xChainge: a platform with a simple user interface for anonymous and decentralized exchange of assets

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Abstract

xChainge is an Ethereum blockchain based platform with a simple user interface for anonymous and decentralized exchange of assets. It allows to conduct simple P2P exchanges, create customizable smart contracts which help execute complex transactions and trade on custom xChainge marketplaces that ensure transaction speed comparable to that of centralized exchanges. All the functionality is available from a single application available on multiple platforms, designed with UI/UX of the best modern online banking applications in mind.

The platform is expected to be the flagship service and the trend-setter of the new era of decentralized exchanges. The XCH tokens are meant to be an economic incentive for users to support the network's transaction security mechanisms and thus grow in value as the number of clients rises.

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C O N T E N T S

1. Introduction

Decentralization is capable of revolutionizing the storage and exchange of assets. Decentralized markets have no national borders — they allow users from all over the world to freely interact with each other [1]. Decentralization improves robustness against random errors, as well as against attacks and collusion attempts by individual participants [2]. Removal of intermediary parties helps to significantly simplify and speed up interactions between users [3]. Decentralization also allows users to maintain full control over their own funds without the need to trust a third party. As a result, storage and exchange of assets becomes much more secure, straightforward, and effective.

However most contemporary solutions built around cryptoeconomy do not take advantage of the decentralized and anonymous nature of blockchain. For example most crypto-assets storage solutions provide access to a very small number of arbitrarily chosen cryptocurrencies and tokens and some even store private keys of their clients which gives them *carte blanche* to stored assets. But the exchange of assets is even more problematic as it's dominated by centralized exchanges, which possess control over all stored assets. Not only it's stands against the blockchain cornerstone ideas; having a single responsible entity means it can block accounts or transactions at will, which is inherently insecure. Most exchanges have KYC rules, which force users to trust not only the assets but sensitive, personal data as well. As a result, in its current state, the cryptoeconomy not only has the disadvantages of traditional, centralized financial system, but is actually inferior to it in terms of security standards and customer service, which greatly hinders its development.

The existing partially decentralized solutions for asset exchange do not solve the problems described above. Even though they do not control their users' assets, they still have dedicated servers that are responsible for transaction clearing, which naturally becomes the single "point of failure" of the whole system. In addition, such solutions are quite complex and demand significant technical knowledge of its users which makes them inaccessible to most people. This, in turn, prevents them from building a significant user base and creating sufficient liquidity in order to become an efficient exchange service. In contrast, xChainge offers a completely decentralized infrastructure, ridden of unnecessary security risks and a modern sleek interface aimed at a regular, non tech-savvy user. Refer to section 6.1 for a feature comparison table.

The mission of the xChainge team is to bring the traditional financial world and the cryptoeconomy together through its technology. The solution developed by the xChainge team will allow users to trade their assets in a secure decentralized manner where the only entity in control of the assets is their owner. The other big feature of the solution is the user interface which will be up to par with modern mobile banking applications and financial services. We believe that the xChainge platform will convince a lot of people to start using cryptoassets in their everyday life and participate in trading.

2. Market analysis

2.1. Current problems

2.1.1. Cryptoasset storage

The number of cryptoasset holders is rapidly growing. According to the study of University of Cambridge in Q1 2017 there were between 5.8 and 11.5 million active wallets and between 2.9 and 5.8 million active users. The total number of Ethereum addresses increased four times between 2013 and 2016 [4]. In 2017, the growth rate has accelerated even further — since the beginning of the year the number of unique addresses has increased tenfold, reaching nearly 10 million.

At the same time, there is still a huge potential for further growth. There are more than 3.5 billion internet users in the world [6] and more than 1.2 billion users of mobile banking services. This number may grow to 2 billion by as early as 2020 [7]. However, the cryptoeconomy needs more solutions aimed at the mass market in order to become more popular.

Currently, there are several ways to store cryptoassets, however, these were designed primarily for early adopters, and they do not answer the needs of ordinary users of financial services, who need a simple and a secure solution that doesn't require a complicated setup process or any technical knowledge whatsoever.

1) **Thick clients (e.g. Geth for ERC-20 tokens)**
   Secure, reliable, but inconvenient and too complicated for an average person. It can only be installed on a computer and it requires lots of disk space: when fully synchronized, Geth takes up more than 300GB [8].Even when the "fast sync" mode is enabled, memory requirements go up to almost 25GB [9]. Other downsides include a complicated interface and the lack of built-in functionality to transfer other types of assets.

2) **Thin clients**
   There is a wide variety of wallets that allow one to store cryptoassets and manage them using a desktop application, a web app, or a mobile app. Despite the fact that these are developed for the mass market, they are nonetheless significantly inferior from a usability and functionality standpoint to mobile banking apps. Almost all of these wallets allow users to store only a limited number of popular cryptocurrencies and tokens [10]. Additionally, the majority of these wallets don't allow users to exchange currencies across different platforms. A small number of solutions, e.g. ShapeShift, do offer this functionality, but they implement it through centralized services.

3) **Centralized exchanges**
   Many users store their cryptoassets on large, centralized exchanges. The main advantage of these exchanges is the ability to quickly exchange various cryptoassets for reasonable fees. However, the security of users' assets is inherently compromised, as all of these exchanges store their clients' private keys which means they have full control over all stored assets. This is prone to

accidents and the history knows a few, namely the cases of MtGox [11], Bitfinex [12], and BTC-e [13]. The downsides don't end here - such exchanges may also take a long time to verify clients, delay fund withdrawal [14], block accounts without warning [15] and share user data with third parties[16].

Despite the risks of asset loss and other disadvantages, many users continue to store their cryptoassets on centralized exchanges, since there is no single user-friendly decentralized alternative to date.

2.1.2 Exchange of cryptoassets

The number of cryptoasset exchange transactions is growing even more quickly than the number of cryptocurrency users. Globally, it has been observed that the number of purchases of cryptoassets with fiat currency has increased several times [17], while the volume of trades on cryptocurrency exchanges has increased from $100–200 million per day at the start of 2017 to $4–7 billion per day in October according to coinmarketcap.com. The capitalization of cryptoassets has grown since the start of the year by nearly 10 times, exceeding $150 billion [18].

On the other hand, the cryptoasset market occupies only a small share of the global financial system and is almost unnoticeable in contrast to the stock market, whose total capitalization exceeds $60 trillion [19], or the forex market, whose daily trading volume exceeds $5 trillion [20]. This is due in part to the fact that current cryptoasset exchange methods have significant shortcomings and until solutions for these are found, further growth will be limited.

1) **Wallets with built-in exchange functionality**
   Only a few existing solutions, e.g. Jaxx and Exodus, have an opportunity of built-in asset exchange; however, this functionality is provided through a third-party centralized service. Currently, there are no solutions that allow to store and exchange assets within a single application without requiring users to trust their assets to a third party.

2) **Centralized exchanges**
   Centralized exchanges allow for quick and convenient exchange of cryptoassets; however, users must trust the exchange with their assets, which leads to potential risks. In addition to this, large exchanges typically offer a very limited list of cryptocurrencies and tokens for exchange. These are selected arbitrarily and exchanges may delist them at any time, either on their own initiative or under pressure from regulatory agencies. Exchange servers are also often subject to DDoS attacks, which leads to lengthy downtime. This prevents clients from managing their active transactions which may lead to losses in case the stock goes down or in fact due to a large number of other issues.

3) **Partially decentralized exchanges**
   Partially decentralized exchanges like EtherDelta and Oasis DEX allow one to exchange a vast variety of ERC-20 tokens without verification or involvement of a third party. However, users of these exchanges are still not protected against loss of funds [21]. The transaction clearing is handled in a centralized

manner, creating risks for the sustainable operation of these exchanges. In addition, usage of these exchanges requires technical knowledge [22], which is unacceptable for most people. This leads to low liquidity and renders the exchange service ineffective.

2.2. The xChainge platform

xChainge is the first entirely decentralized solution for secure and anonymous token storage and exchange that utilizes the best UX/UI practices of modern online banking applications. A key focus of the xChainge team is the creation of a secure, yet simple and convenient cryptoasset management platform with an intuitive interface available on all modern platforms (Windows, OS X, iOS and Android) and free of charge for its users. xChainge runs on top of a custom decentralized transaction matching network, designed specifically for anonymous and fast asset exchange that is ridden of the downsides of both modern centralized and decentralized exchanges.
With time, the xChainge platform will include the following features:

- A Smart Contract builder to allow users to execute complex transactions with a variety of additional conditions and custom execution scenarios.
- Custom P2P marketplaces to trade real-world goods and services for cryptocurrencies with the help of the mediator mechanism.
- Marketplaces to quickly exchange tokens at speed comparable to that of centralized exchanges maintaining full control of assets at any step of transaction.
- A unified decentralized trading system to exchange cryptoassets without trusting your private data and assets to any third party.

All these features together will make up a full-blown platform of cryptoasset management services available from a single application screen.

3. The xChainge Wallet

The xChainge Wallet is a core component of the xChainge platform which stores digital assets of users. Our goal is to make the xChainge Wallet a payment center that people will use to make daily transactions with XCH tokens or any cryptoassets supported in the future.

Key features of the xChainge Wallet:

1) **Security**
   The private keys of the xChainge Wallet users are created and stored on a local device and are never transferred to any external server. Users maintain complete control over their assets.

2) **Anonymity**
   The xChainge Wallet doesn't require users to identify themselves or verify any information. This eliminates the discrimination of users and the risk of their personal data being leaked.

3) **Convenience**
   The xChainge Wallet will be available on all major platforms (iOS, Android,

Windows, and OS X) and will be translated to the most popular languages (see the "Roadmap" section). The xChainge Wallet team heavily focuses on providing the best UX possible and strives to create a product that is intuitive and straightforward for everyone. The team's accomplishments and relevant skills are listed in the "User experience" section.

