

# AMPERA

# ECONOMY



WHITEPAPER



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## Project Overview

*Each module described here is designed with the others in mind. The project aims to satisfy multiple needs in both cryptocurrency and trading markets. Each module performs a task to this end. The design of each module took consideration of the others, so each should be considered when observing a single design.*

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## Cryptocurrency: Ampera (AXA)

Ampera is built with the security of Bitcoin and the flexibility of Ethereum, specialized for financial assets.

### 1.1 The Ampera Network

#### 1.1.1 Design

The Ampera network uses a binary serialization format designed specifically to minimize the byte footprint of each transaction on disc and over network. Because transactions are smaller, the Ampera Network has a higher transaction throughput per megabyte per block than Bitcoin and other altcoins that use JSON for serialization.

There is a REST service planned that will run on relays allowing other services to more easily interact with Ampera. Once the Ampera clients leave, beta work will begin on the REST service.

#### 1.1.2 Purpose

The Ampera network serves as a power supply for the Asset Backed Tokens (ABTs), providing a means of securing transactions and running contracts to pass tokens back and forth. As an incentive to donate computing power to the network, block rewards and transaction fees are paid out to miners the same way they are paid in many other cryptocurrencies such as Bitcoin. These rewards and fees are paid in Ampera, which will, at the same time, give Ampera an intrinsic value since it must be used for all transaction fees.

### 1.2 Protocol Structure

#### 1.2.1 Blockchain

Ampera runs on a custom built blockchain which was designed for speed, efficiency, and security. There has been a long road of development and research to get to the level that the Ampera chain is at now, and it is still improving, although it is nearing final release at which point the spec will be finalized. A recent improvement made was to reduce chain size on disk from 200MB down to a mere 80MB by changing serialization from JSON to a

custom binary library created by us with the specific purpose of blockchain in mind. This number was not optimized at all, and we expect another round of space savings after optimizations on serialization size are finished. Improvements were also made to handle less String data in blocks during hashing and verification, which helped cut down on verification time by removing the need to re-create Strings to mutate them with new data. While these efficiencies are important, we've also improved our use of SHA-3 hash functions by removing the need for Strings in hashing and by reducing the number of times the hashing function is called per block by optimizing data paths.

The blockchain itself has proven to be one of the most reliable and stable systems during Ampera beta testing, it has not changed much since it's conception, except for optimizations like the ones mentioned above. When the spec is finalized, data handling can be more heavily optimized for better improvements all around.

### 1.2.2 Transactions

Transactions are built to be as flexible as possible. Supporting a custom P2SH protocol that allows for advanced financial contracts and scripts for things like micropayment channels, multi-signature wallets, and the decentralized exchange. Limits imposed on transactions are based on size of scripts for P2SH and transaction inputs and outputs used within the transaction. The limits imposed allow for more efficient packing of blocks, since there is not a hard limit on the size of a block, but rather limits on each component. The current planned structure would allow for ~16x the transaction processing of Bitcoin, with the ability to process around 8,333 transactions per 5-minute block. This assumes a non-P2SH transaction with 12 transaction inputs and outputs per, and since contracts are generally fairly small, this wouldn't change much and could even get faster for P2SH transactions.

A more detailed list of the limits imposed on the Ampera blockchain:

- 100,000 TXIOs per block (outputs and inputs)
- 15-25MB max storage size for P2SH transactions
- 50,000 signatures per block (brainpool keys have higher fees here, as its signatures take almost 10x the amount of time to verify as Ed25519)

These limits are currently being tested and pushed to allow for as much room as possible for the exchange to grow. They will change once they are completely finalized.

### 1.2.3 Tokens

Tokens are similar to normal cryptocurrencies, but they are not mineable, and piggyback off the Ampera blockchain in order to do transactions. The tokens on the Ampera system are linked to real world assets and track their value, allowing people to trade commodities and other resources on the chain or at the Ampex exchange.

## 1.3 Ampera Token Structure

Ampera tokens are the only mineable currency on the network. Block rewards and transaction fees are paid in Ampera, with the starting block reward being 100 tokens and decreasing steadily with each block instead of sudden decreases like Bitcoin.

## 1.4 Platform Integration

### 1.4.1 Overview

The Ampera network, including EKO, will be closely tied to the Ampex Exchange, and with the REST service in place, will have the ability to be tied to other exchanges and financial services with ease.

### 1.4.2 Example

For example, a user could buy EKO with Bitcoin on the Ampex Exchange, where it would be converted to USD and posted to a trading account and be used to purchase the backing assets for the EKO token(s) in question. The automation and speed behind this allow for near instantaneous trading of assets and currencies through EKO on the Ampex Exchange.

Using the previous example, a user wanting specific assets rather than the asset backed EKO token(s), could purchase the assets they want (gold, silver, palladium, etc.) with the same ease and convenience.

## 1.5 Ampera Software

The Ampera software includes code for a full node in the currency, a miner, Ampex Decentralized Exchange, and the wallet management software.

### 1.5.1 Ampera Full Node

Running a full node allows a user to have a complete local copy of the blockchain and participate as a relay in the network to transmit block and transactions. A lite node may also be offered and will not require a full local copy of the blockchain.

### 1.5.2 Wallet

The wallet management side allows a user to send transactions, manage their balance, change addresses, view recent transactions, and print all transactions of their current address to an excel readable format.

### 1.5.3 ASE

The Ampex Script Engine (“ASE”), is the virtual machine library that Ampera uses to process P2SH scripts during verification. ASE is lightweight and thread safe, so we can run multiple instances of the ASE virtual machine in parallel for faster verification. ASE is designed so it is easy to load different instruction sets into different instances of the ASE virtual machine, so it will be easy to create soft forks to update the system to use new instruction sets we’ve designed. Writing scripts for ASE will be easy because we’re developing ASE Utility Language, which is a simple, statically-typed scripting language that will compile to ASE bytecode. An early version of a compiler has already been built and tested, with plans for data hooks an integrated development environment (“IDE”) would be able to use to give users static analysis feedback on their programs.

### 1.5.4 Exchange

Ampex Decentralized Exchange (“ADX”) is a peer to peer exchange running on the Ampera blockchain. It serves as a marketplace where different tokens can be traded in arbitrarily advanced ways, securely, and on-chain. The exchange benefits from the security of the blockchain system, and the load balancing properties of a relayed p2p network. Ampex will provide non-minable asset backed tokens for mining use, with a reasonable fee structure that may include: deposit, withdrawal, and trading taker fees. ADX will be accessible through the GUI of the main Ampera wallet program, allowing for complete management of all aspects of Ampera to take place in a single program. This system is extensible and allows for contracts to be added to the exchange in the future without need for a chain fork.

### 1.5.5 Tesseract Network

Introduction:

The Tesseract Network allows transactions of all Ampera tokens securely and nearly instantaneously off the block chain. This means that there is no wait time for verification, and thus transactions can be retail fast. It will soon power the ADX, allowing for incredibly high volume and lightning fast trading. Outside of the ADX, it has applications in POS, ongoing business relations, and even day to day transactions sent between friends and family.

Abstract:

The Tesseract Network works through a network of wallets built specially for the system. These wallets have 2 parties holding keys for them, and both parties must agree when tokens are to be moved out of a wallet. Transactions can then be specially formed to pay out part of the wallet to one party, and the other part to the other party. These transactions are not submitted to the network, but rather held as a form of balance sheet between the two parties that can be regularly updated. Since these transactions do not need to be sent to the network, one party only needs to receive the transaction from the other (this is very fast) and they can then consider the payment complete. When the parties want to terminate the balance sheet, they can commit the current transaction to the chain.

Through these wallets, a network can be formed linking from any one wallet to another over a certain number of “hops”. These hops are, for instance, if wallet A is the sender and wallet D is the receiver: from wallet A to B, wallet B to C, and then wallet C to D. These hops can be reliably found and stored and occur naturally without any extra work required by the end user.

#### Competitive Advantages:

The Tesseract Network is built entirely from scratch, focusing on speed and security of off chain transactions. Since Ampera runs many asset backed tokens, assets can be traded this way as well, and even used as payment in transactions. This allows Ampex to provide asset changing services so businesses can accept a particular asset and a customer can pay in another. Ampex can also offer fast cashout of assets service this way, by taking assets and selling them on the ADX through the Tesseract Network and returning funds to the user almost immediately. These advantages play very well with Ampex’s business model, and provide very useful features and services to users.

#### 1.5.6 Miner

Mining is the process of maintaining and updating Ampera’s blockchain, its ledger. Miners receive lists of pending transactions and use them to create new entries for the ledger, called blocks. Blocks can only be accepted onto the blockchain if they have sensible transactions and a proof that is difficult to spoof. When miners mine they are attempting to create proofs for their blocks. When a block is accepted onto the blockchain the miner who proofed the block is given a monetary reward of Ampera to incentivize mining.

Mining Ampera is relatively simple. Users may need to download drivers for some of their hardware, but otherwise the Ampera client is designed to autotune itself to work as efficiently as possible on a wide variety of machines. Once users have the Ampera client they will only need to press a button to solo mine.

Solo mining is when a user is responsible for proofing blocks alone. Users can work together to proof blocks faster by joining pools. Pool mining is like solo mining, except users will need to use the pool version of the Ampera client, enter the URL of the pool they wish to join, and then click a button. Pools usually take a small fee of the block reward when a block is accepted by the blockchain, but they pay more consistently than solo mining.

Ampera proofs blocks with the SHA-3 512 hashing algorithm, which has better security than the hashing algorithms used by most other cryptocurrencies. Ampera’s mining software has been optimized to run on almost any GPU compatible with OpenCL 1.0 and above, including integrated graphics cards.

These numbers were generated with the following formula:

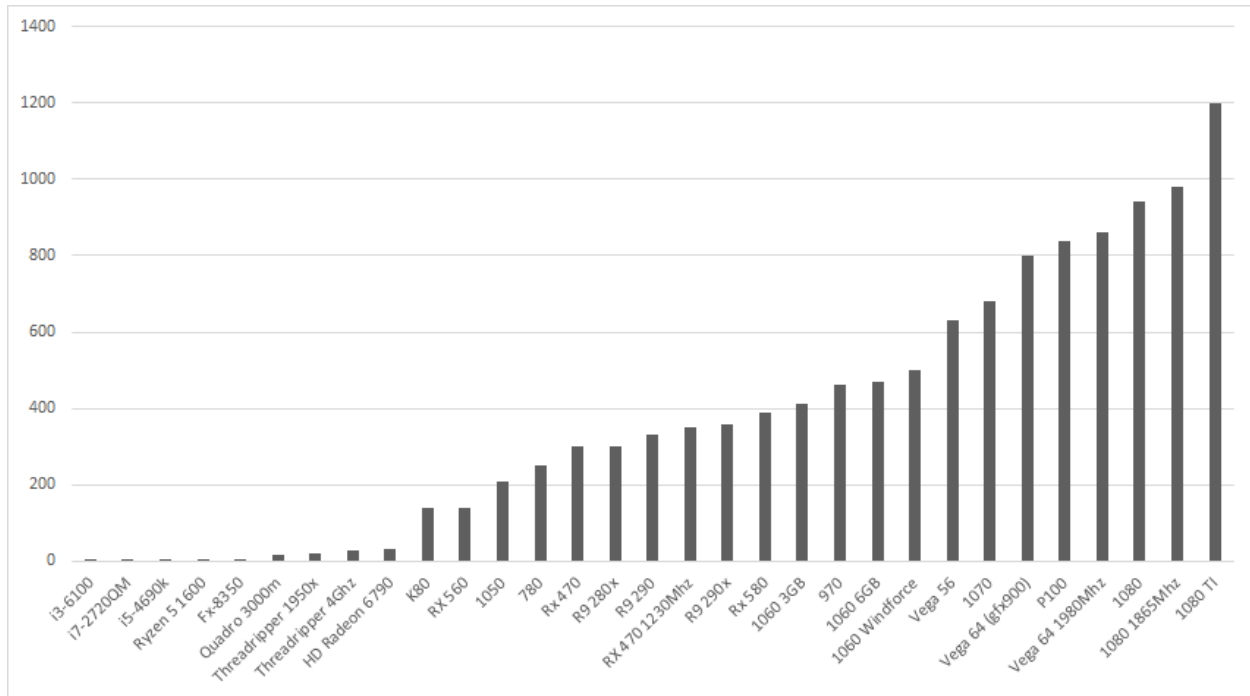
BouncyCastle:

$$\text{Total-Input-Data/second} = \text{Hash/second} * \text{Size-Of-Input}$$

$$\text{Total-Input-Data/second} = (\text{Hash/second} * (208 \text{ bytes} + (\text{Size-Of-Input} / (2^{32}-1))))$$

Where Size-Of-Input is between 2000-4000 bytes and (for the 1080 TI) Hash/second is 1,300,000,000. This major optimization was achieved by breaking the hashing algorithm into two distinct parts, where the “absorb” function of the sponge algorithm is completed once, then the sponge data is reused (200 bytes) with a modifier of 8 bytes in the “squeeze” function to create the desired hash, resulting in the 208 byte constant.

The algorithm has been optimized to the point of surpassing the de-facto standard in SHA-3 hashing speeds, a program called “Hashcat”. In tests, every card was able to surpass its hash rate on hashcat by ~10%. The following is a graph of approximate hash rates on cards and CPUs tested from different vendors and series:





## 1.6 Ampera Advantages

- Block time of 5 minutes for faster transaction verification.
- 8x the block transaction capacity than Bitcoin, which, paired with half the block time gives 16x total transaction capacity.
- Smaller transaction binary sizes for faster transfer and verification.
- Built in Decentralized Exchange
- Longer lifespan for block rewards
- Integrated miner, mining pool, and wallet software. Easily expanded to any platform that will run java, and ability to mine on any platform that supports OpenCL.
- Roughly every 4 years Bitcoin experiences what's called a "halving event" where the block reward halves. The last one was in July of 2016, and the reward went from 25 bitcoins per block to 12.5. The next one is in 2020 and the reward will drop to 6.25 bitcoins per block. Ampera works by decreasing the reward at a linear rate with each new block from a starting rate of 100 Ampera coins per block. The rate is such that by roughly January 1<sup>st</sup> 2150, the block reward will be zero (0) and miners will be paid entirely by transaction fees.
- A built-in IDE for writing P2SH scripts. It will use our own custom scripting language, ASE Utility Language, for which a compiler has already been made. The language is statically typed, so many errors will be caught at compile time, which will reduce the incident of improperly designed utility scripts. Static analysis tools will report errors to users so users can fix their utility scripts before committing funds to them.

### 1.6.1 Security Advantages

- Stronger cryptographic hash (SHA-3 512) as opposed to Bitcoin's SHA-2 256. SHA-3 is also quantum resistant.
- Stronger wallet keys (BrainpoolP 512) and (ED25519) can be used interchangeably. Brainpool keys have more security bits but are on a weaker EC algorithm than ED25519, but still stronger than BTCs. ED25519 is included in the hopes of future revisions of ED keys with more security bits, as well as providing higher algorithm security.
- Highly optimized miner algorithm for GPU and CPU mining means the most mining power is applied to the chain as possible, making an attack harder.
- Specialized P2SH system built specifically for advanced financial contracts
  - Allows for flexibility in transferring funds, asset backed tokens, and digital assets while reducing fraud and the possibility of scam programs.

These advantages give Ampera an overwhelming edge in a market flooded with sub-par cryptocurrencies, enabling it to compete even with Bitcoin. The software itself is in late public beta testing stages, with over 7000 downloads.

## 2.0 Ampera Tokens

Ampera will boast many different commodities, currencies, assets, and financial contracts all on one blockchain.

List of assets to be listed on the Ampera blockchain with the type of reserve backing is shown in the chart below. The goal of Ampera is to put commodities and other assets on the blockchain, for use as a store of value, speculation and commerce.

*Ampera Physical Backed Assets:* Ampera can run over 100 different assets simultaneously. Some of these are backed by futures contracts and others are backed by real world assets. In this case we have made assets that are deliverable or available for pickup.

Hedged Tokens		Fiat Currencies	
EKO	Physically Backed 1:1	USDX	Account Backed 1:1
QI	Crypto Backed 1:1	EURX	Account Backed 1:1
Crypto Backed Tokens		JPYX	Account Backed 1:1
Bitcoin	Crypto Backed 1:1	CNYX	Account Backed 1:1
Bitcoin Cash	Crypto Backed 1:1	GBPX	Account Backed 1:1
Litecoin	Crypto Backed 1:1	CADX	Account Backed 1:1
Dash	Crypto Backed 1:1	AUDX	Account Backed 1:1
Metals		Energy	
Gold	Physically Backed 1:1	Oil	Contract for Difference 1:1
Silver	Physically Backed 1:1	Natural Gas	Contract for Difference 1:1
Platinum	Physically Backed 1:1	Heating Oil	Contract for Difference 1:1
Palladium	Physically Backed 1:1	Softs	
Copper	Contract for Difference 1:1	Wheat	Contract for Difference 1:1
		Corn	Contract for Difference 1:1
		Soybeans	Contract for Difference 1:1
		Cocoa	Contract for Difference 1:1
		Sugar	Contract for Difference 1:1

## 2.1 Planned Assets

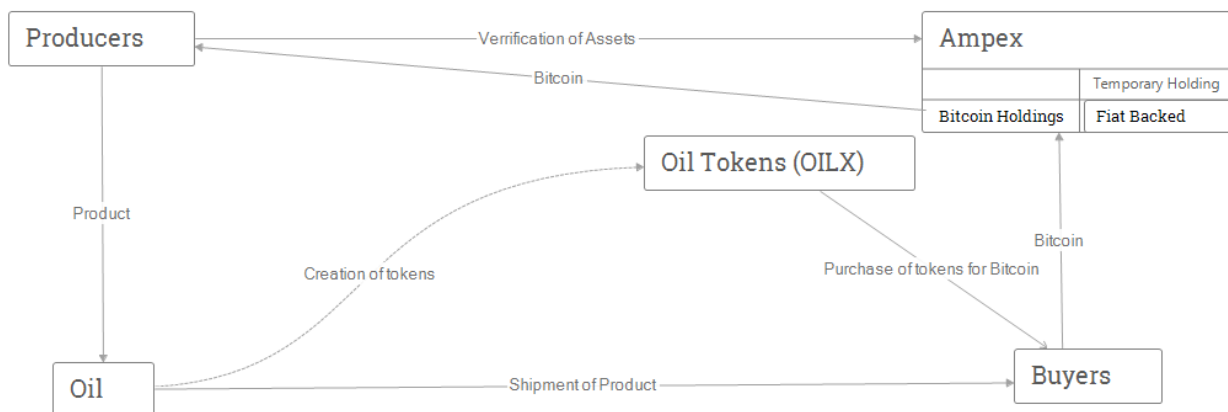
### 2.1.1 Oil Tokens

One oil token will be worth 1 barrel of crude oil and will be traded in the following pairs:

OilX / Bitcoin  
OilX / Gold  
OilX / Ampera  
OilX / USDB

Procedure:

- 1) Verification of assets.
- 2) Once the product has been verified the tokens will be listed on the Ampex Asset Exchange under the OTC section where they can be purchased.
- 3) The tokens can now be sold for one of the already mentioned assets.
- 4) After the sale, Ampex will convert the asset received (in this case Bitcoin) into a fiat backed token.
- 5) Shipment of product.
- 6) The fiat tokens are now converted back into Bitcoin and sent to the producers



### 2.1.2 Ampera Real Estate Backed Assets (Future Developments)

In addition to providing physically backed tokens we will also back tokens with mortgage notes.

The structure of our platform will be completely transparent to best position the platform against potential fiascos such as the financial crisis of 2008 in the United States that was caused in part by subprime lending and packaging of these bad loans into bonds that were rated ridiculously high for what was in them. We strive to offer stable products that are trustworthy. We will offer lower tier products such as our BB sets that are higher risk but greater payout, and they will be comprised of appropriate loans to fit the rating scale.

### 2.1.3 Token creation process

#### **Stage 1**

Identifying low risk mortgages to package into a mortgage pool. We look for the highest quality notes to package and this process is fully transparent, allowing each investor to review all details of each mortgage note that we package.

#### **Stage 2**

Once we have selected all the mortgages we categorize them based on past performance and credit rating into the following categories with the lowest risk lowest reward starting at AAA and going down to BB with a higher risk and higher yield.

All non-personal information will be available for each mortgage in each token pool, running on the Ampera blockchain.:

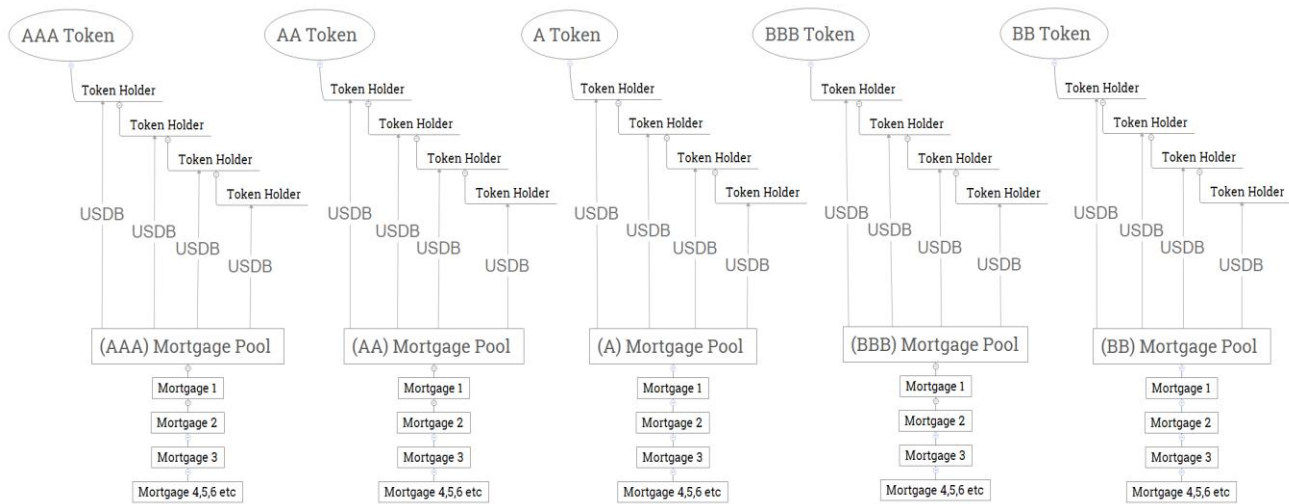
- AAA
- AA
- A
- BBB
- BB

#### **Stage 3**

After the token has been created it will be listed on the Ampex Derivatives Exchange for purchase by investors.

#### **Stage 4**

Payouts will be made through our USD backed token where the investor can choose to reinvest or trade funds for Bitcoin, Gold, etc.



## 2.2 EKO Global Hedge

Cryptocurrencies have completely changed the game, revolutionizing the industry showing the entire world that a new financial system can be created that is fair, open, and outside of the market manipulation.

Ampex has developed a solution to hedge against fiat currencies by using inflation against them. This hedge incorporates five major fiats: USD, EUR, GBP, GBP, and CNY to counter the volatility in the forex markets. On top of the fiats we use real world physical assets: Gold, Silver, and Palladium. These commodities offset the inflation from the fiats. The quantity percentage of each asset has been determined by our AI algorithm by feeding it market data from 1980. The result is a near perfect hedge from inflation, that we have named EKO Global Hedge. The performance of EKO is absolutely astonishing. For example:

\$100 USD in 2007 now has \$82.42 worth of purchasing power in 2017 or -17.52% loss in value. now looking at EKO, 100 EKO purchased at the same time in 2007 would have \$108.37 of purchasing power or an 8.37% increase in value. As can be seen from the performance of EKO it more than counters inflation and provides a return on capital.

### 2.2.1 EKO to Fiat:

EKO is always backed at a 1:1 ratio to our reserves so inflation of the currency from the backing will never occur. Investors can be assured that value of their assets is secure.

Since EKO is derived from 8 assets that Ampex holds in reserve. The price of EKO reflects the value of the combined assets. When an individual chooses to sell the EKO for fiat they have two options.

1) They may withdrawal EKO form Ampex, in this case we will sell the proportional amount of the reserves and credit the individual with our USD backed token.

2) The individual may also sell their EKO to another individual on the Ampex exchange who wishes to purchase it. The price they choose to sell or buy at is determined by the free market, although we do provide market data regarding the price that we purchase EKO for.

### 2.2.2 Implementation of EKO:

The goal of EKO is to transition and replace existing fiat currencies by offering a low volatility, impenetrable security, and fast transaction speeds. EKO is going to change the way we think of currency.

EKO can be easily sold for Bitcoin and other cryptocurrencies, as well as fiat backed token, making it perfect for investing, transactions and a low volatile store of value.

With our “Multi Token Wallets” all Ampera tokens including EKO will be held in the same wallet. By doing this, all Ampera wallets will support EKO as the platform expands EKO will have significantly larger market share.

### 2.2.3 Uses for EKO:

As a hedged counter inflationary currency EKO is making it easier for business to pay salaries at a fair rate to the USD without the burden of inflation.

As can be observed from the past performance of EKO it is an excellent way to store value with low volatility and complete transparency of the real-world assets that back it.

This currency is also a predictable way to transact, due to the fact that the all users have access to data providing value and price information. Since it is a diversity backed currency and can be sold with ease, it is an excellent solution.

## 2.3 User Interface

### 2.3.1 Beta Wallet GUI

The Beta Wallet GUI displays the following information:

- Wallet:** Ampera
- Chain Height:** 208
- Address:** 125010scZpeHNNFG+EbBWMo8ozjbcF6aHgQ18iDCyfrmeUtd4=XZCaU5Dj
- Balance:** 13,799.865166 Ampera
- Transactions:** 6

Address	Sender	Amount	Direction	Message
125010scZpeHNNFG+EbB...	125010scZpeHNNFG+EbB...	100.00000158	Sent	funding ADX Buy contract [125011sYnr4434y/nc53HLu...
125010scZpeHNNFG+EbB...	125010scZpeHNNFG+EbB...	100.00000161	Sent	funding ADX Sell contract [125011GqyutILLqMTzwnC...
125010scZpeHNNFG+EbB...	125010scZpeHNNFG+EbB...	100.00000161	Sent	funding ADX Sell contract [125011KthNSktexfNQ5TDV...
125010scZpeHNNFG+EbB...	125010scZpeHNNFG+EbB...	50.00000158	Sent	funding ADX Buy contract [125011GvWCOkN0qg9DBl6...
125010scZpeHNNFG+EbB...	125010scZpeHNNFG+EbB...	4.999	Received	ADX transaction [125010scZpeHNNFG+EbB...
125010scZpeHNNFG+EbB...	125010scZpeHNNFG+EbB...	4.999	Received	ADX transaction [125010scZpeHNNFG+EbB...

### 2.3.1 The ADX GUI

The ADX GUI displays the following information:

- Market:** Market, Limit, Active Orders, Order History
- Market Data:** Open - 0.003, High - 0.004, Low - 0.003, Close - 0.004
- Order History:**

Amount	Price	Direction
ORA	0.003	Buy
BTC	0.001	Sell
ORA/BTC	0.001	Buy
0.004	0.004	Sell
- Recent Trades:**

Price	Amount	Direction
0.004	1	Buy
0.003	1	Sell
0.004	1	Buy
0.004	5	Buy
0.004	5	Buy
0.003	5	Sell
0.003	0.1	Sell
0.0035	10	Sell
0.004	50	Buy
0.005	50	Buy
- Market Chart:** A candlestick chart showing price movement over time. The current price is 0.004 BTC.
- Order Book:**

Total	Size	Price	Price	Size	Total
3.9	3.9	0.003	0.004	38	38
9,853.9	9,850	0.001			
9,856.9	3	0.001			

## 3.0 Ampex Core (“AXC”)

AXC is the primary location where liquidity enters and exits the platform.

### 3.1.1 Liquidity

Ampex Core is the main location where users will purchase the Ampera asset backed tokens like gold and silver. Ampex core also serves the Ampex asset exchange (“AAX”). When a user purchases tokens, they have the option to keep the funds in their account or transfer to the wallet to be traded on the ADX.

### 3.1.2 Deposits

AXC offers many ways to fund accounts from fiat ACH or Credit Card\*, to numerous cryptocurrencies. No matter the funding method capital can be exchanged to the desired asset with ease.

### 3.1.3 Commodities

Commodities will also be available for purchase through AXC these types of assets will need to be purchased by USD to increase the speed of the transaction as well as protect against volatility upon sending the transaction. If a user does not have USD available they will be able to purchase these assets from AAX or ADX.

## 3.2 Process example

An individual wishes to purchase 1 gold token (1oz) on axcore.io

After account creation, KYC documentation and wallet address is required to be submitted to make a purchase/investment. KYC verification takes 24-48 hours, at that point the user chooses gold from the list of available assets to purchase. Payment can be made in many forms, such as: Credit Card\*, ACH transfer, Bitcoin, or Bitcoin cash. Once the payment has been cleared we purchase 1oz of gold and send the token to the specified address.

AXC is the heart of the Ampex economy, acting as the mediator of supply and demand in the ecosystem.

Ampera is required for all transactions, to be used as the transaction fee. Due to these users who don't already own Ampera will be required to purchase some. The price at which they purchase and the market price will be different, this spread in price is used to cover KYC expenses during account creation.



Token availability rollout:

1. June, 23 Bitcoin
2. June, 24 Bitcoin Cash, Litecoin, Dash
3. July, 1 USD
4. July, 15 EUR, GBP
5. August, 1 CAD, AUD, JPY, CNY,
6. August, 15 Gold, Silver
7. August, 20 Platinum, Palladium
8. August 23 EKO Global Hedge
9. September, 1 Copper, Natural Gas, Heating Oil, Oil, Sugar, Wheat

## 4.0 Ampex Decentralized Exchange (“ADX”)

### 4.1 The ADX

Ampex Decentralized Exchange (“ADX”) is a decentralized exchange that will run on the Ampera blockchain. The system is powered by Ampera’s custom P2SH system, which was designed with the features of BTC and ETH in mind, but made from scratch and built from the ground up. The P2SH system runs on the Ampex Script Engine, and the operation set defined for it was carefully designed to prevent some of the fraud and scams built on the ETH platform from being able to be built on the Ampera platform. It does, however, expand on the abilities of Bitcoin’s P2SH system, and allows for far more advanced utility contracts for flexible transfer of assets. The ADX is built of sets of utility contracts designed for specific types of trading, and allows for advanced contracts such as futures and swaps to be built for it as well. