

Unified Voucher Interface (UVI): A System for Merging and Utilizing Reward Points Across Sellers

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January 2025

Abstract

Reward points offered by apps and shops often remain isolated within their respective ecosystems, limiting their utility for customers. The Unified Voucher Interface (UVI) aims to solve this problem by creating a unified system that allows customers to merge, trade, and utilize reward points across various sellers. This document outlines the proposed architecture, incentive schemes for sellers, and technical implementation strategies, addressing potential challenges and ensuring system robustness. The UVI system leverages a probabilistic distribution model, a tiered subscription system, and advanced security measures to create a scalable and secure platform for cross-seller reward point integration.

1 Introduction

Reward systems are an effective strategy for customer retention. However, their limited usability across different sellers results in inefficiencies and reduced customer satisfaction. UVI proposes a unified platform where:

- Customers can merge, trade, or utilize reward points universally.
- Sellers can benefit from increased customer engagement, targeted promotional opportunities, and a larger customer base.

The goal is to provide incentives for sellers to participate while ensuring technical feasibility, security, and scalability of the system. This document provides a detailed overview of the UVI system, its architecture, and its implementation.

2 Incentives for Sellers

To encourage sellers to join the UVI ecosystem, we propose the following incentive schemes:

2.1 Expanded Customer Base

Sellers gain access to a larger pool of customers who are more likely to engage with the platform due to the increased utility of reward points. By participating in UVI, sellers can attract customers from other platforms, increasing their reach and potential sales.

2.2 Targeted Promotions

Sellers can utilize the UVI platform to create targeted campaigns, distributing vouchers probabilistically based on customer preferences and engagement history. This ensures that promotional efforts are more effective and yield higher returns on investment.

2.3 Subscription Tiers

Sellers can choose from three subscription tiers:

- **Tier 1 (Premium):** High visibility and priority distribution of vouchers. Suitable for large businesses with significant promotional budgets.
- **Tier 2 (Standard):** Moderate visibility and distribution. Suitable for medium-sized businesses.
- **Tier 3 (Basic):** Basic visibility and distribution. Suitable for small businesses.

This tiered model ensures that sellers of all sizes can participate and benefit from the system.

2.4 Performance-Based Fees

The UVI charges a fee based on voucher utilization, incentivizing sellers to increase customer engagement without incurring high upfront costs. This performance-based model aligns the interests of sellers and the platform, ensuring mutual growth.

3 System Architecture

The UVI system is built on a robust technical architecture designed to address key challenges such as data storage, security, and scalability.

3.1 Overview

The UVI system comprises the following components:

- **Centralized Voucher Database:** A secure, distributed database to store voucher data, customer balances, and transaction records.
- **Probabilistic Distribution Engine:** A model that allocates vouchers to customers based on seller-defined parameters and subscription tiers.
- **API Integration Layer:** APIs to integrate seller systems with UVI for seamless voucher management and tracking.
- **Customer Interface:** A web and mobile app for customers to merge, trade, redeem, and track reward points.

3.2 Probabilistic Model for Voucher Distribution

The distribution engine uses probabilistic algorithms to ensure fairness while prioritizing higher-tier sellers. For example:

$$P(\text{voucher}|\text{seller}) = \frac{w_s}{\sum_i w_i}, \quad (1)$$

where w_s represents the weight assigned to a seller based on their subscription tier and voucher budget. This model ensures that:

- Higher-tier sellers receive more visibility and priority.
- The distribution is fair and within the specified budget.
- Customers receive a diverse range of offers.

4 Unified Voucher Interface (UVI): Implementation and Novelty

The Unified Voucher Interface (UVI) system is an innovative solution designed to merge and utilize reward points across multiple sellers. By addressing critical technical challenges and leveraging advanced technologies, the UVI system ensures fairness, security, and scalability. This section elaborates on the system’s implementation details, the challenges it addresses, and the novel features that set it apart from existing solutions.

The development of the UVI system is structured into three interconnected phases:

4.1 Phase 1: Database and API Development

The foundation of the UVI system is a centralized database that employs blockchain technology to ensure transparency, immutability, and security. Blockchain’s decentralized ledger ensures that all transactions, including reward points allocation and redemption, are secure and tamper-proof. This enhances trust among sellers and customers.