4) Availability

The xChainge Wallet will not charge users for any transfers neither involving ETH, nor any of the ERC-20 tokens. The only expenses the user will face will be Ethereum network transaction fees. Installing the wallet to store cryptoassets is, naturally, free of charge.

4. P2P exchange platforms

4.1.   xChainge on-chain P2P platform

The xChainge on-chain P2P platform will allow users of the xChainge Wallet to conduct on-chain exchanges of any ERC-20 tokens directly from the wallet. This P2P exchange approach is the most relevant for one-time transactions which involve low-liquidity tokens that aren't available on popular exchanges whose prices are not subject to drastic fluctuations. It can also be used for large one-time exchange transactions involving ETH or other popular tokens. xChainge does not charge for P2P exchanges, but users incur a small Ethereum network transaction processing fee.

To perform an exchange, a user can either submit the exchange offer to the platform and wait for it to be picked by another user, or choose an existing offer to conduct the transaction immediately. To publish an offer a user should go to the "P2P Exchange" section of the xChainge Wallet, select the option to create an offer, pick the type of assets to be exchanged, enter a desired , enter the expiration date of the offer and confirm the offer. After this, the offer is published to the Ethereum blockchain, making it available for other participants to see. To help set the best for the offer, real-time quotations from most major exchanges and stock aggregators will be provided on the same page. xChainge does not have agreements with any such services, the charts will be extracted from public sources. A user may as well ignore the suggested s and set the desired himself. Publishing an offer, changing its parameters or removing it from the platform entails a small Ethereum network fee.
A user may wish to select an existing offer from the list of active offers. xChainge Wallet allows a user to filter that list by token type, and transaction volume. Should a user select an offer, it is confirmed and the result of the transaction is published to the Ethereum blockchain. Confirmation of the offer also entails a small Ethereum network fee.

4.2.   Smart contract builder

The smart contract builder significantly expands the functionality of P2P exchanges within the xChainge platform by providing an opportunity to create custom transactions backed by smart contracts that would support most of the real-world financial operations. The builder allows to set the maximum transaction execution time and a variety of parameters special to the transaction. UI-wise it comes in the form of standard templates - users will only need to fill in the required fields and confirm the transaction, which doesn't require any technical knowledge.

4.3.   xChainge cross-chain P2P platform

Using the xChainge cross-chain P2P platform, xChainge Wallet users will be able to exchange ETH and ERC-20 tokens for any other cryptocurrency. Currently, there are no technical solutions that allow such exchanges without having to trust the other party. To resolve possible disputes that can arise during the exchange procedure, the mechanism of arbiters is introduced. Arbiters are special xChainge users who receive compensation in the form of xChainge tokens (XCT) for resolving conflicts that may arise between the parties of a transaction. To conduct transactions using the xChainge cross-chain P2P

platform, users must have sufficient XCH tokens that would be used to pay the arbiter for his services. Arbiters must also possess a certain number of XCH tokens in their wallets that serve as an insurance to prevent abuse on their part. These insurance tokens should be deposited to the smart contract before the start of the transaction.

If a user wants to conduct a cross-chain exchange, i.e. sell ETH from his xChainge Wallet to buy BTC, he must first navigate to the appropriate section of the wallet, choose currencies to be exchanged, set the desired and transaction volume filters. This will give him a list of offers from other participants.

If none of the listed offers are appropriate for the user, he can create an offer himself. In order to do this, a user should fill out a simple form in the xChainge Wallet interface, which asks for all the required exchange parameters and the offer expiration time. Filling out and confirming this form creates an offer on the Ethereum blockchain which instantly becomes available for other users to see. The offer remains active until expired or accepted by another user. An order can also be cancelled at any time before expiration.

An arbiter for a transaction can be assigned at random, or it could be proposed by either party. If the other party accepts the proposed arbiter, he becomes attached to the transaction, otherwise an arbiter is also selected at random. After an arbiter is selected, a number of XCH tokens equivalent to the arbiter's fee is frozen on both parties' wallets. Arbiters are rewarded either with a fixed number of XCH tokens or a fraction of the transaction volume, yet this number must not be smaller than a certain minimum.

After an arbiter is assigned to an ETH-BTC transaction, a required amount of ETH is deducted from the seller's account (A) and transferred to a temporary "2-of-3 multisignature" wallet. In order to transfer that ETH to the buyer's account (B), either both parties have to provide their signatures, or one party and the arbiter. After the ETH is locked in the intermediate wallet, the transaction participants have to agree on a transaction involving the other cryptocurrency, which is BTC in this case. The participants may use any means of communication. After receiving the required amount of BTC in accordance with negotiated terms, client A confirms the transfer of ETH from the intermediate wallet to client B and after client B receives the tokens the transaction is considered complete. In this case, the arbiter is not involved in the transaction and receives no compensation. The XCH tokens that were locked in both parties' wallets are unlocked. Users pay only the necessary Ethereum network fee and the Bitcoin transaction fee.

If during the process of a transaction a dispute arises between clients that they cannot resolve themselves, either client may call for an arbiter. The arbiter requests information from both parties and decides whether to return the ETH from the intermediate wallet to client A, or transfer it to client B. Communication with the arbiter may take place in any manner convenient to the transaction parties and the arbiter. When the arbiter intervenes in the process of an exchange, he receives compensation for his services. The arbiter's fee will be taken from the party who violated the terms of the transaction.

In case an arbiter abuses their position and colludes with one of the parties or is insufficiently qualified and makes a poor decision, a second-level arbitration mechanism

takes place. Either party of the transaction may appeal the first-level arbiter's decision within 24 hours after the transaction is completed. To do so, they must first allocate a fixed number of XCH sufficient to pay for the services of three random arbiters. These second-level arbiters will consider the arguments submitted by the protester and, if necessary, the decisions made by the arbiter and the other client. The decision of second-level arbiters is made via voting and is final, meaning it may not be appealed. If second-level arbiters support the first-level arbiter's decision, the user who filed the protest bears the cost of the arbiters' services. If second-level arbitration supports the user's protest, the first-level arbiter pays for all the expenses of the client and covers the cost of second-level arbiters' services. He will also be banned from being an arbiter in the future.

As the cross-chain exchange technology improves, we expect that direct P2P exchanges between participants will be possible without the participation of arbiters. Raiden Network and Token Swap are working on solutions that can be used in the future to create an end-user service. As soon as necessary technology appears, we will integrate it to the xChainge Wallet to allow direct cross-chain exchanges between users without involvement of the third party.

4.4. The xChainge P2P Marketplace

The xChainge P2P marketplace will give the xChainge Wallet users an opportunity to trade physical goods and offline services in exchange for ETH or any ERC-20 token. Online shops can create an xChainge Wallet and install a website extension to allow customers to choose xChainge as a payment method.

To resolve possible disputes during the exchange process, xChainge will introduce a decentralized arbitration mechanism similar to that described above for cross-chain exchanges. However, unlike with cross-chain transactions, where all pieces of relevant information are inherently public, resolving disputes during marketplace transactions is significantly more complicated because it is based on human input. For example after the goods are delivered the recipient may claim that they are fake or broken or don't match the description, while the merchant may deny these claims.

For such situations, the xChainge P2P marketplace includes an additional type of mediator: a notary. By mutual consent of the parties a notary may be called in after the necessary amount of XCH is frozen on both parties' accounts. As in the case of an arbiter, the parties may choose a particular notary or one may be selected at random. The notary offers a broad range of services, such as confirmation of the existence of a product, its authenticity, confirmation of a particular operation, and so on. A notary is responsible for setting his own for his services, as such services can not be standardized. The notary fees can be split between clients in any way agreed upon in advance. In addition, the selected notary must explicitly confirm his participation in the transaction. The notary must also create a deposit with a sufficient number of XCH tokens to cover arbitration fees, should this be necessary. Upon confirmation of the notary's involvement in a transaction, a record is created in the Ethereum blockchain with a description of all relevant agreements. If confirmation is required by both parties of the transaction an intermediate "2 of 4" or "3 of 5" multisignature wallet is created.

The signature privileges of the wallet belong to the parties of the transaction, the notary, and the arbiter (two signatures, in case of "3-of-5" wallet).

Actions of a particular notary should be negotiated and accepted by all parties prior to his work. After the notary's job is done, he sends a payment request. The request may be accepted by one or both parties of the transaction, depending on the initial agreements. If a dispute arises between the parties of the transaction and the notary, a final decision will be carried out by an arbiter. The arbiter's decision is final and is not subject to appeal. The cost of the arbiter's services is covered by the party which claimed his services. If the clients are not satisfied with the notary's services, they may call for a new one by mutual consent, having to go through the procedure from the start.

Another important characteristic of marketplace transactions is the amount of data it carries — both textual, e.g description of goods and audiovisual, e.g images or video material. Recording all this data to the the Ethereum blockchain may be impractical or even impossible. Instead, solutions similar to IPFS may be used, which are designed to store large amounts of data in a decentralized manner. The blockchain transaction will store just the hash signature of the stored data.

5. Marketplaces for rapid token exchange

P2P-based token exchange, as described in the item 4.1, has natural limitations that belong to any kind of on-chain operations. These are primarily expressed in the form of restricted transaction speeds and low liquidity. In order to provide users with the ability to rapidly exchange any ERC-20 tokens, the xChainge platform will introduce decentralized clearing nodes (so called Matcher nodes). Our prototype will be based on existing solutions, the "0x procotol" in particular.

