



# ETHEREUMX

WHITEPAPER

# Ethereum X

## A Directed Acyclic Graph Protocol with Smart Contracts Enforcement

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*A scalable distributed ledger would launch cryptocurrency into mass adoption at a high-scale level. As observed during the last ICOs, the Ethereum main chain can easily be clogged, which leads to endless transaction times. The new Ethereum X solution is based on a more efficient technology called a Directed Acyclic Graph (DAG) network. The network is faster, cheaper and more secure while enforcing smart contracts. This opens new opportunities for worldwide global payments and money transfer without borders. Dedicated wallets, mobile applications and debit cards will also be released along with the DAG network.*

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# 1. Ethereum X

## 1.1 Our Vision

Ethereum is suffering because of its success. Due to the excessive number of token sales, the main Ethereum chain is now saturated and transaction speed is the first affected. Ether main purpose is only to fuel DApps like ICOs or CryptoKitties. ETH therefore struggles to gain value and would never be a robust monetary asset. That's why we created Ethereum X, an Ethereum scalable side chain dedicated to payments. Our vision is to take Ethereum to the next level as a financial asset.

Ethereum development was a key stage and has been extremely cheered by the crypto community. Major technological breakthroughs were achieved by their team, and the world's blockchain ecosystem is definitely grateful for that. However, Ethereum remains focused on the technical field and does not propose solutions to be commonly used by the general public. Ethereum X will bring the missing link required for the everyday life use.

## 1.2 Our Values

We are a team of cryptographic engineers and developers, driven by a common passion towards decentralisation. Ethereum X will pave the way for new scalable opportunities never achieved before. We are concerned to take our time and communicate on our progress being as transparent as possible. We remind that we love Ethereum, we do not concur with them. Ethereum is a fuel for decentralised applications (DApps), Ethereum X is a fuel for global payments.



## 1.3 A Community

One of the inherent principles of a cryptocurrency is based on the sharing and collaborative economy. Thus, we believe that our greatest strength is you, our community. Each individual contributes to the durability of the ETHX currency, either by holding it or mining it. That is why we strive to reward our community every time a participation is made to the Ethereum X development. We recently ran a bounty campaign thanks to all of you who helped us to translate and promote Ethereum X.

Our first airdrop was another milestone involving our community. As mentioned above, our core value is transparency. To do so, we communicate through our social media channels : Twitter, Facebook and Telegram. We really value your feedback as every single voice is important.

## 1.4 For All

Ethereum X is here for everyone, for everyday use :

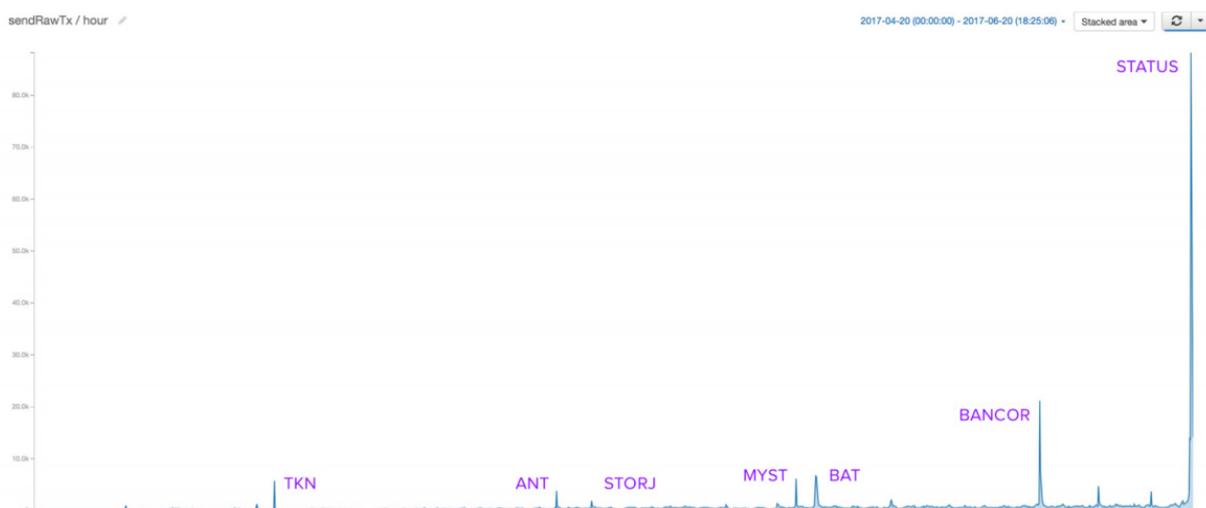
- Spend your Ethereum X with our physical credit card
- Use the mobile app to trade, pay and send ETHX
- Benefit from the best exchange rates
- Benefit from the lowest fees
- Trade your ETHX with ETH



