Group 15
Professor Donyanavard
CS 250
10/11/24

Ramen House Online Ordering System

1. Software Title

Ramen House Online Ordering System

2. Team Members

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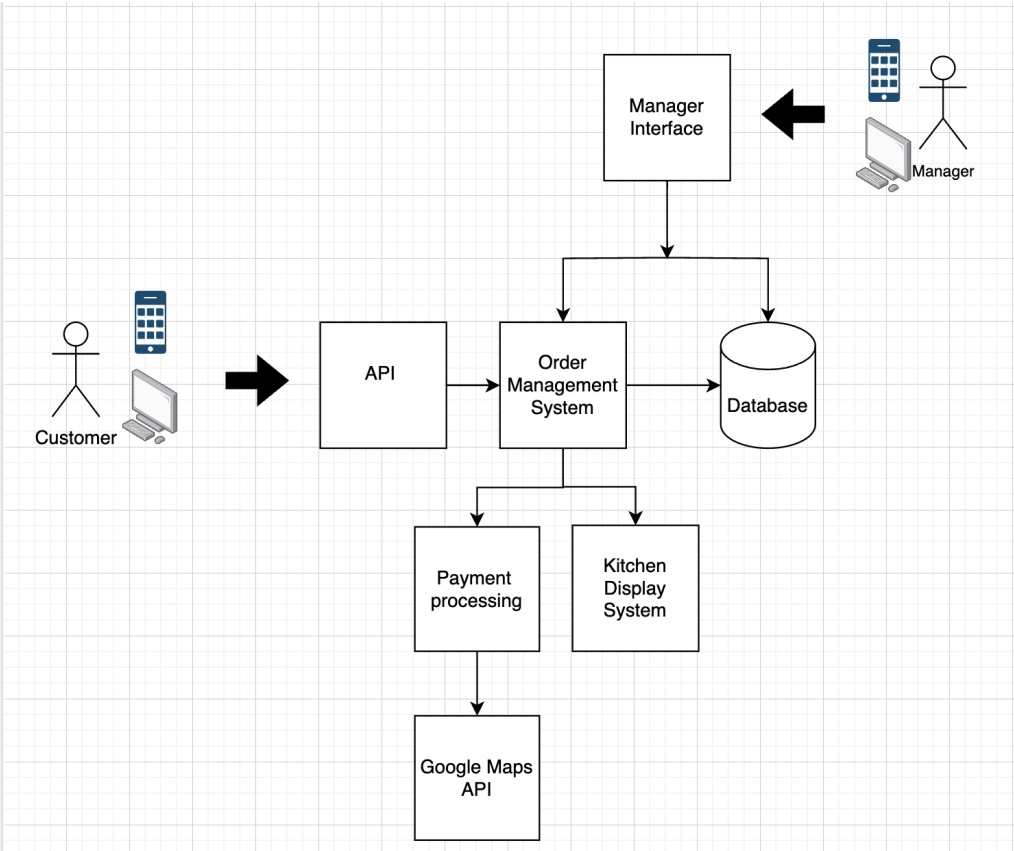
3. System Description

The Ramen House Online Ordering System intends to promote an increase in profit by enabling customers to conveniently place orders online. Customers can choose to either pick up their orders in-store or have them delivered by Ramen House drivers. They will have access to the entire menu, which includes detailed descriptions and ingredient lists for each dish, as well as the ability to browse their order history. Managers will have the capability to update the menu and pricing as needed, including adding or removing dishes.

