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Enterprise Blockchain for Digital Coupons

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Executive Summary

Discount coupons were invented more than a century ago by Coca-Cola. Since then, companies have widely used coupons for marketing needs, such as sales promotions, sales acceleration, price sensitivity research, and revenue maximization. With the advancement of technology and the growth of online shopping, digital coupons distributed throughout social media, mobile apps, and specialized websites are becoming significant aspects of marketing strategies.

Coupon creation, distribution, and redemption are complex and often costly. In addition, it typically involves multiple parties and steps. Besides traditional coupon distribution services and platforms that automate almost every aspect of coupon campaign management, deals or coupon sites that allow customers to search for deals based on various criteria are becoming increasingly popular among online shoppers.

The digital coupon market is growing worldwide, boosted by online shopping and the transition from paper to digital coupons. According to Inmar's Promotion Industry Analysis, in 2020, the digital coupons market rose by 27% and surpassed paper coupon redemption for the first time ever. According to Statista, approximately 25% of consumers search for coupons before shopping. Additionally, most consumers turn to coupon websites and follow brands' websites or social media to find discounts and deals.

Besides typical difficulties, such as the transition from paper to digital coupons, digital fraud is the main factor limiting digital coupon adoption. Currently, companies aim to solve this problem by using technological advancements and secure coupon redemption procedures provided by third-party services.

When the problem domain involves three or more independent parties and complex multi-step business rules, distributed ledger technology and smart contracts offer certain advantages. While blockchain's inherent immutability and transparency elevate trust, the blockchain network establishes an ecosystem where teams collaborate to foster a new design paradigm. This document attempts to demonstrate blockchain and smart contracts' potential in digital coupon distribution, redemption, and related domains.

Overview

Sales Promotions

Sales promotion is a marketing communication framework for maximizing revenue or providing extra value to distributors, sales, and customers over a short time period. Sales promotion activities include special offers, discounts, deals, and other non-recurring selling efforts.

Companies use different channels and mediums to communicate sales promotions: printed materials like posters, discount coupons, direct mail pieces, and billboards. They also use radio and television ads and digital media like text messages, email, websites, social media, and other methods to promote sales promotions.

Companies use sales promotions to increase demand for their products and services, accelerate sales, improve product availability among distribution channel partners, conduct market research, and coordinate selling, advertising, and public relations.

Discount coupons provide an immediate price reduction of an item, goods, or service. The coupon value is the amount of price reduction that is reimbursed to the retailer by the item supplier or manufacturer. Additionally, retailers may receive a handling fee for accepting discount coupons depending on the agreement.

A shrinking or weak economy stimulates consumers to collect coupons to get special bargains or deals, like free or double coupons, like buy-one-get-one (BOGO).

Marketing on the internet scale offers consumers access to international stores and correspondingly to coupons, promotions, and other rewards. While more and more consumers find coupons or deals online, a significant amount of consumers still cut coupons from the inserts of newspapers.

Loyalty programs are another popular application of discount coupons where merchants or stores often provide coupons to returning customers as a reward to motivate them to spend more and build long-term relationships with the brand.

Coupon Economics

Coupons are an effective way to categorize customers by price sensitivity. Customers who are very responsive to price changes, such as customers with elastic demand, are likely to take time to find coupons that effectively lower the goods or services price. On the other hand, customers less responsive to price changes aren't as likely to take the time to find coupons.

When starting a coupon campaign, a company first establishes a single price for the good. A company then lowers the cost for customers possessing a coupon. Therefore, customers who don't have a coupon pay the price P, while customers using the coupon pay the price P - C, where C represents the coupon's value. For example, restaurant customers at a vacation destination fall into two major groups - vacation travelers who must eat out and have less elastic demand and local residents who can eat at home and thus have a more elastic demand for restaurant meals.

Price elasticity of demand measures how the quantity demanded is sensitive to a good's price. With a price increase, the demand quantity decreases almost for any good. However, for some goods, it drops more than for others. In other words, price elasticity describes the quantity demanded as a function of price increase, given all other factors are constant.

In order to maximize revenue, it's necessary to set the good's price so that its elasticity is equal to one. There are many research and practical methods to determine price elasticity, including analysis of historical data, test markets, or conjoint analysis. In addition, companies often use price elasticity to predict the behavior of a tax on that good.

Coupon Downsides

Frequent use of discount coupons raises consumers' expectations to purchase the product at a lower price and creates the risk of delayed sales. Especially for returning customers, the strategy 'trains' them to wait for a better deal. Thus discounting items that require an extra sales boost is a far better approach than accelerating sales of items that trade at acceptable market prices.

Moreover, coupons can diminish the value of the product or even hurt a brand's reputation when used abusively to drive volume or accelerate sales. Even though retailers have no intention to lower the value proposition, discount coupons and sales promotions are often associated with end-of-life products, final sales, and tactics that sell out unsuccessful products.

Discounts and promotions decrease bottom line revenue simply because they are marketing expenses with additional costs depending on whether to acquire new customers or retain existing ones. Therefore, discount campaigns are not sustainable and are a less beneficial strategy in the long term as opposed to competitively priced products, value proposition, and excellent overall customer experience.

Many online stores inadvertently incentivize customers to abandon their shopping carts by including a discount or promo code area. Knowing that they can obtain the product at a lower price, the customers tend to start looking for coupons online or even abandon the purchase if they don't find one.

Coupons Use Cases

This section outlines the main business use cases related to various forms of coupons. They are expanded more in the subsequent technical sections.

Personalized Coupons

Targeted or personalized coupon campaigns aim to reach specific categories of consumers in order to maximize top-line revenue. The general strategy, in this case, is to deliver discount coupons to consumers sensitive to price changes and stimulate them to spend more.

Marketers often explain targeting efficiency by utilizing distribution channels (email, SMS, social media, etc.) or third-party marketing platform performance. Using different channels and comparing their performance is often a preferred approach.

Promo Codes

Brands commonly use promotional codes to increase the number of new customers, accelerate sales or create opportunities to up-sell more profitable products. As opposed to coupons, promo code is a word or combination that is shared with all potential customers, often using websites, mobile applications or direct communication.

Promo codes are effective in distribution channel efficiency measurements and comparison.

Loyalty Program

Brands can reward customers with discount coupons, vouchers, or bonus points that incentivize them to spend more.

Coupons are often used as a reward for loyal customers and serve as means of building a stronger relationship between the customers and the brand. Brands can combine the coupon mechanics with bonus points to allow customers to pick preferred rewards.

Another popular application of the loyalty rewards system is to incentivize the return of old customers.

Referral Program

Customers may refer each other to a brand or merchant, increasing new customer flow and promoting the brand within the friend's network. However, the friend is supposed to be a first-time customer in order to get a discount on products or services.

The mechanics work well with loyalty programs since referring customers naturally expect a reward for their efforts.

Coupon Marketing

There are various approaches and tools used for coupon marketing nowadays. Let's briefly describe them before diving into solutions based on enterprise blockchain.

