Team 1 Ecommerce

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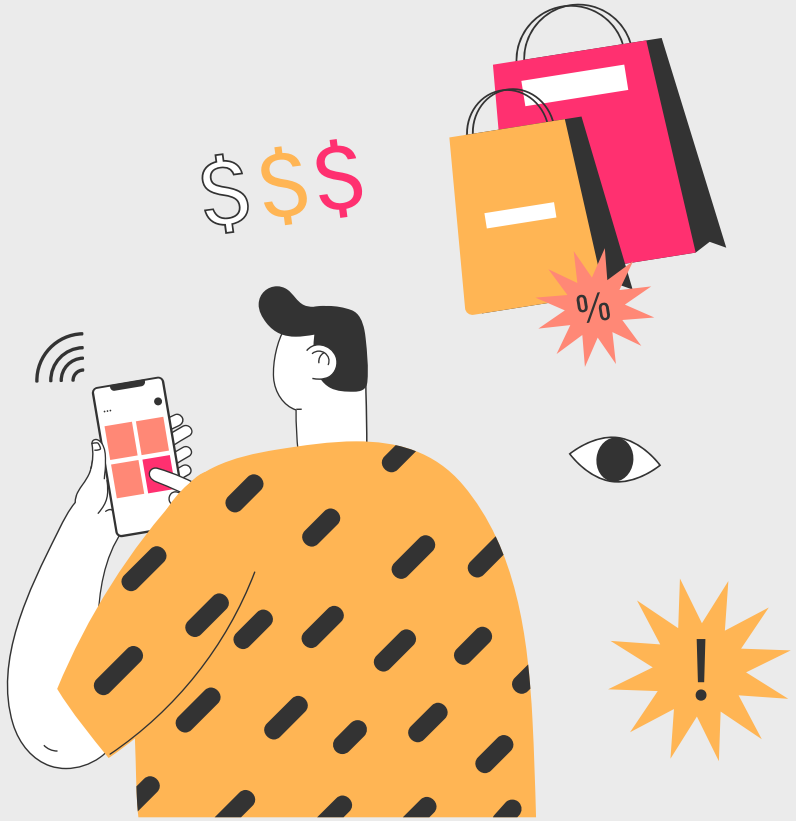
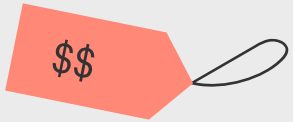
Objective

The purpose of this E-commerce application is to provide a unified, reliable, and scalable digital platform where independent vendors can easily list and sell their products, while customers enjoy a seamless, secure, and user-friendly shopping experience. The platform aims to streamline vendor onboarding, centralize product management, simplify order processing, and support secure payments. The system increases customer choice, creates market reach for small and medium businesses, and creates an efficient end-to-end commerce workflow that benefits all stakeholders.





Cost Estimation

Function Point:

Great for applications with multiple inputs, outputs, and user interactions.

	Function Category	Count	Complexity			Count X Complexity
			Simple	**Average**	Complex	
1	Number of user input	12	3	**4**	6	48
2	Number of user output	10	4	**5**	7	50
3	Number of user queries	13	3	**4**	6	52
4	Number of data files and relational tables	8	7	**10**	15	80
5	Number of external interfaces	3	5	**7**	10	21
			Gross Function Point		**GFP**	**251**

	Category	Complexity
1	Does the system require reliable backup and recovery?	5
2	Are data communications required?	3
3	Are there distributed processing functions?	3
4	Is performance critical?	4
5	Will the system run in an existing, heavily utilized operational environment?	3
6	Does the system require online data entry?	4
7	Does the online data entry require the input transaction to be built over multiple screens or operations?	4
8	Are the master files updated online?	3
9	Are the inputs, outputs, files, or inquiries complex?	3
10	Is the internal processing complex?	3
11	Is the code designed to be reusable?	4
12	Are conversion and installation included in the design?	3
13	Is the system designed for multiple installations in different organizations?	4
14	Is the application designed to facilitate change and ease of use by the user?	5
Processing Complexity	**Total PC**	**51**

Gross Functional Point (GFP) = **251**

Processing Complexity Adjustment (PCA) = 0.65 + (0.01 x 51) = **1.16**

Functional Point (FP) = GFP x PCA = 251 x 1.16 = **291.16**

Productivity = 5 FP per person-week

Effort = FP / Productivity = 291.16 / 5 = 58.23 ≈ **58 person-weeks**

Team size = 6

Duration = Effort / team size = 58 / 6 ≈ **10 weeks ≈ 2.5 months**

Billing rate = $70 /hr = $2800 /week (for 40 hr/week)

Cost = 2800 x 10 x 6 = **$168,000.00**

Software Cost Estimation

1. **Internal Admin & Operations**
   a. Product: Retool or Forest Admin.
   b. Purpose: Provides a drag-and-drop internal dashboard for our customer support and operations teams.
   c. Cost: $50 - $65 / user / month (Business/Pro Plans).
      i. Estimate for 3 Admin Staff: ~$150 - $200 / month.

