



A Peer-to-Peer Vehicle Parking System

INTRODUCTION

Of all the costs associated with owning a car, finding a parking space may be considered a minor one. The future of transportation systems will certainly involve autonomous electric vehicles, ride sharing, and efficient mass transportation, but those solutions will take a number of decades to be fully realized.

Meanwhile, the population in urban and suburban areas continues to increase, leading to more traffic congestion (e.g. commuters). The San Francisco Bay Area is an excellent example of this - NYC and Los Angeles are two other examples of how complex transportation networks can be. Even if an urban area has an excellent mass transportation system (London), the convenience and flexibility available with a car can outweigh other considerations depending on the individual's needs.

Drivers therefore will always be faced with the problem of where to park their car. The answer could be a difficult one - park in a commercial space which overcharges at outrageous prices or drive around for an unexpected and unwarranted amount of time trying to find a decent parking space on the street. Usually, that space is farther away from your destination than desired.

But "there is an app for that", of course. A number of companies currently exist that try to address this problem of finding available parking spaces. Corresponding with this growing market is the rise of the "sharing economy" and the idea of monetizing one's personal parking space when one owns the relevant parcel of land (e.g. your driveway). Of these companies, however, there is no market leader and the sharing of parking spaces has not become prevalent.

ParkCryption plans to become a significant player in this immature market. There are a number of opportunities and shortcomings which can be addressed in novel ways - the key one being the use of cryptocurrency and related technologies. By using the Binance Smart Chain Blockchain or Ethereum Blockchain along with Solidity Smart Contracts, ParkCryption will provide two payment methods with lower fees and be more secure than credit/debit card transactions while taking advantage of the growing trend towards a cashless economy.

To summarize, ParkCryption will reduce the hassle of parking your car - less time to find and book a parking space and for less money.

OUR VISION

There are quite a number of parking space finder and rental companies now, all with their own mobile application (or "app"). Surveying these companies reveal the same set of fundamental features - book a space, find a space on the fly, sign up to rent your own space... Merely duplicating the best versions of ideas and application features is certainly doable given an analytic comparison. The lessened need to develop new software technology from scratch is also a positive; journey planning software is no longer a bleeding edge tech, for example. A parking space focused business is also viable - the success of these existing prototypes can be evaluated and decisions made about what they are doing wrong.

But the use of cryptocurrencies and related technologies is notably missing; along with all the related benefits that a growing cashless economy will create.

By using the Binance Smart Chain and Ethereum blockchains along with software smart contracts to automatically manage the reservation booking and payment process, it is projected that ParkCryption will reduce the associated costs (transactions, etc.) up to 1780%.

BENEFITS OF PARKCRYPTION

Free to Use

ParkCryption is free to use and payment transaction fees average \$0.10 for parking anywhere in the world --unlike the competition who are associated with multiple fees: for using their parking software, fiat card transaction fees and cross-border fiat currency conversion fees when parking in a country where you do not have a credit or debit card.

Security and Privacy

ParkCryption will use Two Factor Authentication (2FA) to provide an extra layer of security beyond passwords and usernames. Using public-key encryption for payment processes and user registration, 2FA will greatly improve the customer experience.

Global Currency

Binance Coin, Ethereum and the ParkCryption PARK token have been developed using cryptocurrency and blockchain technology, allowing users to provide and use parking services anywhere in the world without the restrictions of cross-border bank fees and fiat currencies.

Smart Contracts

ParkCryption uses Blockchain Smart Contracts to make payment only when the customer's vehicle has been recorded through GPS as having been parked at a designated parking space for a reserved amount of time, which also protects consumers and parking providers from fraud.

Automated Payments

Automated blockchain payments eliminate unfair credit card or PayPal chargebacks. The detection of the vehicle allows the Smart Contract to automatically transfer payment tokens to the parking space provider once the parking space has been released.

Data Science Enhanced Functionality

With enough data crunching, features such as "AutoPark" will be possible - the ParkCryption system will recommend suitable parking spaces to customers as they drive into a town or city based on their customer preferences, previous parking choices, real time updates about parking availability and their chosen destination.

HIGH-LEVEL FUNCTIONALITY

The ParkCryption parking system will have two methods of helping a customer to find a suitable parking space.

