**Applied Software Project Report**

By

Dipak Mansurali Vanzara

**A Master’s Project Report submitted to Scaler Neovarsity - Woolf in partial fulfillment of the requirements for the degree of Master of Science in Computer Science**

May, 2025



**Scaler Mentee Email ID :** dipakvanzara@gmail.com

**Thesis Supervisor :** Naman Bhalla

**Date of Submission :** 01/05/2025

**Certification**

I confirm that I have overseen / reviewed this applied project and, in my judgment, it adheres to the appropriate standards of academic presentation. I believe it satisfactorily meets the criteria, in terms of both quality and breadth, to serve as an applied project report for the attainment of Master of Science in Computer Science degree. This applied project report has been submitted to Woolf and is deemed sufficient to fulfill the prerequisites for the Master of Science in Computer Science degree.

Naman Bhalla

…………………

Project Guide / Supervisor

**DECLARATION**

I confirm that this project report, submitted to fulfill the requirements for the Master of Science in Computer Science degree, completed by me from 09 April 2024 to 27 June 2024, is the result of my own individual endeavor. The Project has been made on my own under the guidance of my supervisor with proper acknowledgement and without plagiarism. Any contributions from external sources or individuals, including the use of AI tools, are appropriately acknowledged through citation. By making this declaration, I acknowledge that any violation of this statement constitutes academic misconduct. I understand that such misconduct may lead to expulsion from the program and/or disqualification from receiving the degree.

**Dipak Mansurali Vanzara**

**<Signature of the Candidate> Date: 01 May 2025**

**ACKNOWLEDGMENT**

I would like to express my heartfelt gratitude to everyone who supported and guided me throughout the completion of this project, which plays a vital role in the successful attainment of my Master of Science in Computer Science degree.

I am deeply thankful to Mr. Naman Bhalla, my project supervisor, for his constant support, timely guidance, and insightful suggestions that helped shape this project from its early stages to completion. His mentorship has been invaluable throughout this academic journey.

I extend my sincere thanks to Scaler Neovarsity - Woolf for designing a robust curriculum and providing the platform to apply and demonstrate the skills learned. This project stands as a testament to the practical knowledge and hands-on experience gained during the program.

Special thanks to my family for their unwavering love, support, and motivation, which kept me focused even during the most challenging times.

I am also grateful to my peers, friends, and instructors at Scaler, whose collaboration, encouragement, and feedback made this learning journey truly enriching.

Lastly, I acknowledge the contributions of all those who, directly or indirectly, played a role in my academic and personal growth, helping me fulfill the requirements for this Master’s degree.

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## Applied Software Project

## Abstract

### The eCommerce industry is one of the fastest-growing sectors worldwide, with backend systems playing a critical role in enabling secure, scalable, and efficient online transactions. This project focuses on the development of an eCommerce backend system using Spring Boot and Microservices, supported by robust technologies like Kafka, Redis, MySQL, Docker, and JWT-based authentication.

### The system is divided into multiple independent microservices — including UserService, ProductService, CartService, OrderService, PaymentService and NotificationService — each performing a specific task and communicating asynchronously using Kafka. Redis caching is used to improve the performance of frequently accessed product data. Security is ensured through Spring Security and JWT tokens with role-based access control.

### The project emphasizes industry best practices such as modular development, containerization with Docker Compose, and integration with CI/CD-ready configurations. Unit testing using JUnit and Mockito ensures code quality, while API testing is validated through Postman.

### The primary aim is to simulate a real-world production-ready backend capable of handling high load, providing modular scalability, and maintaining clean separation of concerns. This report details the project's objectives, system design, development flow, feature implementations, and deployment processes, making it a valuable reference for real-world backend development.

### Overall, this capstone project demonstrates how microservices and modern backend practices can be leveraged to build reliable, maintainable, and performance-optimized systems in today’s digital commerce landscape.

### Project Description

Describe the project, Outline the objectives and explain its relevance.

Use Pictures, flow diagrams to illustrate the project well

Use the below format as reference when including a picture



**Figure 1.1**: Project Development Process (Figure captions go below figures.)

### Requirement Gathering

* Describe the requirements - Functional, Non-Functional Requirements
* Describe the Users and Use Cases
  + Include detailed Use Case Diagram / Images to illustrate
* List and detail out the Feature set -
  + Use Tables to list out the feature set

Use the below format as reference when including a table

**Table 1.1:** < Table caption > (Table captions go above tables.)

|  |  |  |
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### Class Diagrams

Describe the Low Level Design of the Project…

Provide class diagrams - Provide proper captions and follow the proper format for including diagrams / figures / images

**Tip** - Make images using draw.io and paste here following the guidelines for adding images / figures

### Database Schema Design

Explain the **Low Level Design** of the Project in more detail by providing the **database schema**