Matcher nodes are essentially trading platforms that can conduct rapid off-chain exchanges of all ERC-20 tokens using the "state channel" technology. A Matcher node maintains a channel to each connected user, allowing users who share the same node to trade tokens with each other. At the same time, a Matcher node does not have access to the connected users' assets. Before opening a channel to a Matcher node, the user must reserve a certain amount of tokens that he wishes to use in a future transaction. Opening a channel costs a small amount of ETH. After the channel is created, the user can send trade requests to the node or accept requests maintained by the node. For every processed transaction, a Matcher node charges the issuer a certain fee in XCH tokens. The exact value is up to each node. We expect that fair competition between Matcher nodes will establish an average fee to be no greater than the average fee charged by existing centralized exchanges. We also plan to implement an xChainge API that would create opportunities for arbitration across various platforms. This, in turn, should increase the liquidity of the platform and attract users of centralized exchanges because our system would provide similar services without requiring direct access to the users' assets.

A user may disconnect from the Matcher node at any time. The reserved tokens that remain after completing all transactions and paying the node's fee are unblocked and returned to the user. Closing the channel, just as opening it, entails a small Ethereum network fee. A user can be simultaneously connected to any number of Matcher nodes as long as he possesses enough tokens to reserve for each connection.

Connecting and interacting with Matcher nodes will be available through the xChainge Wallet's interface. A user can choose a pair of cryptocurrencies to be exchanged, select one of the available nodes according to their fees, liquidity and availability, and the size of the XCH deposit. The interface and trading functionality will be developed by xChainge, and will be the same for all marketplaces. The marketplace interface will include familiar charts and other interface elements and in general will be similar to traditional, centralized exchanges.

6. Custom token exchange protocol

Important Note:

The following section provides a high-level description of a proposed solution to the problem of fast and secure decentralized clearing of transactions with digital assets. The proposal is in no way complete and requires major R&D work in order to be used as a basis for implementation.

6.1. Prerequisites to developing a new protocol

The xChainge team's primary goal is to create a protocol that will allow to make fast, affordable transactions without needing to trust a third party at any stage of a transaction. For this, all of the following conditions must be satisfied:

1) Users must maintain control over their assets at any time
2) The exchange of assets must take place without involvement of intermediaries
3) Transaction processing must be distributed and have no single point of failure
4) Transaction processing must be resistant to collusion and fraud of processing nodes
5) The system must ensure transaction processing speed up to par with existing centralized solutions
6) Transaction processing overhead should be negligible regardless of the lot size

At the time of writing, there are no solutions that meet all of the following criteria. Below is a comparison table of major competitors.

#	Criteria	Centralized exchanges (e.g. Poloniex)	Current DEX (e.g. EtherDelta)	On-chain exchange (e.g. Ethereum)	Off-chain protocols (e.g. 0x)	Simple peer-to-peer network
1	Security of funds	No	Yes	Yes	Yes	Yes
2	Exchange without intermediaries	No	Yes	Yes	Yes	Yes
3	Distributed clearing	No	No	Yes	No	Yes
4	Resistance against node collusion and fraud	No	No	Yes	No	No
5	Rapid transactions	Yes	No	No	No	Yes
6	Affordable transactions	Yes	No	No	No	Yes

6.2. The Ariadna Network

The xChainge team set out to develop a technology called "Ariadna Network". It is a hybrid distributed network of simple computational nodes of different roles built on top of a proprietary blockchain. The responsibilities of each individual node at any given time depend on a set of measurable parameters. Nodes of a network receive rewards in the form of transaction fees paid by users.

All network nodes are interchangeable and can be created and set up by anyone on any personal computer.

A set of exact responsibilities of a node can be transferred between nodes based on one or more of the following parameters:

- Time
- Availability
- Historical availability
- Capacity (computational speed)

Role distribution is determined by a pseudorandom cryptographic method, which eliminates the possibility of predicting the outcome of the process regardless of what actions the nodes themselves do or do not take. This approach also makes it impossible for nodes to influence the operation of a network through collusion as long as no more than 50% of the network's processing power is involved.

#	Role	Task	Number of nodes at a given time	Selection criteria
1	Master node (Input/Output channel)	Accepting incoming requests, assigning computations to computing nodes, computation, transmission of results to request senders, result comparison	= 1	- Time - Availability - Historical availability - Capacity (computational speed)
2	Computing node	Accepting requests from the master node, calculation and comparison of results	≥ 2	- Time - Availability - Historical availability - Capacity (computational speed)
3	Role manager	Assigning node roles	≥ 3	- Availability - Historical availability
4	Index Holder	Storing network operation history	∞	All free nodes

6.3. Proof-of-snitch computation evaluation method

General algorithm

Node #1 is the master node which receives data from users of the network - nodes U_1 to U_n

1. #1 receives a request and passes it on to subordinate nodes
2. Calculation is started on all involved nodes
3. Calculation results are compared between each and every node
4. If all nodes produced the same result, it is transmitted further to the network
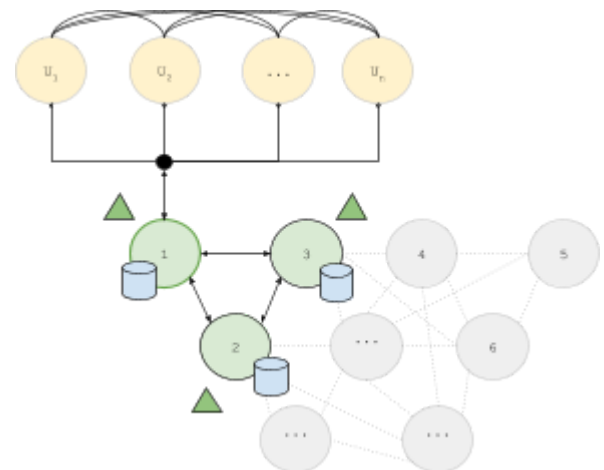
If one of the nodes produces an incorrect result

Assume node #2 is the 'faulty' node.

#Output of Node #2 is ignored and output of Nodes #1 and #3 is transmitted to the network. We call this process "snitching" on Node #2. After the faulty node is excluded, node #5 joins the group and receives the calculation history of nodes #1, #3, and #2. To avoid infinite "snitching" loop the "majority check" algorithm is used
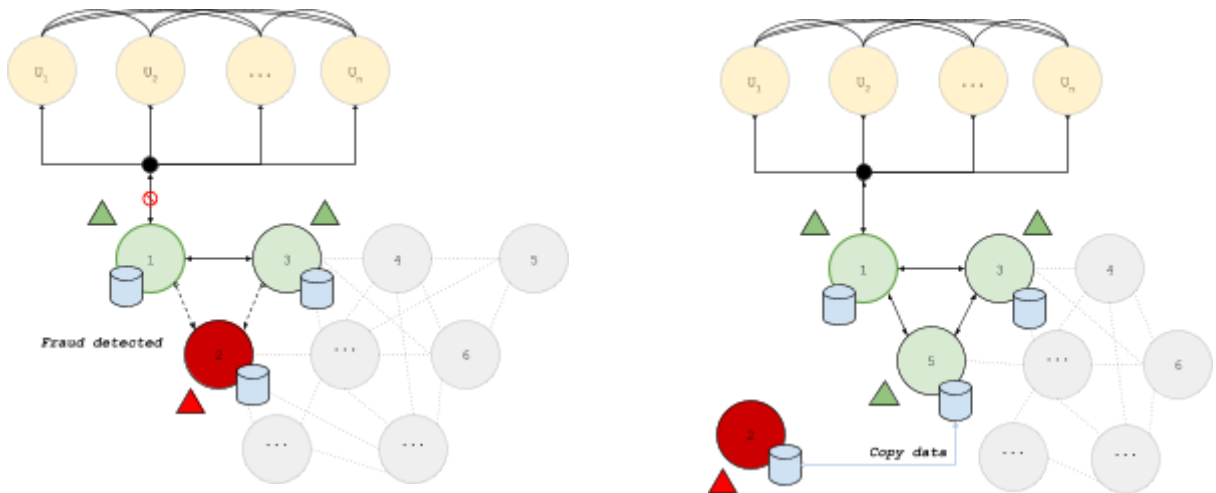
Majority check

If nodes #1 and #3 "snitch" on more than three victim nodes (here #2, #4, #5) and the output of victim nodes is equal, nodes #1 and #3 are excluded from the network and replaced with victim nodes, otherwise, if the output of victim nodes is different, snitch nodes are kept and victim nodes are excluded instead.
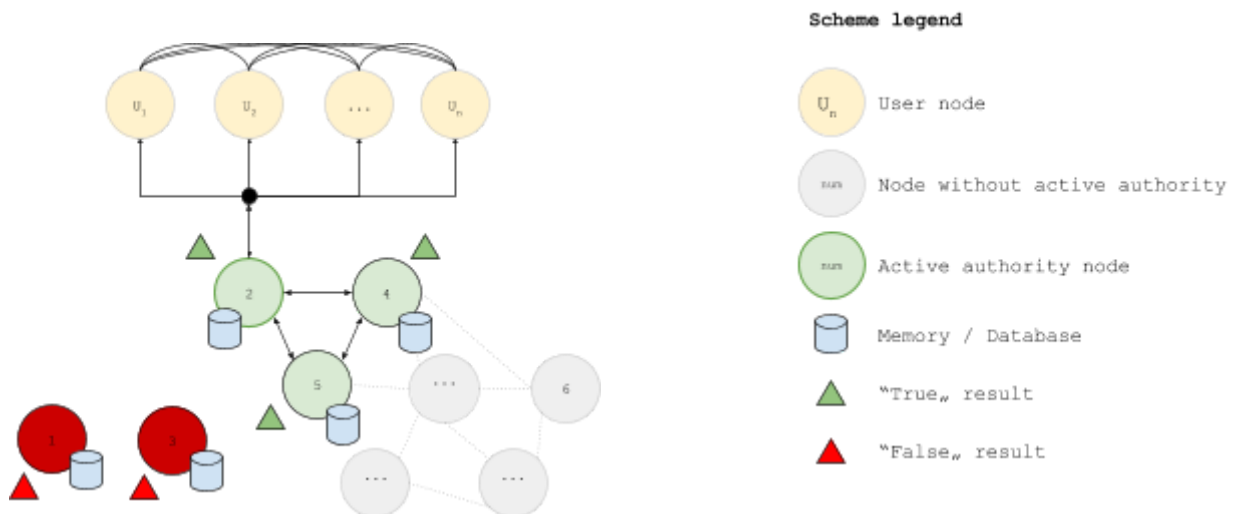
7. Target audience and use cases

7.1. Mass market consumers: storage, payments, and transfers

The target audience of the xChainge platform are people without significant technical skills who are looking for a simple, convenient, and secure solution to store tokens, use them for payments and transfer them to other users. Such people are expected to use only a small subset of the most popular tokens, e.g. ETH and use them infrequently

7.2. Owners of illiquid tokens: storage and exchange within the system

A large subset of existing tokens is not listed on major exchanges, so the liquidity of such tokens is very limited. These include recently created tokens that have yet to negotiate their inclusion to exchange lists or in fact any tokens that are not yet on the list. xChainge gives owners of such tokens an opportunity to securely store and exchange them to other assets.

7.3. Mediator transactions: arbiters and notaries

The mediator mechanism used for cross-chain and offline exchanges will attract more users to the platform and encourage greater involvement from existing users, since it will provide an opportunity to earn additional income in exchange for services that maintain the platform's operation.

7.4. Marketplace creators: access to a large user base to receive commission-based income

xChainge platform provides a convenient tool to create custom marketplaces and a large user base who wish to exchange their tokens and possibly use custom marketplaces.

7.5. Traders: using the platform for trading

The "Matcher Nodes" feature opens up big opportunities for traders to make deals both quickly and frequently in exchange for reasonable fees. Traders can also use the xChainge API to conduct arbitrage operations while maintaining full control over their own assets. We expect these opportunities to attract a large number of traders from centralized exchanges to our platform.

8. User experience

One of the key priorities of xChainge is creation of a straightforward user-friendly interface to make the process of storing and conducting transactions accessible to any user. The following section describes our accomplishments in creating that interface.

Below is a **prototype** of the interface, which reflects our vision in terms of functionality and provides a general impression of the upcoming product. The **prototype presented here is in no way a standalone design project**; rather, it serves as a fundamental basis for creating a final design in the near future.

8.1. The xChainge Wallet interface

Upon entering the application, the user is presented with the Dashboard, which is composed of basic information about the user's wallets, account balance change chart, recent transactions and exchange rates of major cryptoassets. The menu on top of the screen allows the user to quickly navigate between the sections of the wallet.
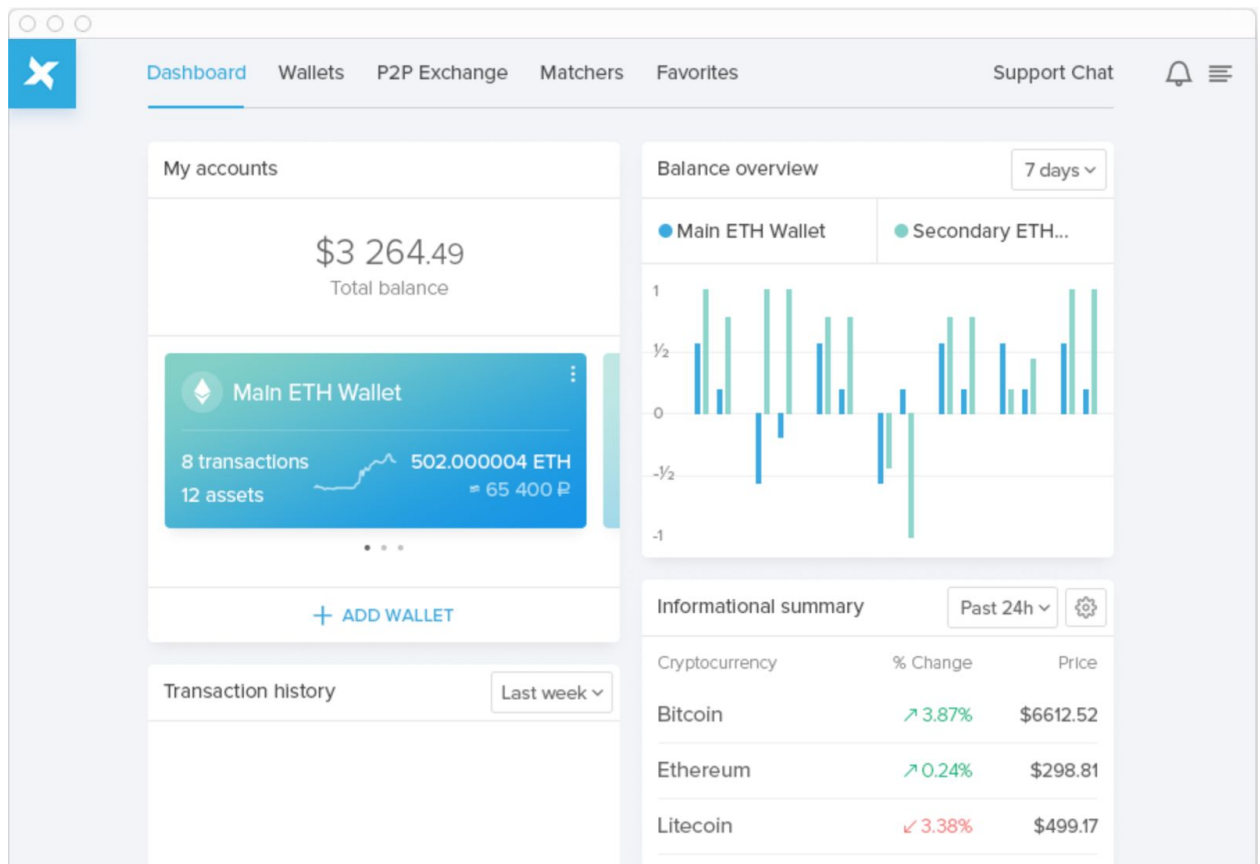
The "Wallets" tab provides the user with more detailed information about their wallets and lets the user to perform various actions. xChainge doesn't impose restrictions on the number of wallets a user can have. The creation of a new wallet occurs instantly upon selecting the corresponding option. Users can assign names to their wallets in order to make navigating between them easier.
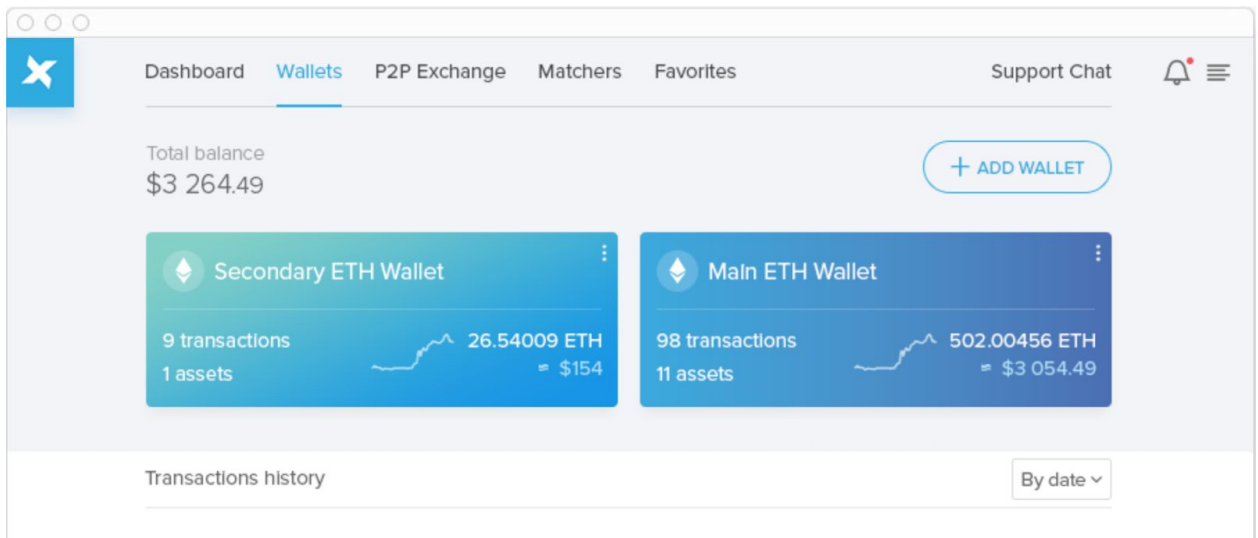
A more detailed analytics is available on a dedicated wallet page which includes a complete list of conducted transactions, currently held assets and other information. On this page wallets can be recharged or used for payments and transfers.
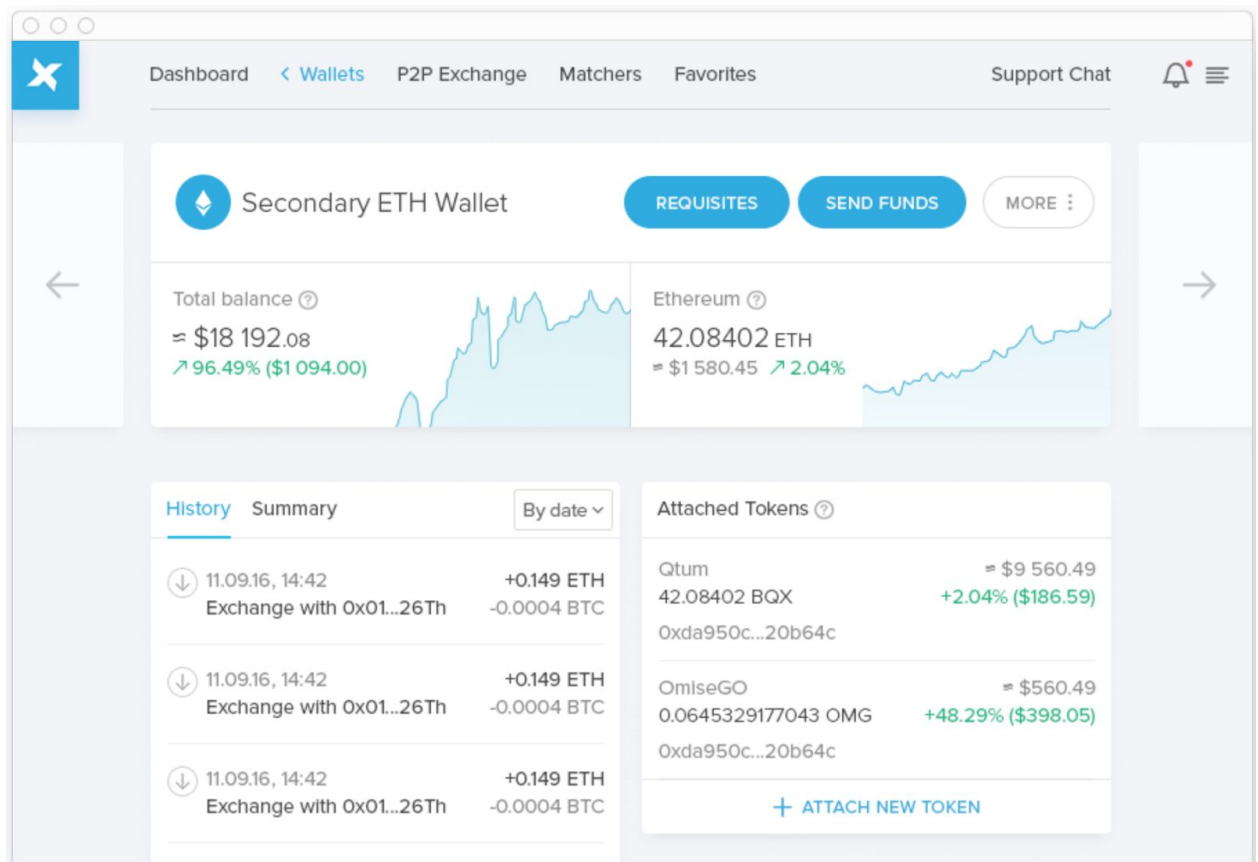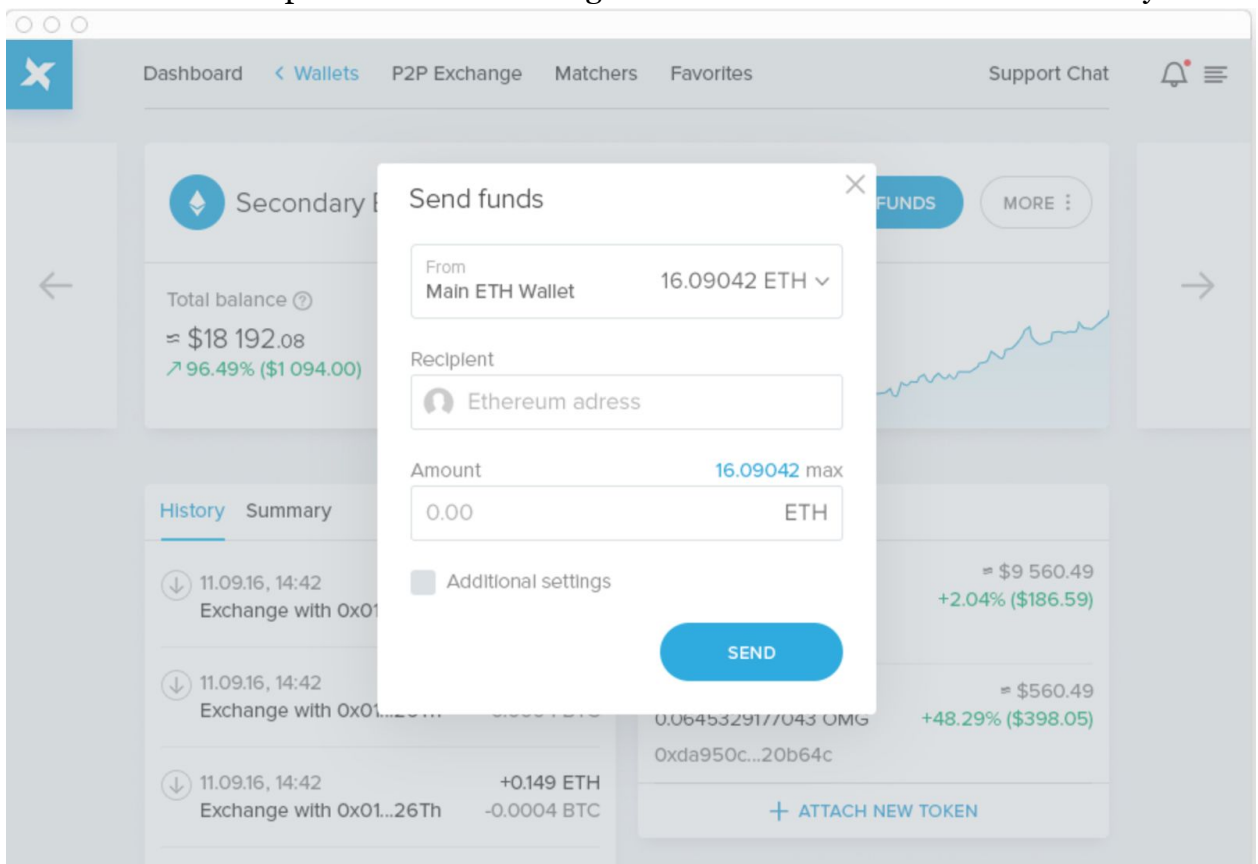

8.2. Recharging, payments, and transfers

To recharge a wallet a user can use its address or a generated QR code which bears the information about the wallet.
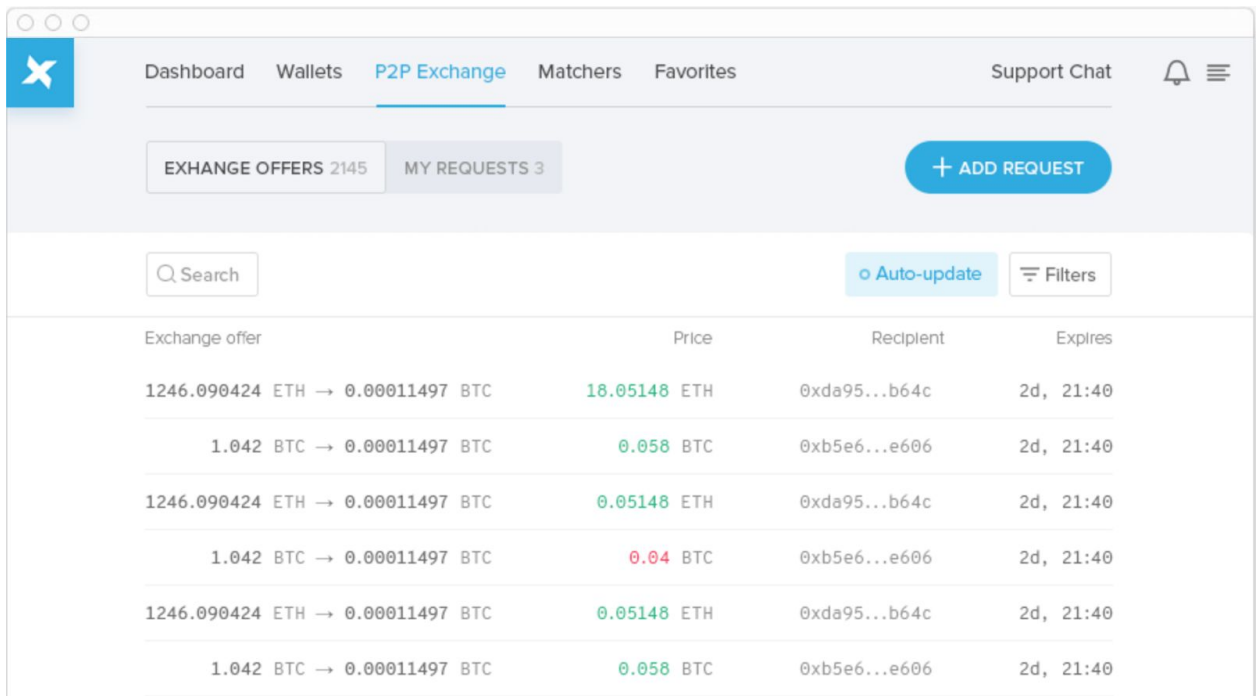
To make a transaction a user should select a source wallet, a target address and the amount of tokens. The Gas Limit, Gas , and the Max Transaction Fee can be left at their defaults or entered manually.
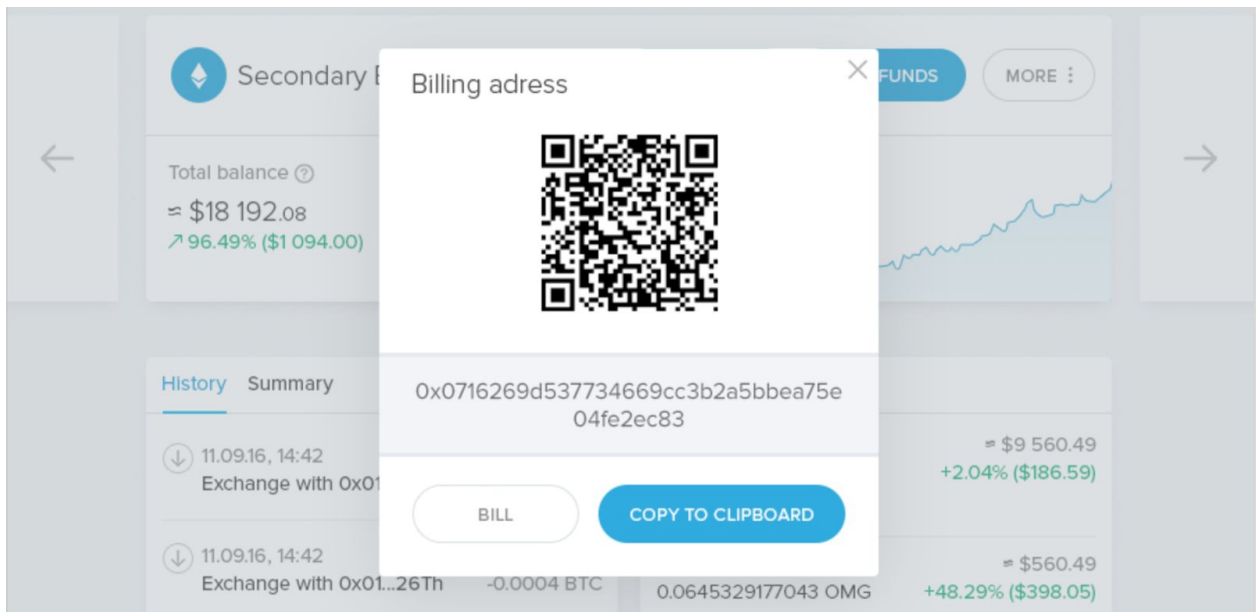
If a user makes frequent payments or transfers to a particular address, it can be assigned a name and saved into the address book for faster access. Later, the user can quickly select it as a recipient without having to enter the wallet's address every time.

8.3. P2P asset exchange

To use the P2P asset exchange, users should navigate to the corresponding section, which lists all available offers. These offers can be filtered by asset type, range and transaction volume.

If a user doesn't find a suitable offer, he can create a new one. To create an offer a user should choose the type of assets, the source wallet, the of the offer, and enter the

expiration date. To help set the best , a list of current exchange rates is provided on the same page. This information is updated in real time based on data extracted from popular exchanges. Users may also manually select a specific exchange to use its rates in the future. After all the parameters are set, the offer is published to the network.
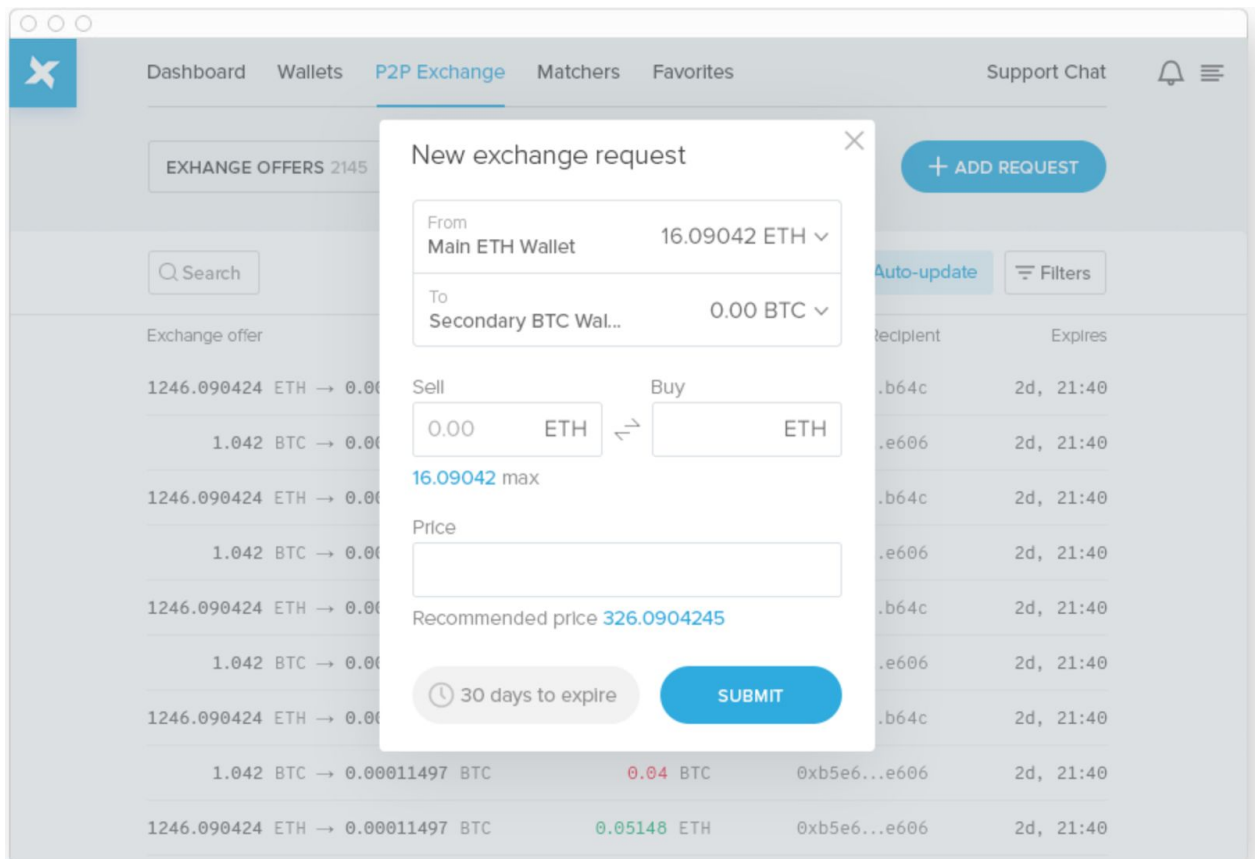
To create the most user-friendly interface we studied applications of the majority of leading financial companies of Russia, Europe and the USA. We discovered the general design trends and incorporated them into our product.

We discovered that the topmost part of the screen should contain an intuitive menu with all of the top level functions of the product; selecting a menu item should bring up a page with all the relevant details. In addition to the traditional elements we also came up with new ones, for example displaying the total value of all assets stored in all of the user's wallets. Total value is calculated against a target currency that could be changed at any time in the account settings. Here's a list of additional features supported by the xChainge Wallet:

- asset value timechart
- simple invoice management
- simple wallet creation and import
- ability to submit and remove new tokens from the platform

To help a new user get accustomed to the interface, the xChainge Wallet will run a welcome wizard the first time the application is opened. To further reduce the learning curve, every functional element of the interface will provide a tooltip with exhaustive information.

9. xChainge Token

The xChainge Token (XCT) is an ERC-20 Ethereum-based token which serves the following functions on the xChainge platform:

1) Matcher node insurance deposit
2) Matcher node fee
3) Mediator insurance deposit
4) Mediator cross-chain and on-chain exchange fee

Before the start of the crowdsale a total of 23,529,412 XCH tokens will be generated, after that no tokens will be emitted. At the end of the sale, unused tokens may be destroyed. Go to section 12 for the detailed explanation.

There are two main long-term drivers of value growth of XCH tokens:

1) An increase in the volume of token operations on the xChainge platform
2) An increase in the share of tokens which are reserved on the xChainge platform users' accounts and don't participate in exchange operations.

The increase in the volume of XCH token operations will occur due to:

● An increase in the volume of transactions processed by Matcher nodes which are rewarded with XCH tokens
● An increase in the volume of cross-chain and offline P2P marketplace transactions that require mediator's services which are also paid with XCH tokens

The increase in the share of reserved XCH tokens will occur due to:

● An increase in the number of Matcher nodes, which store deposits in XCT
● An increase in the number of participants and transactions in cross-chain and offline P2P marketplaces, which require deposits in XCT
● An increase in the number of mediators in cross-chain and offline P2P marketplaces, which also require deposits in XCT

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10. Governance

The ICO project is currently under negotiation with the Financial Market Authority (FMA) of Liechtenstein.

FMA
Finanzmarktaufsicht
Liechtenstein

A non-profit XCHAINGE Foundation responsible for implementation of the platform and all its subsidiaries will be established in the Principality of Liechtenstein. The XCHAINGE Foundation will make key decisions regarding the platform implementation and supervise the XCH token crowdsale. The XCHAINGE Foundation will operate in full compliance with the laws of the Principality of Liechtenstein, and will issue regular financial reports in accordance with the requirements of the Financial Market Authority of Liechtenstein. An independent audit company will be involved in preparing the reports.

