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Tap & Serve: Digital Restaurant Management System

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Abstract

Tap & Serve is a clever and user-friendly digital solution that makes restaurant operations much more efficient. Order taking, inventory control, billing, and ensuring that consumers receive excellent service are just a few of the daily duties it facilitates. Utilizing cutting-edge technology, such as mobile apps, cloud storage, and real-time data, Tap & Serve reduces errors, saves time, and maintains efficiency. With the use of extensive analytics and reporting capabilities, it gives restaurant owners the ability to keep an eye on the performance of their businesses and provides information on consumer preferences, sales patterns, and inventory levels. By offering automated notifications for low-stock items and real-time stock updates, Tap & Serve's inventory management tool helps to avoid shortages and overstocking. To monitor client information, administer loyalty plans, and customize the eating experience, the system additionally incorporates customer relationship management (CRM) technologies. By incorporating speed, precision, and convenience into every facet of restaurant management, Tap & Serve transforms the conventional eating experience with its focus on user-friendliness and operational excellence. Tap & Serve helps restaurants optimize their daily operations while providing outstanding service by fusing efficiency, creativity, and customer-centric features. Both employees and consumers benefit from services including computerized menus, automated order processing, table reservations, and feedback gathering. Additionally, restaurant owners have access to clear reports and insightful data that allow them to monitor business success. In general, Tap & Serve streamlines all aspects of restaurant administration by adding speed, accuracy, and convenience.

Keywords: CRM, cloud storage, restaurant management, user friendliness, mobile app, real time data

INTRODUCTION

Technological breakthroughs and shifting consumer demand have caused the restaurant sector to change quickly in recent years. These days, a restaurant's success is mostly determined by its management and service. A complete and cutting-edge solution created to meet these demands by incorporating digital technology into all facets of restaurant operations is the Tap & Serve: Digital Restaurant Management System.

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To provide smooth and effective experience for both restaurant employees and customers, the Tap & Serve: Digital Restaurant Management System seeks to streamline the administration of orders, inventory, billing, and customer support. Tap & Serve saves service time, minimizes human error, and boosts overall efficiency by utilizing cutting-edge technology including cloud computing, mobile applications, and real-time data processing.

The Tap & Serve project redefines the dining experience by integrating modern digital technology into restaurant management. This

system leverages the power of QR codes, real-time data processing, and user-friendly interfaces to streamline operations for restaurant owners and provide seamless, contactless service for customers [1–5].

SCOPE

The scope of this project involves the development of a digital restaurant management system that uses table-specific QR codes to digitize the entire dining process. Customers can access the menu, place orders, and make payments through their smartphones, while restaurant administrators gain full control over menu management, order processing, and feedback handling. This project emphasizes efficiency, scalability, and user convenience, paving the way for the future of restaurant automation [6–11].

OBJECTIVES

The objectives of this project are,

- *Customer Experience:* Enable customers to access a digital menu, customize orders, and complete payments effortlessly.
- *Admin Control:* Provide administrators with tools for real-time menu updates, order tracking, and feedback management.
- *Technological Integration:* Utilize web technologies, like PHP, HTML, CSS, JavaScript, and SQL, to build a robust system with plans to transition to the MERN stack for enhanced functionality.
- *Scalability:* Develop a flexible system that supports future integration with advanced features, like AI recommendations and IoT.
- *Security:* Ensure secure payment processing and data handling for all users.

Problem Statement

Traditional restaurant management systems rely heavily on manual operations, leading to inefficiencies, delays, and customer dissatisfaction. Existing digital solutions often lack customization options or require significant investment, making them inaccessible to smaller establishments. A need exists for a cost-effective, user-friendly system that enhances customer experience and streamlines restaurant operations with minimal investment in additional infrastructure.

EXISTING SYSTEM

Current systems in restaurants involve physical menus, manual order-taking, and cash-based payments, which are time-consuming and prone to errors. While some restaurants use point-of-sale (POS) systems or mobile apps, they often lack flexibility, are expensive, or fail to provide a fully integrated solution for managing both customer orders and administrative tasks (Figure 1).