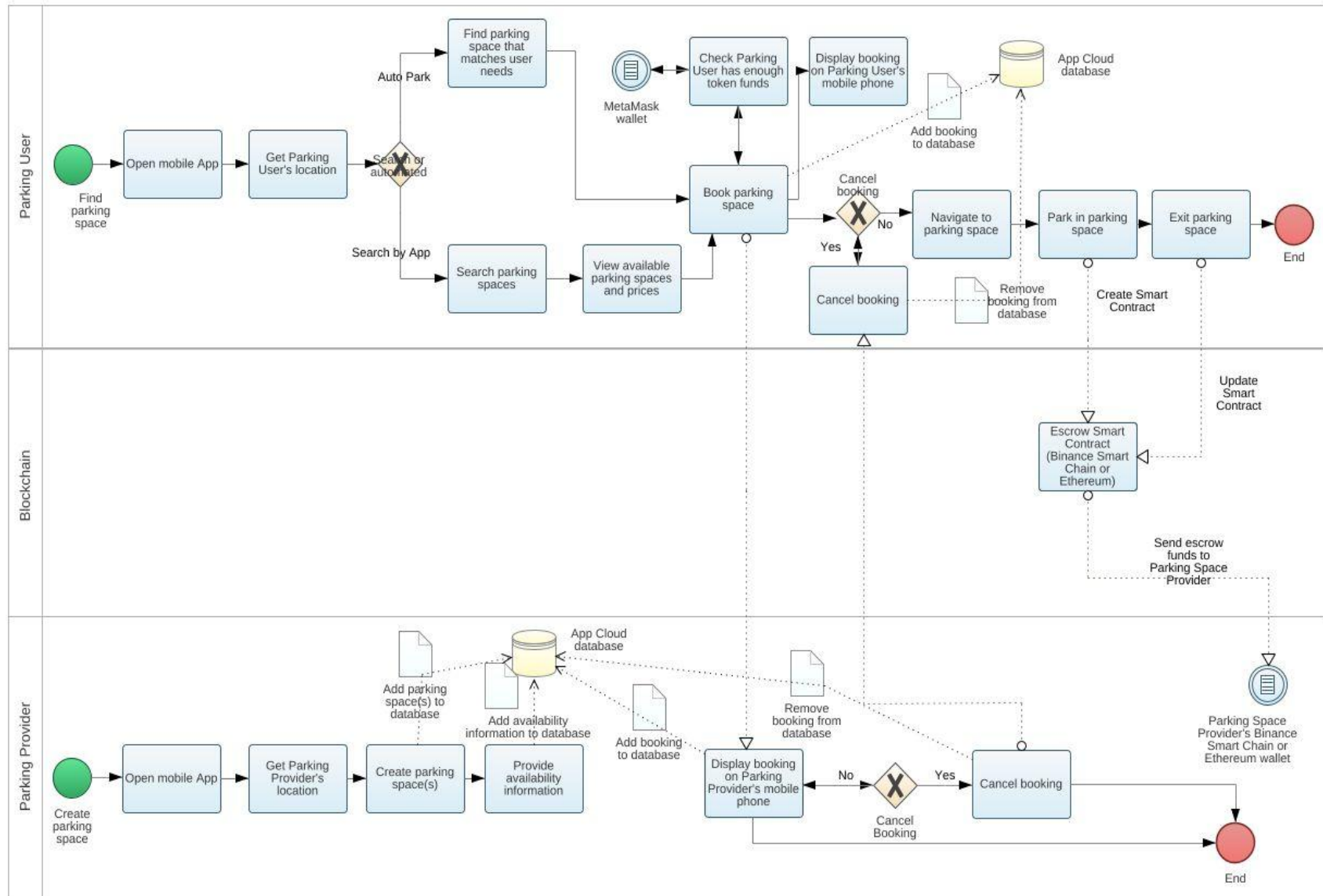
The first option, similar to existing apps, will be to let the customer search for a parking space by entering relevant information (when, where, how long, etc.) and then a list of possible parking spaces is presented. The user would then choose a suitable option and thus reserve that parking space.

The second option is the 'AutoPark' feature - not found in any other existing system. After asking the customer for destination related information (e.g. city, town, building, landmark, etc.), the ParkCryption parking system will find relevant parking spaces and then devise a journey to direct the customer to a parking space that matches their parking requirements.

ParkCryption will also differ from existing apps as it will use GPS coordinates associated with a parking space to enable the parking system to know when a customer parks in that parking spot for a booked period of time. This allows the blockchain smart contract to automatically transfer tokens to the parking space provider once the customer has used the parking space for the reserved amount of time.

