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a universal blockchain protocol for the travel industry

# Table of Contents

Abstract	<b>1</b>
<b>1. Problems in the Travel Industry</b>	<b>2</b>
1.1 Monopolization of the Middlemen	3
1.2 Unleveled Playing-Field for Businesses	4
1.3 Lack of Incentive for Content Creators	4
1.4 Ineffective Loyalty Program and CRM Engagement	5
<b>2. The Marco Solution</b>	<b>7</b>
2.1 Key Features of Marco Network	8
2.2 Key Value Propositions	9
2.3 Key Utilities of Marco Token	10
2.4 Partnerships in the Travel Industry	11
<b>3. Technical Framework</b>	<b>12</b>
3.1 Core Blockchain Layer Components	14
3.2 Identity and Security Encryption	15
3.3 Service Layer Components	16
3.4 Application Layer	24
<b>4. Marco Ecosystem</b>	<b>31</b>
4.1 Open Source Development	31
4.2 Infrastructure for Token Offerings	31
4.3 CRM and Inventory Management Systems	32
4.4 Marco Wallet	32
4.5 Measures to Encourage Adoptions	32
<b>5. Marco App</b>	<b>35</b>
5.1 The Location-Based Review and Content Application	35
5.2 Review and Content Creation	36
5.3 Transactions on the Marco App	36
<b>6. Token Economics</b>	<b>38</b>
6.1 Marco Token (MRC)	38
6.2 MRC Use Case	38
<b>7. The Team Behind Marco</b>	<b>43</b>
7.1 Core Team Members	46
7.2 Advisors	48
<b>8. Partners</b>	<b>50</b>
<b>9. The Roadmap</b>	<b>53</b>
<b>10. Token Sales and Use of Funds</b>	<b>54</b>
<b>11. MRC Risks</b>	<b>55</b>
<b>References</b>	<b>57</b>

## Abstract

The travel industry is one of the largest global vertical markets, valued at over 8 trillion USD<sup>1</sup>. In 2016, over 1.24 billion cross-border trips were made, generating 1.22 trillion USD in revenue. It is also a highly centralized industry where a few powerful platforms control the user data, content, marketplace and dictate the terms of business. This leads to an inefficient ecosystem that marginalizes both consumers and businesses.

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This paper outlines the case for the development of the Marco Protocol a next-generation travel protocol that connects all consumers and businesses to a distributed smart network for data, content and transactions.

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- Consumers can own their digital identity, transactional data and receive compensation for the content they create and the data that they disclose.
- Suppliers can offer their inventory directly to consumers without the cost of an intermediary and access user data across the platform on a consent basis, building stronger 1-to-1 relationships with consumers in digital marketing.
- Travel businesses and IP owners can provide services, build independent DApps and launch their own token offerings to the community through Marco protocol.

Our blockchain technology brings a disruptive opportunity to reinvent the travel ecosystem, with Marco representing a paradigm shift that decentralizes data, content and transactions in the travel industry to a secured and trust-free open- network, and in the process, unlocking value and new possibilities for both consumers and businesses.

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<sup>1</sup> Global tourism industry - Statistics & Facts <https://www.statista.com/topics/962/global-tourism/>

# 1 Problems in the Travel Industry

Despite being one of the world's largest and oldest industries, global travel consumption is still rapidly growing, driven by emerging markets like China (which contributed 21% of international spending in 2016), fresh demand by a new generation of travelers and technological advancements that make traveling easier and more accessible.



Figure 1: Monopolization in the Travel Industry

The industry is plagued by monopolized interests and a centralization problem. A few powerful middlemen in the market effectively dominate the data, content, and traffic and have created a lucrative business model in monetizing them. While such centralization may have brought about certain efficiencies, it has also led to the creation of a bottleneck in relationships between businesses and consumers, a great many of which have become one-sided in favor of the middlemen.

## 1.1 Monopolization of the Middlemen

Over the past two decades, built on the revolution of the internet, Online Travel Agencies (OTAs) started to aggregate accommodation, transport and experiences, selling them to consumers online. Through a series of mergers and acquisitions, a powerful few conglomerates now control between 60-95% of the market<sup>2</sup>.

The largest online travel agency (OTA) in the western world is Booking Holdings (previously called Priceline Group), which owns travel aggregators and meta search engines like booking.com, priceline.com, agoda.com, kayak.com, rentalcars.com and opentable.com. In 2016, consumers booked 556 million room nights and rented 66 million cars on their platforms<sup>3</sup>. In the eastern hemisphere there is Ctrip, the Chinese travel behemoth who in 2016 generated a net revenue of 3 billion USD and recently went on a global buying spree acquiring qunar.com, elong.com, skyscanner.com and trip.com. It is no coincidence that Booking Holdings also holds a significant stake in Ctrip.

These conglomerates hold a centralized monopoly on the following:

- Market pricing
- Traffic flow
- User ID
- Transactional data

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<sup>2</sup> Priceline, Expedia Global Travel Empire Still Faces Hurdles, Threats  
<https://www.investors.com/research/industry-snapshot/how-the-internet-killed-60000-jobs-to-modernize-the-travel-trade/>

<sup>3</sup> Notice of Annual Stockholder's Meeting and Proxy Statement  
<http://files.shareholder.com/downloads/PCLN/6198605835x0xS1308179-17-159/1075531/filing.pdf>

## 1.2 Unleveled Playing-Field for Businesses

*By using their scale, user base and data, these powerful intermediaries dictate the terms of the business and charge superior margins, causing double marginalization for both consumers and suppliers. Hotels typically pay 15-25% in commissions to the centralized platform. They reduce hotels and other service providers' abilities to better serve their customers by taking large shares of their income and restricting access to important user data and insights. Consumers are losing out as they bear the inflated cost of supply.*

The centralized and highly concentrated nature of the market means that startups in the travel business face a highly unleveled playing-field<sup>4</sup>. The monopolies have little incentive to innovate as they pour resources to lock in the status quo through ad-spending, traffic acquisition and/or price bullying (Booking Holdings and Expedia are two of the biggest spenders on Google AdWords, and together spent over 7 Billion USD in digital marketing in 2017 alone)<sup>5</sup>. This is money that creates no real productive gain in the ecosystem except enriching pockets of the platforms and Google.

A collaborative ecosystem that changes from “centralized + monetization” to the “decentralized + collaboration” model would be a more efficient solution, which is made possible by blockchain and Smart Contract Technology.

## 1.3 Lack of Incentive for Content Creators

A core component of the travel industry is the business of travel content and reviews. More than 80% of travelers make purchase decisions based on them<sup>6</sup>. In the current ecosystem, content platforms take full ownership of the content and sell the data and traffic for advertising revenue. This centralized data ownership model is the core business for companies such as Facebook and TripAdvisor.

TripAdvisor, for example, has over 315 million registered users and hosts over 500 million reviews and opinions about hotels, restaurants, attractions, experiences, which are created by users but owned and monetized by the platform.

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<sup>4</sup> Hotel industry targets Priceline and Expedia's 'duopoly'  
<https://www.cnbc.com/2017/05/05/hotel-industry-targets-priceline-and-expedias-duopoly.html>

<sup>5</sup> Google can rejoice: Priceline Group spent \$3.5 billion on PPC in 2016  
<https://www.tnooz.com/article/priceline-group-3-5-billion-advertising-2016/>

<sup>6</sup> Use and Impact of Online Travel Reviews  
[https://www.researchgate.net/publication/221357282\\_Use\\_and\\_Impact\\_of\\_Online\\_Travel\\_Reviews](https://www.researchgate.net/publication/221357282_Use_and_Impact_of_Online_Travel_Reviews)

This system is inherently unfair because the creators do not receive a fair share of the economic benefits from the value created. There are no incentives for more in-depth participation, and the quality of the content suffers. TripAdvisor's posts pale in comparison to the creativity and quality of paid travel-blogs and articles. To realign interests at a large scale, we need a decentralized incentive protocol for content that is scalable, trustworthy and self-governing. A tokenized economy run on blockchain and Smart Contracts offers an ideal framework to solve this.

#### 1.4 Ineffective Loyalty Program and CRM Engagement

The travel industry is the most prolific user of loyalty and CRM programs. Hotels, Airlines, restaurants, theme-parks, museums and other establishments all tried to sign up consumers on their own loyalty programs of various formats, the most common being a point system in which different tiers of rewards can be redeemed. However, the results have been mostly unsatisfactory due to the following three reasons:

1. Mistrust of consumers over data security and usage of their data.
2. Inefficiency in acquiring complete and authentic user info, as filling in different loyalty programs is time-consuming and non-standardized.
3. Redemption processes are cumbersome and options are limited mostly within the vendor's offering.

55% of CRM programs that focus on promotions and offers via push notification and direct messaging have not proven to deliver results. One key factor is that consumers see CRM engagement as a solicitation rather than value-adding/opt-in.

Businesses also have no access to large-scale, cross-vendors, authentic user behavior and purchasing data, which are currently controlled by centralized platforms. This limits their ability for effective marketing and CRM engagement. This kind of data bias is one of the reasons that platforms like Booking Holdings, Amazon and Alibaba are gaining a larger market share as they continue to stack more and more user data.

An ideal loyalty system should provide consumers true ownership and control over their identity and data, more tangible value in rewards and the ability to redeem goods and services across different vendors in the entire travel spectrum.





Our goal is to create the Marco Network, a new global travel ecosystem, built on a universal base-layer blockchain protocol.



## 2 The Marco Solution

An opportunity presents itself with the emergence of blockchain technology to truly disrupt the highly centralized travel ecosystem of data, content and transactions, to solve the problems described in the previous chapter. Our goal is to create the Marco Protocol, a universal protocol layer for travel industry.

Marco will provide a smart-contract based protocol that connects all consumers and businesses in the travel industry on a decentralized travel ecosystem that incentivizes content creation, transactions and consent-based sharing of user data.

It gives control back to the user over his/her identity, data and content IP, provides businesses with a direct and transparent channel to conduct transactions and collaborations, and empowers all 3<sup>rd</sup> party travel companies to create their own application logic and token-economics.