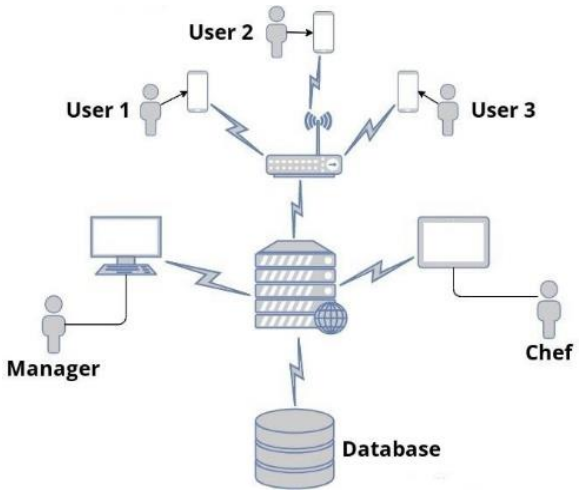

Figure 1. Proposed system architecture.

PROPOSED SYSTEM

The Tap & Serve system addresses these limitations by providing a comprehensive, modular, and scalable solution for restaurant management. Key features of the proposed system include,

- *Table-Specific QR Codes:* Customers can scan QR codes to view menus, place orders, and complete payments digitally.
- *Admin Dashboard:* Restaurant owners can manage menu items, track orders, view order history, and respond to customer feedback in real-time.
- *Secure Payment Options:* Support for both online and cash payments ensure convenience and security for customers.
- *Future-Ready Design:* Transitioning to the MERN stack for better performance and preparing for integration with AI and IoT features.

Key Features

Customer-focused features

- Contactless ordering and payment process.
- Easy navigation of digital menus with dynamic updates.

Admin Tools

- Intuitive dashboard for order and menu management.
- Real-time feedback and order tracking system.

Technical Excellence

- Built using robust technologies with plans for upgrading to a modern stack.
- Scalability to support multi-branch restaurants and large customer bases.

Future Integrations

- AI for personalized recommendations.
- IoT for integrating with kitchen display systems and smart devices.

System Operations

- *Customer Interaction:* Customers scan table-specific QR codes to access the digital menu, place orders, and pay seamlessly through their smartphones.
- *Admin Interaction:* Administrators access the dashboard to manage orders, update menus, and analyze customer feedback.
- *Secure Data Handling:* All payment and user data are processed securely to ensure customer trust.

System Requirement Specification

Use case diagram of the proposed system as shown in Figure 2.

DETAILED DESCRIPTION OF SYSTEM

Customer Modules

The application provides all the modules (Figure 3) the customer needs, when they visit the restaurant, such as viewing the digital menu, placing an order, and paying online.

The consumer module contains the following:

- *Scanning Module:* This is the first module (Figure 4) when a customer starts with the process. When the customer arrives at the restaurant, he scans the QR code on the table which redirects him to the restaurant website to continue. The QR code contains a unique table ID on top of a URL that will be stored for later processes.
- *Login/Registration Module:* In this module (Figure 5), customers are required to log in to the website if they are already registered, using their unique username. New customers must complete the registration process before logging in. The customer must select the number of

people with him and continue with the process after logging in.

- *Menu Display Module:* Customers can view the current menu of the restaurant using this module (Figure 6). In addition to the different categories of dishes, the top selling and recommended dishes are also displayed so they can see what is popular. The product image is included, along with the product name, price, and some descriptions.
- *Cart Module:* The customer's cart is automatically updated as soon as an item is added, displaying both the subtotal and the order quantity. Customers can edit their cart at any time before placing an order (Figure 7). To prevent data loss, items in the cart are also stored in the session. Once an order is placed, customers can add additional items and update their orders before proceeding with payment.
- *View Previous Orders Module:* This module allows customers to view past orders in detail, including total prices, payment IDs, and the date of each order.
- *Payment Module:* In this module, as soon as a customer clicks on the "PAY" button, he can view his final bill and proceed with payment. The payment module is integrated with the TestMojo API, which provides a secure payment gateway. After completing the payment process, the customer can either order again or end his session followed by feedback.
- *Feedback Module:* In this module, customers can evaluate each dish, comment on the ordering process, and suggest improvements to the restaurant's hospitality.
- *Notification Module:* A notification will be sent by WhatsApp with order details upon placing an order. After successful completion of payment, customers will receive a notification with the amount received for an order ID. Payment receipts are also sent by TestMojo API to their registered email address.