The highest governing body of the XCHAINGE Foundation is the Foundation Council, which will include the founders of xChainge, advisors, independent directors, and representatives of regulatory bodies of the Principality of Liechtenstein. All members of the XCHAINGE Foundation will be determined and listed on the xChainge website before the start of the crowdsale.
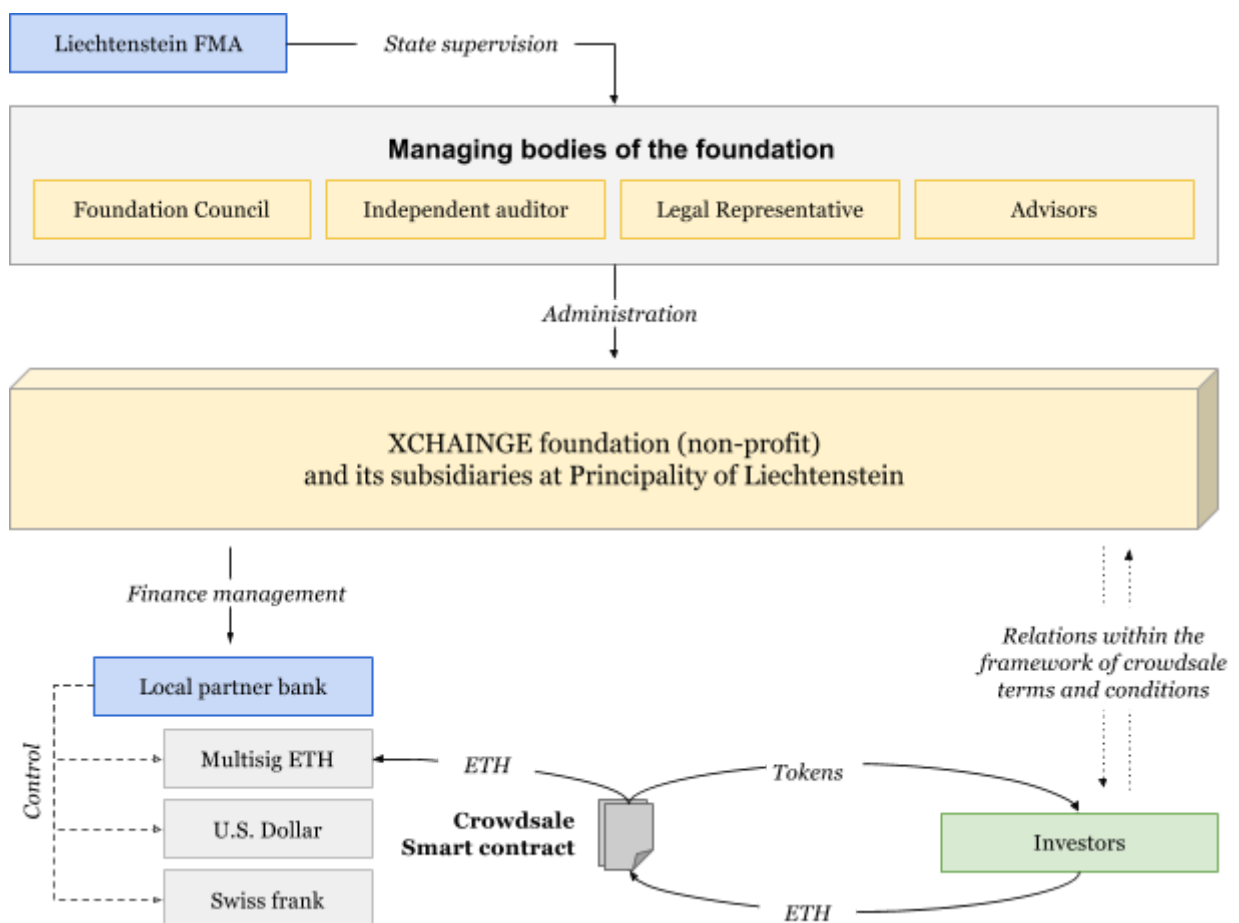
The xChainge team pays particular attention to legal issues. Currently the majority of tokens fall under the definition of security tokens. Such tokens are subject to heavy regulation by the government and the authorities, which could result in their delisting

from centralized crypto exchanges, inability to enlist new tokens and possible penalties to token holders and the issuing organizations. xChainge token (XCT) is by nature a utility token as ensured by the Financial Market Authority of Liechtenstein thus it doesn't entitle its holder to a share in the assets of the Foundation or any of its subsidiaries. XCH doesn't generate passive income and may not be sold back to the xChainge Foundation. It's main purpose is to be used on the xChainge platform.The XCHAINGE Foundation and all its subsidiaries reserve the right to apply the KYC procedure for crowdsale participants.

11. Roadmap

The first version of the product is a wallet for ERC-20 tokens which supports decentralized exchange. Our plan is to release the first version in Q1 2018 with full English and Russian language support. In the future, we also plan to translate the product to other languages[1].

The main stages of xChainge platform development are as follows:

Q1 2018 — v. 0.0.1
- Release of the xChainge Wallet for Windows
- Launch of a decentralized P2P exchange platform for ERC-20 tokens

Q2 2018 — v. 0.0.2
- Introduction of the Smart Contract builder
- Release of the xChainge Wallet for iOS and OS X

Q3 2018 — v. 0.0.3
- Launch of Matcher node functionality for Windows
- Launch of a P2P decentralized cross-chain exchange platform

Q4 2018 — v. 0.0.4
- Launch of a decentralized P2P exchange platform for physical assets
- Release of the xChainge Wallet for Android

Q1 2019 — v. 0.1.0.
- Launch of Matcher node functionality for OS X
- Closed testing of Ariadna Network and the proof-of-snitch protocol

**Q2 2019 — v. 0.1.0.**
- Launch of Ariadna Network

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[1] In the future, the xChainge team plans to translate its product to Chinese, Spanish, German, French, Portuguese, Japanese, and Korean. Additional languages may also be supported with the help of community members or external contractors.

12. XCH token crowdsale

In total, 23,529,412 XCH tokens will be issued. They will be distributed as follows:

- 85% - crowdsale rewards
- 10% - xChainge team
- 3% - project advisors
- 2% - bounty campaign participants

Advisors 3,0%
Bounty 2,0%
Team 10,0%
Crowdsale 85,0%
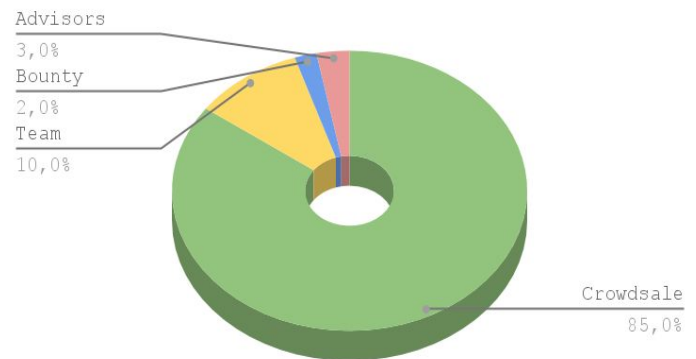
The xChainge crowdsale will be conducted starting December 5th until December 30th using the Dutch auction model, similar to Raiden Network[23]. At the start of the crowdsale each token will cost 0.05 ETH and it's will gradually decrease over time with constant rate. The rate will be determined before the start of the sale and published on the xChainge site. The hard cap of the sale will be equal to 20,000,000 XCH tokens.

A Dutch auction allows each user to independently determine the maximum they are willing to pay for a token. If a user wishes to buy at least n XCH tokens at a no greater than y ETH per XCH token, they should submit $m = n \cdot y$ ETH to the xChainge crowdsale smart contract. The variable y is defined as the auction at the time of the transaction. If the final auction x ETH per XCH token is equal to $y,$ the smart contract converts m ETH into n XCH tokens and sends these tokens to the user. If the final auction $x < y$, the smart contract converts m ETH into $k = \frac{m}{x}$ XCH tokens and sends these tokens to the user. In this case $k > n$ i.e. the user receives more XCH tokens at a lower than was initially planned.

In our opinion, the Dutch auction model is the most fair way to assess the value of tokens and distribute them to crowdsale participants. The first time a similar model was applied to a crowdsale was for Gnosis[25]; however, it attracted a significant amount of criticism, because it had a fiat currency hard cap that was quickly reached. As a result, only about 5% of all issued tokens were distributed to the crowdsale participants[23]. Setting the hard cap in terms of the number of sold tokens ensures their fair uniform distribution.

The crowdsale ends if either of the following conditions are met:

- The value of all bids in ETH is equal to the maximum number of available tokens times the current auction $x.$
- If this first condition is not met by 23:59 GMT, December 30th, the auction becomes equal to 0.05 ETH. After that the crowdsale ends and all requests are processed with a of 0.005 ETH per token. Unsold tokens are destroyed. Similarly, tokens designated for members of the team, advisors, and participants in the bounty program will be destroyed in the same proportion as unsold crowdsale tokens.

XCH tokens distributed during the crowdsale and bounty campaign will be available to users within 10 days after the end of the auction, with no restrictions on their further use. The team's tokens have a two-year vesting period with a six month cliff. Advisors' tokens have a three-month vesting period. We expect XCH tokens to be open for trading on one or more of the following centralized exchanges: Poloniex, Bittrex, Kraken, Bitfinex. We also expect crowdsale participants to start trading XCH tokens on decentralized exchanges like EtherDelta as soon as they receive them.

All funds collected during the crowdsale will be stored in a multisignature wallet under the supervision of a bank on the territory of the Principality of Liechtenstein. The partner bank will be announced before the start of the crowdsale. All collected funds will be under control of the supervisory council of the XCHAINGE Foundation, and will be allocated to the project team gradually according to the established schedule.

The expected fund distribution chart:

- 70% - product implementation, payroll
- 15% - marketing and promotion
- 10% - related academic research
- 5% - other expenses
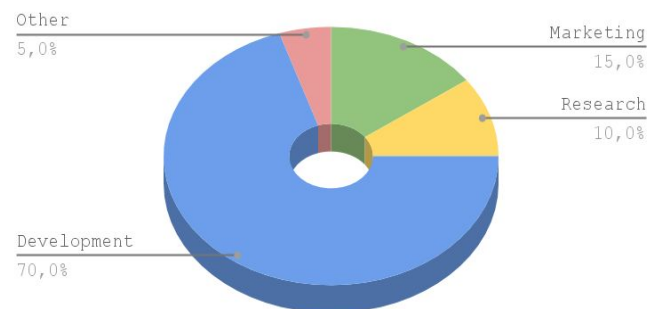
The soft cap is set at 10,000 ETH. If the soft cap is not reached, all funds will be returned to investors.