4. Software Architecture Overview

4.1 Architecture Diagram

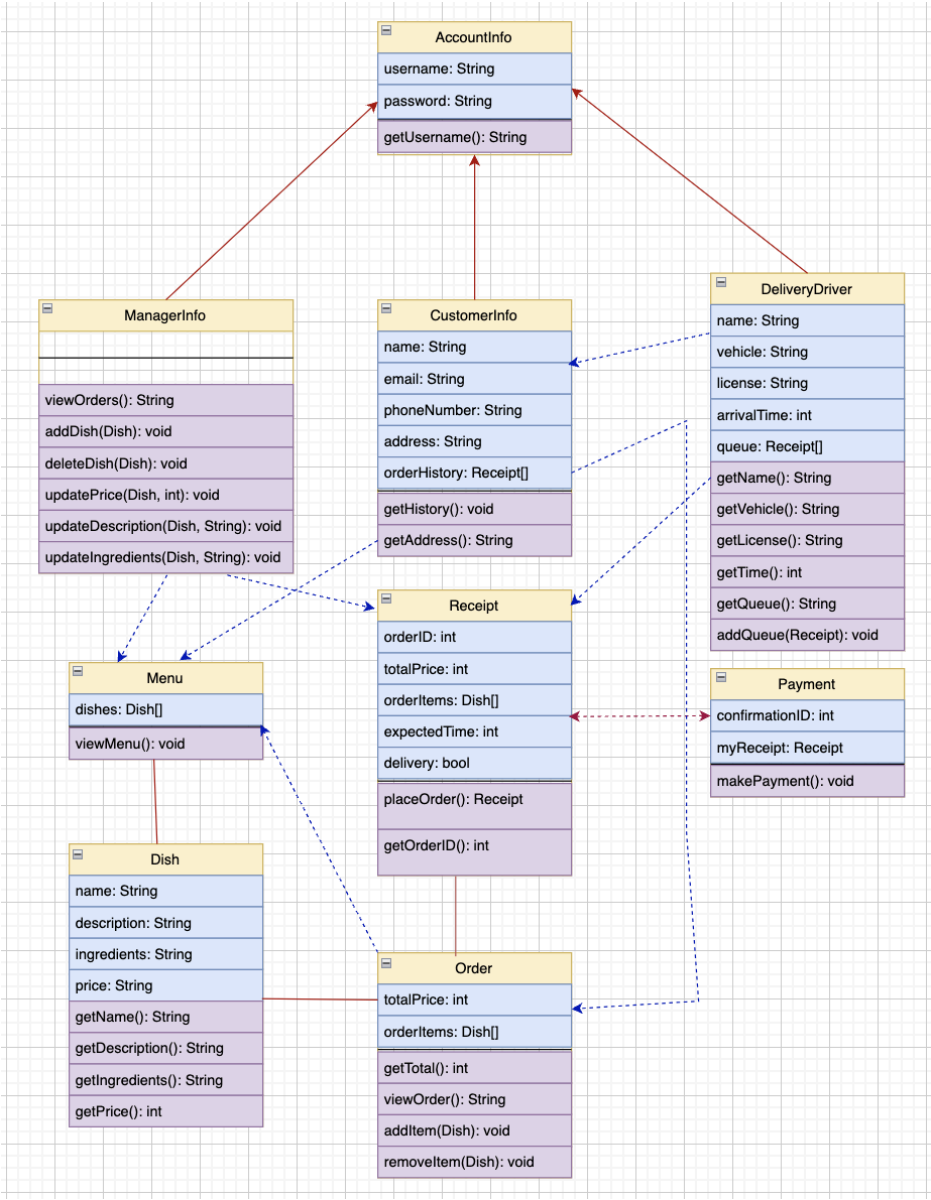


4.2 Description of Architecture Diagram

- **API:** Customers will interact with API to browse the full ramen menu and add items to their cart. When the customers are done adding items to their cart, this order information will go to the Order Management system.
- **Order Management System:** Once the order information is received, this will organize all information and send it to the database to be stored. It will also send the same information to the payment processor, and kitchen display.
- **Database:** This will hold all menu item information like prices and various items. It will also store customer information, revenue and order information.
- **Payment Processing:** this will provide a secure way for customers to checkout when they are finished adding items to their cart.
- **Kitchen Display:** Once information is received from the order management system, this will display all orders in chronological order.

- **Google Maps API:** Once order is complete from the payment processor and the delivery driver takes the order, customers will be sent here to track their orders location while it is enroute.
- **Manager Interface:** this will provide management with the ability to manipulate orders in the order management system. Also it will provide access to the database to retrieve or change information on orders, menu items, and financial information.