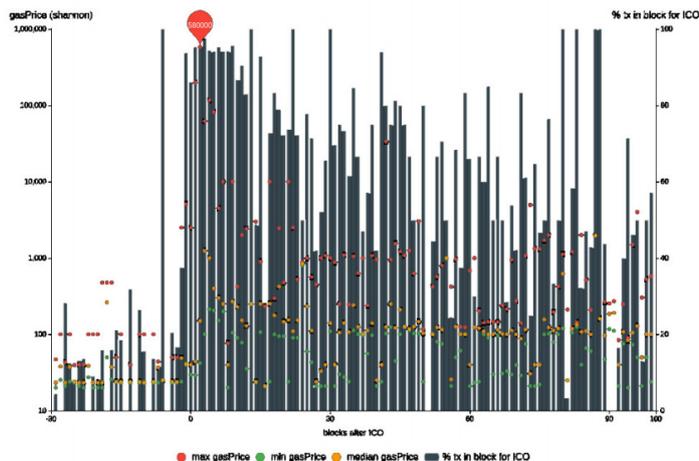
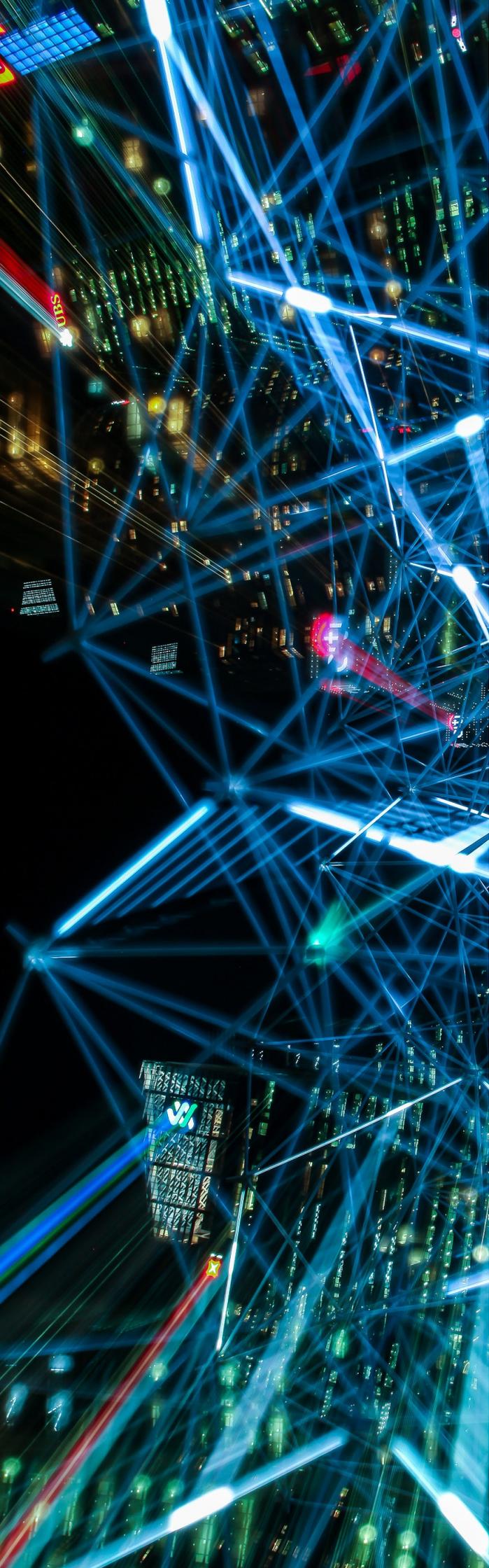
# 2. Problem: Ethereum unscalability