### Marco Protocol

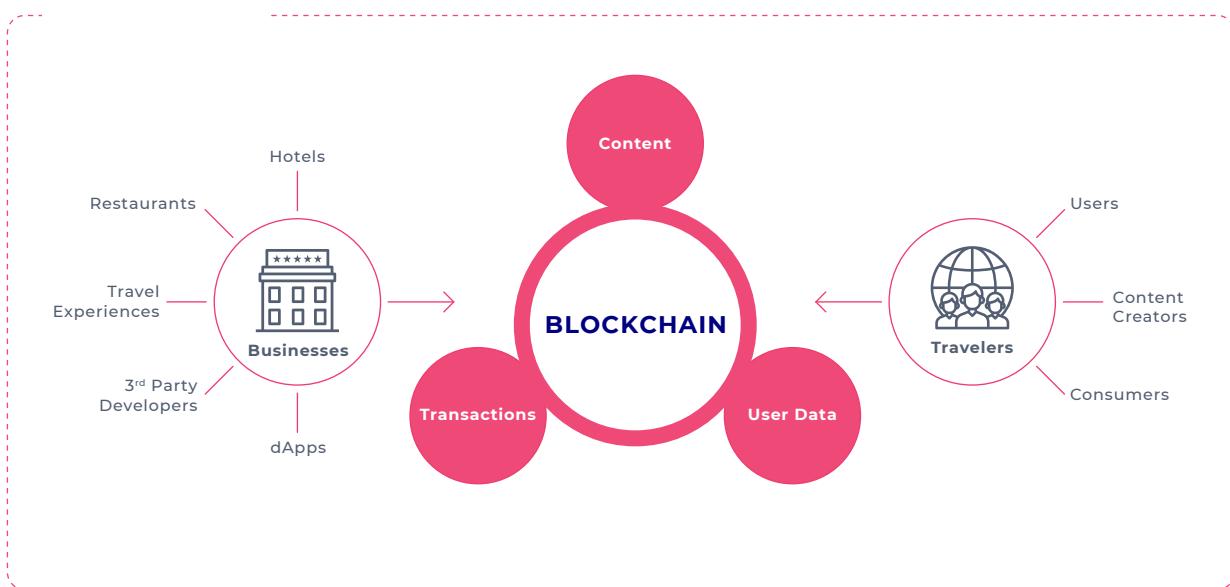


Figure 2: Marco Protocol

## 2.1 Key Features of Marco Network

**Decentralized Database:** Each entity can access records on the entire database via our external API, but no single entity controls the data or the information. Marco will capture all user data and relevant information about a venue into the blockchain, including its reviews/ratings and transactions.

**Publicly Accessible Blockchain:** Marco enables the creation of verifiable data, files and processes on the blockchain, which are shared to allow anyone to view the contents stored inside. Marco will make all blockchain infrastructure publicly accessible through our API, inherently rendering the system to be transparent and trustworthy.

**Authorship and Ownership Protection:** Users and suppliers are empowered because they have control over their information and transactions. Additionally, blockchain enables the attribution of digital content with unique IDs and certificates of authenticity to protect the authors. For the content producers and viewers on the protocol, creating a blockchain-enabled social media system will facilitate tracking of the content, author, timestamp, viewership, comments, as well as votes/likes in a public record.

**Smart-Contract Based Governance:** Allows the automatic enforcement of rules and conditions for a transaction to occur. This, in turn, enables the creation of a decentralized travel ecosystem that is self-regulating and transparent. With Smart Contracts, content creators will be automatically rewarded when posting content and when users vote for their content. Business venues can also set up automatic predetermined rewards for users when they post content about their venue.

- ▶ Custom Contract API: Marco enables developers to customize Smart Contracts from a list of templates on the Marco platform without requiring experience in Smart Contract development.
- ▶ Channel Management API: Marco enables developers to connect to various global channel management systems to obtain availability and pricing data for venues on the platform, as well as supporting instant confirmations for bookings.

## 2.2 Key Value Propositions

### Incentivize Content Creators

To kick-start the ecosystem, we will first need to address user traffic. Some of the biggest traffic owners in today's internet world are content websites and apps such as Facebook, Instagram, YouTube, Pinterest and TripAdvisor. Research proves that good, relevant and abundant content is the most effective way in attracting user traffic. Users are always in need of quality and relevant travel and lifestyle suggestions for hotels, restaurants, bars, retail and activities. Content creators will play a vital role in the development of the Marco ecosystem.

A key aspect of the Marco ecosystem is a content platform with a decentralized incentive mechanism. Marco will use its part of the token reserve and annual supply of new tokens to incentivize content producers to generate location-based content. Content creators will be fairly rewarded for their creations, which will be determined by an up-voting mechanism. Content on other existing platforms can also be easily migrated to Marco.

### Give Data Ownership Back To Users

Each user will have a complete user profile that includes transactional history and live purchase data across all vendors in the ecosystem, which will be stored on the blockchain. Users can securely own and control their user data and opt-in to monetize it for product recommendations and direct marketing from businesses.

Travel businesses can now pay for access to user profiles, engage in consent based direct marketing with customers as well as promote transactions, and rewards loyalty through the use of Marco tokens. All these can be done without the middlemen. Smart Contract feature will be the means of engagement between consumers and businesses.

### Zero Commission Market Place

Marco provides a decentralized and commission-less infrastructure between vendors and consumers to engage in transactions of goods and services. Vendors can manage their inventory and pricing, and consumers can use tokens to make direct purchases. This will provide significant savings for the vendors (vendors typically pay 15-25% commission to centralized platforms) and re-align incentives in the ecosystem. Transacting with tokens will also save on the various transaction costs associated

with foreign currency conversion and cross-border bank charges, leading to a more efficient transaction economy.

## 2.3 Key Utilities of Marco Token

The Marco Token is MRC. It is the unit of exchange in the Marco ecosystem and delivers the following utilities.

### Rewards Token

- Marco Network uses MRC from its reserve to reward content producers for creating useful and high-quality content.
- Venues can use MRC to engage and reward content producers for creating content about their venues.
- Businesses can use MRC as the base currency for their loyalty and reward program, providing customer rewards of more tangible value and the option to redeem across different vendors in the Marco ecosystem.

### Payment Token

- Customers can use MRC as a form of payment for goods and services offered by vendors/suppliers in the ecosystem.

### Currency of Exchange for 3<sup>rd</sup> Party DApps

- Marco provides base-level infrastructure including blockchain, on-chain-off-chain storage, content API, payment gateway, channel / inventory management, and a custom contract API. This enables 3rd party developers to build innovative products and DApps on the platform. MRC will be the token of exchange used by these DApps.



## 3 Technical Framework

Marco will provide a robust travel ecosystem that will record and process venue booking transactions via Smart Contracts. Venues will also be provided with an interface that allows them to customize their own Smart Contracts to comply with their business policies and agreements. This ensures cooperative yet trust-free relationships between service providers, venues, and customers across the entire travel value chain. There are many benefits to this, including cost savings with the removal of intermediaries such as OTAs, time savings from automated business processes that verify/confirm the parameters defined in the Smart Contracts, and the trust created from storing information on a public ledger.

The Marco framework is comprised of three distinct layers: Core Blockchain Layer, Service Layer, and Application Layer. Each layer in the framework contains components that execute processes and services for the layer above. The three layers of the framework are:

- **Core Blockchain Layer**

All data collected about a venue's reviews and descriptions will be stored in external distributed storage. There will also be support for off-chain storage to capture more private user and transactional data.

- **Service Layer**

The service layer acts as an interface where Marco developers and 3rd party developers can access the data stored in the core blockchain layer and services provided via our APIs to allow them to create innovative and decentralized applications utilizing the Marco protocol.

- ▶ MRC as the medium of exchange and incentive creation, which can lead to the development of travel statistics and reporting tools, local apps that are country or city specific, or interest specific vertical apps (e.g. car-rental, driver and tour guide services, adventure travel, foodie travel, etc.). Hotels, restaurants and IP owners can also tap into the community and issue their own tokens based on MRC, to finance their expansion plan through crowdfunding.

- **Application Layer**

Our Application layer is where the end users and venues will interact with our system and data. Users can use the applications in this layer to read and write reviews, as well as make venue bookings. Venues have the chance to respond to reviews and manage their bookings. In addition, the application layer will allow venues to customize their own Smart Contracts from a list of templates that will provide them with automated solutions to enable, confirm, and enforce the execution of a contract or policy.

### 3 Technical Framework

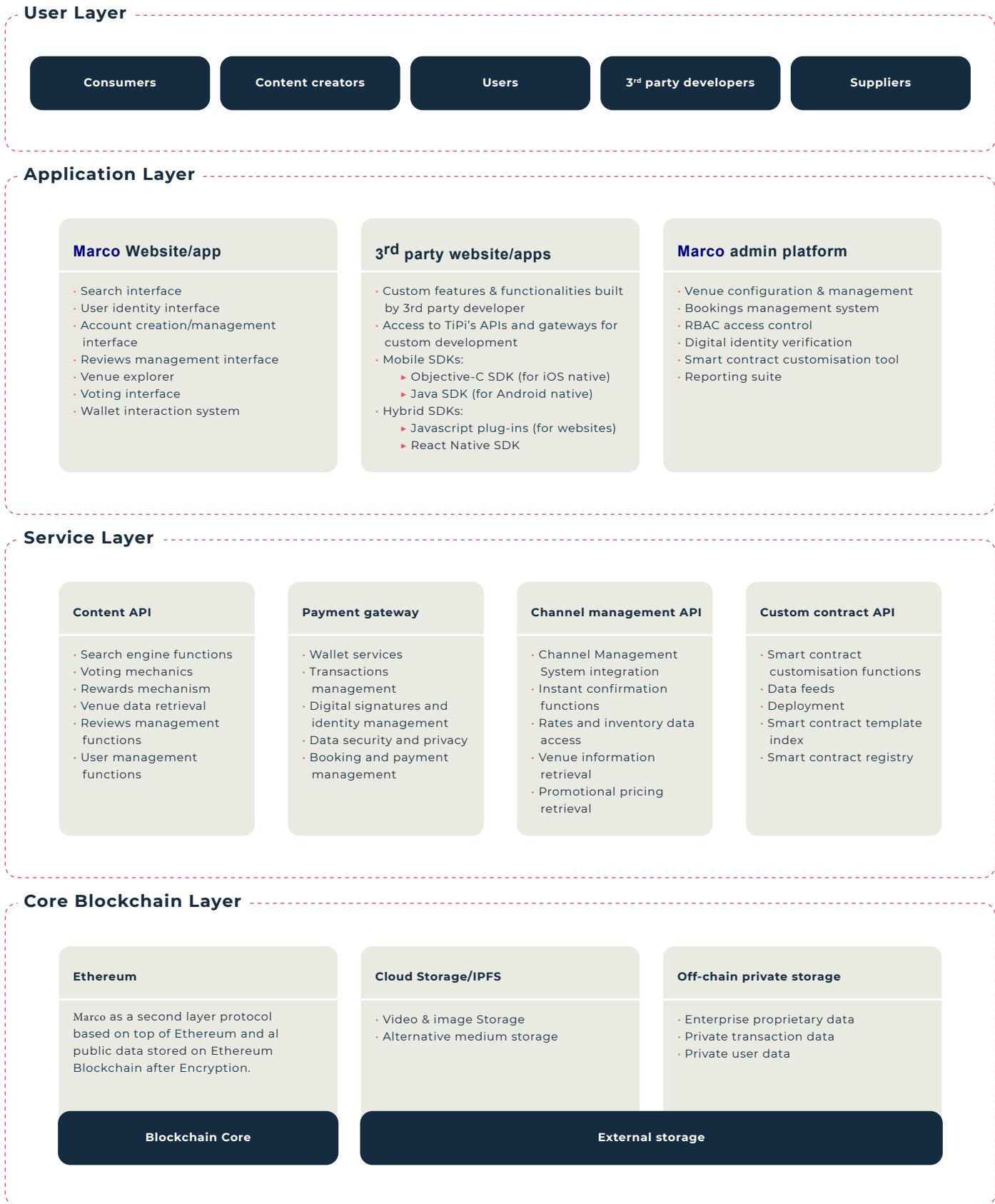


Figure 4: An overview of technical framework

## 3 Technical Framework

### 3.1 Core Blockchain Layer Components

The Marco protocol is built as a second smart contract layer on top of several existing open-source libraries, protocols and distributed systems which makes Marco possible.