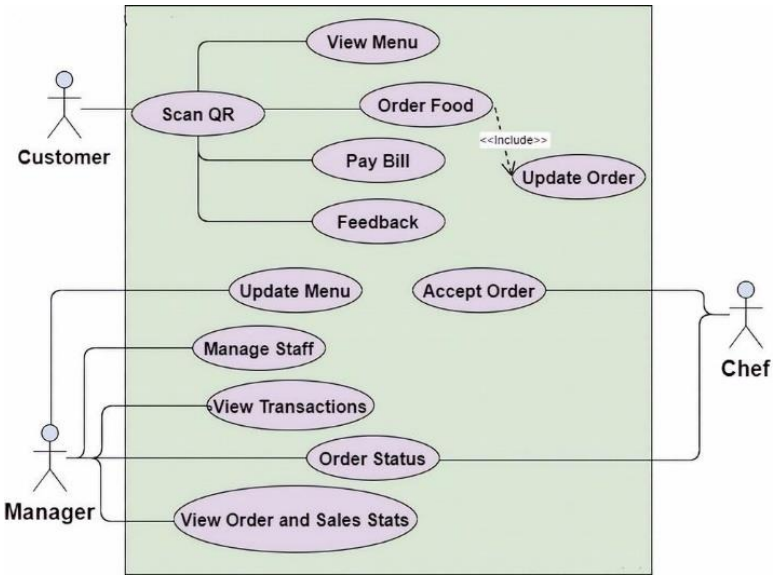

Figure 2. Use case diagram.

Figure 3. Customer module.

Figure 4. Scanning module.

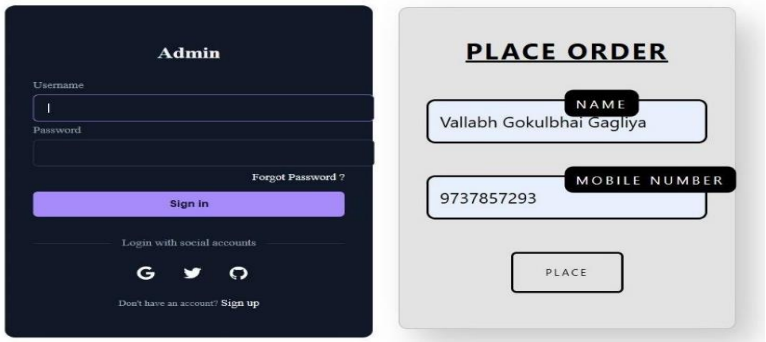

Figure 5. Login/registration module.

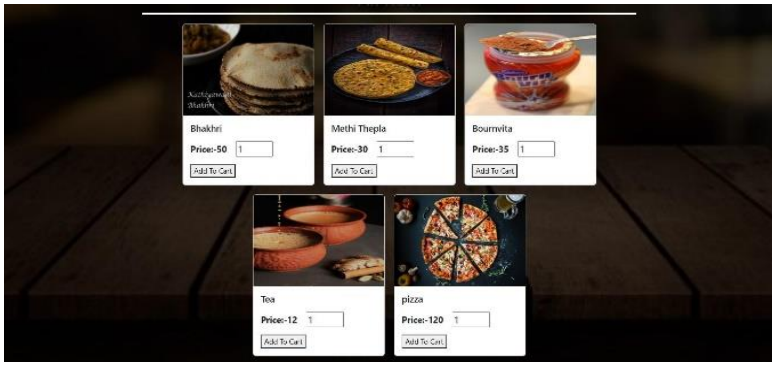

Figure 6. Menu display module.

Figure 7. Cart module.

Manager Modules

This includes all the features a manager needs to manage a restaurant. This includes analysis of orders, product management, order and sales management.

