K Keen

Keen: Autonomous Ride-Hailing Platform

White Paper v1.8 (20/03/2018)

team@keenplatform.com

Abstract

Urban public transportation will become increasingly crowded and unsustainable in the future that will result in an increased dependency on ride-hailing corporations like Uber and Lyft to handle transportation needs of the common people. As importance of ride-hailing services grow, concerns related to exploitation of drivers and riders will grow with it as these corporations keep taking cut off driver's fee, impose surcharges and boost their profits by violating privacy rights of its users. Not to mention the many locations where these corporations refuse to offer their services for some reason or other. Here comes the need of an autonomous ride-hailing service that nobody controls but the people who use it. A service that is available everywhere and at all times. And a service that is so easy and intuitive to use that everyone can use it.

Contents

1.   The Problem

1.1   Service availability

Ride-hailing services that are controlled by corporations require special permits to offer such services to the customers. If the operation is not permitted then these services mobilize public support backed by lobbyist to pressurize the regulators in order to change such regulations. [1] [2] This process is not sustainable and centralized ride-hailing services have greatly failed to expand as a result of their inability to penetrate into countries and cities that would otherwise have a great demand for the services. For locations where this has been achieved, often it includes reaching compromises with local municipalities on new regulations and company policies.

1.2   Safety concerns and user privacy

There have been known cases where concerns regarding safety standards of centralized ride-hailing services have been raised as despite of receiving multiple complaints related to their drivers, these services choose to keep the drivers without any restrictions or penalties to maintain their competitiveness against other ride-hailing services.

Ride-hailing services collect the details of each ride, including location traces, together with the rider's real identity. Executives and staff of ride-hailing corporations have access to all user data and the rides they are taking now or have taken in past. There have even been cases where these services have admitted that their employees access such data for questionable purposes. [3] Further, there have been a number of reported incidents where all this customer data had been stolen by attackers hacking into servers of ride-hailing corporations. [4]

1.3   Charges

Ride hailing corporations want to keep a significant commission from the trip fare for themselves. For instance, Uber keeps 25% whereas Lyft

keeps 20% from the ride fare that goes out of pocket of the rider [1]. This commission is taken from the normal fares and in case of surge fares the commission recovered is even higher. Ideally, surge fares should be applied in case of a higher demand for rides, but off-course the corporations do not provide any means to determine the authenticity of such surcharges. Further, there have been known cases where drivers team up to trick centralized ride-hailing apps into believing that there is a shortage of drivers and hence apply surcharges. Also, the surcharges often result in unexpected fare for the riders. [5]

2.   The Solution

2.1   A service available everywhere

A purely decentralized ride-hailing service that nobody controls can penetrate into markets that ride-hailing platforms under ownership of corporations cannot. Drivers and riders can interact directly through a purely peer-to-peer mechanism that has no centralized parties involved. Keen mobile app will interact with KeenNet [2]. Since there is no central authority involved, there is no single point of failure. Everything is processed through smart contracts and becomes a part of the blockchain. Keen will be a global platform available to everyone who wishes to use it irrespective of their geographical location.

2.2   Decentralized governance model

A service that can be self-governed through the community of riders and drivers where everyone that is part of community inherently runs the operations of the platform. Keen uses a decentralized governance mechanism that will not involve any centralized offices at any stage. The authenticity of the drivers, riders and their rides taken will be determined by the system based on behavioral aspects to detect any attempts to defraud the system through fake rides. For example, an

---

[1] Ride-hailing services also apply additional charges such as service fee, booking fee and others that results in an overall increased commission deducted from the ride fare.
[2] KeenNet is the blockchain component of the platform. For details please refer section 4 titled 'KeenNet'

attacker could attempt to defraud the system by using fake GPS on their mobile phones to boost their overall reputation score. This will involve creating accounts for drivers and riders and then accepting own ride requests to trick the application or otherwise send inaccurate ride details directly to the blockchain. However, at the same time the accounts being used will keep receiving ride requests from legitimate sources that have to be ignored and ride requests made through these accounts will be accepted by legitimate drivers that have to be cancelled as well. Ignoring or cancelling multiple ride requests alerts the system of unusual behavior and accordingly penalize all detected accounts by lowering their reputation scores and essentially disabling them on the platform. In addition to this, all new drivers that are added to the platform have to be vetted for authenticity by riders having high reputation scores [3] and hence chances of an illegitimate driver account on the platform decrease exponentially.

2.3   Own rates and no fees

No one will be taking any cut from the ride fare and the driver will get entire fare of the ride. Also, drivers will get to set their own rates and this will create a competitive landscape for everyone as drivers with the lowest rates and highest ratings will be given priority in getting rides. Drivers will be able to see rates being offered by other drivers in their geographical region so they can adjust their own rates. An attack vector will be to use multiple driver accounts within a given region and set the rates so low that it becomes impractical for other drivers within the region to adjust their rates accordingly. To address this, weightage given to rates set by drivers within a region will directly depend on their reputation score and rates that have a high variance from the network's average for a given region will be ignored by the platform. This will allow the rates set by drivers to be as reasonable and authentic as practically possible and will be inherently optimized for different locations.

---

[3] Refer section 3.2 titled 'Driver on-boarding' for details on registration process for new drivers

3.   How it operates

3.1   Ride Matchmaking

Location of riders and drivers will be anonymously broadcasted across the platform and ride requests will be matched for riders and drivers based on their current locations. Riders can choose to go with drivers that are nearest to their location and offering the lowest rates or they can set their preferred fare for their drop-off location and drivers within their vicinity can accept the ride at suggested rates of the riders. Drivers will be required to set rates based on both distance and time travelled.

3.2   Driver on-boarding

Unlike traditional ride-hailing services that are competing against each other to take on-board as many drivers as possible, Keen relies on its community of riders to decide which new drivers are worthy of being part of the network and which ones are not.

Every new driver will be taken on-board provisionally and will give 2 free rides to volunteers. The first volunteer who gets the ride will take a profile picture of the driver through the app at the start of the ride and then provide 1st confirmation at the end of the ride. A second volunteer will take the next ride and will be shown the profile picture of the driver before start of the ride and provide the 2nd confirmation at the end of ride to confirm as a permanent driver. In case any of the volunteers choose not to confirm a driver, the process will be repeated from the start. Volunteers will be chosen based on their stake in the platform verified through ownership of Keen Tokens and riders can easily opt-out from taking free on-boarding rides through app settings.

3.3   Build your fleet

If a rider had a great experience with any of the drivers that was found through Keen then the rider can save them as a favorite and choose to ride with them again any number of times. Keen will choose the driver who is nearest to a rider's location by default but riders can choose to ride with any of their previous drivers whom they find the most

dependable. Riders will be able to see their past drivers who are currently active on the platform.

3.4   Proof-of-Loyalty

Keen uses a Proof-of-Loyalty (PoL) algorithm to identify members who have committed the most for Keen's ecosystem based on number of rides given or received, amount and duration of Keen tokens held in their wallets, ratings received for rides taken, referred users and how long they have been a part of Keen's community as a driver or a rider. Members will be rewarded in form of fee waivers for token transaction fees, priority in ride selection and free rides.

3.5   Payments

To make the platform truly decentralized, there can't be any third-party payment service providers so all payments within the platform will be processed through cash or keen tokens. Drivers will be able to set their rates in both local currency and keen token. Ride fare will be auto calculated from start of the ride based on distance and time travelled. Riders will be able to select their preferred form of payment before starting a ride.

3.6   Referrals

Keen incentives riders and drivers to refer others to the platform. Users simply need to scan a public key or scan a QR code through the app to confirm a referral. Every driver or rider that is referred to the platform boosts the reputation score depending on how well they contribute to the platform in terms of rides taken / received and positive reputational score. [4]

---

[4] Refer section 3.4 titled 'Proof-of-Loyalty' for detail on incentives of having a higher reputation score on the platform

4.   KeenNet

Ethereum smart contracts are well suited to handle all activities for the platform and decentralize its operations on the blockchain. However, current scalability issues with the mainnet along with unstable network fees makes it unsuitable to be used for Keen platform.

KeenNet will be based on Ethereum that uses Proof-of-Stake (PoS) algorithm. Validators will be required to stake their keen tokens into a smart contract to validate blocks and earn block reward. Block reward will be 100 KNT initially that will be halved after every 250,000 blocks. To control economics related to total circulating supply of tokens and active validators, reward drops when there are too many validators in the system and in case there aren't enough validators then the reward increases to attract more validators into the system. Block rewards will initially be generated from a pool consisting of 33,600,000 keen tokens and afterwards through token transfer fees that will be applied to all transactions other than ride fares.

Proof-of-Stake (PoS) consensus system is the preferred option for KeenNet due to lesser electricity requirements bringing benefits to the environment and at the same time security of the network will be independent of overall hash power of the good nodes. An attacker would be required to first purchase 51% of the total number of keen tokens in supply and thus making it expensive to mount an attack on the network and in a hypothetical scenario if the attack is successful then the market will react by pushing the prices down and attacker would be the most in loss. Additionally, a significant number of tokens will be staked in the platform by users other than the validators that will make obtaining enough tokens to mount a 51% attack highly impractical.

5.   Keen App

Keen apps will be available for iOS and Android. This will be the interface for all riders and drivers using Keen platform and will be focused on usability and intuitiveness. Mobile apps will be developed to be compatible with maximum number of Android and iOS devices with

backward compatibility for all OS versions that have even just 1% or more usage share. This means that all versions starting from Android 4.1 (Jelly Bean) and iOS 9 will be supported by the app.

All versions of the app available can be decompiled by the users such that these could be audited by independent parties by downloading from both app store and play store. Also, the codes could be conveniently compared to the peer-reviewed open source codes available at the repository. Developers will be free to make their own versions of the app if required to interact with Keen platform.

6.   Keen Tokens

Keen Tokens (KNT) will be used for payments and tipping to drivers through the Keen platform. Also, the tokens will be transferable amongst users within the Keen platform through the built-in app wallet. Transfer fees will only be charged in case Keen Tokens are transferred through the app wallet or using any other third-party wallet to transfer the tokens i.e. in any case where the tokens are not being used to pay for the ride charges.

Keen Tokens will represent a value of 10^{18}. Following Système international d'unités, this will allow divisions of $1/10^0$ (keen token, KNT), $1/10^1$ (deci-keen, dKNT), $1/10^2$ (centi-keen, cKNT), $1/10^3$ (milli-keen, mKNT), $1/10^6$ (micro-keen, μKNT), $1/10^9$ (nano-keen, nKNT), $1/10^{12}$ (pico-keen, pKNT), $1/10^{15}$ (femto-keen, fKNT) and $1/10^{18}$ (atto-keen, aKNT).

Keen Future Tokens (KFT) are ERC-20 standard tokens that will be distributed to pre-sale participants. No restrictions will be imposed on movement of these tokens and KFT will be transferable over Ethereum's mainnet, however the purpose of these tokens would be to work as a proxy token for early investors till they are exchanged for KNT. KFT will be swapped with KNT at a 1:1 ratio when KeenNet (alpha) is online.

7.   Fund Spendings

All funds contributed as part of the pre-sale will be used for development, testing and release of Minimum Viable Product (MVP). Further, these funds will be used to support community building campaigns.

Funds contributed as part of ICO will be spent on rolling out the final version of the platform and its mainstream adoption. Areas on which ICO funds will be spent include product enhancements (including bug

bounties), 3rd party audits, testing, marketing and reserves for any possible contingencies. Break down of funds that will be spent on each area can be seen in the given chart.
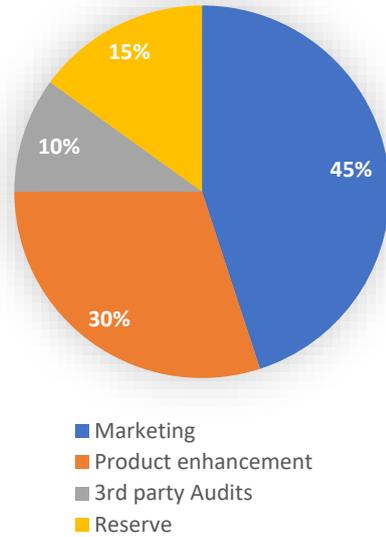
8.   Token Distribution & Release

Total of 70,000,000 Keen Tokens will ever be created out of which 52% tokens will be allocated for the team, advisers, bounty participants and investors (pre-sale + ICO). Remaining 48% tokens will be forgeable[5] and distributed as block reward to validators. Team and advisers will be on a 2 - year vesting schedule and will receive $1/4$ of their allocated tokens 6 months after ICO has been completed. Thereafter, they will receive $1/8$ of their allocated tokens every 3 months.

---
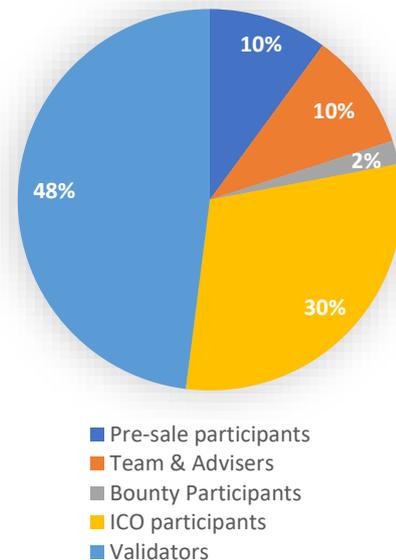
[5] Forging in Proof-of-Stake is equivalent to mining in Proof-of-Work consensus systems

A 1% transfer fee will apply to all token transfers other than the ride charges that will be locked in and begin to release for validators only when the initial 48% have been forged.

9.   Token Value

As the number of riders and drivers increases so will the transactions volume and this will increase the number of tokens staked in the platform. Accordingly, circulating supply of Keen tokens that are not staked in the platform goes down with user adoption as users will keep tokens in platform to pay for the rides, get rides faster / cheaper, get more weightage in terms of ratings and to get free on-boarding rides[6]. Also, validators will be required to stake their tokens in the platform as part of Proof-of-Stake (PoS) consensus system.

$$K(token) \propto (\sum N(users+validators))^2$$

Hence, price of each token will rise in value as number of users and validators on the platform keeps on increasing.

10.   Anticipated Timelines

Q1-Q2 2018

- Market analysis and R&D for software architecture
- Whitepaper release
- UI / UX design and front-end tests
- Keen Tokens pre-sale
- Distribution of Keen Future Tokens[7] to pre-sale contributors
- Community building campaigns

Q3 2018

- Launch of Android and iOS apps (alpha) with basic ride-hailing functionality over Ethereum's testnet
- Launch of KeenNet (alpha)

---

[6] Refer section 3.2 titled 'Drive on-boarding' for explanation of free on-boarding rides
[7] Keen Future Tokens are ERC-20 standard proxy tokens that will be issued to pre-sale participants and swapped with Keen Tokens at 1:1 ratio when mainnet goes online

- Independent third-party security audits
- Token swap of Keen Future Tokens with Keen Tokens
- Keen Tokens Crowdsale

Q4 2018

- Keen Tokens availability on exchanges
- Keen apps integration with KeenNet
- Beta launch of Keen Platform
- Extensive rides testing and bug bounty campaigns

2019+

- Rollout of a stable release
- Continuation of community building campaigns
- Ongoing support and maintenance of the platform

11.   User Acquisition Strategy

Keen's primary user demographics will be crypto communities who will kick start use of the platform in their respective regions. These demographics will be engaged through the use of social media platforms. A key demography within crypto communities will be regions that are not currently supported by other ride-hailing services.

Keen incentives its users to refer others to the platform in form of fee waivers for token transaction fees, priority in ride selection and free rides. Incentives received as part of the referral program will be directly dependent on how well the referred users have contributed to the platform in terms of numbers of rides taken / received and their reputation score.

Positive word-of-mouth is the most effective way to raise user awareness and Keen's design in terms of being a decentralized and autonomous platform along with incentives to refer other users anticipates an organic boost to its mainstream adoption. Influencer marketing will be used to spread the word within different regions and user communities.

12.   Conclusion

Ride-hailing is a growing sector that is expected to grow to $285 billion by 2030. [6] Ride-hailing services are being seen as a way to reduce reliance on automobile ownership and path to reduce traffic congestions and environment pollution. According to an independent survey conducted in 2017, following is the adoption rate of ride-hailing apps in various countries:
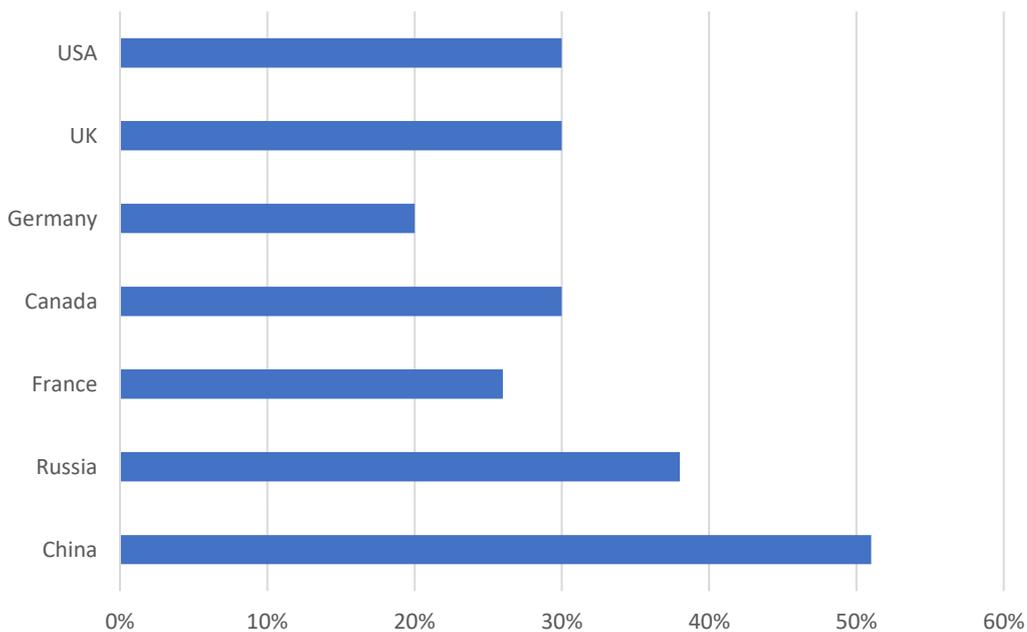
More people are starting to use ride-hailing services and there is a significant room for growth. However, major ride-hailing services have been unable to turn into profits due to their operational costs and their business model is considered as flawed making them unsustainable for the future [7] as either they'll be required to significantly increase their fares or experiment with other options such as self-driving cars to cut their operational loss severely impacting either the riders or the drivers.

Keen offers a solution to make the ride-hailing sector more sustainable for both riders and drivers by decentralizing it completely without dependence on any central authorities at any stage. Simplicity and user-friendliness of the platform will make its mainstream adoption easier and faster.

13.   References

[1] How Uber Took Over Portland (2015, June 25), Bloomberg Business. Retrieved from https://www.bloomberg.com/news/features/2015-06-23/this-is-how-uber-takes-over-a-city.

[2] The Uber-ization of Activism (2015, August 7), The New York Times, Retrieved from https://www.nytimes.com/2015/08/07/opinion/the-uber-ization-of-activism.html

[3] Senator Al Franken Asks Uber's CEO Tough Questions on User Privacy (2014, November 19), TechCrunch. Retrieved from https://techcrunch.com/2014/11/19/senator-al-franken-asks-ubers-ceo-tough-questions-on-user-privacy

[4] Uber Database Breach Exposed Information Of 50,000 Drivers, Company Confirms (2015, February 15), TechCrunch. Retrieved from https://techcrunch.com/2015/02/27/uber-database-breach-exposed-information-of-50000-drivers-company-confirms

[5] Uber drivers gang up to cause surge pricing, research says (2017, August 2), The Telegraph. Retrieved from http://www.telegraph.co.uk/technology/2017/08/02/uber-drivers-gang-cause-surge-pricing-research-says

[6] Ride-hailing industry expected to grow eightfold to $285 billion by 2030 (2017, May 27), Market Watch. Retrieved from https://www.marketwatch.com/story/ride-hailing-industry-expected-to-grow-eightfold-to-285-billion-by-2030-2017-05-24

[7] Uber would need to quadruple fares to become profitable, expert claims (2016, December 2), News.com.au. Retrieved from http://www.news.com.au/finance/business/travel/uber-would-need-to-quadruple-fares-to-become-profitable-expert-claims/news-story/df96001b40f6d9bf0412714e7362b64a