#### 3.1.1 Ethereum Blockchain

Marco Protocol is built on the Ethereum blockchain, the most widely adopted and stable blockchain infrastructure. It enables smart contract which makes real life operation executable. User-generated content, venue created content, social media activities (such as up-votes or likes and comments), and booking transactions will be stored on Ethereum blockchain. Larger media files, such as images or videos, will be stored externally and links to the media assets will be recorded on the blockchain.

The immutability of the content will be preserved by creating a hash of each media file and recording it on the blockchain. This will allow anyone to mathematically verify the authenticity of any media asset linked to the blockchain. By storing media files and metadata externally, such as on Amazon S3 or IPFS, there will be a much wider range of options for storage providers to work with.

IPFS is a protocol and network designed to create a content-addressable, peer-to-peer method of storing and sharing hypermedia in a distributed file system. It allows Marco to be able to economically store data outside of Ethereum Network in a secure manner.

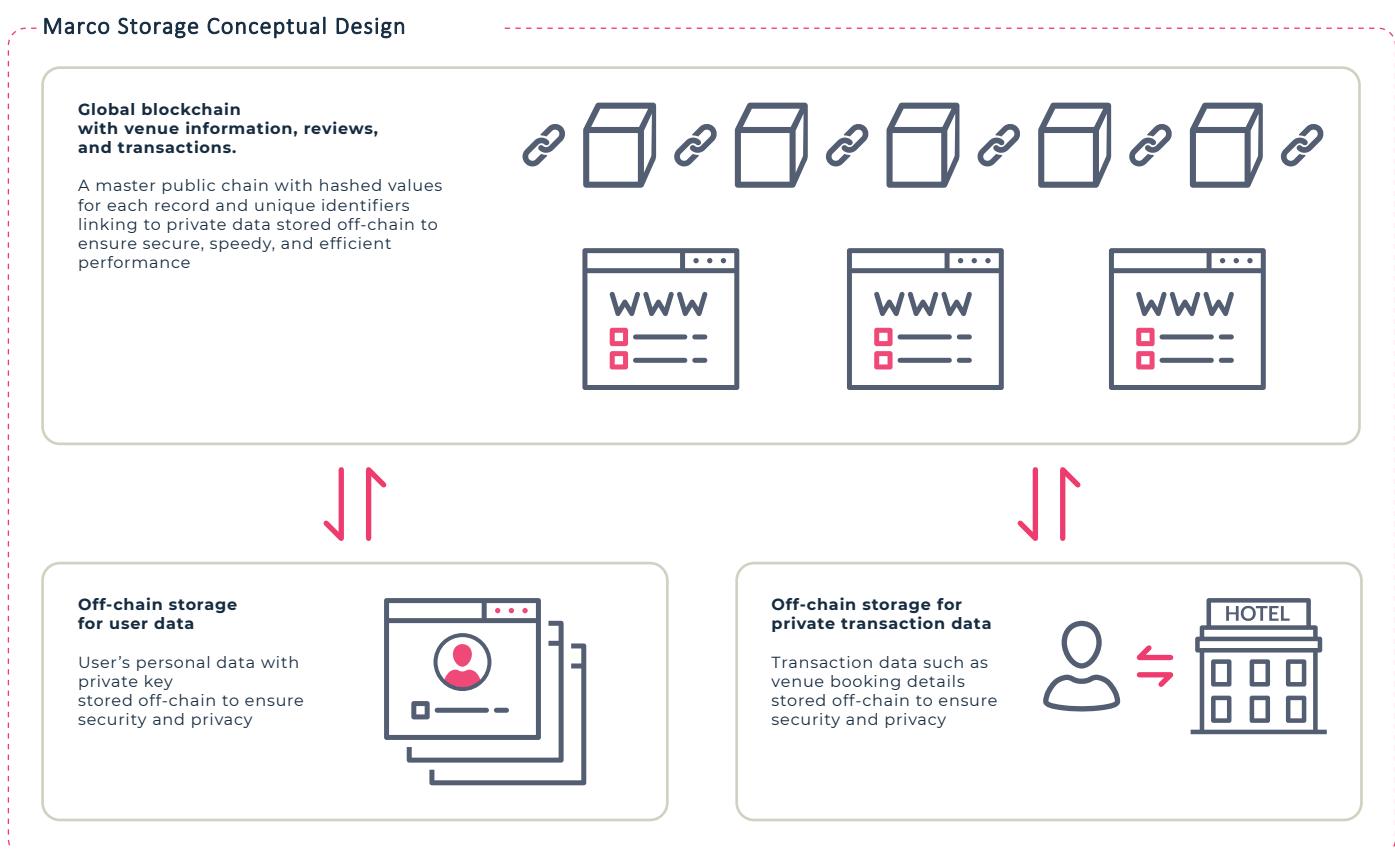


Figure 5: Marco storage conceptual design

### 3 Technical Framework

#### 3.2 On-chain and off-chain Storage

In order to maximize ecosystem growth during development of Marco protocol and platform, certain features will be built on-chain, while others will initially be done off-chain and later moved to on-chain if required, or once those capabilities become available as blockchain development progresses (e.g. digital identities and verification). Any public data such as reviews, venue information, and user votes will be executed on-chain.

Any private data such as hotel booking details or passport numbers will be securely stored off-chain on the Marco system to protect privacy, with the corresponding pseudonymous identifier recorded on the public blockchain.

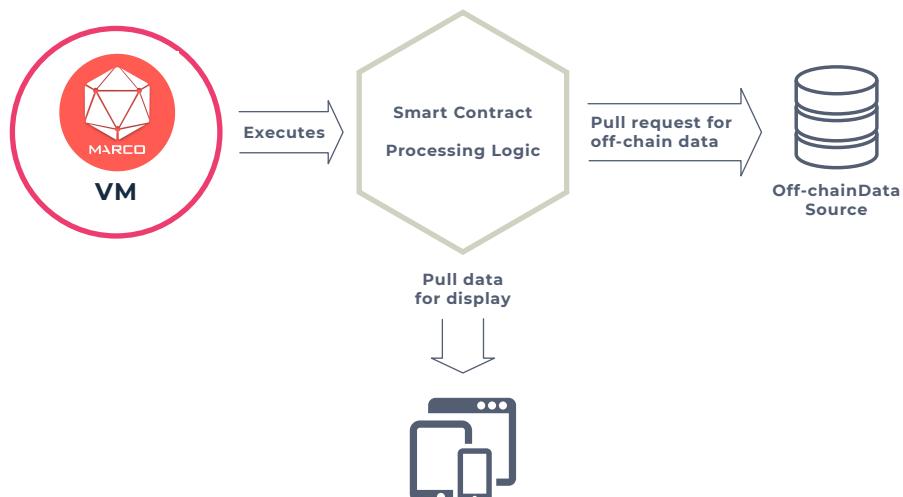


Figure 6: An illustration of data-pull mechanism

### 3 Technical Framework

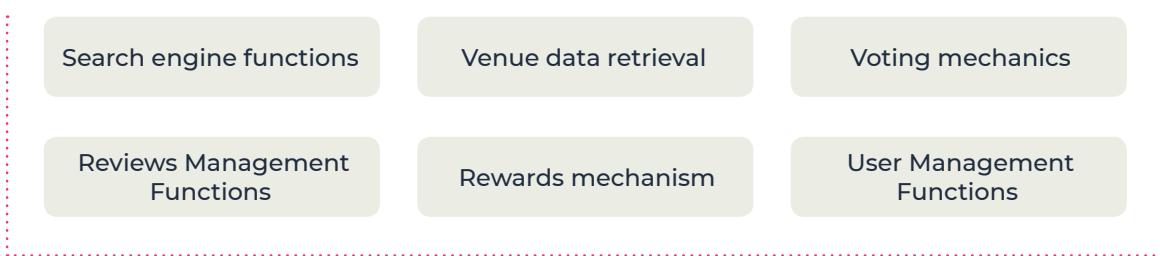
#### 3.3 Service Layer Components

A modular design approach is one of the central focuses of the Marco Protocol implementation. Our API is designed to take away the technical details of working with the blockchain and offers a simple programming interface for 3rd party developers to interact with the system without requiring vast experience working with blockchain technology.

The Marco platform provides the following APIs and services that integrate with several components of blockchain architecture:

##### **Content API**

The Content API provides methods for developers to create, modify and query venues and reviews stored on the Marco protocol. All review and voting reward mechanisms will be abstracted away and managed by the API, so 3<sup>rd</sup> party developers do not need to concern themselves with handling the dynamics of the social media reward economy.



##### **Payment Gateway**

A payment gateway enables developers to handle online bookings and transactions, including the transfer of MRC to venues for reservations made through the 3rd party app or website.



### 3 Technical Framework

#### Channel Management API

This API enables developers to connect to various channel management systems to obtain availability and pricing data for venues on the platform, as well as supporting instant confirmations for venue bookings made. It will provide developers with significant flexibility over venue pricing and promotions, as well as access to real-time availability data.



#### Custom Contract API Template

In order to write and deploy a Smart Contract, it takes advanced programming skills and requires extensive experience. Even the most advanced programmers can make mistakes and create vulnerabilities that can be exploited.