An important point to make about the ParkCryption system is that no new technology needs to be invented from scratch - cryptocurrencies, blockchain smart contract development languages and journey planning systems already exist. Google Maps, for example, is the immediately obvious solution for journey planning. The development work then becomes more a matter of system integration of these components as needed, along with reusing open source solutions for data science related functionality (e.g. Netflix's Metaflow or MLflow) or the products offered by companies such as Databricks and Amazon AWS. Based on this, the development of the ParkCryption system and an app is anticipated to be fairly straightforward, given a small scale initial prototype to validate the business idea and work out issues before scaling up.

HIGH-LEVEL PROCESS DIAGRAM



POTENTIAL PARTNERSHIPS

Cryptocurrency Exchange

Once ParkCryption is at v1.0 and live, users will be able to acquire Binance Smart Chain (BEP20) and Ethereum (ERC20) PARK tokens directly through the app using MetaMask. The price paid per PARK token will be linked to prices listed on a partner cryptocurrency exchange. ParkCryption will not add any extra costs to these transactions.

Car-sharing Companies

As part of the sharing / peer-to-peer (P2P) economy, car-sharing companies such as zipcar.com, car2go.com, turo.com and hiyacar.co.uk provide vehicles to customers. There is an obvious synergy between what ParkCryption is bringing to the car parking market and that of car-sharing companies. We believe that the decentralization of finance is the next logical step forward for the P2P economy.

Rent-a-Car Companies

Rent-a-Car Companies are being forced to adapt to the pressures of the P2P economy eating into their revenue streams. They will need to adapt fast and begin offering services that appeal to younger generations of users that are familiar with cryptocurrencies and mobile applications.

Commercial Car Park Providers

Similar to rent-a-car companies, the revenue streams of commercial car park providers are being affected by the P2P economy. The traditional commercial car parking sector also will need to adapt fast and begin offering services that appeal to the younger generations of users.

POTENTIAL PROBLEMS AND SOLUTIONS

As with any service that relies upon third-party providers (e.g. parking space providers) ParkCryption will not be able to control every aspect of the customer's experience. However, some issues currently faced by existing parking app providers can be controlled by the use of blockchain smart contracts. Below is a list of common problems that may occur with the ParkCryption service that have been identified and an explanation of what steps that can be taken to mitigate these issues if they happen. This is not the exhaustive list, but just the most common possibilities.

Security of Users' Binance Coin, Ethereum and Park Tokens

Mobile application wallets can be classified as hot wallets - the user's mobile phone is generally always connected to a mobile phone provider's network or a local WIFI network. Also, with a mobile wallet, the mobile app stores the crypto wallet private keys. In order to address these possible vulnerabilities, the ParkCryption parking system will be using the MetaMask wallet app to allow users to send, receive, and store Binance Coin, Ethereum and PARK tokens. Users will also be required to use Two Factor Authentication to login to the ParkCryption app. Furthermore, the ParkCryption system does not store crypto-currency private keys and a 2FA app (e.g. Authy or Google Authenticator) will be used every time a parking booking is initiated by the user.

Customer Refunds

Refunds will not be needed because ParkCryption will use Blockchain Smart Contracts to make payment only when the customer's vehicle has been recorded as having been parked at a parking space for the reserved amount of time. GPS coordinates associated with a parking space allow the ParkCryption app to know when a customer parks in that parking space for a booked period of time. Thus, the Smart Contract can automatically transfer Binance Coin, Ethereum or PARK tokens to the parking space provider after the parking contract has completed.

Control of Parking Spaces

This is a problem for any parking space provider whether consumer or commercial. Booking terms and conditions (T&C's) will cover related issues.

Non-app User Using a Parking Space

This is a problem for any parking space provider whether consumer or commercial. Booking T&C's will cover this possibility.

Parking Overstayers

The ParkCryption parking system will remind customers, e.g. a pop-up message on the user's mobile phone, when the parking contract will soon expire (user-settable). It will also provide the option to increase the booking time period if the parking space will still be available. If chosen, the app can then reserve further Binance Coin, Ethereum or PARK tokens by updating the Blockchain Smart Contract, and notify the parking space provider via a text message and/or app push notification.

In the booking process, the T&C's popup message (that has to be agreed to before a booking can be created) includes the provision that overstayers will be charged for the time that they have overstayed, rounded up to the nearest unit (hour or half-hour). Overstayers could turn GPS off, but that possibility will also be covered in the booking T&C. Customers found to be disregarding the T&C's policies will have

their account immediately deactivated.