Other
5,0%

Marketing
15,0%

Research
10,0%

Development
70,0%

13.   Team, advisors and partners

13.1.   Team

The xChainge founders have a unique experience in starting and leading various investment companies, financial products and marketing solutions. All co-founders have a unique expertise in private equity, venture investment, financial products and marketing solutions.

The core team of founders and early investors are the shareholders of Aktivo. Aktivo is a leading service of collective investments to commercial real estate property on the Russian market.
The team also includes two private venture capital investors.

Founders and early investors:

- Albert Ibragimov, *co-founder and CEO*
  Key roles: operations management, information security, project management
  Experience more than 10 years of experience in web development and software engineering Nornickel, Kaspersky Lab, Workle, Asteros
  LinkedIn Github

- Danil Popov, *early investor, co-founder*
  Key roles: product development, marketing strategy, PR
  Experience: CMO and co-founder of Aktivo (crowdinvesting company). Founder of Multiways (advertising agency)
  LinkedIn

- Artur Ustimov, *early investor, co-founder*
  Key roles: strategic development, partnership network
  Experience: COO and co-founder of Aktivo, commercial department of Unilever
  LinkedIn

- Egor Klimenko, *early investor, co-founder*
  Key roles: raising capital, strategy
  Experience: CEO and co-founder of Aktivo, managing partner at NRG Capital, director of SARS Capital
  LinkedIn

- Andrey Balakirev, *early investor*
  Key roles: internal auditing
  Experience: more than 10 years in leadership positions with SNS Group (FMCG distribution), managing partner of Pallada retail network, private investor since 2011

- Sergey Skachidub, *early investor*
  Key roles: internal auditing

Experience: general director of TIUSOM (exclusive distributer of British American Tobacco in Russia), managing partner of the Pallada **retail network,** private investor since 2011

Engineering team

- Albert Ibragimov, *CEO*
  see "Founders and early investors" section

- Evgeny Shakhmaev, *CTO / back-end developer*
  Experience: more than 5 years of experience developing server-side web applications, including requirements analysis and creation of high-level architecture. Experience in the development of Smart Contracts for the Ethereum platform. Worked at Zvooq, Informatica, Fujitsu GDC
  LinkedIn Github

- Konstantin Mazurov, *front-end developer*
  Experience: former CTO of AppInWeb**,** more than 3 years of experience developing automation systems. Extensive expertise working with big data, optimization of business processes, integration of internal corporate systems with third-party solutions of any complexity.

- Alexandr Zhulin, *head of design*
  Experience: 10 years of experience in interface design, graphic design, branding, printing, and art direction. Winner of international and Russian graphic design competitions.
  Behance

- Kirill Bedraty, *product manager*
  Experience: More than 3 years of experience in managing IT projects: building project development strategies, KPI planning, process control development.
  LinkedIn

- Konstantin Dolzhenko, *UI/UX lead*
  Experience: *1*0 years of experience in development and design of informational and commercial products. Project implementation for Tinkoff Credit Systems, QIWI, Art. Lebedev Studio.

- Pavel Krutikhin, UI/UX designer
  Experience: 7 years experience in general design and interface design for commercial and educational projects.
  LinkedIn

- Linar Molotov, *head of system modeling*
  Experience: employed by Higher school of business (MBA) of Kazan Federal University, patent holder for complex systems quantitative indicator forecasting methodology.
  LinkedIn

- Ilya Vorobiev, *head of analytics*
  Experience: founder of Chain Media, 5 years of experience in strategy and analytics at MegaFon, Unilever, 3M.
  LinkedIn

- Polina Lysenko, *Head of support*
  Experience: administrative director of Front Office business space, project manager for Novosibirsk Oblast Youth Initiative Support Agency.
  LinkedIn

- Olga Pavlikova, *Head of PR*
  Experience: Co-founder of TrendFox PR-agency, professional journalist with 10 years of experience in business media, television and online publications.
  Ex-head of PR-department of Technopolis "Moscow".
  Linked In

13.2. Advisors and consultants

- Theodosis Mourouzis, PhD in symmetric cryptanalysis sciences
  Experience: Research Fellow at the UCL Centre for Blockchain Technologies (UCL CBT) and Programme Director of the MSc in Business Intelligence and Data Analytics at the Cyprus International Institute of Management (CIIM).
  Consultant to both private and governmental organisations, including Lloyds Banking Group, Technology Strategy Board (TSB) and Centre for Defence Enterprise (CDE).
  Research interests: symmetric cryptanalysis of block ciphers and hash functions, algebraic encoding of complex algebraic structures (e.g., such as Boolean circuits with respect to Multiplicative Complexity), applications of Blockchain technologies and password analytics.
  Personal page; **Linked In**

- Dr. Stylianos Kampakis, PhD in Computer Science
  Experience: Expert data scientist, member of the Royal Statistical Society statistician, honorary research fellow at the UCL Centre for Blockchain Technologies.
  Research interests: natural language processing; recommender systems; data science strategy; injury prediction and game outcome prediction; neural networks.
  Personal page; **Linked In**

- Natalya Tokareva, Grand PhD in physico-mathematical sciences
  Experience: Senior researcher at the Laboratory of Discrete Analysis in the Sobolev Institute of Mathematics, associate professor at Novosibirsk State University, researcher at the Algorithmics Laboratory of Novosibirsk State University, team leader of the CRYPTO-group.
  Research interests: symmetric cryptography, Boolean functions and discrete mathematics.
  Personal page; **Math-Net**; **ResearchGate**; **dblp**; **Scopus**

- Anastasiya Gorodilova, PhD in physico-mathematical sciences
  Experience: Researcher at Sobolev Institute of Mathematics, assistant professor at Novosibirsk State University and NSU Specialized Educational Scientific Center.
  Research interests: Boolean functions in cryptography, APN functions, cryptography, combinatorics, algebra.
  ResearchGate; dblp; Scopus

- Alexey Oblaukhov
  Experience: Researcher at Novosibirsk State University, lecturer at Novosibirsk State University and NSU Specialized Educational Scientific Center.
  Research interests: blockchain technology, cryptography, and discrete mathematics.
  ResearchGate; Mathnet; Springer

- Mariya Lapuk
  Experience: Founder of Vinci Agency, 10 years of experience in digital PR and marketing transformation: Head of the Media Department at Internet Initiatives Development Fund (IIDF), Vice President of the PR Department at Odnoklassniki (part of Mail.Ru Group)
  Linked In

- Sergej Schmidt
  Experience: Accredited EEA lawyer (Germany) in cooperation with MÜLLER & PARTNER RECHTSANWÄLTE, Head of Legal and Partner at Audina Treuhand AG, Member of the Liechtenstein Chamber of Lawyers, Member of the Koblenz Chamber of Lawyers.

13.3. Partners

Science:

- **The CRYPTO Group**
  Cryptography and cryptanalysis scientific group of the Mechanics and Mathematics department of the Novosibirsk State University and Sobolev Institute of Mathematics.

- **Master's degree programme "Master in Cryptography„**
  MSc in Cryptography of Novosibirsk State University is an innovative programme designed to engage young researchers in the modern cryptography and improve their skills in the domain. The programme covers all the basic aspects of cryptography and cryptanalysis and also provides deep theoretical and practical background.

Legal:

- **Juricon**

Juricon Treuhand Anstalt was established in 1976, though its history goes back to 1955. The highly qualified team at Juricon is composed of 15 employees,

including lawyers and economists with international experience. Juricon Treuhand Anstalt became one of the six founding members of IAG, Integrated Advisory Group, in 1989. Today, the association includes more than 100 members from Europe, North and South America, and Asia.

- **Actusag**

An international consulting company which specializes in tax consulting and financial planning.

- **Audina**

Founded in August 1985 in the Principality of Liechtenstein by a group of lawyers, Audina Treuhand AG has been operating successfully for over a quarter of a century providing a wide range of services and serving as an independent trust company.

14. Conclusion

The xChainge team believes that the ability to freely exchange assets is an integral right of every human being. For thousands of years the act of exchange facilitated growth of general welfare of people despite strong limitations imposed by traditions and financial illiteracy.

At the modern age, trustless decentralized peer-to-peer exchange could mark the beginning of a new chapter in the book of human society, however at this point it is confined to small groups of technologically advanced crypto enthusiasts.

We hope that the solution created by xChainge will help to make this type of exchange accessible to anyone.

15.   References

[1]https://medium.com/@FEhrsam/why-decentralized-exchange-protocols-matter-58fb5e08b320
[2]https://medium.com/@VitalikButerin/the-meaning-of-decentralization-a0c92b76a274
[3]https://twitter.com/vitalikbuterin/status/916926487172968448
[4]https://www.jbs.cam.ac.uk/fileadmin/user_upload/research/centres/alternative-finance/downloads/2017-global-cryptocurrency-benchmarking-study.pdf
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[15]https://support.bittrex.com/hc/en-us/articles/115002187632-Statement-on-disabled-accounts
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[17]https://coin.dance/volume/localbitcoins
[18]https://coinmarketcap.com/charts/
[19]https://data.worldbank.org/indicator/CM.MKT.LCAP.CD
[20]http://www.bis.org/publ/rpfx16fx.pdf
[21]https://hackernoon.com/how-one-hacker-stole-thousands-of-dollars-worth-of-cryptocurrency-with-a-classic-code-injection-a3aba5d2bff0
[22]https://www.reddit.com/r/EtherDelta/comments/6hrxjw/etherdelta_guides_for_first_time_users/
[23]https://medium.com/@raiden_network/the-raiden-token-auction-explained-1cc0c7946b26
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[25]https://medium.com/@raiden_network/the-raiden-token-auction-explained-1cc0c7946b26
[26]https://thenextweb.com/cryptocurrency/2017/11/07/ethereum-parity-wallet-freeze-dollars/