To facilitate seamless integration, a suite of standardized APIs and SDKs is developed, enabling sellers to connect their systems with the UVI platform effortlessly. Comprehensive documentation and technical support are provided to ensure smooth onboarding. During this phase, sellers’ systems are integrated, and rigorous testing ensures compatibility across diverse platforms. This phase establishes the backbone of the UVI system, ensuring reliability and scalability for subsequent phases.

4.2 Phase 2: Probabilistic Model Deployment

A core innovation of the UVI system lies in its probabilistic distribution algorithm. This algorithm dynamically allocates vouchers and cashback based on sellers’ specified budgets. By incorporating real-time analytics and customer behavior data, the model ensures optimal distribution of rewards. Sellers benefit from greater visibility and engagement, while customers receive tailored rewards, enhancing their experience.

The algorithm is periodically updated based on feedback from customers and sellers, ensuring continuous improvement. This iterative approach allows the system to adapt to evolving market demands and customer preferences. Additionally, the probabilistic model

incentivizes sellers of varying sizes to participate, fostering a competitive yet inclusive ecosystem.

4.3 Phase 3: Customer Interface Development

The final phase focuses on developing a customer-facing interface available as both a web platform and a mobile application. This interface allows customers to:

- View and manage their unified reward points.
- Browse offers from participating sellers.
- Redeem points seamlessly across multiple sellers.

The interface prioritizes user experience, featuring an intuitive design, responsive layout, and seamless navigation. Features such as personalized recommendations and a real-time balance tracker enhance user satisfaction. By merging reward points across sellers, the platform eliminates fragmentation and maximizes the value for customers.

4.4 Technical Challenges and Solutions

The UVI system addresses several technical challenges to ensure its robustness and scalability:

1. Interoperability: *Challenge:* Integrating diverse seller systems without disruption.

Solution: Standardized APIs and SDKs facilitate seamless integration. Sellers receive comprehensive documentation and dedicated technical support to overcome compatibility issues. Regular updates and backward compatibility ensure sustained functionality.

2. Fraud Prevention: *Challenge:* Preventing misuse of vouchers and ensuring fair distribution.

Solution: Advanced fraud detection algorithms, periodic audits, and machine learning models identify and flag suspicious activities such as duplicate transactions or voucher misuse. This ensures a secure and trustworthy platform.

3. Data Privacy: *Challenge:* Protecting sensitive customer and seller data.

Solution: The system complies with global data protection regulations, such as GDPR and CCPA, ensuring robust data privacy measures. End-to-end encryption safeguards data during transmission, while blockchain technology provides transparency and immutability.

4. Voucher Liquidity: *Challenge:* Maintaining a balance between voucher supply and demand.

Solution: The probabilistic algorithm dynamically adjusts voucher distribution probabilities using real-time analytics. This responsive approach ensures equilibrium and prevents oversupply or scarcity.

4.5 Novelty of the UVI System

The UVI system introduces several groundbreaking features that differentiate it from existing solutions:

- **Unified Reward Platform:** A single platform that consolidates reward points from multiple sellers, offering unmatched convenience for customers.

- **Probabilistic Distribution Model:** An innovative algorithm that optimally allocates vouchers and cashback, ensuring fairness and incentivizing seller participation.
- **Inclusive Subscription Model:** A tiered subscription structure accommodates sellers of all sizes, from small businesses to large enterprises.
- **Blockchain Integration:** Transparency and security are enhanced through blockchain technology, which ensures tamper-proof transactions and fosters trust.
- **Performance-Based Fees:** The system aligns seller incentives with platform success by implementing fees based on seller performance, ensuring mutual benefit.
- **User-Centric Design:** A customer-friendly interface enhances the user experience, making reward redemption intuitive and efficient.

5 Conclusion

The Unified Voucher Interface (UVI) system represents a transformative approach to reward point management. By merging reward points across sellers, the system maximizes value for customers and fosters collaboration among sellers. Its use of blockchain technology ensures transparency and security, while the probabilistic model and dynamic algorithms create an equitable ecosystem.

Addressing critical challenges such as interoperability, fraud prevention, and data privacy, the UVI system establishes itself as a robust and scalable solution. The innovative features, including a unified platform, blockchain integration, and user-centric design, highlight its potential to redefine reward systems. With its focus on scalability, fairness, and security, the UVI system is poised to revolutionize the future of customer rewards, creating a win-win scenario for sellers and customers alike.