Various modules included here are:

- *Analysis Module:* This module provides a variety of data visualizations to the restaurant manager including bar graphs, line graphs, and pie graphs. The module (Figure 8) also gives customer and product statistics as well as order information and daily and monthly revenue estimates.
- *Product Management module:* Managers can perform CRUD operations on products, such as adding categories, adding new products based on categories, updating the current products, and deleting them. Furthermore, they can manage the current date's menu, based on its availability (Figure 9).
- *Sales Module:* Managers can get all the details of a product's sales with this module. It contains the details, such as product details, customer ID, quantity ordered, order ID and date of order. Incoming orders are notified by a beeping sound to the manager and a record of the seen/unseen status of each order is maintained.
- *Bill History Module:* This module allows the manager to view all billing information (Figure 10), including past orders, and delete them. It provides additional information, such as total price, payment status, and payment ID for each order.
- *Report Module:* This module helps the manager to download the report of sales, orders and customers in various formats like PDF and CSV.

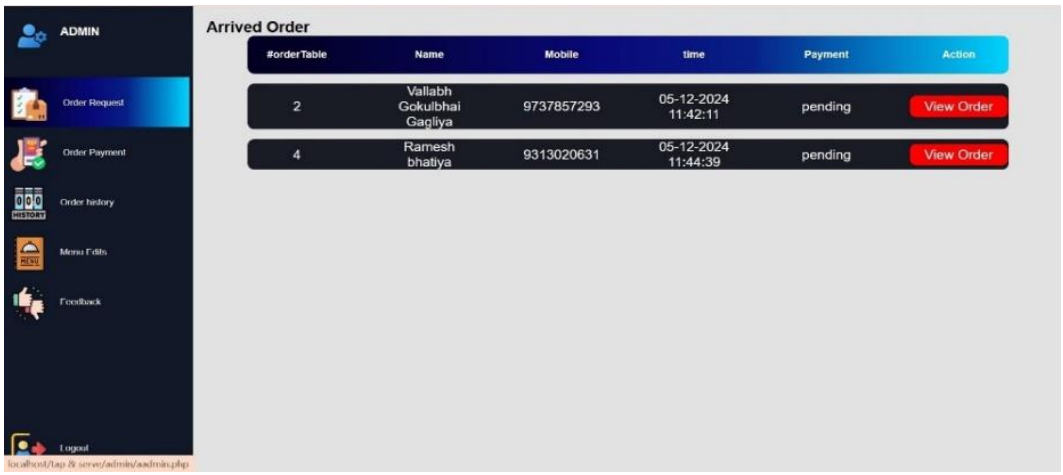

Figure 8. Analysis module.

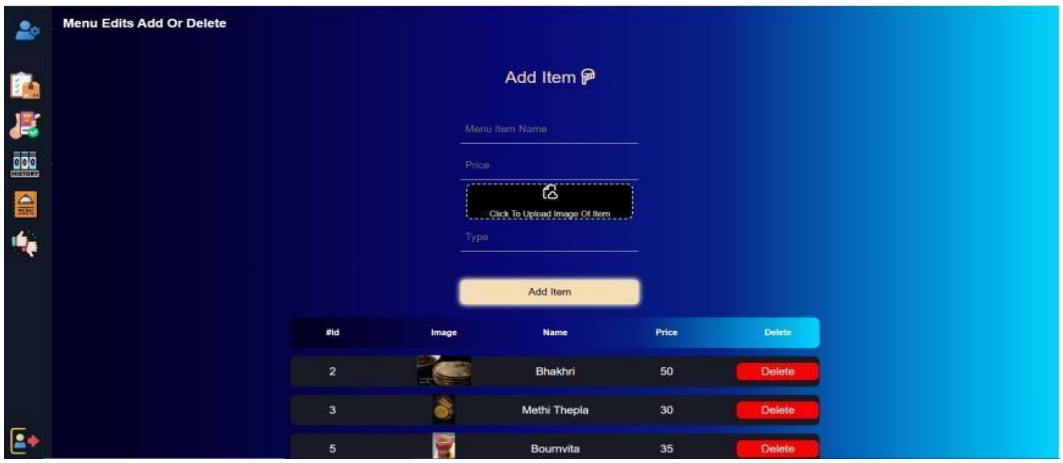

Figure 9. Product management module.