4.3 UML Class Diagram



4.4 Description of Classes

- **AccountInfo:** This class manages the login information for all user types, and directs users to the appropriate interface based on whether they are a customer, manager, or delivery driver.
- **CustomerInfo:** This class stores the information customers must provide for order delivery, such as their address, and outlines the functionalities available to them.
- **ManagerInfo:** This class facilitates the actions required by managers to maintain an up-to-date system.
- **DeliveryDriver:** This class provides details about the delivery driver to assist customers in identifying their delivery.
- **Menu:** This class organizes an overview of the main menu to display all available dishes.
- **Dish:** This class contains detailed information about each dish, including its description, ingredients, and price.
- **Order:** This class manages the customer's order cart by tracking added dishes and calculating the total price.
- **Receipt:** This class confirms the customer's order, including a unique order ID, estimated completion time, and whether the order is for pick-up or delivery.
- **Payment:** This class processes payments and provides a confirmation ID and receipt to customers.

4.5 Description of Attributes

- **username: String** - This is a unique username for all users to login with.
- **password: String** - This is a unique password for all users to login with
- **name: String** - This is used in the CustomerInfo and DeliveryDriver class to identify the customer’s or driver’s name.
- **email: String** - This is the customer’s email for receiving receipts and delivery updates.
- **phoneNumber: String** - This is the customer’s phone number for receiving receipts and delivery updates.
- **address: String** - This is the customer’s delivery address for food drop-off by drivers.
- **orderHistory: Receipt[]** - This is an array of receipts that records previous orders.

- **vehicle: String** - This is a description of the delivery driver's vehicle to help customers identify it.
- **license: String** - This is the delivery driver's license plate number for added security in identifying the correct vehicle.
- **arrivalTime: int** - This is the estimated time of arrival for the delivery driver, indicating when customers can expect their order.
- **queue: Receipt[]** - This is the order for the drivers to follow when delivering multiple orders.
- **dishes: Dish[]** - This is an array of dishes currently available on the menu.
- **name: String** - This is the name of the dish.
- **description: String** - This is an appetizing description of the dish.
- **ingredients: String** - This contains a list of ingredients in the dish, allowing customers to check for allergy concerns.
- **price: String** - This is the price of the dish.
- **totalPrice: int** - This is the total price of the dishes added to a customer's cart.
- **orderItems: Dish[]** - This array tracks the dishes in a customer's order.
- **orderID: int** - This is a unique order number on the customer's receipt for easy identification.
- **totalPrice: int** - This is the total price of the order, including tax and tip.
- **orderItems: Dish[]** - This is an array of all dishes ordered by the customer.
- **expectedTime: int** - This is the estimated completion time for the kitchen to prepare the customer's order.
- **delivery: bool** - Delivery will be true if the customer wants a delivery and false if they prefer to pick up the order.
- **confirmationID: int** - This is an ID confirming that the customer's payment was received.
- **myReceipt: Receipt** - This is the customer's copy of the receipt for their records.

4.6 Description of Operations

- **getUsername(): String** - This method returns the user's username.

- **viewOrders(): String** - This method allows the manager to view all incoming orders chronologically, ensuring all are processed.
- **addDish(Dish): void** - This method accepts a Dish as a parameter and adds it to the menu for customer ordering.
- **deleteDish(Dish): void** - This method accepts a Dish as a parameter and removes it from the menu.
- **updatePrice(Dish, int): void** - This method updates the price of the specified dish with the provided amount.
- **updateDescription(Dish, String): void** - This method updates the description of the specified dish with the provided text.
- **updateIngredients(Dish, String): void** - This method updates the ingredients of the specified dish with the provided text.
- **viewMenu(): void** - This method allows customers to view all dishes on the menu by parsing the dishes array.
- **getName(): String** - This method returns the name of the selected dish.
- **getDescription(): String** - This method returns the description of the dish.
- **getIngredients(): String** - This method returns the ingredients of the dish.
- **getPrice(): int** - This method returns the price of the dish.
- **getTotal(): int** - This method calculates and returns the total price of the dishes in the customer's order by summing their prices.
- **viewOrder(): String** - This method returns all of the dishes in the customer's order.
- **addItem(Dish): void** - This method adds the specified Dish to the order.
- **removeItem(Dish): void** - This method removes the specified Dish from the order.
- **placeOrder(): Receipt** - This method completes the transaction, returning a Receipt while adding it to the customer's order history.
- **getOrderID(): int** - This method returns the unique order ID for customers or delivery drivers to identify the correct order.
- **makePayment(): void** - This method handles the payment for the customer's order, offering options for credit card, PayPal, or Apple Pay.
- **getHistory(): void** - This method allows the customer to view their past receipts.

- **getAddress(): String** - This method returns the customer's address for directing the delivery driver.
- **getName(): String** - This method returns the name of the delivery driver, helping customers identify their driver.
- **getVehicle(): String** - This method returns the delivery driver's vehicle description to inform customers which car contains their delivery.
- **getLicense(): String** - This method returns the driver's license plate number for customers to verify the correct vehicle.
- **getTime(): int** - This method returns the estimated arrival time of the driver, indicating when customers can expect their delivery.
- **getQueue(): String** - This method returns the deliveries in the order of first to last for the driver to make.
- **addQueue(Receipt): void** - This method assigns more orders to the back of the queue to indicate the orders drivers are responsible for delivering.

5. Development Plan and Timeline

Because the client requested that this software is completed within six months, the tasks will be delegated to complete this in a timely manner. While responsibilities will be assigned individually, there will be an emphasis on following an iterative process, which includes allocating time for integration and testing to ensure the system is functioning as expected.

5.1 Partitioning of Tasks

There will be three members responsible for the development of this system. To work efficiently, the tasks will be partitioned between the members equally. One member will be responsible for the backend development, including the server-side logic, APIs, and ensuring smooth communication between the frontend and the database. This includes handling user authentication, order processing, and payment integration. The second member will focus on database management, designing and implementing the database to efficiently store and retrieve user information, orders, and menu items. They will also be responsible for optimizing queries to ensure high performance. The third member will handle the frontend development, designing an intuitive user interface that allows customers to easily navigate the menu, place orders, and

receive updates. Every member will work together to test each other's functionality during integration to debug and revise the code as needed. These outlined responsibilities will promote efficient collaboration in building a robust online ordering system for Ramen House.

5.2 Team Member Responsibilities

Effective teamwork is essential for the success of this software. Every team member will be responsible for maintaining consistent communication on progress updates and challenges relevant to the system. If any concerns arise, they should be communicated as soon as possible to be resolved efficiently. Individual responsibilities should be completed within four months to allocate two months to integration, testing, and optimization. Project management tools to track tasks and deadlines will ensure everyone stays on track and is held accountable. Working consistently in an organized manner and fostering a communicative environment will ensure the completion of this online ordering system within the six-month timeline.

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SDS: Test Plan

Test Set 1: Test Online Ordering

This test verifies the successful placement of a customer's order. It ensures that items are correctly added to a customer's cart and that the order is received by Ramen House.

Unit Test*: Check Add/Remove Item to Order*

Input Vectors:

- Input different ramen dishes like Tonkotsu Ramen, Shoyu Ramen, Curry Ramen, etc. into addItem(Dish)
- Observe if viewOrder() accurately returns all added dish items, including the correct quantity number
- Remove dishes from the order and observe if viewOrder() still correctly reflects the expected order

Targeted Features: Order form functionality

Coverage: This test aims to evaluate the accuracy and reliability of adding and removing dishes from an online order, ensuring that all functionalities work as intended.

Potential Failures: Failures in this test may include the inability to remove a dish from an order, incorrect quantity updates for duplicate items, or inaccurate display of order items.

Example: Add Tonkotsu Ramen, Shoyu Ramen, Tonkotsu Ramen, Curry Ramen. Remove Shoyu Ramen. Viewing the order with viewOrder() should reflect 2 Tonkatsu Ramens, 1 Curry Ramen, 0 Shoyu Ramen.

Integration Test*: Verify Correct Order Receipt*

Input Vectors:

- Add different dishes to an order
- Place the order for Ramen House

- Verify the receipt received by the manager contains correct items

Targeted Features: Ensure correct order is received by restaurant

Coverage: This intends to test the accuracy and reliability of the system transferring the correct order from the customer to the restaurant.