Coupon Services

Brands commonly create, distribute, monitor, and measure coupon campaigns through third-party marketing services. There are numerous services available; besides covering main coupon distribution and redemption use cases, they provide a rich set of tools, targeting, integrations, and reporting capabilities, including user-facing applications that companies can brand and customize.

Deals Websites

Recently deals websites or platforms are gaining popularity. They allow users to search for the most relevant deals and promotions before shopping. For the merchants, such platforms become a place to advertise products and services to a broad audience or accelerate sales for a fee. The mechanics are different from discount coupons in the sense that the deal (voucher) should be purchased first and redeemed later.

Gamification and Instant Redemption

Many techniques aim to capture customers' attention and stimulate sales based on gamification. They rely on game mechanics involving challenges or puzzles, where brands reward customers when they solve them with a discount coupon or voucher. For example, rewarding users with discount coupons in exchange for likes and promotions on their friend's network.

Artificially created sense of urgency or a time limit on purchase discounts prompts customers to act sooner, thereby increasing the conversion probability. A commonly used trick is an instant coupon redemption, given to selected customers on a shopping cart checkout that stimulates spending more.

Market Challenges

The main challenges for the digital coupons market are growing digital fraud and the transition from paper to digital coupons.

With the rise of digital coupons, digital fraud is growing too. For companies to fight this, many coupon distribution services incorporate technologies into their offerings, like blinking pixels preventing QR-codes from screenshotting or limiting coupon usage count and lifetime. However, judging by customer reviews of popular deal sites, dispute resolution remains a serious issue.

Regardless of how secure the chosen digital coupon marketing platform is, merchants have to trust its data and rely on the provided tools fully. There are several developments based on blockchain technology, such as a company in Dallas building a single secure coupon blockchain network for retail that supposedly solves trust and transparency problems or a range of digital coupon platforms backed by Ethereum tokens.

Despite legal issues, coupon clipping services exploit paper coupon distribution and redemption issues, providing users with a wide selection of coupons that can be 'purchased' and delivered to customers' addresses for a handling fee.

In 2020, following marketing campaign cost cuts and reduced newspaper issuance, digital coupons surpassed paper coupons in redemption rates. Though digital coupons are more cost-effective, many companies have built their marketing pipelines for decades, and switching to digital will require changing internal processes, introducing new roles and tools, and training employees to use them.

Digital Coupon Services and Sites

Digital coupon marketing platforms that have many similarities in digital coupon distribution, redemption, and security features dominate the coupon distribution market.

CouponTools is probably the most advanced coupons marketing platform. It offers personalized, secure, single-use coupons distributed via email, SMS, brand websites, and social media channels. The service enhances coupon distribution with dedicated gamified apps and social interactions, for example, sharing or replying to claim a coupon. In addition, there are rich reporting and campaign performance tracking features that integrate with POS terminals and dozens of third-party services. This service also provides a loyalty program and a White Label platform.

There are a few runner-up platforms, such as Komo digital coupons, Woobox coupons, and Code broker coupon platform, that offer personalized coupons, similar distribution channels, redemption, and reporting options. Among their unique features, geo-location tracking and social gamification are worth noting.

The following are the top-visited websites of 2020 that have excellent coupon and discount strategies:

- SlickDeals - accounts for the majority of Internet traffic (2020)
- Groupon
- RetailMeNot
- Rakuten

They are all similar in features among these websites that allow consumers to search for deals and discounts, shop online, and earn cashback. Although customer privacy, customer support, and user experience differ depending on the site.

Regardless of whether the website is a coupon site or a digital coupon marketing platform, the solution is all-inclusive and provides a complete set of tools to distribute and redeem coupons and monitor campaign performance. These websites offer user-facing applications through web and mobile apps. Although, consumers tend to prefer mobile apps. Additionally, there are separate apps for consumers and merchants.

Deals websites provide additional integration through browser plugins to track consumer purchases and earned cashback, which raises security and privacy concerns. The number of integrations, use cases covered, and digitization of reporting tools vary depending on the provider.

Enterprise Blockchain for Digital Coupons

Technology

Blockchain technology is a peer-to-peer distributed transactional database where cryptography ensures data integrity. Public and permissioned blockchain technologies depend on consensus mechanisms and the ability to create accounts on the blockchain freely.

Public Blockchains

Public blockchains focus on cryptocurrencies, tokens, and smart contracts. Bitcoin, Ethereum, and Cardano are some of the well-known blockchain platforms.

Companies designed these platforms to be tamper-proof, secure, and work on the internet at scale. Public blockchains rely on proof of work and proof of stake consensus algorithms as a distributed database. While they are quite secure, transaction throughput and privacy are limited. In addition, companies require a small fee (commission) with each transaction.

Public blockchain applications include:

- Cryptocurrency and exchanges
- Hybrid wallets (USD, BTC, etc. in one wallet)
- Escrow and other complex transactions, where 3rd party is the network
- Assets tokenization (NFT): digital art, estate, stocks, shares

Enterprise or Permissioned Blockchains

Permissioned blockchains tend to focus on solving general enterprise problems for the company's assets, however, implementing various tokens is also possible. For example, Hyperledger, Quorum, and Corda focus on using blockchain in this way. Companies use permissioned blockchains for privacy, certificate-based identification, and higher throughput. Generally, companies employ raft consensus with dedicated transaction coordinator nodes. It has no transaction commission, but the network requires governance for organization, joining the network, deployment chaincode to channel, and more.

Private, Permissioned, and Consortium blockchain applications:

- Retail
- Finance
- Supply chain
- Origin tracking
- Ticketing
- Finance
- Micro-Insurance
- Education
- Advertising

Several characteristics make blockchain or distributed ledger technology unique:

- Irreversible
- Transparent
- Transactional
- No intermediaries

Blockchain or distributed ledger technology offers unique immutable data storage designed to be tamper-proof. Blockchain can achieve this quality through cryptography, transparency, and distributed consensus algorithms able to tolerate even Byzantine faults.

Support of smart contracts allows teams to effectively implement and maintain complex multi-party, multi-stage business transactions and eliminates intermediaries' needs.

In addition, enterprise blockchains or distributed ledger technologies offer increased levels of security (identification, access control, policies, encryption) and throughput, as well as integration with other services and client SDKs.

Enterprise blockchain has a few drawbacks, mostly related to network setup and integration:

- Centralized governance
- Apps and blockchain integration
- Somehow limited privacy and throughput

Despite its distributed nature, enterprise blockchain networks require centralized governance. Network node deployment and configuration, security hardening and testing, joining peer organizations, identity registration, and chaincode deployments are just a few examples of routine tasks.

Organizations deciding to join the network have to deploy several nodes serving different roles. Unlike well-known client-server applications, applications based on blockchain communicate with a subset of network nodes and have to adhere to specific access control and transaction handling rules.

One of the strengths of distributed ledger technology is its transparency. While individuals can't modify data on the blockchain, it is still open to all network peers for reading. There are several approaches available (channels, partitions, private data) to address the issue, though they either limit scalability, completely avoid shared ledgers, or store sensitive data off-chain.

Teams can scale the Hyperledger Fabric network to 20k transactions per second; however, the throughput is not high enough to process transactions on the internet at scale.

Reference Implementations
There are more than a dozen blockchain-based digital coupon marketing platform implementations available. The following are a few popular and studied examples:

- BMarkEn - Ethereum
- Coupon Chain - Ethereum
- Neon Network - Ethereum
- Rouge - Ethereum
- Sardcoin - Hyperledger Fabric

The majority of the platforms use Ethereum fungible tokens that clients can purchase to settle subscriptions and other fees within the platform. A certain amount of the tokens back the digital coupon value. Therefore, platform clients should plan ahead before starting the campaign and account for the high volatility of crypto markets.

Please see the References section for more details and comparisons.

Technology Maturity: Ethereum and Enterprise Blockchains
As of now, public blockchains with smart contracts (Ethereum and some others) provide alternative token-based payment systems to large numbers of startups and businesses in the energy, entertainment, digital art, and e-commerce domains, with Initial Coin Offering becoming a widely popular founding model.

A smart contract is a code stored and executed on a blockchain network as part of the transaction. Smart contracts allow us to implement business rules of arbitrary complexity, for example, escrow transactions or secure auctions.

Tokenization is a problem domain modeling approach representing business entities as tokens or assets with transferable ownership. The assets can be fungible or non-fungible tokens.

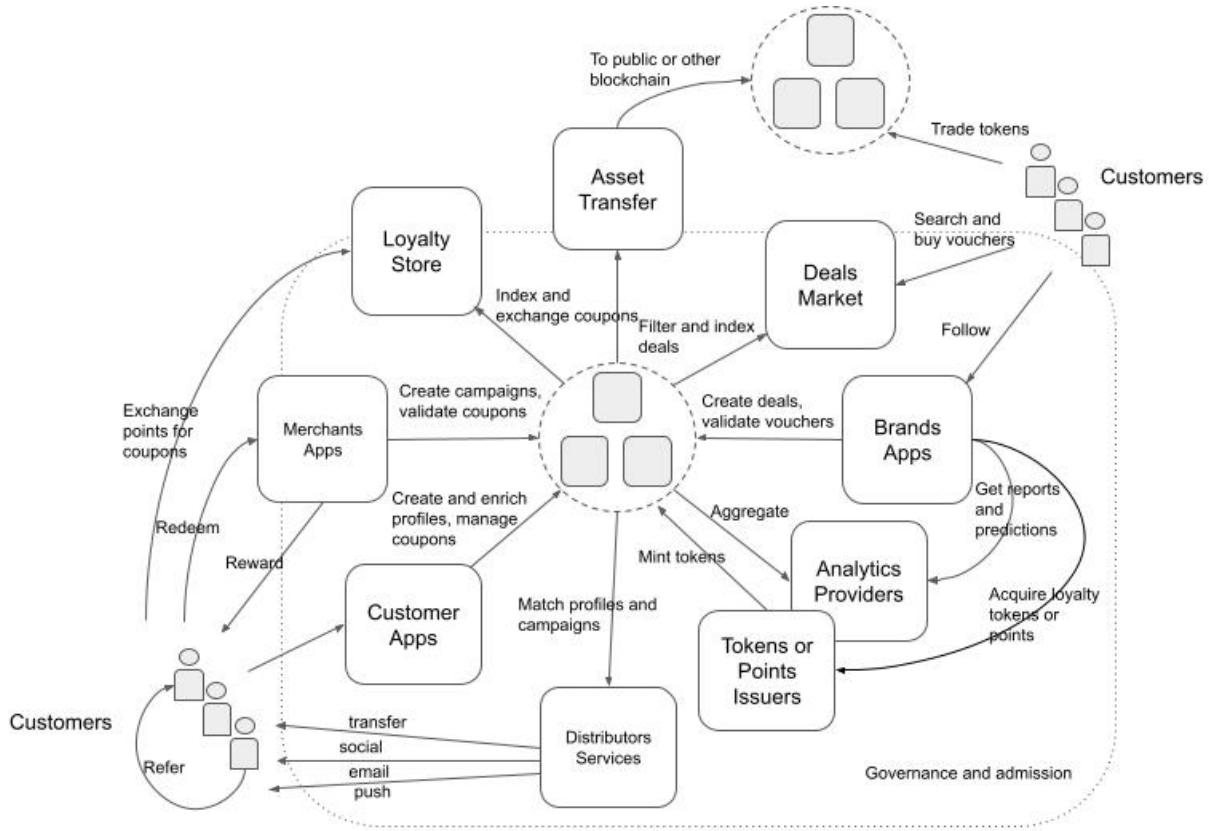
Enterprises successfully utilize permissioned blockchains to solve problems that require transparency in the supply chain, manufacturing, finance, and e-commerce domains.

The Blockchain Ecosystem

In the digital coupon market, because of its distinct characteristics, companies can effectively utilize distributed ledger technology and smart contracts to implement solutions for the following problems: authenticity tracking, fraud prevention, dispute resolution, improved targeting, and secure ownership transfer.

In addition, the blockchain-based coupon network establishes an ecosystem where every party joining the network owns a full copy of data (ledger) and contributes to the network depending on its role (creation, validation, auditing transactions, analytics, etc.). It ensures that every asset (coupon, user profile, loyalty point, etc.) stored on the blockchain can be identified, tracked, measured, and analyzed, thus making the ledger a single source of truth.

Merchants or brands deciding to start a coupon campaign have a few options: develop their own coupon distribution capabilities, use a third-party service (most typical), or collaborate with distributor partners on the blockchain network. If a brand decides to utilize the latter, then they selected the strategic choice where transaction complexity, number of involved parties, and data trust outweigh integration efforts.



The context diagram depicts various organizations or applications collaborating on blockchain networks to solve problems arising during digital coupon distribution and redemption. Some organizations do not contribute directly to the process but provide services to network participants (analytics, token issuers, etc.).

Customers Applications

A personal coupon wallet is a client application that allows customers to manage personal coupons and collect, redeem, transfer, and search them. On the other hand, it will enable customers to link their profile with assets and history stored on a ledger for improved security and relevance.

The application is responsible for creating and maintaining customer profiles on the blockchain.

Merchant Applications

Brand applications would integrate with the blockchain to create coupon campaigns and issue personalized coupons to specific consumer groups or a broad audience.

The applications can reward loyal customers with tokens stored on the blockchain and exchangeable for deals or discount coupons in their online or partner stores.

The main responsibility of the application is to create and maintain coupon campaigns and deals offered on the blockchain network.

Distributors Services

By using coupons issued by brands or merchants, distributors can utilize various channels (email, SMS, mobile, social or direct) to deliver digital coupons to targeted customers.

Additionally, it is possible to develop a blockchain-based deals store, where customers can search for available discounts themselves.

The main responsibility of the application is to match coupons with customers based on targeting rules.

Analytics Providers

Big data and analytics services can be incorporated to continuously mine blockchain and provide data to improve targeting and relevance to all parties participating in the network. Examples of such reports can range from simple goods categories of interest in the last half-year to trends prediction or fraudulent patterns detection.