Marco's Custom Contract API enables developers to customize Smart Contracts from a list of professionally audited and legally binding templates that will handle common agreements between travelers and venues, such as cancellation policies, prepayment/deposits, and delayed payment rules (e.g. pay on check-out).

### 3 Technical Framework

#### API Use Cases

Below are descriptions of how some of the core requests on the Marco API will work:

##### Writing a Review

When a user submits a review to the Marco platform, the following information will need to be passed to the API request:

Parameter name	Type	Description
<b>Review content</b>	string	The content of the review written by the user
<b>User ID</b>	integer	Pseudonymous identifier of the review's author
<b>Venue ID</b>	integer	ID of the venue being reviewed
<b>Rating</b>	integer	The user's star rating of the venue (1-5 stars)
<b>latitude</b>	decimal	Latitude of the location user is reviewing (optional). Used to detect venue user is located in if GPS is enabled.
<b>longitude</b>	decimal	Longitude of the location user is reviewing (optional). Used to detect venue user is located in if GPS is enabled.

The process of creating a review on the Marco platform and API will work as follows:

1. User submits their review and rating for a venue to the Marco application or third- party application.
2. API receives the review and stores the review and IDs onto the blockchain.
3. The verified venue owner is notified of the review and can access the admin platform to respond to the review if needed.

### 3 Technical Framework

#### Booking a Hotel

When a user makes a booking for a particular hotel, the following information will be passed to the API:

Parameter name	Type	Description
<b>Check-in date</b>	datetime	The check-in date specified by the guest
<b>Check-out date</b>	datetime	The check-out date specified by the guest
<b>User ID</b>	integer	Pseudonymous identifier of the review's author
<b>Venue ID</b>	integer	ID of the venue being reviewed
<b>Room type</b>	integer	The ID of the room type at the hotel that the user booked (e.g. standard room, honeymoon suite, etc)
<b>Promotion type</b>	integer	The ID of the promotion booked by the user (e.g. early bird discount, buy 3 nights get 1 night free, etc)
<b>Room count</b>	integer	Number of rooms booked by the guest
<b>Adult count</b>	integer	Number of guests staying at the hotel
<b>Children count</b>	integer	Number of children staying with the guests at the hotel
<b>Lead guest name</b>	String	Name of the lead guest
<b>Guest phone</b>	String	Phone number of the lead guest
<b>Guest email</b>	String	Email address of the lead guest
<b>Bed type</b>	String	Bed type requested by the guest (e.g. twin beds, queen size bed, etc)
<b>Extra services</b>	String	Extra services requested by the guest (e.g. airport pickup, spa treatment, etc)
<b>Total price</b>	Decimal	The price of the booking as obtained from Marco's pricing database or from the channel management system used by the hotel

Below is the procedure and workflow for hotel bookings on the Marco platform and API:

1. Users enter their travel details, such as stay dates, guest count, guest names, contact details, etc. for a hotel and submit it to the application.
2. The API receives the information and checks the rates and availability database to obtain the total price and to verify that the guest's requested dates are available for the selected room type.

### 3 Technical Framework

3. If the hotel has a vacancy, the API returns the price breakdown for the booking back to the application, which in turn displays it to the user.
4. Users confirm and the booking request is sent to the API.
5. The API receives the booking request from the application and performs the following steps:
  - I Deduct the room inventory from Marco' availability database.
  - II If the hotel is integrated with a channel management system, the API will forward the booking request to the channel management system for instant confirmation and track the booking details for the hotel.
  - III Record the pubic details of the transaction and guests on the Marco protocol.
  - IV Record the private details of the transaction and guests on off-chain storage.
  - V Send a message to the hotel to let them know about the guest's booking.
  - VI Send an email/SMS to the guest to inform them of the booking.
  - VII Transfer the guest's Marco tokens from their wallet to the hotels.

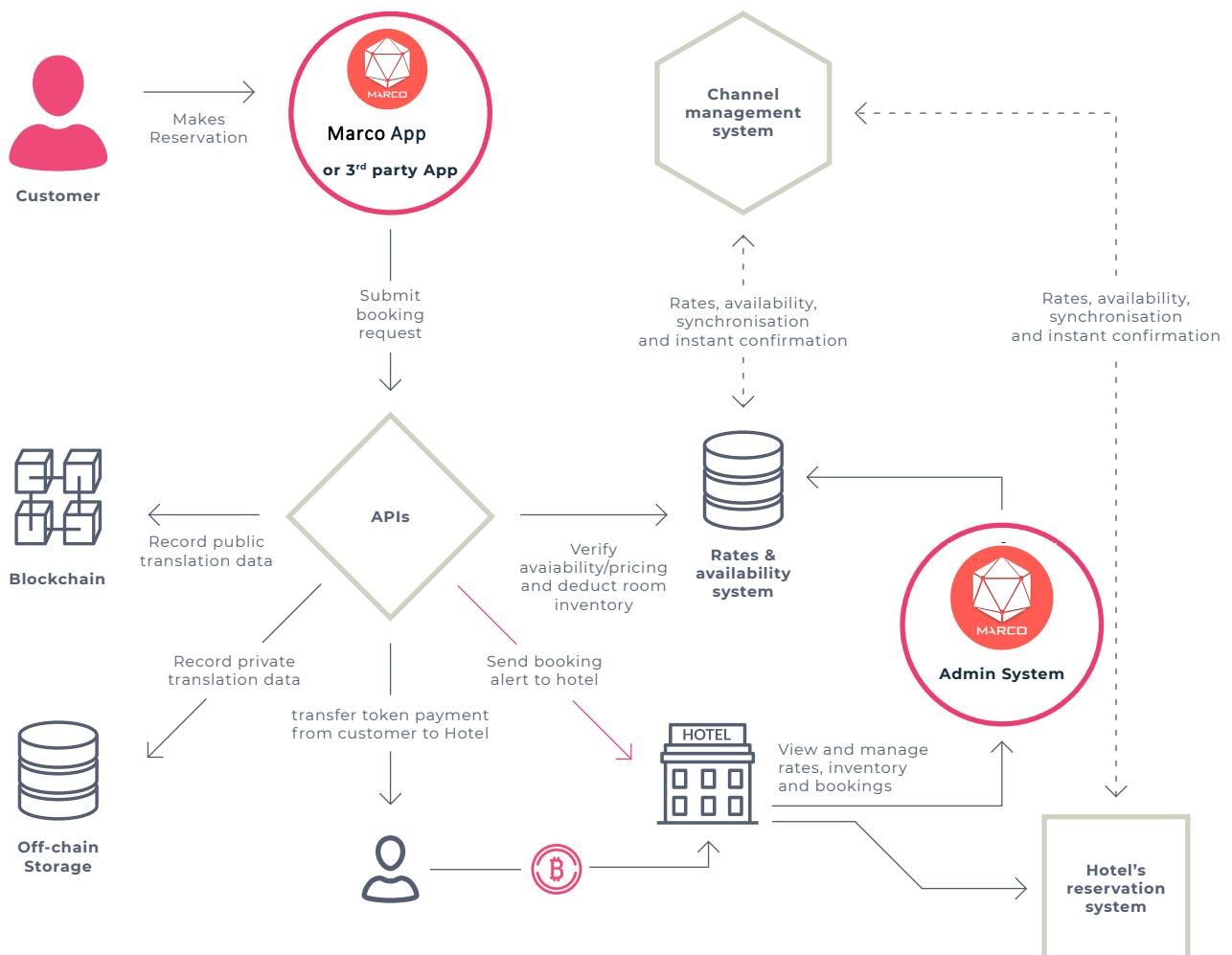


Figure 10: Booking process

### 3.3.1 Service Layer Components

This is a mechanism to overcome the non-deterministic nature of hotel and venue pricing structures, policies and inventory. On any channel management system, these values and policies will often change over time, which means if an individual were to look up the price of a hotel room today and then look up the price of the same hotel room for the same check-in date a few weeks later, there is a high possibility that the price will have changed. We will resolve this by storing, on the blockchain, the verified output generated by any transaction at the time it was made, keeping a permanent record of the venue's pricing, inventory, discounts/promotions, cancellation policies, etc. at the time of the booking. This data will be converted into JSON and stored onto the Marco protocol, creating an immutable snapshot of the attributes and particulars of the booking transaction for future reference.

In order to maintain confidentiality, only the information required for the fulfilment of the contract is stored on the blockchain, which includes items such as price, cancellation policies/fees, check-in dates, etc. All other private contract information

(such as customer's name or passport number) will be stored off-chain. A hash function will be applied to the off-chain data, and the resulting hash is then recorded onto the blockchain. This hash is a random string of characters and will not reveal any private data to the public. The off-chain data can be verified to ensure it has not been tampered with by repeating the hashing function and comparing the resulting hashes to make sure they are identical.

Here is a proposed schema for capturing hotel booking details:

```

1  {
2      "title": "Hotel booking",
3      "description": "A representation of a hotel booking transaction",
4      "type": "object",
5      "properties": {
6          "booking_id": { "type": "string" },
7          "hotel_id": { "type": "integer" },
8          "user_id": { "type": "integer" },
9          "check_in_date": { "type": "integer", "format": "date-time" },
10         "check_out_date": { "type": "integer", "format": "date-time" },
11         "room_type": { "type": "string" },
12         "room_count": { "type": "integer" },
13         "adult_count": { "type": "integer" },
14         "children_count": { "type": "integer" },
15         "promotion_id": {
16             "description": "The unique identifier of the promotional discount used in
17             the booking",
18             "type": "integer"
19         },
20         "price": { "type": "number" },
21         "additional_services": {
22             "description": "Extra services requested by guest (e.g. airport pickup)",
23             "type": "string"
24         },
25         "address": {
26             "type": "object",
27             "properties": {
28                 "street_address": { "type": "string" },
29                 "city": { "type": "string" },
30                 "state": { "type": "string" },
31                 "country": { "type": "string" }
32             }
33         },
34         "policies": {
35             "type": "object",
36             "properties": {
37                 "cancellation_policy": { "type": "string" },
38                 "general_policy": { "type": "string" },
39                 "children_policy": { "type": "string" }
40             }
41         },
42         "date_created": { "type": "integer", "format": "date-time" },
43     },
44     "required": [ "booking_id", "hotel_id", "user_id", "check_in_date",
45                 "check_out_date", "adult_count", "children_count", "price", "country",
46                 "cancellation_policy", "date_created" ]
47 }
```

Figure 11:  
Hotel Booking Schema

### 3 Technical Framework

#### 3.3.2 Voting System / Curation Model

Marco's curation model is based on the idea of "one MRC, one vote". Whilst adopting this model, individuals who added value to the ecosystem will be rewarded with MRC according to their contribution.