2. **Tax**
   a. Product: TaxJar Professional or Avalara AvaTax.
   b. Purpose: Real-time API that calculates the exact tax rate at checkout and automates state filing.
   c. Cost: $99 - $350 / month

3. **Legal**
   a. Product: Termly or lubenda.
   b. Purpose: Manages cookie consent banners, privacy policies, and data deletion requests automatically.
   c. Cost: $20 - $100 / month

4. **Application Health**
   a. Product: Sentry (Team/Business Tier).
   b. Purpose: Alerts developers immediately when a user sees a "Something went wrong" error, including the exact line of code responsible.
   c. Cost: $29 - $89 / month.

5. **Specialized Security Software**
   a. Product: Cloudflare Pro.
   b. Purpose: Provides a "Software Firewall" (WAF) to block SQL injection attacks, DDoS attacks, and automated bot scraping before they hit our servers.
   c. Cost: $20 - $25 / month.

6. **Transactional Email Software**
   a. Product: Postmark or SendGrid.
   b. Purpose: High-deliverability email API strictly for "system" messages (password resets, receipts).
   c. Cost: $15 - $50 / month (for ~10k - 50k emails).

Software Cost Estimation

Category	Software Product	Estimated Monthly Cost
Internal Admin	Retool (3 seats)	$150
Tax Automation	TaxJar Professional	$200
Privacy/Legal	Termly Pro	$20
Error Tracking	Sentry Team	$29
Security WAF	Cloudflare Pro	$20
Email API	Postmark	$15
TOTAL:		**~$434 / Month**

Hardware Cost Estimation

1. **Application Compute (Web/API Servers)**
   a. Product: Google Compute Engine/AWS EC2
   b. Purpose: The platform supplies the foundational virtual server instances (vCPUs and RAM) that execute our application code. These instances are essential for automatically scaling to ensure reliable service for 500 concurrent users.
   c. Cost: $300 – $500 / month (starting cost for a scalable, production cluster)

2. **Managed Database**
   a. Product: Google Cloud SQL and AWS RDS (such as PostgreSQL)
   b. Purpose: To safely store all product inventory, user accounts, and order transaction data in a fully managed, high-availability database service. It also takes care of the need for dependable backup and recovery.
   c. Cost: $80 – $150 / month

3. **Content Delivery Network (CDN)**
   a. Product: AWS CloudFront / Cloudflare CDN
   b. Purpose: Caches static assets at global edge locations, including product images, JavaScript, and CSS. To meet the 3-second load time NFR, these files must be delivered promptly.
   c. Cost: $10 - $50 / month

4. **Load Balancing & High-Availability**
   a. Product: Cloud Load Balancer (e.g., AWS ELB)
   b. Purpose: The goal is to automatically distribute incoming customer traffic among our application servers in order to minimize downtime, guarantee system uptime, and manage traffic spikes for high concurrency
   c. Cost: $15 – $30 / month

Hardware Cost Estimation

Category	Estimated Monthly Cost	Rationale
Compute/Server (Managed Cloud)	$400	Provides scalable virtual machines (vCPUs/RAM) to handle up to 500 concurrent users.
Database (Managed Service)	$100	Cost for a managed database (Neon Postgresql) for product, order, and user data.
Content Delivery Network (CDN)	$30	Caches product images and assets globally to ensure the 3-second load time NFR.
Load Balancer & Network	$20	Distributes traffic across servers to manage the 500 concurrent users and ensures 24/7 uptime.
TOTAL (Monthly)	**$550**	

Cost of Personnel

Category	Cost
Prorated Personnel Cost (10 weeks)	$313, 700
Training & Certification	$19,700
Total Estimated Cost	**$333,400**