The analytics role in the ecosystem is to provide customer profile data anonymization, better targeting (relevance), demand prediction, and fraud detection.

To summarize, the system has the following properties:

- decentralized applications
- smart contracts instead of intermediaries
- enables complex collaboration
- event-driven communication
- extensible and replaceable services

These properties make the system different from existing digital coupon marketing platforms.

Teams designed the resulting system to span multiple brands, merchants, customers, analytics and governance services, and applications, openly collaborating. Parties and brands joining the network can take advantage of available services or bring their own capabilities to the network. For example, a coupon wallet application can bring its user's database there while offering them access to new brands and discounts.

Generally, companies chose Hyperledger Fabric to demonstrate distributed ledger applications for digital coupon business use cases. Companies make this decision based on the Fabric's general-purpose design, modularity, performance, security, and various client SDKs.
Security, Privacy and GDPR

The described solution architecture below relies on the following Hyperledger Fabric security and privacy features:

- Certification Authority represents each organization, number of network nodes, and administrative account
- A certificate issued by the organization CA identifies each participating node
- Each connected application has an associated account registered by organisation administrator
- Applications and network nodes communicate over TLS
- Teams deploy separate channels (ledgers) where communication among parties requires privacy
- Private Data Collections available to selected organizations to store sensitive (PII) data off-chain
- When deployed to a channel, smart contracts have to be approved (signed) by a majority of network nodes (adjustable via policies)
- Network nodes that have no specified smart contract (chaincode) installed and approved cannot endorse associated transactions
- Organizations should identify each transaction by N nodes from M organizations (adjustable via policies)

In addition, teams should ensure the following measures to protect all involved parties from fraud:

- Smart contracts implement access control and input validation
- Smart contracts implement secure asset transfer with mutual validation and approval
- Merchants issue a limited amount of coupons or vouchers to control potential expenses
- Private Data Collections (PDC), public hashes comparison, or a combination of both match sensitive data
- Teams use intermediary encrypted tokens (coupon or voucher) for transport and redemption
- Key domain entities are stored and maintained on ledger (customer profile, campaign, targeting, coupon, coupon token, etc.) along with all changes in history

Since the blockchain storage is immutable, to support GDPR, it should only store non-sensitive data, for example, zip code, date of birth, and gender. Social profiles and PII on off-chain, GDPR-compliant storage can link this data, where teams can delete this data on customer request.
Integration with Public Blockchains

There are benefits to integrating with the public blockchain and the corresponding ecosystem. First, tokens and NFTs on a public blockchain can be associated with a certain value and openly traded using smart contracts and wallets. Second, Initial Token Offering opens new ways to fund start-ups utilizing token-based currency as an alternative payment system.

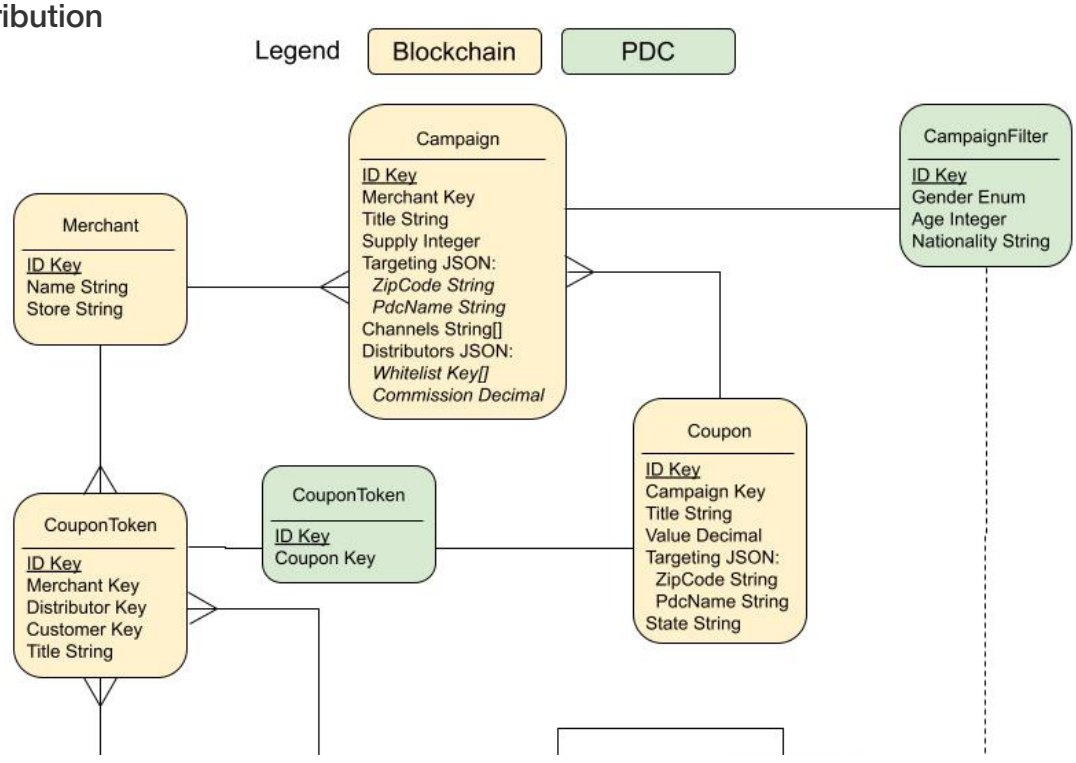
The downside of the integration is its complexity and coordination overhead for tokens stored on separate blockchains. As such, it's often more feasible to transfer assets to the public blockchain rather than maintaining consistency between them.

Solution Architecture

The following sections describe the high-level architecture of the digital coupons ecosystem built on distributed ledger technology (particularly Hyperledger Fabric). The architecture describes four popular digital coupon use cases and explains how they can implement to address collaboration, digital fraud, and dispute resolution issues.

Besides DLT, the high-level architecture diagrams rely on well-known building blocks to communicate the intended design: databases, message queues, event listeners, workers, and more, which make up the infrastructure and backend of the solution. Mobile apps, internal sales, admin portals, and public websites represent the front end.

Secure Distribution



The digital coupon journey starts with a merchant or brand sales manager creating and submitting campaigns to a distributed ledger. The campaign consists of targeting (zip code, age, interests, etc.) and associated coupons in its simplest form. The coupons can be an individual asset or just a counter on the campaign entity in case the number of coupons is vast.