An annual fixed supply of MRC will be distributed to content creators and curators according to the number of up-votes received. The most up-voted content will be deemed the most valuable by the community and the creator will receive the highest payout. 75% of the total payout will be made to the content creator and the remaining 25% will be distributed to the curators who up-voted the content. The algorithm that will determine the distribution to curators will be stake-weighted and will have a time- decay factor, so people who have a higher number of MRC and who voted the content earlier will have a more favorable return.

The system also features controls for a "limited voting power", which ensures fairness and prevents abuse. An MRC holder who votes more frequently will have each vote count for less than someone who voted less frequently. The voting power will diminish by 10% per vote and replenish daily at a rate of 20%.

This decentralized curation system will provide the right alignment of interest. Community members who own tokens will have the financial incentives to vote in a way that maximizes the long-term value of Marco.

#### Reputation System

#### 3.3.3

Creators are adding value to the platform by creating useful content that drives users to the platform and keeps existing ones engaged. The curators who take time to evaluate and vote on the content are important in our ecosystem as they help with the distribution of tokens according to merits. The system rewards both of these activities based on the collective wisdom of the community through a decentralized and stake-weighted reputation algorithm. Based on the number of up-votes, 65% of the annual inflation of new MRC will be distributed to reward content creators and curators, 25% to Development Reward Pools.

In a decentralized social media platform, a reliable reputation system is essential to support with the rewarding of creators and curators of high-quality content, as well as for detecting abusive users who post spam and fake reviews.

In Marco's reputation system, users can up-vote or flag reviews posted by content creators, and the overall rating of a post and its corresponding creator is the sum of these ratings over a designated period of time. These ratings will be recorded on the public blockchain, so each user's reputation will be known by all.

For example, each time user  $i$  reads a review by creator  $j$ , they may rate the review

### 3 Technical Framework

positively by up-voting ( $tr(i, j) = 1$ ) or negatively by flagging it ( $tr(i, j) = -1$ ). User  $i$  may rate a review negatively if it was copy and pasted from somewhere else, or if it was unhelpful.

With this data, we can establish an individual trust score  $S_{ij}$  as the sum of the ratings of each review that user  $i$  read from creator  $j$ :

$$S_{ij} = \sum tr_{ij}$$

Please note that a group-based ranking method for reputation ranking will also be considered.

The trust score will be aggregated for each creator, based on all user ratings that were submitted for his/her content. The aggregated score will be recorded on the public blockchain, so anyone can get a broad perspective of each creator's reputation.

We can extend this reputation system transitively based on the assumption that a user will trust those creators who had written reviews that the user rated positively, and in turn he will likely trust the opinions of those creators, since creators who write trustworthy and helpful reviews will also be honest in their ratings of reviews written by other creators on the platform.

We believe that this approach will be effective in finding the highest quality contributors in the community in order to reward them appropriately, as well as enhancing the detection of fake reviews and spam posted on the platform. In addition, it creates a self-policing system that is enforced by the users in the community and not by some centralized authority.

#### Advertising Pricing Model

**3.3.4** The advertising backend algorithm will calculate the amount of MRC required for the banner ads and in-feed ads given the supply / demand dynamics. It will take into consideration the parameters of bid/ask price and number of target-users reached, with an implementation based on Google's Generalized Second Price Auction (GSP model).

In the GSP model, each ad has a bidding price  $b_i$  and a quality score  $q_i$ . The ads will be sorted in descending order of  $r_i = b_i q_i$ . Ads that have a lower bid can still have a higher ranking than ads that have a higher bid, if the former's quality is regarded as superior.

### 3 Technical Framework

The price paid by the advertiser for ad  $i$  will be equivalent to the price enabling them to beat the next ad, where the price of an ad is inversely proportional to its own quality.

$$p_i = b_i + 1 - \frac{q_i + x}{q_i}$$

#### 3.4 Application Layer

##### 3.4.1 Customizable Smart Contract Templates

Smart Contracts that are built on the blockchain have required the expertise of programmers who are experienced in blockchain development. Many venues do not have this kind of expertise in-house, therefore, Marco will provide an intuitive visual interface to allow regular individuals with no coding experience to create Smart Contracts based on their venue's policies.

The Smart Contract customization tool allows venues to select from a list of Smart Contract templates that they can customize to reflect the venue's policies so that the transfer of money and enforcement of the agreement can be automatically supervised by the nodes.

#### 3.4.2 The Contract Creation Process

The Smart Contract customization tool will work as follows:

1. The venue owner selects a contract from Marco's list of Smart Contract templates (e.g. booking contract or cancellation contract).
2. An online form will be provided for the venue owner to customize the variables of the Smart Contract. For example, if the user is working with a cancellation contract, they will specify the penalty/fees charged for late cancellations, at what time cancellations will allow full refunds (e.g. up to 1 hour before arrival time), etc.
3. After confirmation that both parties have followed through with their end of the agreement, Marco will execute the token transfer based on the rules specified in the Smart Contract.

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In the case of venues that have fluctuating price based on booking dates, such as hotels, the Smart Contract can be customized to automatically obtain the prices from the Marco rates database or from the channel management system based on the user's specified stay dates whenever they submit a booking request to Marco.

In order to ensure privacy, only a small selection of data required to fulfill the contract will be stored on-chain, including conditional costs (such as penalties for cancelations), check-in and check-out dates, or date of the transaction. Any other data will be stored off-chain. When the contract is agreed, a hash function will be applied to the data, and the resulting hash will be stored on the blockchain. This hash will not reveal any details of the contract to the public, while the parties involved in the transaction, who will have a text-based copy of the contract's policies and data, can confirm the validity by running the hash procedure on their respective copies and compare the results with the corresponding hash on the blockchain.

## 3 Technical Framework

### 3.4.3 Service Agreement Mechanics

Marco brings together multiple venues/suppliers and consumers, providing them with an online platform to book and pay for reservations. All participants in a transaction are subjected to certain risks. For example, a supplier may not get paid for late cancellations or the consumer may not be happy with the service. To resolve this, Marco will encode the venue's policies into a service agreement, where the payment, settlement, verifications and policy parameters can be specified, therefore enabling the enforcement of these rules.

Marco will utilize a two-phase contract, equivalent to an escrow account. Funds are locked with a status of "pending" until the terms of the agreement have been met (e.g. the venue confirms a reservation). The service is then either executed or terminated.

- If executed (e.g. guest checks out of the hotel), funds are released to the venue.
- If terminated (e.g. hotel confirms a guest's cancellation request), funds are returned to the guest with any termination fees deducted. By providing guests with access to the Marco app/website, venues with access to the Marco admin system, as well as integration with current channel management systems, Marco can track whether a service agreement has been executed or aborted in order to enforce these rules.

Sample code for service agreements

**Lock:**  
Guest.deposit //deposit/prepayment for the service  
Venue.policy //smart contract rules.....

• **Complete:**  
Guest.check\_out //verify service completed .....

• **Terminate:**  
Guest.request\_cancellation  
Venue.confirm\_cancellation

### 3.4.4 Admin Platform

The Marco admin platform is a secure, password-protected backend management system, which will be provided to verified venues to enable the management and control of various aspects of their business, including managing reservations, venue profiles, pricing, availability, customer reviews, etc.

## 3 Technical Framework

### Venue Configuration & Management

This module will be available to venues to enable them to customize the information displayed to users about their business, including the name, description, address, phone number, photos, etc., allowing venues to maintain their profile to ensure the information is relevant and accurate. We will provide an intuitive step-by-step form for venue owners to fill in, so they can create and manage all content about their venue and publish it on the Marco platform.

### Customer Reviews Management

Responding to customer reviews is a great way for venues to understand and build solid relationships with their customers. Marco's customer reviews management module enables venues to read and publicly or privately respond to customer reviews posted in the Marco ecosystem.

### Reservations Management

Marco's reservation engine will immediately relay information to the admin platform as well as any channel management systems the venue is working with, keeping all distribution channels up-to-date and synchronized. Venues without channel management integration can use our reservations management module to view and manage customer reservations, including processing check-ins and check-outs, confirmations and cancellations, as well as modifying the booking dates, room counts, guest counts, etc.

### Rates and Availability Management

For small venues and boutique hotels that have not integrated with a CRS/GDS system, Marco's admin platform will include a free rates & availability management system to manage all aspects of their pricing and availability throughout the year. Our system will also provide full support for flash sales, early-bird discounts, as well as full control over BAR (best available rate) and custom rates by date and season. These can include employee rates, loyal customer rates, etc. This enables smaller businesses to leverage the same technology used by large OTAs and chains to manage promotional rates and availability and provide instant confirmation for customers booking through the Marco ecosystem.

### Channel Management Integration

Marco's admin platform is also fully integrated with major global channel management systems, including Sabre/Synxis, SiteMinder, EZYield, RateTiger and etc. If a venue is working with any channel management systems, they can provide their credentials to the Marco admin system, and all of the venue's information including pricing and availability data will be synchronized with the channel management system's data and across all of Marco's applications and websites. This enables venues to manage their properties across multiple channels without hassle, providing a central proof of rates and availability across the board whenever a reservation is made.

### 3 Technical Framework

#### **Reporting Suite**

Marco will also provide various production, financial and activity reports for venues, enabling them to know when their customers are booking, track which guests are staying, arriving, or departing so they can efficiently assign their resources, as well as view transactional reports to get insight into high/low days, monthly revenue, etc.

#### **Role Based Access Control (RBAC)**

A vital business function of any organization is to protect their data. An RBAC system can safeguard a business' information to ensure it meets privacy and confidentiality regulations. RBAC works by analyzing a given workforce, grouping users into roles based on their shared job responsibilities and data/function access needs. Access is then assigned to each user based on their designated roles.

With RBAC on the Marco admin platform, venue owners can set up as many staff accounts as they like on our system, define the roles, and specify the level of access for each role. Venue owners will have full control over which functionality and data the roles can access, allowing staff only to access the necessary information and features to effectively perform their jobs to the best potential, as well as having fine grain control over specific tasks such as the ability to read, create, or modify a booking record.

#### **Venue Identity Verification**

In order to verify a venue's identity to confirm its authenticity, Marco will be integrating with the location databases from Factual and FourSquare, which are used by Uber, Amazon, Yelp, MasterCard, and Apple for identifying locations and venues around the world. By combining the data from both sources, Marco will be able to identify over 3 billion venues from more than 200 countries and regions around the world, including geo-location data, addresses, hours of operation, venue categories, email contacts, and phone numbers. Once verified, venue owners can claim ownership of their business on the Marco platform, which will then open up access to the admin portal so the venues can start receiving bookings, respond to customer reviews, and manage their rates & availability.