**design** description

Provide the schema design textually as well as diagrammatically

Sample Schema Design described textually -

“”

Tables:

Batches

* + Batch\_id
  + Name
  + Start\_month
  + Current\_instructor
  + Batch\_type\_id
  + Primary Key(Batch\_id)

Students

* + student\_id
  + name
  + graduation\_year
  + University\_name
  + email
  + Phone\_number
  + batch\_id
  + Buddy\_id
  + Primary Key(student\_id)

Classes

* Class\_id
* Name
* Date
* Time
* Instructor
* Primary Key(Class\_id)

Mentors

* + Mentor\_id
  + Name
  + Current\_company
  + Primary Key(Mentor\_id)

Mentor\_Sessions

* mentor\_session\_id
* time
* Duration
* Student\_id
* Mentor\_id
* Student\_rating
* Mentor\_rating
  + Primary Key(mentor\_session\_id)

Batches\_Classes

* + Batch\_id
  + Class\_id
  + Primary Key(Batch\_id, Class\_id)

Student\_batch\_history

* + student\_id
  + batch\_id
  + Shift\_date
  + Primary Key(student\_id, batch\_id)

Batch\_type

* + Batch\_type\_id
  + Batch\_type
  + Primary Key(Batch\_type\_id)

**Foreign Keys:**

* Batches(batch\_type\_id) refers Batch\_type(batch\_type\_id)
* Students(batch\_id) refers Batches(batch\_id)
* Mentor\_Sessions(Student\_id) refers Students(Student\_id)
* Mentor\_Sessions(Mentor\_id) refers Mentors(Mentor\_id)
* Batches\_Classes(Batch\_id) refers Batches(batch\_id)
* Batches\_Classes(student\_id) refers Students(Student\_id)
* Student\_batch\_history(student\_id) refers Students(Student\_id)
* Student\_batch\_history(batch\_id) refers Batches(batch\_id)

**Cardinality of Relations:**

* Between Batches and Batch\_type -> m:1
* Between Students and Batches -> m:1
* Between Batches and Classes -> m:m

“”

### Feature Development Process

Pick One key feature - Talk about its development process, implementation and performance optimisation / metric optimisation achieved…

For example, ‘Book a seat’ feature in developing ‘BookMyShow’ app

Elaborate the request flow to backend

* 1. API Request Payload
  2. Service which picks the request
  3. Flow of MVC architecture

Explain the performance improvement / metric optimization achieved.

For example,

* Used Cache to reduce API Response time by X seconds…
* Optimized Query Response time by using Indexing…

Benchmarking of response time without the optimisation and post the optimisation

### Deployment Flow

Explain how the deployment will work via AWS (Describe the below) -

* EC2
* VPC
* Security Groups
* RDS
* Cache
* Managed Infra / Elastic Beanstalk

Use diagrams, images to explain better

### Technologies Used

Kafka, MySQL, Springboot, Cloud etc…

* For each key technology used in building the project,
  + Detail and describe each of them
  + Elaborate how they can be used in real life
  + Provide example of real-life applications using them

Use diagrams, images to explain better

**Tip** - Use the internet to improve your project but DO NOT PLAGIARIZE - Include proper references if you are quoting articles from the internet

### Conclusion

The Conclusion should include some key points as elaborated below -

* Key Takeaways: Highlight the important concepts and technologies learned from doing the Project
* Practical Applications : Significance of technologies with their real-world applications
* Limitations : Limitations of the technologies, cost implications and suggestions for improvement

## References

Include the websites or works or the list of works referred to in a text or consulted by you for writing this report

1. Name of the Website, Date and time of referring to the Website, Name of the Author, Title/Topic
2. Author Name, Title / Topic, Research Paper Name / Book Name, Year of Publication

Format Guidelines

1. Detailed and Elaborate report of 40 pages at least is expected
2. Margins - Every page of your document must meet the margin requirements of 1.25 inches on the left and right, and 1 inch on the top and bottom.
3. Font:
   1. Style: Times New Roman,
   2. Font Size:14 (For Headings), 12 (For body text) in black colored text.
   3. All text must be the same justification, like left justified or fully justified.
4. Line Spacing:
   1. Body of the text: 1.5
   2. List of Tables/graphs/charts/bibliography: single line.
5. Alignment:
   1. Title page: Centre
   2. Chapter Heading: Centre
   3. Subheading: Left
   4. Body of the text: Justify
6. Titles: All titles and subtitles should be in bold. All tables/graphs/charts/figures should have appropriate titles.
7. Numbering of the tables, charts, graphs should be in the following fashion: Second table/graph/chart in the second chapter should be numbered as Table/graph/chart no. 2.02; where the first digit stands for chapter no. and digits after (.) stands for number of table/graph/charts in that chapter. Same numbering should be followed for all other chapters.