## 2.1 Problem and consequences

The Ethereum network, valued at about USD 35 billion at the time of the completion of this white paper, is struggling to cope with scaling issue despite a low volume of users. Ethereum has currently never been used in large-scale products, such as in a worldwide transaction network for instance. Concerns arise when questioning about its future as it is due to reach mass adoption. The most likely answer would be that current problems would worsen. A simple example is illustrated in ICOs, where the Ethereum blockchain can be saturated during several hours. Furthermore, the increase in average transaction fees is a direct result of the exponential growth of the ICO market. Another recent example of the clogged Ethereum blockchain is the famous DApps CryptoKitties.



*Figure 1: Volume of transactions during June 2017 ICOs*



*Figure 2: Gas price during the Basic Attention Token ICO (June 2017)*

Ether is also currently used as a currency by some investors and users. However, it is not the primary use case of the token. Indeed, it was designed to power decentralised applications. Thus, unlike Bitcoin or Ethereum Classic, it has an inflationary money supply rather than a fixed supply. Contrary to what some investors may think, Ethereum is therefore not a store of value.

## 2.2 Solutions

A wide range of altcoins is based on the Ethereum blockchain, many of which continue to see a frenzied commercial activity with the completion of various ICOs. What the future holds for ETH is more and more uncertain.

Fortunately, several solutions are emerging to deal with this scalability issue. Not to mention them all, the use of state channels - such as Raiden - or the transition to the PoS Casper protocol can temporarily solve the problem. The most promising solution is the use of a new sort of distributed ledger: the directed acyclic graph (DAG).

# 3 Ethereum X's Technical solution

## 3.1 DAG Network

In a conventional blockchain protocol, transactions are validated within blocks. The validation process takes a certain time as the miners need to solve the proof-of-work problem. The groups of transactions have to be compiled together, the merkle tree of their hash ensuring the integrity of the blockchain. As the number of transactions increases, the time needed for a block to be filled up increases as well. It is now common to wait several minutes until a new block is created so that the transactions are validated. This waiting queue creates a backlog of transactions, and the only way to make your transaction validated on the blockchain is to pay a high transaction fee, which will attract and incentivise the miners to prioritise your transaction. Transaction speed, blockchain scalability, fees and mining process are then closely linked one to each other.

In the protocol proposed for Ethereum X, transactions are not grouped within blocks but linked one to others. Each transaction validates one or more previous transactions and therefore carries the proof-of-work and the hash to one or more previous transactions. This data structure is called a Directed Acyclic Graph (DAG) of transactions. A challenge with the DAG approach is to prevent all new transactions from referencing the same set of parent transactions, which would degenerate the DAG into an exploding tangle with a high degree of entropy. Abstractly, the DAG must not increase in «width» but in «length». It must stay in a cylindrical tangle shape. A chain of DAG has therefore the following properties :

- All non-parent nodes are linked  $k$  times;
- The chain length is proportional to the original node count by a factor close to  $2k$ ;
- A DAG that has more than  $2k$  nodes can be cut in two separate DAG having the same properties. Each half has a factor  $k$  which is close to the original  $k$  factor.