### 3 Technical Framework

#### 3.4.5 SDK Support for 3<sup>rd</sup> Party Website & Apps

To enable third-party developers and businesses to build their own applications on the Marco platform, we will provide them with SDKs to simplify the operation and interaction with our blockchain and APIs.

SDKs will be available for the following platforms:



Marco's Android SDK will provide build scripts, source code, and sample apps to get developers up and running on Android devices.



Marco's iOS SDK delivers libraries and sample Xcode projects for developing native mobile apps on iOS. It will support Objective-C and Swift.



React Native is a framework released by Facebook for writing native mobile apps using JavaScript, markup, and style sheets. It allows web developers to write mobile apps that look and feel native. The code that is written is shared between platforms, with React Native making it easier and more effective to develop apps for both iOS and Android simultaneously. Our React Native SDK will wrap around the iOS and Android SDKs, providing access to native UI elements and APIs, from login to booking, all done through documented JavaScript modules.

These SDKs, as well as Marco's public API, will provide 3rd party developers with the capacity to develop their own DAPPs for user reviews, voting, venue reservation, and user management. In addition, we will also provide plug-ins for third parties who already have their own content sites, travel blogs, forums, or reservation apps to directly integrate our content and functionality into their systems. For example, a travel blogger could embed a "Book Now" plug-in into their page, allowing users to directly book the hotel that the blogger was writing about on that page.





The Marco protocol is open source, provides a custom contract API and a library of professionally audited smart contracts, so third parties can easily develop applications and services that will reach the whole Marco community



## 4 Marco Ecosystem

### 4.1 Open Source Development

The Marco Protocol will be open source and as such, freely available to the community of 3rd party developers. Marco encourages the creation of DApps, token issuances on the platform.

Marco' Custom Contract API enables developers to customize Smart Contracts on the Marco platform without having to possess extensive experience in Smart Contract development.

The Marco Protocol will offer a selection of professionally audited and legally binding Smart Contract templates that will handle common agreements between individuals and venues, such as

- Cancellation policies
- Prepayment/deposits
- Delayed payment rules

3<sup>rd</sup> party applications and services on the platform will be able to reach the whole Marco community, in which we can envision the following scenarios:

- Various products and travel services such as car rentals, air-tickets, tour guides, specialized tours, short-term rentals, etc.
- Premium content such as guides, tutorials, classes and consulting services.
- B2B services including analytics, CRM, ERP and channel management.
- Various community projects such as emoji's, games, etc.

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### CRM and Inventory Management Systems

**4.2** Marco provides a decentralized and commission-free infrastructure for suppliers to list inventory and for customers to complete accommodation bookings, restaurant reservations or tickets for events.

Marco will work with existing Channel Management System (CMS) and Property Management System (PMS) providers to allow for easy API integration. As such, hotels and airlines that already use such systems will be able to connect their inventory to Marco, quickly and effortlessly.

### Marco Wallet

The Marco Wallet is a digital wallet that enables users, venues, content creators, and 3rd party developers to securely store and manage their Marco tokens, including the ability to transfer, withdraw, and deposit.

**4.3** When a new account is registered, the Marco platform automatically creates a personal online wallet. All transactions are stored on Ethereum blockchain with total transparency. To protect user's privacy, the wallet will use pseudonymous identification, which shows the user's relevant transactions, while hiding their true identity and only allowing access to the verified

### Measures to Encourage Adoptions

#### Incentives for Early Adoptions

**4.4** The very nature of the token ecosystem itself is a powerful advocacy for widespread adoption. The core value proposition, that the platform decentralizes the economic distribution within the ecosystem to the token holders and the content creators themselves, provides strong economical and ideological incentives for early adoption, especially with a millennial audience.

**4.5**

#### 4.5.2 Suppliers

Vendors who join the platform early and adopt the token for either advertising payments or transactions in coupons or vouchers will face more favorable economics and higher ROI.

- The system will provide free and discounted advertising space quota for suppliers during the first 12 months after launch.
- The supply and demand economics will be more favorable towards early bidders for ad space, as the user base size will be considerably smaller at the beginning.
- We will also look to provide airdrops of MRC to select partners to try out the system.

#### 4.5.3 Content Creators and Curators

65% of the annual supply of the new tokens will be rewarded to content creators and curators. As the supply of the new tokens is fixed, the early content creators will have a natural early-mover advantage and are more likely to be rewarded with more tokens.

- There will naturally be less content in the beginning, as the amount of content increases, the number of tokens per content decreases.
- There is generally a network effect for early adopters to attract more fans and a bigger following, this has happened on Instagram, Weibo and most other content-driven social networks.
- There will be a KOL recruitment campaign and airdrop with content producers at the beginning.

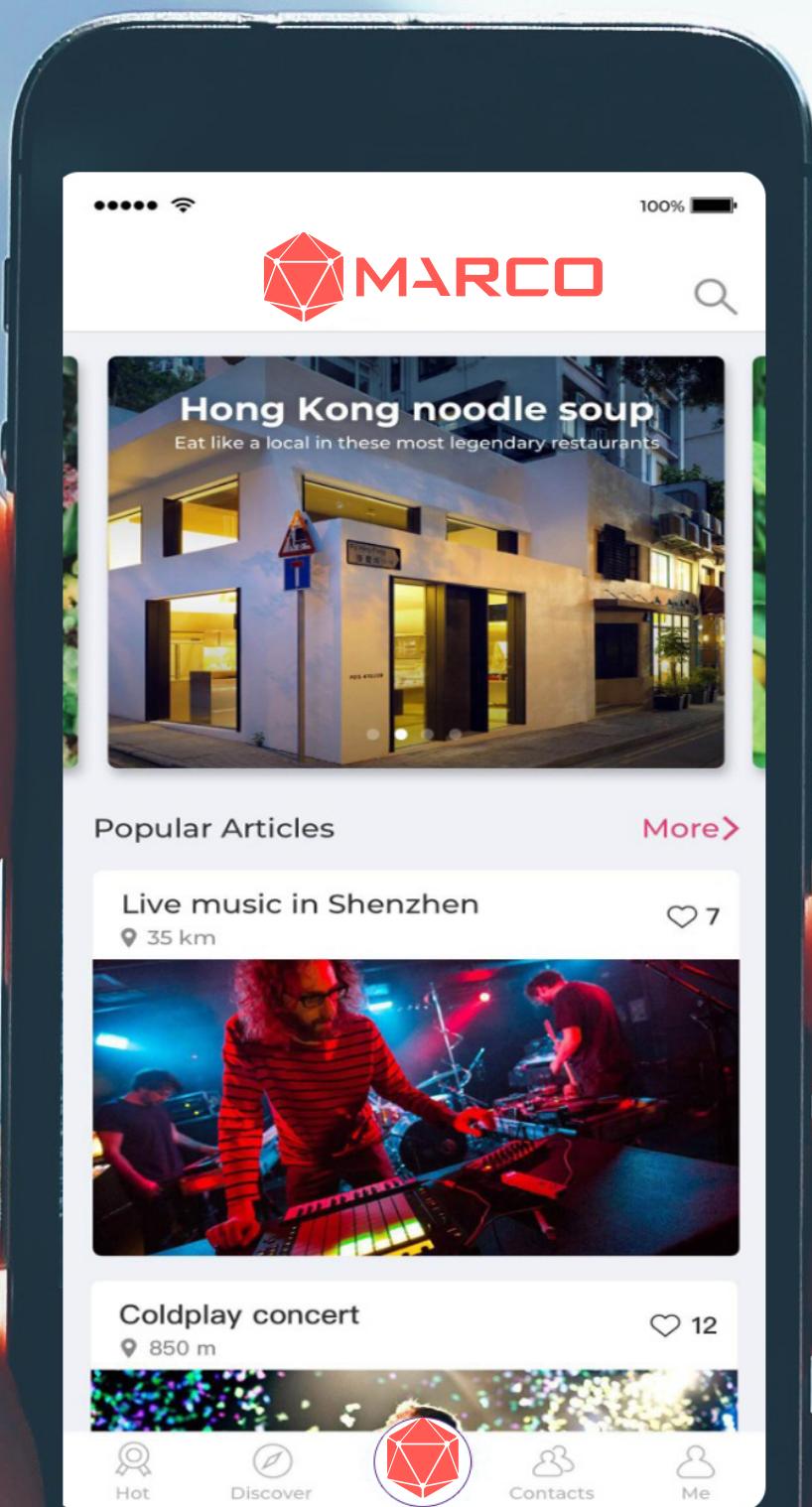
#### 4.5.4 MRC -To - Fiat Wallet Exchange

Our wallet will be linked to an exchange which will allow market-to-market conversion of USD for the holder of the token. This alleviates the insecurity of the supplier accepting tokens for the payment. Suppliers should have confidence in the stability of MRC and the liquidity in converting to USD or other major cryptocurrencies.

At the adoption stage, the platform will also accept fiat payment for the transaction of services, which will see the purchaser charged with a 5% commission fee. All fiat raised via this method will be used to purchase MRC, which will be added to the reserve.



The Marco App allows users to access the decentralized database of location-based information about hotels, restaurants, bars, clubs, shops, museums and other travel and lifestyle venues.





## 5 Marco App

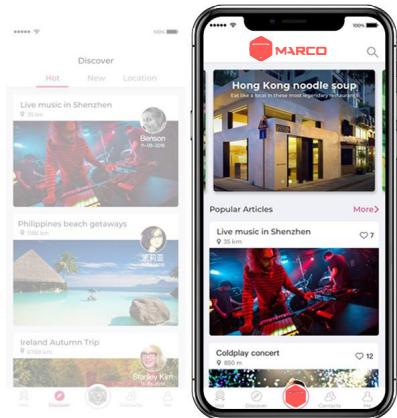
The Marco App is the key application to bring the value of the Marco Network to life. It is an example of a DApp on the Marco protocol, using its open API and transparent data access. It also serves to upstart the ecosystem, by forging a content platform with a powerful incentive scheme, a zero-commission marketplace for business venues and an advertising model that rewards users.

The Marco App allows users to access the decentralized database of location-based information about hotels, restaurants, bars, clubs, shops, museums and other travel and lifestyle venues. Users are encouraged to share quality reviews with the community in exchange for MRC tokens.



An early version of the Marco App on iOS is currently under development.