Total Annual Salaries (Before Overhead):$1,255,000

Employment Overhead = 30%
1,255,000 × 0.30=$ 376,500

Total Annual Personnel Cost: 1,255,000 + 376,500 =$1,631,500

Cost Allocated (10-Week Duration):10 weeks / 52 weeks =19.23% of annual workload

Project-Specific Personnel Cost:1,631,500 × 0.1923 ≈ $ 313,700

Total Training Cost :$19,700

Total Personnel Cost for the E-Commerce Project
$313,700 + $19,700 = $333,400

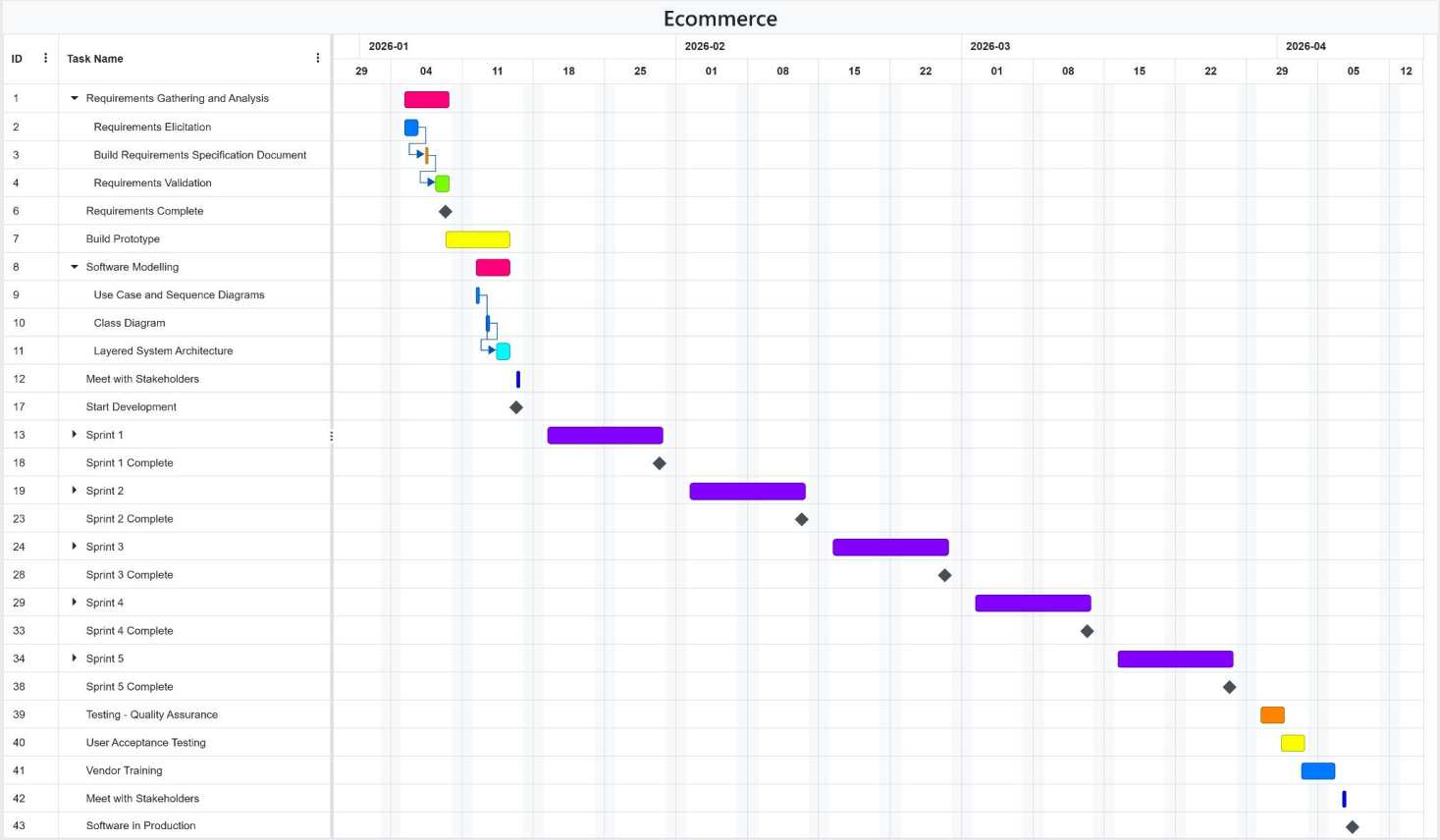
Role	# Employees	Avg. Salary	Rationale
Software Developers	6	$110,000	Core engineering team for backend, frontend, and integrations
QA Engineers	2	$85,000	Testing, automation, regression, and load testing
Project Manager / Scrum Master	1	$100,000	Scheduling, risk mgmt., coordination
DevOps / Cloud Engineer	1	$120,000	AWS deployment, CI/CD, scaling
Security Engineer	1	$125,000	Payment security, PCI-DSS, API hardening
Vendor Onboarding & Support Specialist	1	$60,000	Vendor training, onboarding, issue resolution