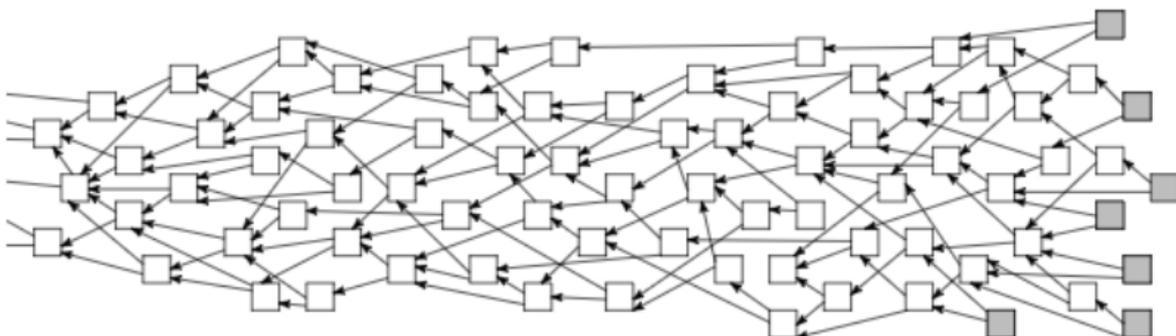


Figure 3: A 'contained' Directed Acyclic Graph of transactions

Our DAG protocol solves an important cryptographic problem. Double-spending is impossible as a transaction receives more than one approval. It is therefore accepted by the system with a higher level of confidence than a conventional blockchain. Furthermore, the DAG network is asynchronous. Transactions do not need to wait to be grouped and validated together, hence a shorter processing time. However, this feature is a double edged-sword. As transactions are validated independently, nodes do not need to communicate and to achieve a global consensus. More than having an eventual side-chain in a conventional blockchain architecture (which will be rejected by the system), it may result in a greater amount of conflicting transactions. Nodes then need to assess which transactions have to be rejected. To solve this problem, an algorithm similar to the one used by IOTA is implemented\*. After running the algorithm, the transaction with the highest number of selections will be kept in the network. The other one will become an orphan. The algorithm needs to run 100 times to be optimal. For instance, if a transaction is selected 95 times after these runs, the transaction is said kept with a 97% interval confidence.

\* The algorithm is described in the following way:

1. Consider all sites on the interval  $[W, 2W]$ , where  $W$  is reasonably large.
2. Independently place  $N$  particles on sites in that interval.
3. Let these particles perform independent discrete-time random walks «towards the tips», meaning that a transition from  $x$  to  $y$  is possible if and only if  $y$  approves  $x$ .
4. The two random walkers that reach the tip set first will sit on the two tips that will be approved. However, it may be wise to modify this rule in the following way: first discard those random walkers that reached the tips too fast because they may have ended on one of the «lazy tips».
5. The transition probabilities of the walkers are defined in the following way: if  $y$  approves  $x$  ( $y \rightarrow x$ ), then the transition probability  $P$

$$P_{xy} = \exp(-\alpha(H_x - H_y)) \left( \sum_{z: z \rightarrow x} \exp(-\alpha(H_x - H_z)) \right)^{-1}$$

Our DAG technology also enforces smart contracts. Scripts can be implemented within the transaction headers and be enforced when conditions are met. Our solution can be seen as an advanced IOTA-like platform but with smart contracts enforcement, or as an Ethereum blockchain but scalable. Hence the name Ethereum X.

## 3.2 Ethereum X's transactions process

Prior to being written in the DAG distributed ledger, incoming transactions will be handled by our decentralised backend platform. We are using IPFS (InterPlanetary File System), which means we are never centralising information. One of the main flaw of several blockchain solutions is that they communicate with their users through a simple web API before registering the transaction in the blockchain. This creates a point of centralisation and erases the benefit of the blockchain. Combining our DAG technology with IPFS allows our system to have no single point of failure.

A transaction will be therefore processed as follow:

1. Request from the debit network is handled through IPFS;
2. Smart contract functions on the DAG network are triggered;
3. Transaction is registered on the DAG distributed ledger;
4. Respond to the debit network within a maximum of 1s;





### 3.3 Ethereum X's Maturity

Ethereum X DAG technology will be released in its stable version around Q4 2018. Meanwhile, we would like to offer our community the opportunity to support us through the ETHX ERC20 token. ETHX holders will be credited the same amount of tokens once the DAG will be live.

A minimum viable product (MVP) of the DAG distributed ledger will be released earlier. We will proceed to a 3-month phase of beta tests in Q3 2018. Users with basic knowledge of distributed ledger architecture, payment APIs, smart contracts and IPFS will be selected to test the core features of our MVP (smart contracts, money transfers, payments by card). The first Ethereum X credit cards will be issued for this purpose.

# 4 Use cases

Banks face cost-cutting pressure and an increasing competition from new players as customer behaviour evolves. Indeed, customers, especially the Y and Z generations, expect their banks to increase their online service offering. As much as 8% of customers in Europe say they have an account in an online bank. A quarter of bank branches should disappear within 5 years as 15% of them are not profitable and suffer a drastic drop in attendance. There is more and more detachment between customers and banks. We believe that it is important that everyone should be able to control their money securely. Ethereum X aims at proposing an innovative system through its cross-platform applications, and its low fees payment card.

## 4.1 What we are aiming to solve

### 4.1.1 Send money without limits

Sending money to companies or relatives is not an easy task, either for remittances, for children tuition fees, for emergency transfer, or for a donation. As widely known, financial institutions are in a monopoly situation and decide the fees they want to charge. When sending money to a foreign country, fees can even be outrageous, without any justification. The transfer amount may also be limited to a certain ceiling, and many other restrictions may apply. With Ethereum X, we truly believe that everyone should be able to transfer his money how he wills.

### 4.1.2 A payment solution fitted to the current economy

In order to cope with the international economy and the derivatives of currency fluctuations, it is key to have a reliable, robust and digitalised alternative. Our solution, is a set of cross-functional and multichannel platforms including a mobile wallet and a payment card.

### 4.1.3 Fast, safe and no watchdogs

The bank is a state institution, which reserves the right to look at transactions and apply this right at will. Payments are monitored and must follow a defined pattern. Ethereum X respects its users' privacy, while offering thanks to the DAG technology a secure and efficient payment alternative. Security is today the new big issue in our society. We all heard about phishing, scamming, hacking, and maybe you have already been the victim of those malicious act. With Ethereum X, these security issues now belong to the past. Our token gives a 10x more secure way of making your transactions thanks to its high level of cryptography.

## 4.2 X Apps

### 4.2.1 Windows Wallet

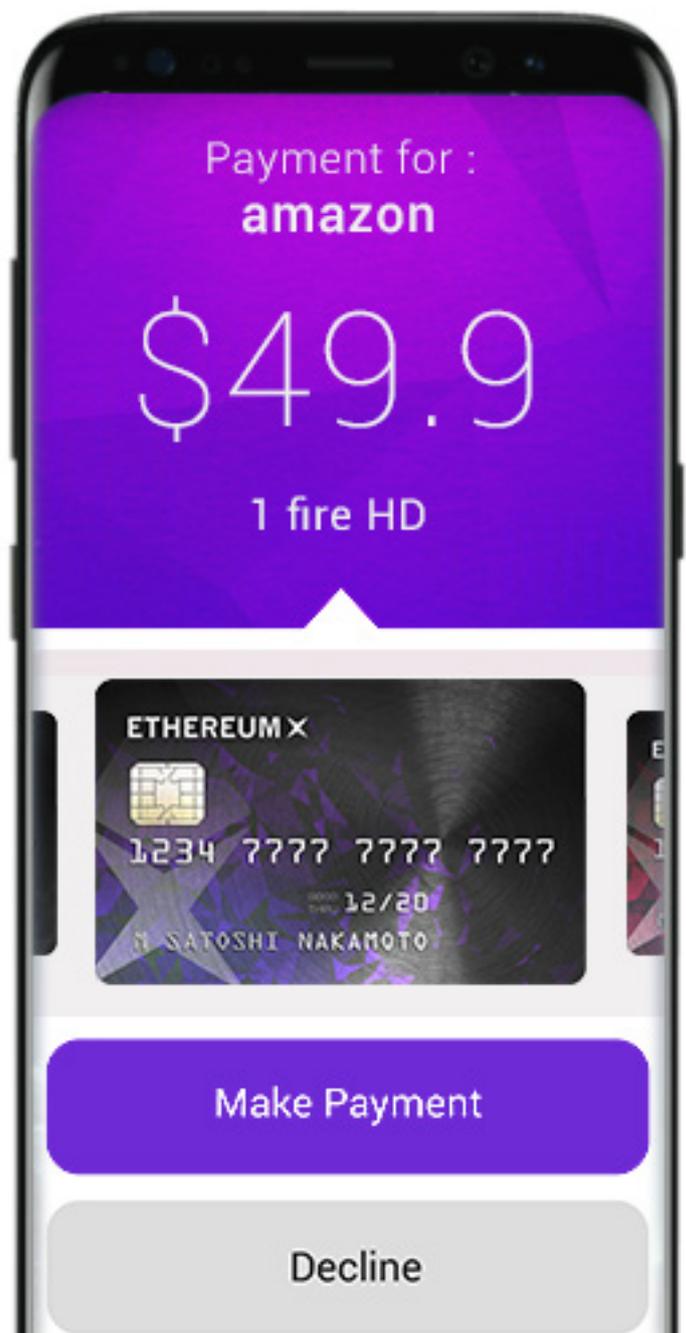
Ethereum X is currently available on software wallets (MyEtherWallet, Metamask, Ethereum GUI) as an ERC20 token. An official first wallet is in development for Windows OS. It will be the indispensable client to manage and store its ETHX seamlessly.

### 4.2.2 Android Wallet

The Ethereum X app is a wallet that allows you to spend and manage assets from your mobile phone and interact with your card. The assets are easily transferable and their value is retained up to when a payment is done.

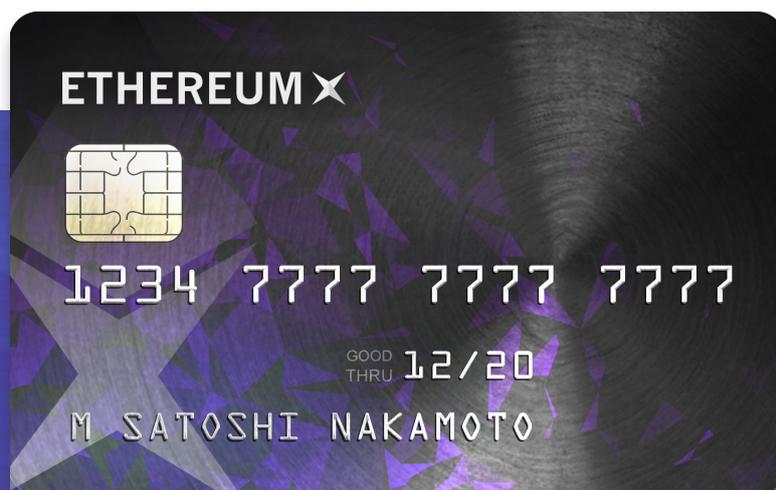
Upon registration, a phone number will be required to secure your account. For online purchases via the Ethereum X card, a confirmation can be sent to the official application to confirm transactions. The storage is decentralised and nothing is recorded on our servers. The application also implements a feature for fast and easy payback between individuals.

The Android application will be available early in the first quarter of 2018. Shortly after, we will direct some resources to our team to develop and publish a WEB and iOS version to meet the multiplatform expectations of our users.



## 4.3 X Cards

The Ethereum X card is a reliable and convenient way to use your digital money. The card is linked to a compatible official wallet. Your balance is updated as soon as the transfer is received on the wallet, no further delays. The dedicated application allows you to define rules such as ceiling limits per month and withdrawal limits per day. This limit is purely optional and made to fit everyone needs.



### 4.3.1 Withdraw money

Just like a classic debit card, the Ethereum card offers the option of withdrawing cash in compatible ATMs. The card can also be used in online and physical outlets.

### 4.3.2 Use around the world

The Ethereum X card can be used world-wide at any physical and online compatible point of sale. The exchange rate is done automatically according to the country of reference and current ETHX rate. The rate is very advantageous compared to traditional banks.

### 4.3.3 Pax less tax

Ethereum X will be a real alternative for its frequent users. The application will help everyone to save on rates - which keep fluctuating.

### 4.3.4 Preorder

The first cards will be available during the Q4 2018. The pre-orders will be launched few weeks before. 100 premium cards and 500 classics will be available. The first pre-order users - whom we consider as early adopters - will benefit from advantages on the fees, and a bonus of ETHX for holding.