Please email [info@marcochain.io](mailto:info@marcochain.io) to request a testflight version



### Discovery

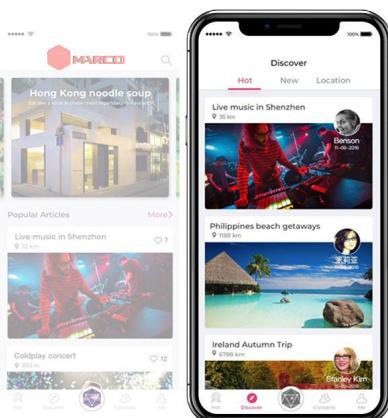
The discovery feed can be toggled between hot topics, new topics and recommendations nearby. Hot and new topics are both feeds controlled by algorithms to make sure the content displayed is of top relevancy.

Recommendations nearby come from friends, groups the user is associated with, experts the user follows or are suggestions based on user profiles.

### Marco Home Screen

The home screen displays the content feed, curated by AI and algorithms that learn about users' location and experience preferences.

The navigation provides easy access to the discovery mode, the content creation tool, friends and groups as well as user profile which includes token management.



### My Profile

On the profile page users can manage their profile and preferences, access bookmarks made and content created, manage their tokens and wallet, visit their transaction history and discover opportunities to make more tokens through bounty hunts or by opting into advertising.



Figure 12: Marco APP screens

### 5.1 The Location-Based Review and Content Application

Existing review websites are plagued by fake reviews and secretive, often unfair treatments by highly centralized service providers. These problems make these services less effective for the one who seeks authentic, unbiased and relevant recommendations.

#### Discovery

On the app, users can find interesting venues that their friends, a trusted expert, the crowd or the AI engine recommend. Thousands of venues in key destinations are pre-populated on the system, and through bounty mechanics and creation incentives, the content will quickly expand. The team also has a system in place to work directly with high-profile hotels and local influencers to identify the top venues in key destinations, get them listed and reviewed systematically, and therefore quickly provide a rich content experience for new users.

#### Smart and Personalized Recommendations

The geo-tagged data of people, where they have visited and who they are following, will allow the system to understand their preferences, enabling the artificial intelligence engine to recommend locations, experiences and other personalized and timely-relevant information. It will also allow the system to recommend people with similar interests. The Marco recommendation engine works similar to Netflix and Amazon, which recommend movies and books based on your previous consumption.

### 5.2 Review and Content Creation

The core functionality for user participation is content contribution. Users review and share their favorite places, along with smart tags and photo or video media. The community will reward users for their contributions.

Marco App rewards content providers in the form of MRC. The more and better quality the content, the more MRC the creator will be rewarded. MRC enables users to up-vote content created by others and be rewarded for it as well.

### 5.3 Transactions on the Marco App

With growing adoption and use of the app, Marco will roll out the transaction functionality that enables venues to list their products and services, with their users being able to make bookings, reservations, and purchases.

The Marco app offers a zero-commission marketplace between venues and their customers. Hotels can add and manage their room inventory, including descriptions with photos or other media, rates, and availability. Customers can use MRC to directly make bookings. Businesses are encouraged to provide 3-5% loyalty rebate in MRC directly to the consumers from the commissions saved for transactions, in exchange for cross-vendors user data by consent.

## 5 Marco App

Fiat payment options will be made available in the beginning. Venues are encouraged to issue coupons and vouchers with MRC that can be redeemed for features like room upgrades, free drinks or discounts on other services. Marco Network will also airdrop MRC to certain preferred partners to kick-start the momentum.

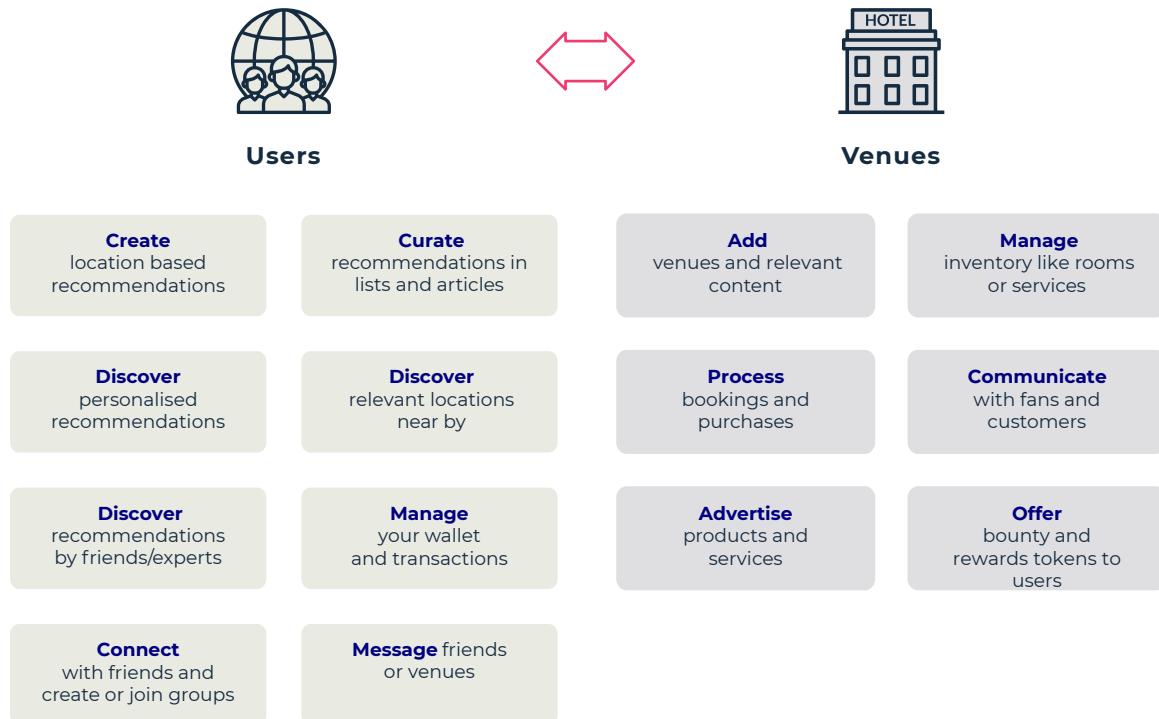


Figure 13: Marco APP functionality





## 6 Token Economics

### 6.1 Marco Token (MRC)

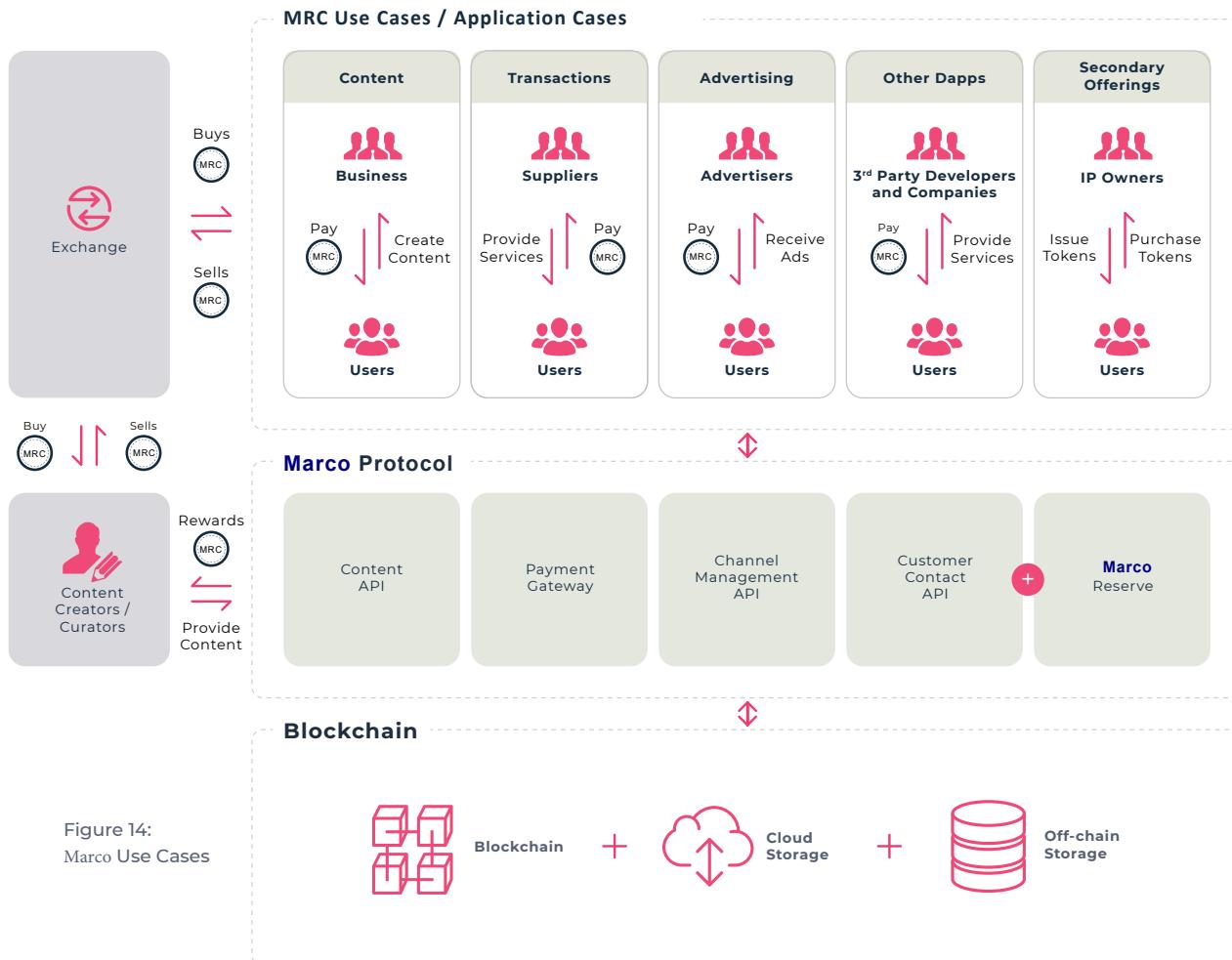
Marco Token (MRC) is the unit of exchange, the bearer of value and the rights of governance in Marco ecosystem.

MRC is a digitally-encrypted virtual currency and a functional utility-token that will be used as a unit of exchange on Marco.

### 6.2 MRC Use Cases

The value of the ecosystem multiplies when tokens can bring more use-cases and utilities into it. Marco is not only used to incentivize content but also as a unit of exchange for real goods and services and other various use-cases that can be devised by ecosystem participants. MRC is the currency within this ecosystem that can be adopted by travel businesses and 3rd party developers. It is also the base currency for token offerings by businesses in the ecosystem.

We will use the Marco app as an example to demonstrate the use cases of MRC, which are content, transactions and advertising.



### 6.2.1 Content

To incentivize content creation, it is of utmost importance to have a fair and decentralized system to attach value to the various forms of content created.