Training Area	Description	Cost
AWS Certification (8 engineers)	Developers + DevOps	$1,200 × 8 = $9,600
Payment Security / PCI-DSS Training	Required for handling transactions	$800 × 7 = $5,600
Secure Architecture & Scalability Workshops	Distributed systems training	$3,000
Vendor Platform Training Materials	Documentation + tutorials	$1,500

Project Timeline

- Start date: 5 January, 2026
- End date: 8 April, 2026
- 14 weeks: Each week is based on a standard 40 hour work schedule, with no weekend work included.
- Sprint(2 weeks):
  - Sprint Planning - Review product backlog & confirm sprint backlog
  - Sprint execution - daily scrums & complete tasks in sprint backlog
  - Sprint Review & Sprint Retrospective - present completed work to stakeholders and reflect on last sprint
- Final Testing:
  - Quality Assurance - proactively focuses on preventing defects
  - User acceptance testing - test the system in real world environment
- Vendor training: training vendors on how to use the platform to manage products, orders, and storefront settings

Project Schedule



Functional Requirements

- The system shall allow a new user to register and an existing user to log in with an email and password.
- The system shall allow customers to search, filter, and sort products.
- The system shall display detailed information for each product, including description, images, price, and vendor information.
- The system shall allow customers to add products to a virtual shopping cart.
- The system shall guide the customer through a checkout process to buy the items in their cart.
- The system shall show all the orders placed by the customer
- The system shall allow a vendor to create and manage their product listings.
- The system shall allow a vendor to view incoming orders.
- The system shall allow a vendor to update shipping information on an order.

Non-Functional Requirements

Performance Requirement:

- The system shall load product listings and search results in 3 seconds under normal network conditions and support 500 concurrent users without performance deterioration.

Operational Requirement:

- The system shall function 24/7 and be compatible with desktop and mobile browsers on all major operating systems.

Security Requirement:

- The system shall protect user data with AES-256 encryption and secure vendor accounts through two-factor authentication.

Safety/Security (Legislative) Requirement:

- The system shall adhere to safety and security rules, including data protection, fraud prevention, and compliance with any consumer protection legislation.

Comparison of Our Work

Shopify - an e-commerce platform that provides tools for businesses to create and manage online stores to sell products.

Similarities:

- Provides services for vendors to manage their products and customer to browse/order products
- Vendors are in complete control of their products, orders, and inventory.

Differences:

- Shopify is an plug-and-play system where the developers have to utilize prebuilt services, limiting the ability to customize according to customer requirements. On the other hand our e-commerce platform is built from the ground-up, as per customer requirements, allowing for greater customization.

Best Buy - a multinational electronics retailer with both offline and online presence.

Similarities:

- Both, Best Buy and our ecommerce platform are built using a Layered Architecture pattern, allowing for separation of concerns, easy maintenance, and high scalability [1].
- The use of CDNs has lead to faster loading times, and reduced hosting costs.

Differences:

- Best Buy is a mature system, built over years. It has daily releases, multiple versions, and low cost of change. Our e-commerce platform is still in the early stages, and will require significant time and development to achieve the same velocity of change as Best Buy.