# 5. PRODUCT DEVELOPMENT

## 5.1 Roadmap

- **November 2017** : ETHX launch ETHX is launched as an ERC20 token on the Ethereum chain.
- **Mid November 2017** : Airdrops 500 000 ETHX will be available for Airdrop subscribers.
- **End November 2017** : ETHX on EtherDelta EtherDelta is the first step before listing the token on major exchanges.
- **Mid December 2017** : Public whitepaper & first ETHX prototype card
- **Q1 2018** : New exchanges Ethereum X to reach mass adoption. Coinexchange, Cryptopia, YoBit, HitBtc, Binance, Bittrex
- **Q1 2018** : Partners announced (Debit card & Merchants) We are currently in negotiation with major payment providers to offer you a worldwide usable card.
- **Q1/2 2018** : ETHX Beta Wallet release (Android, Windows, iOS) and debit cart pre-order
- **Q3 2018** : More partnerships Wider range of companies accepting ETHX. First targets are the biggest e-commerce websites.



## 5.2 Beta Ethereum X application

We will release a beta application to collect user reviews and answer to the community. The app is expected to come out in Q1 2018 on Android and later on iOS. We are very sensitive about our community welfare, so we try to do our best to keep our members informed about the latest news. The app will also help us to inform and get suggestions.

## 5.3 Team Expansion

Ethereum X is community driven. If you are also a cryptography and distributed ledger technology enthusiast and want to support the project, please feel free to contact us. Additional developers as well as community managers for our social networks will be hired soon.

## 5.4 Partnership

As a payment solution provider, we strive to make it easier for e-commerces to integrate our solution. We will provide a platform for websites to accept Ethereum X. It is important to work with these commerces as many of them are not knowledgeable about cryptocurrency and have no idea on how to implement such solutions. We are that help, their guardian and their guarantee that everything will be smooth.

For other companies willing to implement our payment solution, there will be some easy-to-set-up processes. One of them is Shopify. Shopify is a worldwide framework used for easily creating e-commerce websites without the hassle of maintaining the technical side. Shopify stated that there are almost 400.000 websites using their software with around 130 million unique customers. Others prospected integrations but not limited to : WooCommerce, Magento, various WordPress e-commerce plugins.

An API for our official Ethereum X wallet is also part of the roadmap. This will allow more advised users to directly work with our wallets functions and directly implement their custom payment solution on their website.

This way, we can both contact websites or be contacted to establish a partnership. Our team and our community will always try to support any website willing to implement Ethereum X.



# 6 Finance & Marketing

## 6.1 Use of Supply

*The ETHX token will support our vision and we therefore do not distribute it through an ICO. ETHX was spread for free during airdrops or made directly available on exchanges. The 5,000,000 tokens are allocated as followed:*

### 6.1.1 Exchanges

2,000,000 (40%) of the coins will be available on the most used trading platforms

### 6.1.2 Team & Advisors

1,000,000 (20%) used to continue developing a high-quality team. If you share our vision and think you have the good skills, feel free reach out to us to join our team.

### 6.1.3 Partnerships & Development

1,000,000 (20%) will be used for partnerships with other companies, production of payment devices and issuance of credit cards.

### 6.1.4 Airdrop

500,000 (10%) are being donated by Airdrop to promote Ethereum X.

### 6.1.5 Bounty Campaign

50,000 (1%) distributed during the Bounty Campaign, including bitcointalk campaign, social media campaign and content creation contests.

### 6.1.6 Security Audit

50,000 (1%) for the security audit of the smart contract.

### 6.1.7 Token Pre-Allocation

400,000 (8%) was used for the Token Pre-Allocation.

# Conclusion



At Ethereum X we believe in a world where people can be their own bank thanks to cryptocurrencies. We are at the dawn of a new era where money management can be decentralised. Without the traditional intermediaries, the power is given back to consumers. However, global adoption remains the main challenge.

Companies like Ethereum X are leading the way to promote the following message : blockchain technology - and in our case DAG technology - should not only appeal to tech-savvy people. Everyone will be able to instantly transfer any amount of money across the world, with low fees, just by a single touch on our X App or by a single swipe with our X Card..

## REFERENCES

- [1] BraveNewCoin (2017), «Ethereum difficulties send Ether tumbling»
- [2] Buterin, V. (2015), «A Next-Generation Smart Contract and Decentralized Application Platform»
- [3] CodeTract (2017), «BAT ICO, USD 35 million in 24 seconds, gas and gasPrice»
- [4] Popov, S. (2017), «The Tangle»
- [5] Nakamoto, S. (2008), «Bitcoin: A Peer-to-Peer Electronic Cash System»