There are 3 ways that content creators can be rewarded.

- From the system: There will be an annual supply of MRC and airdrops from the reserve to reward content creators and curators.
- Peer-to-Peer: Users can choose to reward content creators who provide valuable information by paying MRC directly to them..
- Venues-to-Users: Business venues can reward users who create content about its venues by offering payment in MRC. Conflicts of interests can be avoided by using a smart contract system that ensures payments are independent of whether the content is positive or negative in nature.

### 6.2.2 Transactions

The Marco app will operate on a zero commission basis for transactions, which will provide significant savings for the vendors (hotels typically pay 15-25% commission to OTAs). Vendors transacting with tokens will also save on the various transaction costs associated with foreign currency conversion and cross-border bank charges. These real savings will help to kick-start the ecosystem by drawing more quality suppliers to the community. Businesses are encouraged to provide 3-5% loyalty rebate in MRC directly to the consumers from the commissions saved for transactions, in exchange for cross-vendors user data by consent.

In a perfect scenario, MRC would be the means of payment for all transactions within the ecosystem for goods, services and activities. We do recognize that the full adoption of the token as the only mean of transactions will require a strong network effect, which will take time. As such, we will adopt a gradual approach to e-commerce transactions.

### **6.2.3 Coupons and Vouchers**

In the early stages, we will start by issuing coupon purchases via MRC. Venues are encouraged to issue coupons on the platform which can function as discount vouchers on food & beverage or redeemable services such as room upgrades. Vouchers will have real value and utility to consumers but will not constitute such a large current account exposure to vendors. Vendors can treat them more as advertising and promotion expenditure. As the network effect of the platform grows and usage of digital currency spreads, vendors will develop full confidence in the stability of MRC. At such time, full token payments for goods and services will be rolled out.

### **6.2.4 Acceptance of Fiat Payment**

Marco will accept payment in fiat and convert it to MRC on the users' behalf with a 5% service fee. Fiat raised via service fees will be used to purchase MRC, which will be added to the reserve.

### **6.2.5 Advertising / Direct Marketing**

Marco can also be seen as a distributed network of users profile with complete cross-vendors purchase history and transactional data of the entire travel ecosystem. Enabled by blockchain, it provides a revolutionized new opportunity for consumers and advertisers to connect. Travel businesses are able to use MRC to pay for consumers profile and direct marketing on a consent basis at the Marco platform. Advertisers have the option to pay in fiat, which will then be converted into MRC, with an additional 5% charge.

The Marco app, as an example, will provide direct engagement between users and advertisers. Users can opt-in to disclose their own data and receive promotional info. In this transparent and decentralized system, advertisers will have a greater return on investment as the middleman is removed and they pay for direct and more effective 1-to-1 engagement with consumers. This more efficient advertising economy benefits both the advertisers and the consumers.

Here are 4 examples of advertising features that will be provided by the Marco app, a DApp developed by the team on the Marco Network.

#### **Banner and In-feeds Advertising**

An ad-placement back-end will be developed and made available on the Marco Network. Advertisers can then choose to target relevant demographics and socioographics, paying the respective costs in MRC. Combined with user-profile analysis aided by AI, the platform will assign a value to each individual account. The platform will record who clicked through on display and in-feed ads on the Marco App, and the advertising proceeds will be paid in MRC.

### **Direct Messaging and Targeted Advertising**

Users can opt-in to disclose their user profile and choose to receive advertising from approved brands directly in their inbox on the Marco App. Based on user profiles, AI would recommend relevant brands and advertisers to the users. On a per-click basis, the advertising revenue will be paid directly to the consented consumers.

### **Bounty Rewards to Post Contents**

Venues can directly encourage the creation of content for their venue by adding bounty rewards. To avoid conflict of interest, Smart Contracts can be set up to ensure that payment is not dependent on the positive or negative nature of the opinion but the popularity of the content.

### **Direct Engagement with KOLs**

The world's biggest KOLs already have amassed millions of followers on social media. On the Marco App, we provide a direct engagement channel. KOLs are directly marketing their services and will benefit from zero transaction fees on our platform.



The team behind Marco have vision to  
lead luxury travel and lifestyle platform  
in the world

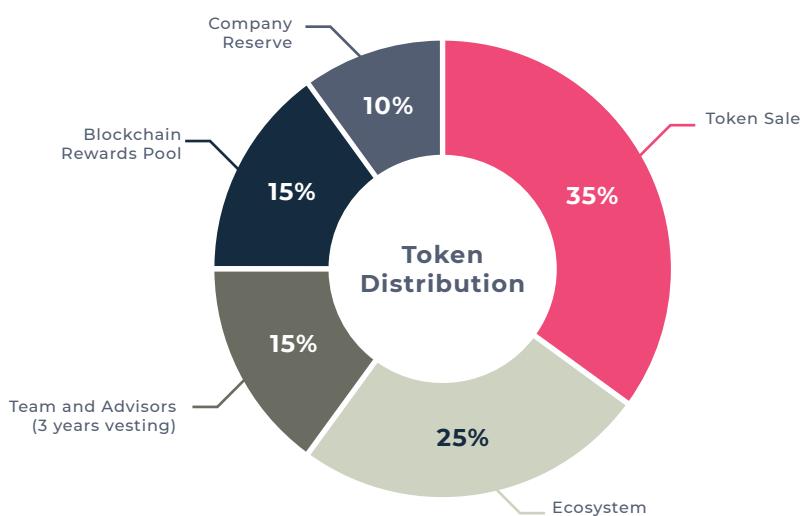


## 10 Token Sales and Use of Funds

### 10.1 Token Sales and Distribution

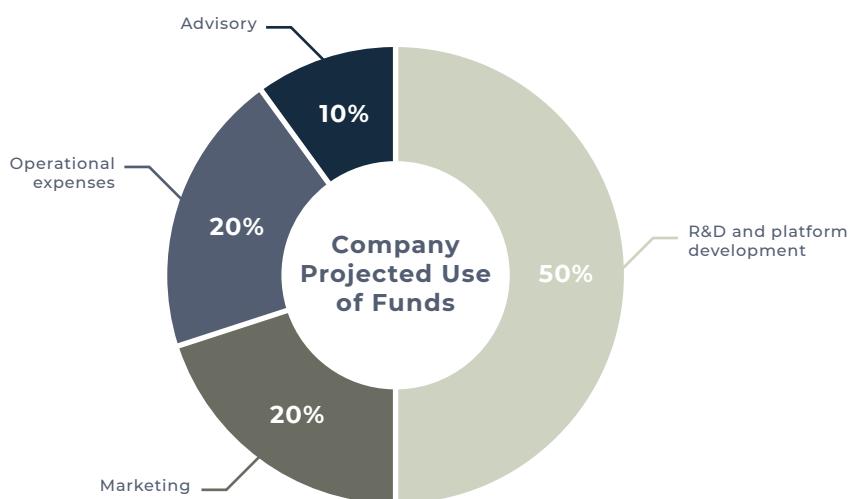
MRC will initially be distributed as token, which will be mapped over to our blockchain following the release of our Mainnet in near future.

**Token Initial Distribution**



Team and advisors allocation of MRC will have a vesting period of 3 years, 33.3% vesting each year, with a one year cliff.

### 10.2 Company Projected Use of Funds





## 11 MRC Risks

MRC is the underlying mechanism that drives the Marco Network, and supporting MRC is a vote of confidence in the success of our platform. That being said, there are several risks that all users should be aware of.

### Project Risk

As with any project, the development and execution of our platform carries with it the risk of delay and even failure. The core team has a strong track record of development and business management experience, but this is not a guarantee of success. The team will endeavor to hit the milestones outlined in the project roadmap, and will be as transparent as possible regarding our progress and any challenges met.

### Cryptocurrency Risk

By nature, cryptocurrencies are highly volatile, with highly fluctuating prices. Do not purchase more MRC tokens than you are willing to lose. Take time to understand our project and vision. Our goal is to find like-minded participants who have a high likelihood of being active contributors and users in our open platform.

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<sup>7</sup> PBoC, <http://www.pbc.gov.cn/goutongjiaoliu/113456/113469/3307529/index.html>

<sup>8</sup> Guiyang, <https://cointelegraph.com/news/as-china-plans-to-regulate-icos-blockchain-consortia-form-framework>

A recent ruling by the U.S. Securities and Exchange Commission (SEC) has indicated that companies that undertake an ICO may need to register with the SEC if the token is considered a financial security<sup>9</sup>.

Most recently, PBoC released a statement<sup>10</sup> regarding ICOs, which include banning raising funds through ICOs, strengthening supervision of related ICO platforms, and stressing the public to be aware of the risks surrounding ICOs.



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<sup>9</sup> SEC, <https://www.sec.gov/news/press-release/2017-131>

<sup>10</sup> PBoC, <http://www.pbc.gov.cn/english/130721/3377816/index.html>



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[https://www.websecurity.symantec.com/content/dam/websitemanagement/digitalassets/desktop/pdfs/whitepaper/Elliptic\\_Curve\\_Cryptography\\_ECC\\_WP\\_en\\_us.pdf](https://www.websecurity.symantec.com/content/dam/websitemanagement/digitalassets/desktop/pdfs/whitepaper/Elliptic_Curve_Cryptography_ECC_WP_en_us.pdf)

## Plagiarism detection:

<http://ceur-ws.org/Vol-502/paper9.pdf>  
<http://ceur-ws.org/Vol-1178/CLEF2012wn-PAN-KoppersEt2012.pdf>

## DPoS:

<http://docs.bitshares.org/bitshares/dpos.html>  
<https://steemit.com/dpos/@dantheman/dpos-consensus-algorithm-this-missing-white-paper>

## Reputation system and spam detection: <https://nlp.stanford.edu/pubs/eigentrust.pdf>

<https://dl.acm.org/citation.cfm?id=1963240>  
<https://www.cs.uic.edu/~liub/publications/cikm-2010-final-spam.pdf>

## Advertising pricing model:

<http://www.benedelman.org/publications/gsp-060801.pdf>  
<https://www.cs.cmu.edu/~sandholm/cs15-892F11/gsp051003.pdf>

## RBAC:

<http://www.cs.unibo.it/~montreso/master/materiale/ac/rbac.pdf>

## Channel management systems:

<https://digitalscholarship.unlv.edu/cgi/viewcontent.cgi?httpsredir=1&article=3598&context=thesesdissertations>  
[https://www.webrezpro.com/whitepaper/2012\\_02\\_16-PMS.pdf](https://www.webrezpro.com/whitepaper/2012_02_16-PMS.pdf)



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