GPS Not Switched On

ParkCryption controls the process of finding and using a parking space because it will use a Google Maps API to show available parking spaces and then Google Maps' Drive functionality to guide the customer to the parking space. If they don't have GPS enabled, then none of this process will work and they won't be able to use ParkCryption.

Current Parking Space User's Car Will Not Start (or equivalent)

ParkCryption cannot control this scenario; therefore the management process will be included in the booking T&C. If this happens, the next customer for that parking space would be automatically directed by the ParkCryption app to an alternative parking space. To help to avoid these kinds of situations, the T&C will include the provision that parking space providers have to allow a certain amount of time between parking space bookings to account for tardiness or other such factors.

THE COMPETITION

The following table shows how ParkCryption compares to other parking service companies. Notable are the high costs - the charges (to the customer, provider, or both) range from 19% to 36%.

Parking App	Fees for Parking Space Providers and Customers
ParkCryption	Blockchain mining fee (average cost \$0.10 cents US).
yourparkingspace	Customers pay a 20% surcharge based on the cost of the space set by the provider.
justpark	Customers pay a 36% service charge. Providers are also charged a fee to cover the cost of processing payments, which is 3% of the rental fee set by the provider.

For example, if the provider wanted to receive £10 for a booking, there would be a £0.30 fee and they

would receive £9.70. For longer bookings (over two months) 20% is deducted from the first month's payment. Subsequently, the fee reverts to 3% / month.

bestparking	Not transparent about what charges they add to parking costs.
parkme	ParkMe pre-negotiates certain parking rates with garages to facilitate the booking of reservations on behalf of their customers. The parking rate charged by ParkMe is a combination of the pre-negotiated rate for parking spots and a facilitation fee retained by ParkMe as compensation. It may also, where applicable, include service fees and taxes.
curbflip	A PayPal business account is mandatory and the fees are 16% of the cost of the parking space and then an additional 3% of PayPal related fees.
parkeasier	The provider pays Parkeasier a commission (an unstated %) of the fee paid by the customer.
parqex	ParqEx charges the provider either a fixed monthly technology fee or a percentage of the fees charged to customers. Customers are also charged a fee by ParqEx which is either a fixed amount or a percentage of the parking fee charged by the provider.
parklet	Providers are charged based on the type of booking customers make: <u>Daily bookings (1 to 6 days, fixed term)</u> 30% (+ VAT) commission of the gross booking fee, with no admin fees. <u>Weekly bookings (1 to 12 weeks, fixed term)</u> 25% (+ VAT) commission of the gross booking fee, with no admin fees. <u>Monthly rolling contracts</u> 20% (+ VAT) commission of the gross monthly rental fee. The first month will also include an additional £25 (+ VAT) administrative fee.

A comparison of transaction costs (in \$US as the blockchain mining fee average cost is \$0.10 cents):

- Parking cost of \$5 and the equivalent in Binance Coin, Ethereum or PARK tokens for a typical daily parking charge.
- The ParkCryption commission is zero; customers have to pay the mining fee of around \$0.10 while the parking provider does not incur any costs at all.
- A 19% commission is \$0.95 which is a 930% increase over \$0.10.
- A 36% commission is \$1.80 which is a 1780% increase over \$0.10.

Clearly, the commission fees charged by the existing parking app providers are very high for what is a relatively simple service.

The following table is a synopsis of the features of existing parking apps and how ParkCryption aims to compete in this domain.

Parking App	Benefits for Parking Space Providers and Customers
ParkCryption	<ol style="list-style-type: none"> 1. Search, book and park 2. "AutoPark" app functionality 3. Automated payments 4. Payment using a global currency (no cross-border bank fees) 5. Enhanced payment and customer data security and privacy 6. Payment fees average \$0.10 for parking anywhere in the world
yourparkingspace	<ol style="list-style-type: none"> 1. Search, book and park 2. Commercial parking management (hotels, public sector, and private sector car parks)
justpark	<ol style="list-style-type: none"> 1. Search, book and park 2. Corporate accounts 3. Commercial parking management (hotels, public sector, and private sector car parks) 4. Digital pay-on-foot kiosks
bestparking	<ol style="list-style-type: none"> 1. Search, book and park 2. Corporate accounts
parkme	<ol style="list-style-type: none"> 1. Search, book and park

2. Commercial parking management (hotels, public sector, and private sector car parks)

curbflip

1. Search, book and park

parkeasier

1. Search, book and park

parqex

1. Search, book and park

2. Commercial parking management (hotels, public sector, and private sector car parks)