Potential Failures: Failures in this test could include failure to show all items for long orders or failure to reflect correct item quantities.

Example: Add Tonkotsu Ramen, Shoyu Ramen, Tonkotsu Ramen, Curry Ramen, Curry Ramen, Curry Ramen, Lemonade. Remove Curry Ramen. Hit place order. The managers should see an order for 2 Tonkatsu Ramen, 1 Shoyu Ramen, 1 Curry Ramen, and 1 Lemonade.

System Test*: End-to-End Ordering Process*

Input Vectors:

- Test the entire process from browsing the menu to processing payments and receiving an order confirmation.
- Test the past orders are recorded accurately and correctly displayed in the order history.
- Test that the printed receipt paper has all the correct information such as order items, price by each item, total price, order id and the expected delivery time.

Targeted Features: Verifying the reliability of the complete ordering process

Coverage: These tests cover and verify that the entire system of ordering from start to finish functions correctly and ensures a seamless user experience.

Potential Failures: Failures in this test could include issues with payments processing, items unable to get added or removed from the order list, customers might not receive the expected delivery time or the order ID. Additionally, the order history may not display correctly.

Example: A customer will browse the menu and add items to the cart. Then the customer will fill out the address and payment information. Once payment is processed the customer will receive an order receipt. As soon as the delivery driver takes the order, the customer will have a live Google Maps location of the driver. Once the order is delivered, all order and payment information will be stored in the order history with complete accuracy.

Test Set 2: Test System's Scalability

This test aims to evaluate the reliability of our system in handling large-scale operations that involve numerous sequential actions for all users.

Unit Test: *Reliable Driver Queue*

Input Vectors:

- Add multiple receipts to a driver's delivery queue
- Ensure the queue maintains the correct order for drivers to deliver. Orders should be sorted from earliest to latest order.

Targeted Features: Assigning multiple deliveries to drivers

Coverage: This test aims to evaluate the scalability and reliability of drivers managing multiple order deliveries. The system should effectively prioritize earlier orders to minimize customer wait times.

Potential Failures: Failures in this test may involve an incorrect order of receipts in the queue or the inability to add one or more orders to the queue altogether.

Example: Add multiple receipts to a driver's queue and retrieve the queue using getQueue(). Verify that the queue contains the same number of orders added and that the order of the receipts matches the expected priority sequence.

Integration Test*: Testing Manager's Menu Updates*

Input Vectors:

- Test that the updates in the menu are reflected in the order options.
- Test to ensure that the items from an updated menu can be ordered without issues.

Targeted Features: Verify the manager's menu updates are reflected correctly in the system.

Coverage: These tests check that changes from the manager applied with the addDish(Dish) and deleteDish(Dish) methods are reflected in the orderItems:Dish[], ensuring users can order updated items. The system should be able to handle many updates including additions and removals for a large menu change (i.e. seasonal menu items).

Potential Failures: Failures in this test may involve users not able to order newly added items or continue to see the items that should have been removed.

Example: The manager adds, removes, and updates menu items depending on menu changes. Then, view items on the menu page to check if the item information is correct. If the information in the menu is as expected, then add new or updated items to the cart and check the menu again. Lastly, complete the order of said items and ensure matching information.

System Test*: High Performance Handling of Customer Orders*

Input Vectors:

- Simulate high volume of order placements to see the system performance and reliability.
- Test the system's ability to handle multiple users placing orders at the same time.

Targeted Features: Handling high volume order

Coverage: These tests assess the system's performance under heavy use to ensure that it is capable of handling high volume orders and maintain its reliability.

Potential Failures: The system struggles to process multiple user orders simultaneously and crashes under heavy use.

Example: Have a test server run our environment and increment the number of simulated customers. Monitor response time for each incrementation and establish where our system response time begins to slow down. Also, test to complete failure to find out our maximum possible users at one time. Lastly, increment the number of users submitting an order at the same time to find at what point our system fails.