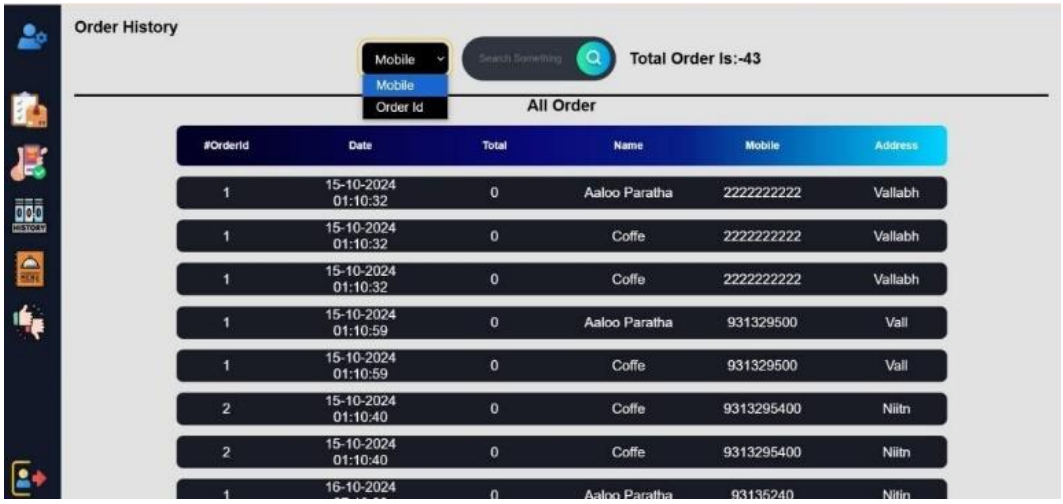

Figure 10. Bill history module.

Chef Modules

It includes modules which help the chef to view the incoming orders in a detailed manner and update the status of each order. Design of the system is shown in Figure 11.

Modules included here are:

- *View Orders Module:* It allows the chef to be notified with a beep sound of when an order is coming in. The chef can then view a detailed list of what is in each order along with the quantity as shown in Figure 12.
- *Update Status Module:* This module allows the chef to update each order's status to "Accepted", "In Progress", or "Rejected".

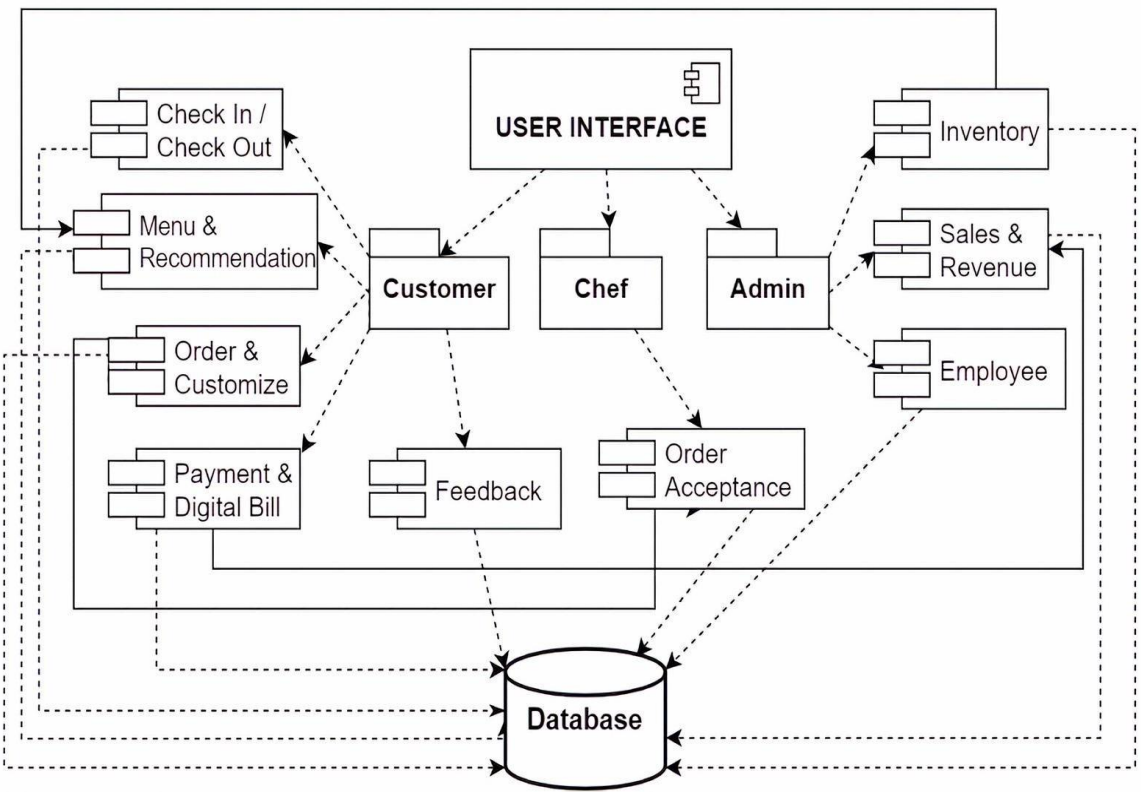

Figure 11. Detailed design of system.