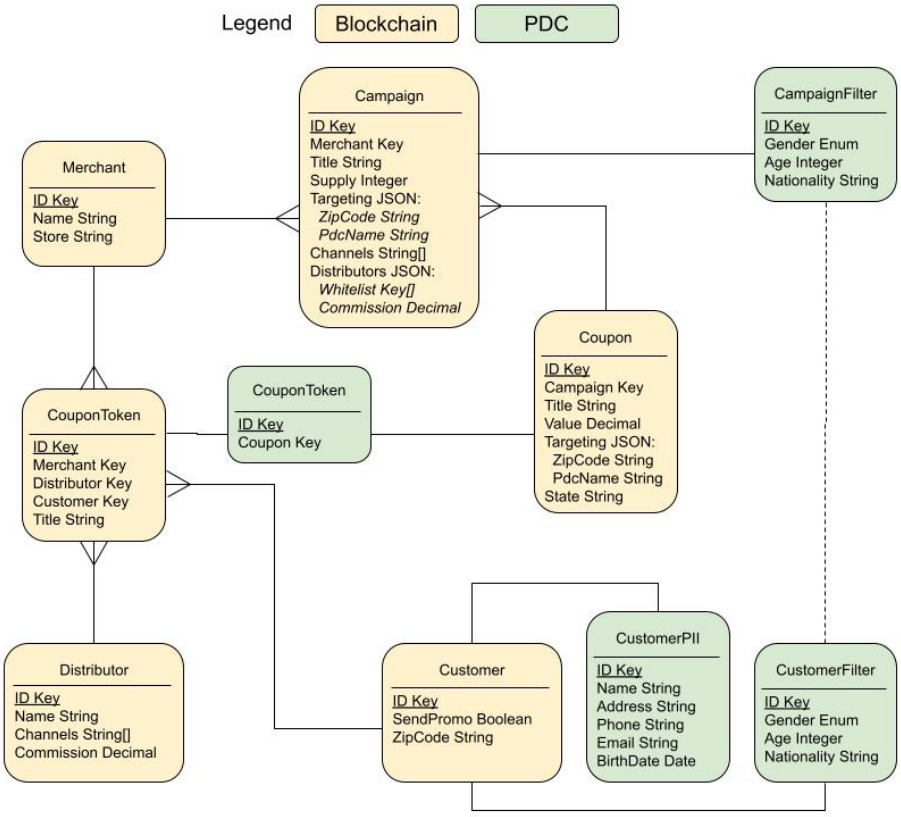
The campaign and coupons form a so-called coupons pool limits the total number of coupons related to the campaign. A distribution service that learns about new campaigns from chaincode events propagated via organization peer nodes indexes the pool.

The distribution service constantly runs its matching routine (CRON batch job) by trying to find customer profiles corresponding to campaign targeting. Whenever it finds a match, it takes one coupon from the pool, links it to a coupon token on private off-chain storage (Private Data Collection), and transfers it to the customer.

Additionally, it can enhance batch matching with real-time events triggered by the purchase of goods or referrals (see Referral program).

The coupon token is a secure intermediary containing only the required information for customers to redeem the coupon. It ensures that the redemption transaction is validated and approved by both merchant and distributor. Since blockchains stores the PDC hash, merchants can validate that the coupon token was linked to the exact campaign.

Upon redemption, merchants validate the coupon token and exchange it for an actual coupon ID so that the platform protects both merchant and distributor. In addition, merchants can link it back to the campaign and approve the discount (convert coupon) with a valid customer profile and coupon ID.



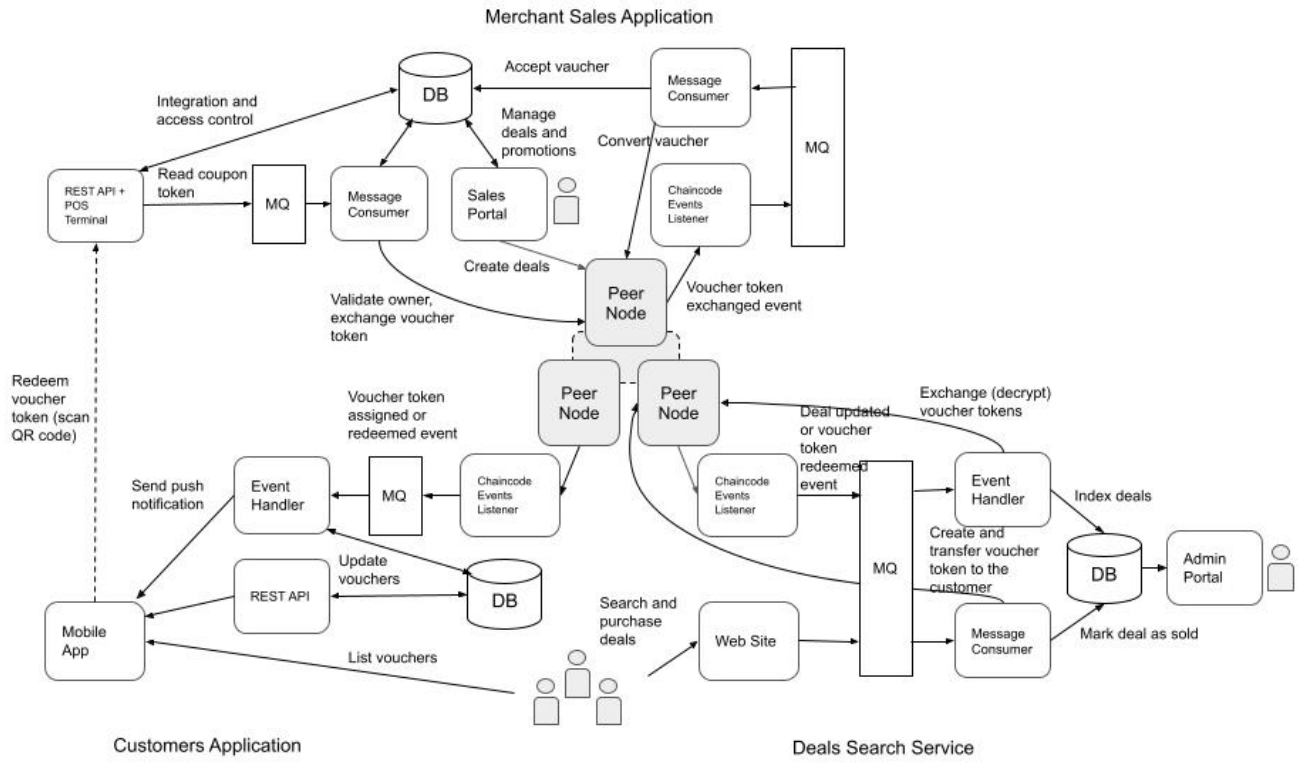
The entity-relationship diagram illustrates coupon distribution and redemption use case data entities. The Hyperledger Fabric uses key-value storage (LevelDB) or document storage (CouchDB) as a backend. Therefore, there are no referential integrity guarantees except those based on cryptography (transactions and block hashes).

Merchants can narrow down the set of available distributors to preferred ones by using additional campaign entity attributes such as channels and commissions, for example, choosing the lowest commission over the number of channels.

Campaign targeting implementation depends on security requirements. Teams can perform targeting over public (stored on blockchain) profile attributes, such as zip code. This can be easy to implement, and matching can be quite flexible but limited to non-sensitive data.

Distributors can run set intersections over private data collection hashes of campaigns and customer profiles targeting attributes for private or secure matching. The downside of the approach is that matching is strict - the number of PDCs with static schema should be created and pre-populated for each matching case, possibly increasing the burden and lowering solution scalability.