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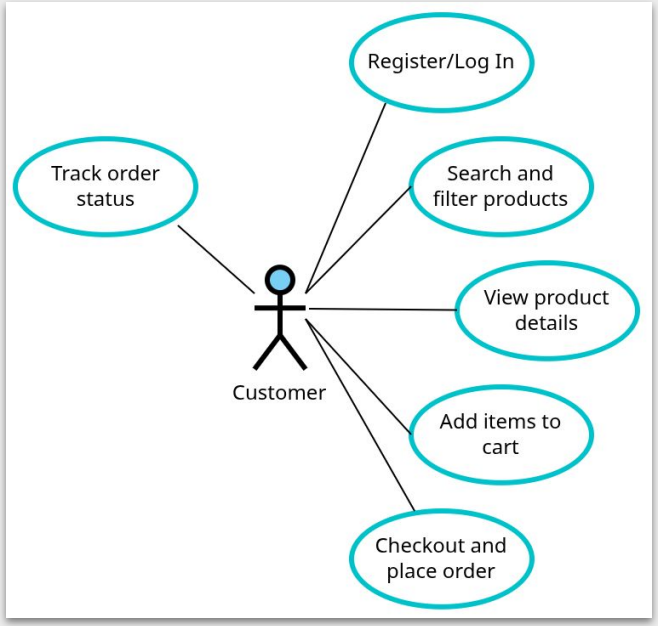
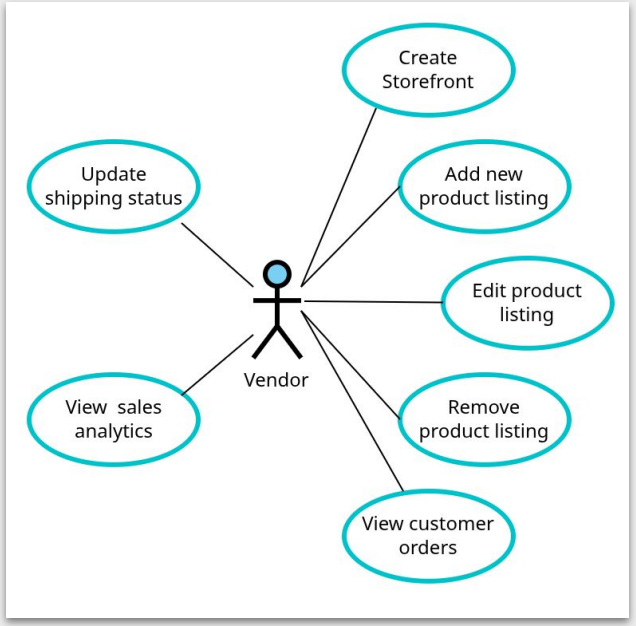
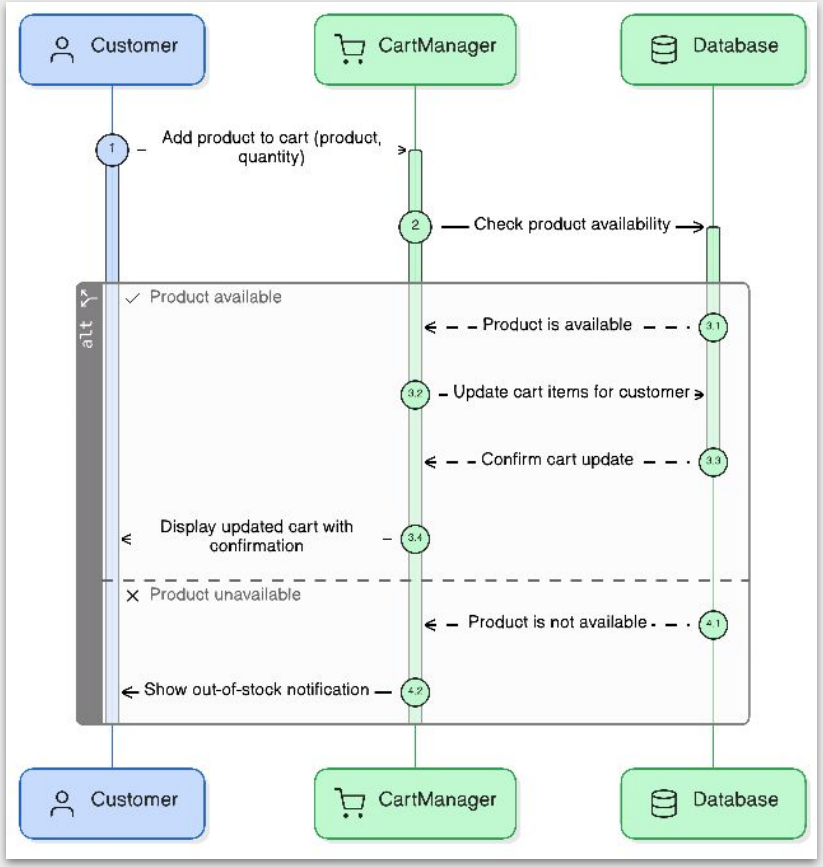
[1] J. Crabb, “BESTBUY.COM’S CLOUD ARCHITECTURE,” Apr. 29, 2013. https://joelcrabb.com/wp-content/uploads/2024/02/bestbuycloudarch.pdf

Use Case Diagrams





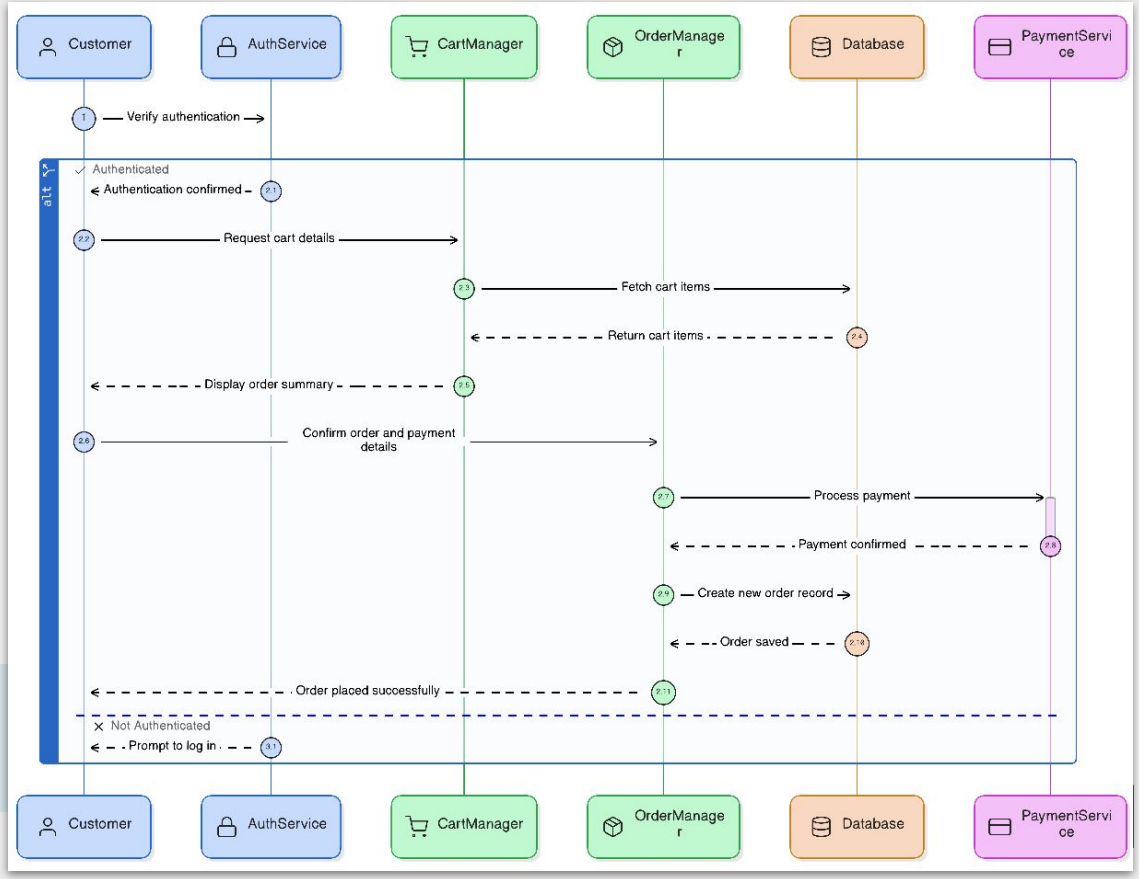
Sequence Diagram - Customer



Customer:

Add an item to cart

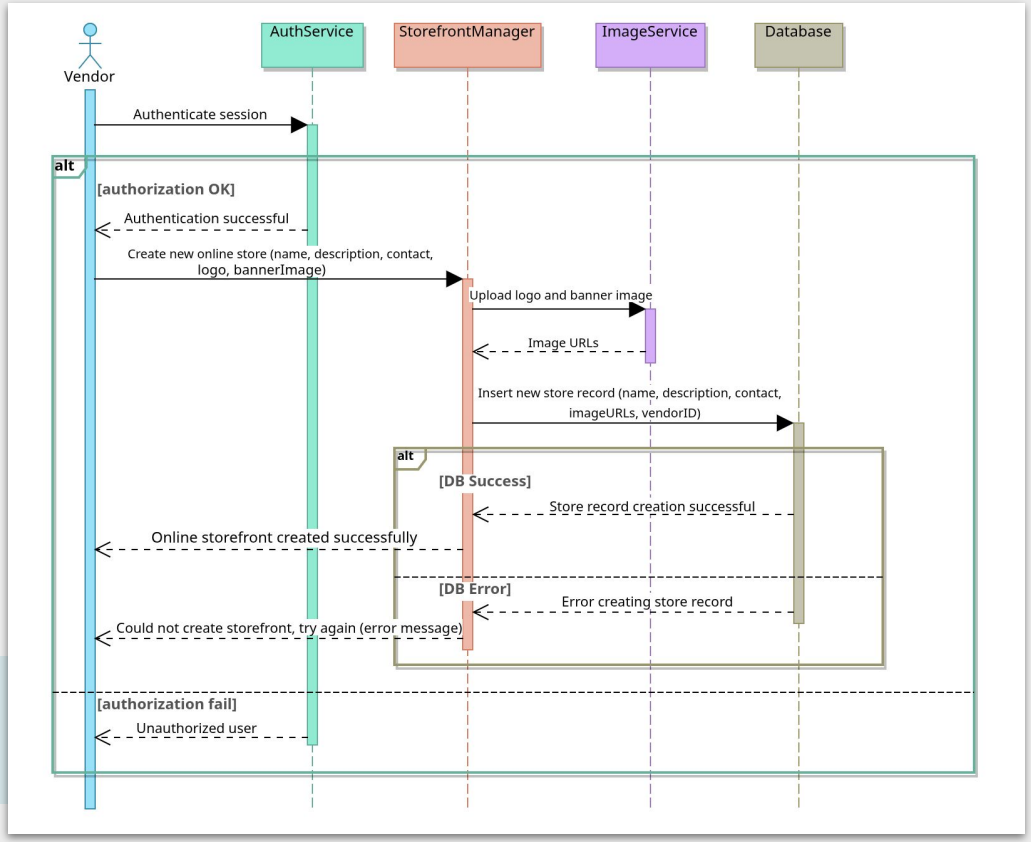
Sequence Diagram - Customer



Customer:

