an option: 1

--- Manage Users ---
1. View All Users        ⬅
2. Add Clerk
3. Remove User
4. Unlock User Account
5. Back to Admin Menu
Please select an option: 1

--- All Users ---
Username: admin, Role: Admin, Locked: False
Username: clerk, Role: Clerk, Locked: False
Username: customer, Role: Customer, Locked: False
Username: customer1, Role: Customer, Locked: False
Username: clerk1, Role: Clerk, Locked: False
Username: clerk2, Role: Clerk, Locked: True
```

Appendix 17: Unlock User

```
--- All Users ---
Username: admin, Role: Admin, Locked: False
Username: clerk, Role: Clerk, Locked: False
Username: customer, Role: Customer, Locked: False
Username: customer1, Role: Customer, Locked: False
Username: clerk1, Role: Clerk, Locked: False
Username: clerk2, Role: Clerk, Locked: True   ⬅

--- Manage Users ---
1. View All Users
2. Add Clerk
3. Remove User
4. Unlock User Account   ⬅
5. Back to Admin Menu
Please select an option: 4

--- Unlock User Account ---
Enter username to unlock: clerk2
User 'clerk2' account has been unlocked.

--- Manage Users ---
1. View All Users
2. Add Clerk
3. Remove User
4. Unlock User Account
5. Back to Admin Menu
Please select an option: 1

--- All Users ---
Username: admin, Role: Admin, Locked: False
Username: clerk, Role: Clerk, Locked: False
Username: customer, Role: Customer, Locked: False
Username: customer1, Role: Customer, Locked: False
Username: clerk1, Role: Clerk, Locked: False
Username: clerk2, Role: Clerk, Locked: False   ⬅
```

Appendices

Appendix 18: Add Clerk with invalid password

```
--- Manage Users ---
1. View All Users
2. Add Clerk
3. Remove User
4. Unlock User Account
5. Back to Admin Menu
Please select an option: 2

--- Add Clerk ---
Enter clerk username: clerk3
Enter clerk password: test        <---
Invalid username or password format.   <---
```

Add Clerk with valid password

```
--- Manage Users ---
1. View All Users
2. Add Clerk                   <---
3. Remove User
4. Unlock User Account
5. Back to Admin Menu
Please select an option: 2

--- Add Clerk ---
Enter clerk username: clerk3      <---
Enter clerk password: Clerk@1234
Clerk registered successfully.
Clerk added successfully.

--- Manage Users ---
1. View All Users
2. Add Clerk
3. Remove User
4. Unlock User Account
5. Back to Admin Menu
Please select an option: 1

--- All Users ---
Username: admin, Role: Admin, Locked: False
Username: clerk, Role: Clerk, Locked: False
Username: customer, Role: Customer, Locked: False
Username: customer1, Role: Customer, Locked: False
Username: clerk1, Role: Clerk, Locked: False
Username: clerk2, Role: Clerk, Locked: False
Username: clerk3, Role: Clerk, Locked: False    <---
```

Appendices

Appendix 19: Remove User

```
--- All Users ---
Username: admin, Role: Admin, Locked: False
Username: clerk, Role: Clerk, Locked: False
Username: customer, Role: Customer, Locked: False
Username: customer1, Role: Customer, Locked: False
Username: clerk1, Role: Clerk, Locked: False
Username: clerk2, Role: Clerk, Locked: False
Username: clerk3, Role: Clerk, Locked: False      <---

--- Manage Users ---
1. View All Users
2. Add Clerk
3. Remove User        <---
4. Unlock User Account
5. Back to Admin Menu
Please select an option: 3

--- Remove User ---
Enter username to remove: clerk3
User 'clerk3' removed successfully.

--- Manage Users ---
1. View All Users
2. Add Clerk
3. Remove User
4. Unlock User Account
5. Back to Admin Menu
Please select an option: 1

--- All Users ---
Username: admin, Role: Admin, Locked: False
Username: clerk, Role: Clerk, Locked: False
Username: customer, Role: Customer, Locked: False
Username: customer1, Role: Customer, Locked: False
Username: clerk1, Role: Clerk, Locked: False
Username: clerk2, Role: Clerk, Locked: False      <---
```

Appendices

Appendix 20: View System Logs

```
--- Admin Menu ---
1. Manage Users
2. Manage Products
3. View System Logs        ←
4. Logout
Please select an option: 3


--- System Logs ---
2025-01-07 18:02:34,101 - ERROR - Error connecting to company validation API: HTTPConnectionPool(host='localhost', port=
5000): Max retries exceeded with url: /validate_company?company_id=COMPANY123 (Caused by NewConnectionError('<urllib3.co
nnection.HTTPConnection object at 0x000002D7B5EF4C40>: Failed to establish a new connection: [WinError 10061] No connect
ion could be made because the target machine actively refused it'))
2025-01-07 18:15:42,911 - WARNING - clerk1 account locked due to multiple failed attempts.
2025-01-11 14:37:27,982 - WARNING - clerk account locked due to multiple failed attempts.
2025-01-12 19:05:18,971 - WARNING - clerk account locked due to multiple failed attempts.
2025-01-13 22:00:37,723 - INFO - New customer registered: customer1
2025-01-13 22:01:01,655 - INFO - customer1 logged in successfully.
2025-01-13 22:20:17,478 - INFO - clerk logged in successfully.
2025-01-13 22:40:21,879 - INFO - admin logged in successfully.
2025-01-13 22:40:45,535 - INFO - New clerk registered: clerk1
2025-01-13 22:40:53,751 - INFO - New clerk registered: clerk2
2025-01-13 22:41:53,439 - INFO - clerk1 logged in successfully.
2025-01-13 22:42:41,617 - WARNING - clerk1 account locked due to multiple failed attempts.
2025-01-13 22:46:46,715 - WARNING - clerk2 account locked due to multiple failed attempts.
2025-01-13 22:47:47,317 - INFO - clerk1 logged in successfully.
2025-01-13 22:49:49,927 - INFO - admin logged in successfully.
2025-01-13 22:55:42,653 - INFO - New clerk registered: clerk3
2025-01-13 23:07:51,483 - INFO - admin logged in successfully.
```

Appendices

Appendix 21: Invalid input

```
--- Admin Menu ---
1. Manage Users
2. Manage Products
3. View System Logs
4. Logout
Please select an option: 5        <---
Invalid option. Please try again.
```

Appendix 22: Logout

```
--- Admin Menu ---
1. Manage Users
2. Manage Products
3. View System Logs
4. Logout
Please select an option: 4
Logging out.

=== Welcome to IMS ===
1. Login
2. Register as Customer
3. Exit              <---
Please select an option: 3
Goodbye!
Press any key to continue . . . |
```