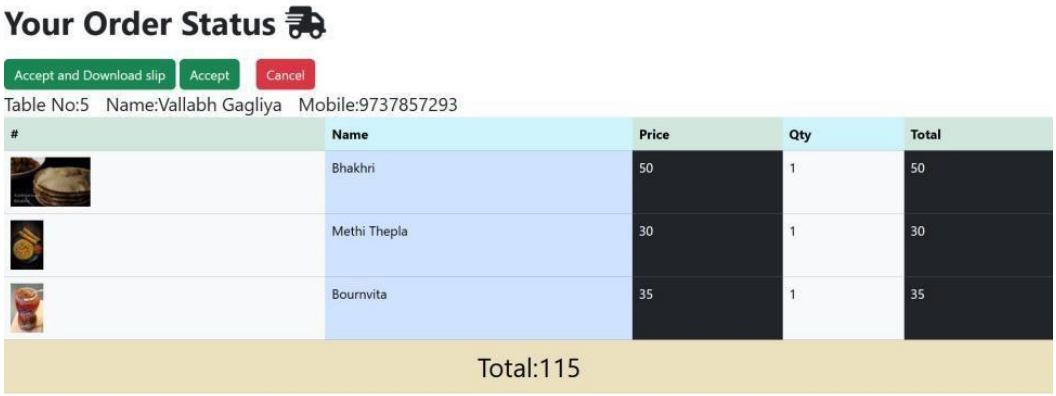

Figure 12. View orders module.

RESULTS AND OBSERVATIONS FROM SIMULATION

Customer Module

- *Cart Functionality:* The cart gets updated in real-time with accurate subtotal and item quantities.
- *Order Placement:* Customers received instant WhatsApp notifications with order details.
- *Payment Module:* The TestMojo payment gateway processed payments securely, with receipts emailed to customers.

Figure 13. Manager module.

Manager Module

Manager Module is shown in Figure 13.

- *Order Analysis:* Managers accessed data visualizations, such as bar and pie charts for daily revenue trends.
- *Product Management:* Menu updates reflected in real-time for customers accessing the digital menu.
- *Notifications:* Incoming orders have triggered beep alerts for the manager, improving responsiveness.

Comparative Analysis

The system demonstrated significant improvements over traditional order management systems. Reduced order processing time by 40%.
Improved accuracy in order details and billing through automated processes.
Enhanced customer engagement with feedback modules and notifications.

Challenges Encountered

- *Integration Issues:* Initial difficulties in integrating the TestMojo API were resolved by updating API keys and sandbox configurations.
- *Session Management:* Persistent storage of cart data faced conflicts, which were addressed by implementing robust session handling using cookies.
- *Notification Delays:* Optimized the notification system by ensuring stable internet connectivity and testing with mock data.

CONCLUSIONS AND FUTURE SCOPE

Conclusions

The "Tap & Serve" project successfully modernizes restaurant operations with features like QR-based ordering, real-time cart updates, secure payments, and detailed analytics. It enhances customer satisfaction and streamlines management tasks, proving to be an efficient and scalable solution for the hospitality industry.

Future Scope

1. *AI Recommendations:* Suggest dishes based on customer preferences.
2. *Mobile App:* Develop Android/iOS apps for broader access.
3. *Multilingual Support:* Include multiple languages for accessibility.
4. *Advanced Payments:* Add options like UPI and loyalty points.
5. *Inventory Management:* Automate stock tracking and restocking.
6. *Delivery Integration:* Enable food delivery services.
7. *Cloud Scalability:* Transition to the cloud for larger operations.
8. *IoT Integration:* Use smart devices for enhanced automation.

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