Deals Marketplace



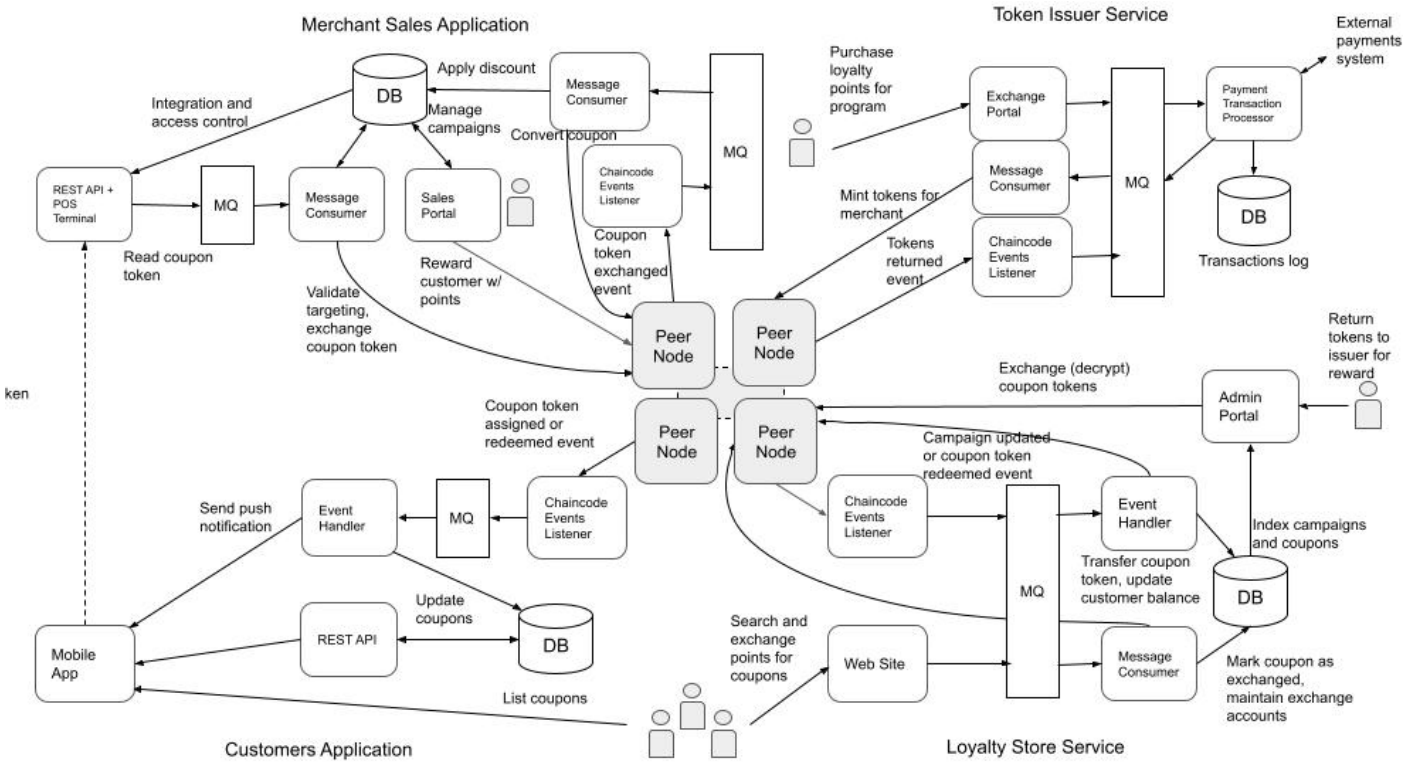
Websites with deals or portals are different from traditional coupon distribution services since customers search for coupons before shopping online or in-store. However, the design of the merchant sales application does not change as much. Instead of campaigns, it creates deal search services offered to potential customers with constantly indexed deals.

Whenever a customer purchases a deal via traditional currency or loyalty points (see Loyalty program), the dealer service creates a voucher token, links it to the original deal, and transfers it to the customer. On purchase, customers receive push notifications on their mobile app with the deal voucher and redemption details.

The digital voucher redemption flow is similar to the one described above (see Secure distribution). This is where customers' mobile app presents QR code to merchants' POS terminal, which the voucher token and customer profile validate, and they exchange it for the original voucher.

Companies often use deal websites for promo-code distribution. However, when companies distribute promo codes to enterprise blockchain applications, they are severely limited because of their natural transparency.

Loyalty Store



Merchant applications can use loyalty points or tokens to reward frequent customers. Customers can then use the points as an alternative payment system within the blockchain network. The system enables a blockchain-based digital coupons store or marketplace where customers exchange loyalty points for coupons or vice versa.

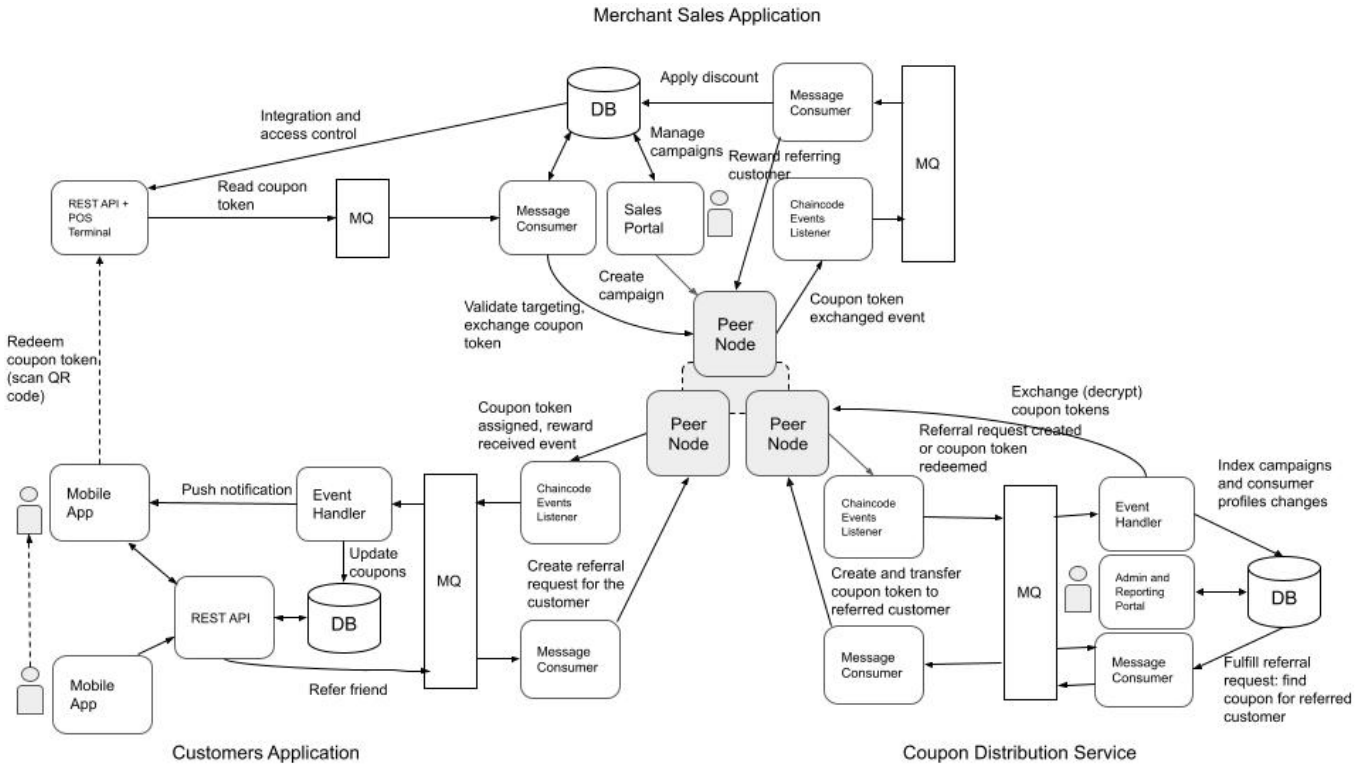
From an architecture and design perspective, merchant sales application remains roughly the same, but a new party joins the network, a loyalty points (tokens) issuer service. It plays the role of a bank, minting the initial amount of loyalty points and selling them to merchant applications. Customers can acquire loyalty points in batches through the exchange portal or issued automatically every time a merchant decides to reward loyal customers.

Loyalty store services should possess similar indexing capabilities to dealer marketplaces to allow coupons and deals to be easily found and exchanged by customers. Same as before, merchants take the coupons from campaign coupon pools. Upon successful transaction, the loyalty store is responsible for issuing and transferring the coupon token to the new owner and updating the index.

Besides, customer applications' loyalty points balance tracking capabilities, the coupon management, and redemption flows remain the same (see previous sections).

Eventually, the loyalty store accumulates a significant amount of loyalty points. Customers should keep part of it in an internal wallet to ensure consistent loyalty points for coupon exchanges. However, the remainder can be returned to the points issuer service for a reward.

Referral Program



The referral program allows customers or end-users to play distributor roles and get rewarded for converted referral coupons with loyalty points (see Loyalty store).

A merchant application is usually responsible for issuing enough referral coupons to incentivize new customers to visit the store or shop online.

When referring a friend, a customer application creates a referral request with a target user ID. Then, the coupon distributor service fulfills the requests using the matching mechanism described in previous sections. However, the interaction is in real-time, where matching happens sooner as the distribution service receives an event from an organization endorsing a peer.

The distribution service creates and transfers the coupon to the referred customer when they find an appropriate match. The customer receives a corresponding push notification and finds the coupon in their wallet.

Upon a successful coupon redemption, merchants reward the referring customers with loyalty points that can be exchanged for coupons or deals later (see Loyalty store and Deals marketplace).

More Solutions to Explore

The existing solution architecture and distributed ledger technology to implement more advanced solutions, and integrations, include:

- Distribution to off-chain client applications
- Deal or voucher transfer to public blockchain
- Coupon distribution services chains
- Token-based cashback system

Accelerators

Hitachi Application Service for Blockchain

Overview

Hitachi's Application Service for blockchain can promptly develop and integrate business logic based on smart contracts and distributed transactions among multiple pirates while maintaining secrecy, authenticity, and transparency with tamper-proof blockchain storage.

Value Proposition

- Reduces the average smart contract implementation timeline by approximately 50% from a full agile sprint (2 weeks) to half of the sprint (1 week)
- Provides the pre-implemented blockchain client with a robust REST API facade that is easy to incorporate and re-use in various solutions
- Node.js SDK data access extensions provide another abstraction level over Hyperledger Fabric smart contracts API to speed up development
- Flexible chaincode template generator from asset definition that enables smart contracts development without writing a line of code

For more information please follow the link here.

Scenarios

Partner Distributing Digital Coupons for Rewards

With Ethereum, Mezoffy is a blockchain-based digital coupon provider that has automated the entire Coupon Chain System. They use promotional methods to sell their coupons to promote their business. Coupons can be directly sold to customers using social media or other channels. Customers are allowed to distribute their coupons to their friends and relatives. Finally, customers can redeem coupons can from authorized merchants.

Below is the demonstration of the same use case:

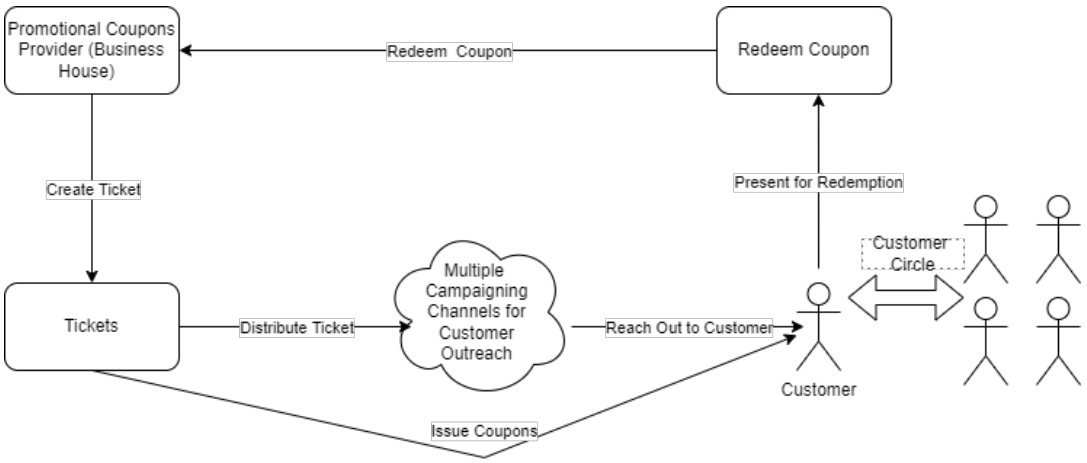
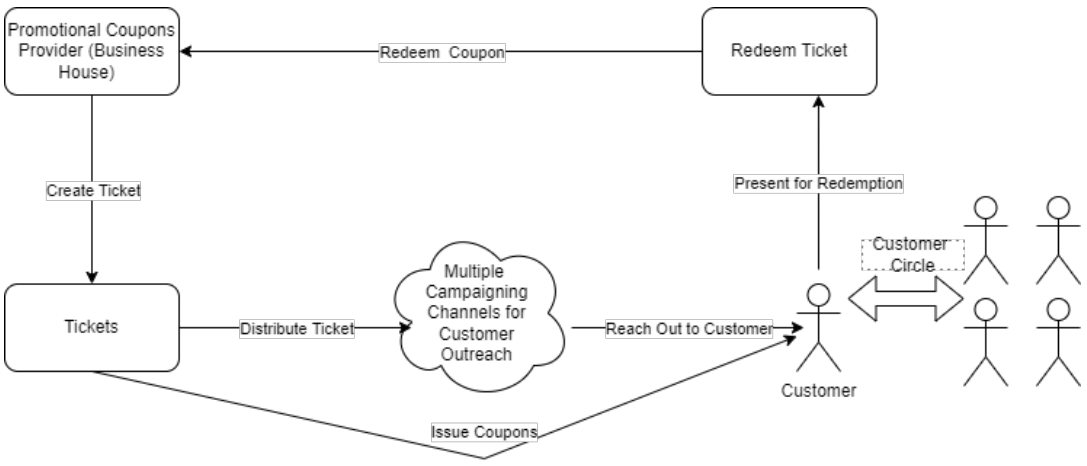


Figure Demonstrating Partner Coupon Distribution

In a similar way, the company can also distribute coupons as tickets seen below:



Users Purchasing Vouchers Forms Deals Marketplace

Rouge is another Ethereum-based digital coupon provider who also provides a marketplace for customers to purchase blockchain-based digital coupons.

The figure below shows the various actions involved for users purchasing vouchers from coupon marketplaces for the Rouge coupons marketplace provider.

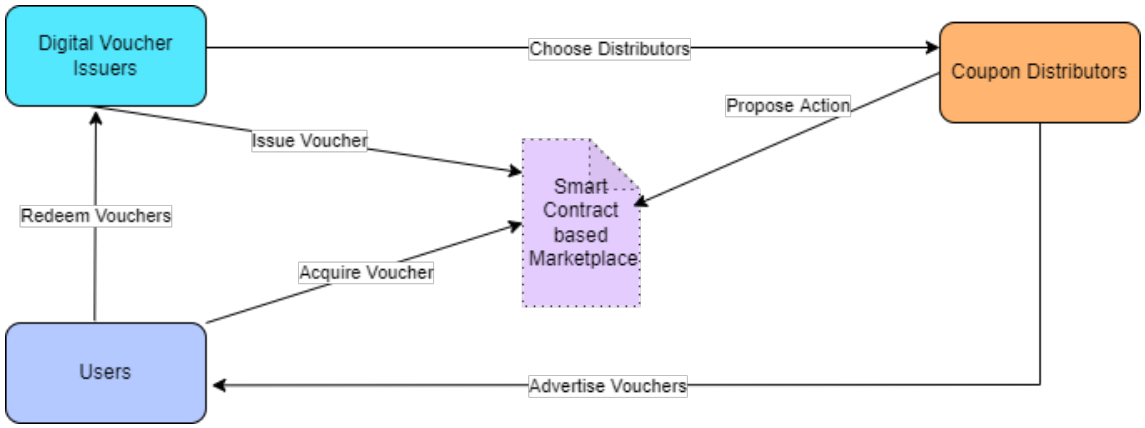


Figure Demonstrating User Purchasing Voucher from Marketplace

Customer Exchanging Loyalty Points for Digital Coupons or Discount Vouchers

Merchants can issue loyalty points to customers in the form of blockchain tokens. This is rewarding for the customer and increases their trust factor as these tokens can't be forged, erased, canceled, or expired by the issuer. Additionally, there is a provision for these tokens to be exchanged and traded with other users.

Customers can redeem these manually or automatically in the form of virtual rewards like cashback, discounts, coupons, or vouchers. Merchants can include consensus rules and regulations of the loyalty program in the blockchain code, so they are transparent and can be executed automatically. The exchange of customer loyalty points for a reward can be an example of direct interaction with the blockchain-based automated Smart Contract.

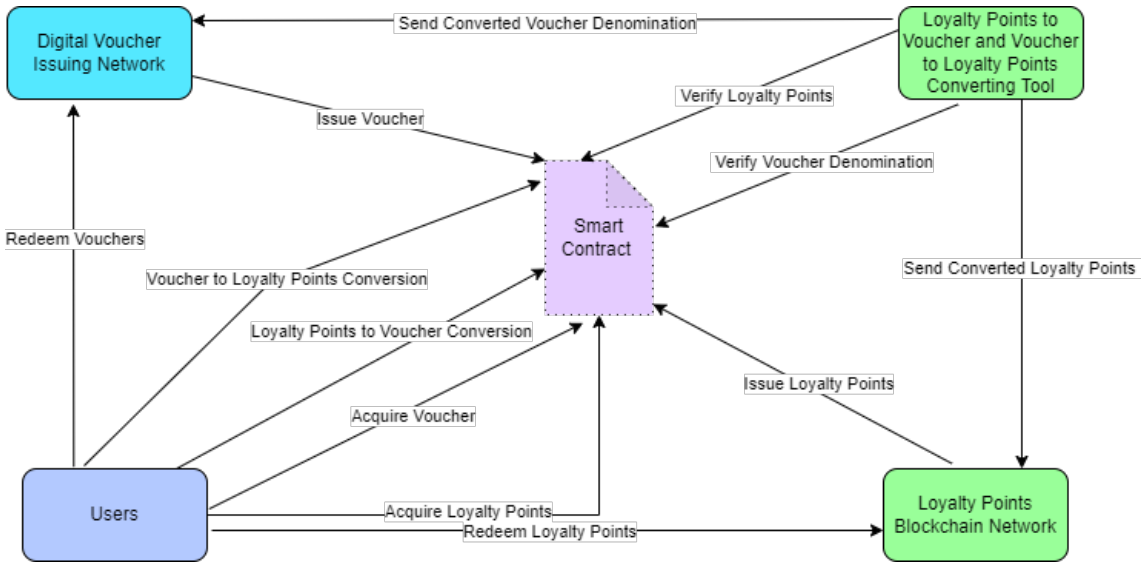


Figure Demonstrating Users redeeming Loyalty Points for Vouchers and vice versa

Glossary

Digital Coupons
Also known as e-coupons (electronic coupons), discount vouchers or promo-codes which are digital versions of paper coupons. Merchants use them as a digital marketing tool and are used to provide customers with discounts or gifts which in turn can help them to attract the purchase of some products.

Deals
Nowadays, e-commerce stores are popular, and the consumers prefer them to physical retail stores or online merchant site visits. This is because e-commerce sites provide better and more popular deals and discounts compared to merchant sites or stores. The customers want to buy products at a discounted price. They are also known as Deal Marketplace, which allows the marketplace sellers to add a daily, monthly, or time-specific deal to their products.

DLT
Also known as Shared Ledger or Distributed Ledger Technology. This is actually a decentralized database that is controlled/managed by multiple participants, across multiple DLT nodes. Distributed ledgers are often known as Blockchains. Blockchain is a type of DLT where the transactions are recorded with an immutable cryptographic signature called a hash.

Smart Contract
A peer-to-peer consensus between two or more different entities on a Blockchain network which must follow the set of pre-defined rules agreed as part of the legal consensus or agreement. In other words, it is a computer program or a transactional protocol which can be used to automatically execute, control or document legally relevant events and actions.

Hyperledger Fabric
An Enterprise Blockchain DLT that uses a private or permissioned Smart Contract between two or more entities. It is open-source and supported by the Linux Foundation. It has a highly modular and versatile architecture that satisfies a broad range of industry use cases. It offers plug-and-play features such as delineation of roles between the nodes in the infrastructure, execution of Smart Contracts (also known as “chaincode” in fabric terms) and configurable consensus and membership services.

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