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Data Management Strategy

Database Choice

For our Ramen House online ordering system, we will be utilizing MySQL databases as our data management strategy. With complex queries and efficient handling of large datasets, MySQL can handle high volumes of data. This robust performance, scalability, and flexibility in handling small and large-scale applications make it ideal for our system because it will be sustainable as the restaurant's ordering system expands to a wider customer base. The ACID properties ensure transactions will be processed reliably, consistently, and securely, minimizing the potential cost of failure. Overall, MySQL databases will be a reliable and scalable option for our system, which will ensure long-term stability.

Logical Data Organization

We would have three tables to separate menu items, active order items, and archived orders. The Menu table would contain the following attributes: dish title, description, ingredients list, and price. This table allows managers to easily update the general menu information viewed by all customers, while also giving customers the ability to sort menu items using filters like price. The Active Order Items table would include: order time, customer username, order ID, list of items, delivery status, delivery address, driver name, and completion status. This table is useful for all users—managers can see a chronological list of orders, and drivers can sort by their names to find their assigned deliveries. Once an order is completed—either through customer pickup or successful delivery by the driver—the order is moved to the Archived Orders table. The archived table is sortable by customer username, providing an accurate order history that is viewable by both customers and managers.

MySQL Tables

1. Menu Table

Column Name	Data Type	Description
menu_item_id	INT	A unique identifier for each menu item.
dish_title	VARCHAR(255)	The name of the dish.
description	TEXT	A detailed description of the dish.
ingredients_list	TEXT	A list of ingredients (can be a text string or JSON array).
price	DECIMAL	The price of the dish.

2. Active order items table

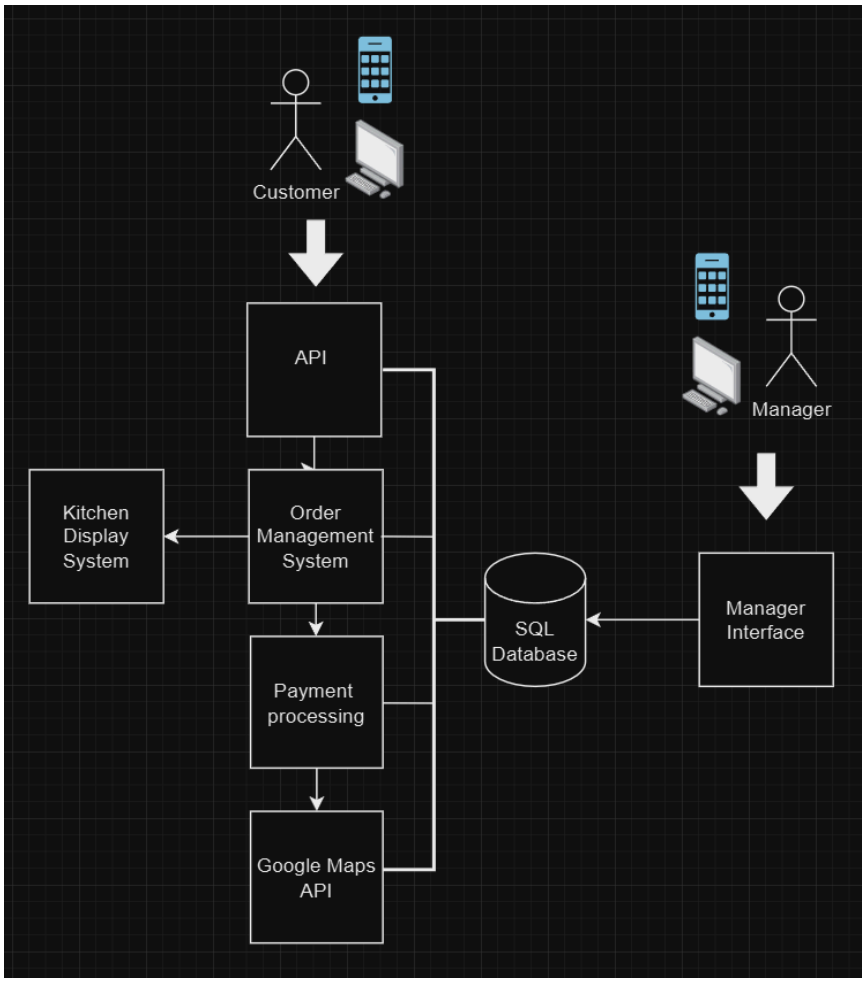
Column Name	Data Type	Description
order_id	INT	A unique identifier for each order.
order_time	TIMESTAMP	The time when the order was placed.
customer_username	VARCHAR(255)	The username of the customer who placed the order.
items_list	TEXT	A list of items ordered (could be a comma-separated list or JSON array of dish IDs).
delivery_status	ENUM (‘pending’, ‘in_progress’, ‘delivered’, ‘canceled’)	The current status of the delivery process.
delivery_address	VARCHAR(255)	The address for delivery.
driver_name	VARCHAR(255)	The name of the driver assigned to deliver the order.

completion_status	ENUM (‘not_completed’, ‘completed’)	The completion status of the order.

3. Archived Orders Table

Column Name	**Data Type**	**Description**
archived_order_id	INT (primary Key, Auto Increment)	Unique identifier for each archived order
order_id	INT (Foreign Key to Active_Order_Items)	The original order ID from the active Order Items table.
customer_username	VARCHAR(255)	The username of the customer who placed the order.
items_list	TEXT	A list of items ordered (same format as in active Orders).
delivery_status	ENUM (‘pending’, ‘in_progress’, ‘delivered’, ‘canceled’.)	The status of the delivery process at the time of the order was archived.
delivery_address	VARCHAR(255)	The delivery address used for the order
driver_name	VARCHAR(255)	The name of the delivery driver who completed the delivery.
completion_status	ENUM (completed, not_completed)	The completion status of order.
archived_time	TIMESTAMP	The time when the order was archived

Updated Architecture Diagram



Updates

- SQL database pushes or pulls data from API, Order Management System, payment processing, and Google Maps API.
- Manager Interface now only communicates with our SQL database to remove, update, or pull data from our SQL tables. Any changes made to the database from the Manager interface will then be pushed to the API to display changes.

Alternative Design Decisions

An alternative design for our database structure could be to store all of our data into one large table. The table would include menu items, active order items, and archived orders. There are some advantages of structuring the database this way because it uses simpler queries.

Because we will have all the data in a single table it doesn't require a lot of joins between tables. Another advantage would be that there are fewer joins, which would lead to faster read times for our database. Now, those advantages seem great but there are also quite a few disadvantages. One of the biggest disadvantages of having one large table is the redundancy of stored data. We want our database to be as efficient as possible and wasting space on redundant data does not help our case. Another drawback is when a customer updates their information, you would have to update all records, this can lead to errors and is time-consuming. Lastly, securing the personal information of customers would become more difficult with one large table. Since the customer's PII (Personally Identifiable Information) will be repeated in the database, we would have to ensure that our encryption is spread to all copies of the data.

Database Comparisons

NoSQL, MySQL, and SQLite each excel in specific use cases. NoSQL databases are ideal for handling large volumes of unstructured data, offering flexibility and scalability. MySQL, a robust relational database, is renowned for its strong performance and ACID compliance, making it a popular choice for web applications. SQLite, a lightweight, serverless database, is well-suited for smaller applications due to its portability and ease of use. Ultimately, the choice of database depends on the specific requirements of a project. By understanding the strengths and limitations of each, developers can make informed decisions to optimize their applications.

For this project, we were initially torn between SQLite and MySQL as our database method. SQLite is an excellent choice for smaller applications because it requires minimal setup and maintenance, which is ideal for a small restaurant like Ramen House. However, MySQL, being optimized for read-heavy operations, is more suitable for web-based applications. Ultimately, we chose MySQL based on the application's requirements and its superior security features compared to SQLite.

We decided not to choose NoSQL for this project because they are typically better suited for applications that require handling complex, dynamic data models or massive datasets. Our project, however, focuses on more structured datasets where relational data and strong data integrity are essential. Since MySQL offers robust ACID compliance, ensuring data consistency and reliability, it is aligned more closely with our needs. Additionally, MySQL offers superior

security features compared to NoSQL options, which was a key factor in ensuring safe and consistent operations for Ramen House.