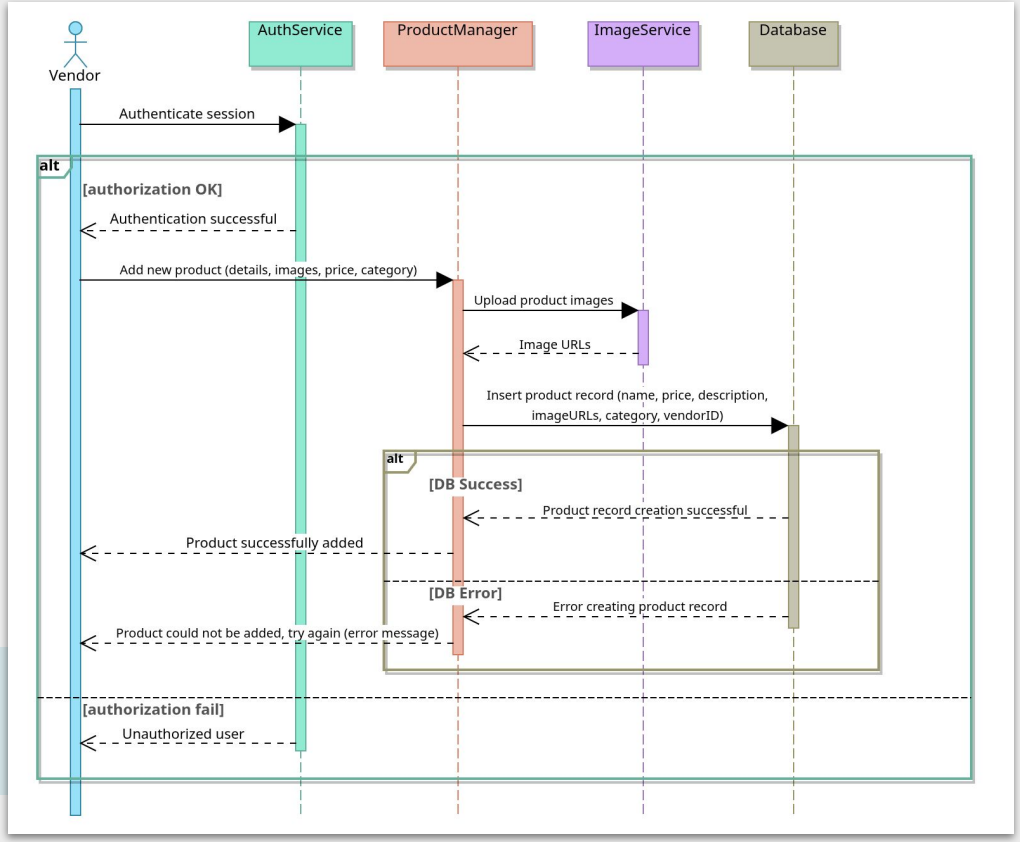
Place an order

Sequence Diagram - Vendor



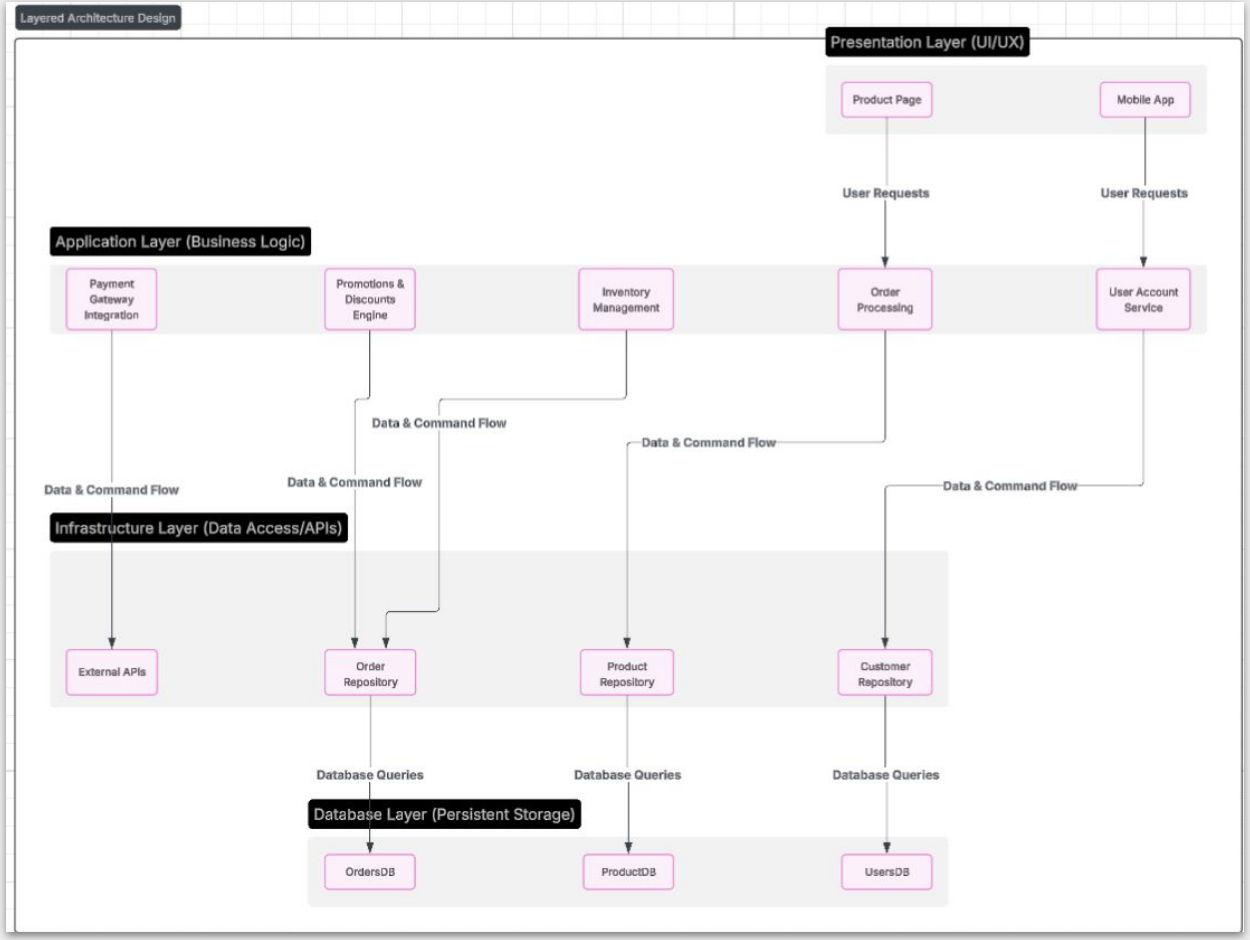
Vendor:
Create storefront

Sequence Diagram - Vendor



Vendor:
Add new product

Architectural Design



Class Diagram

Prototype Demo

Thank You

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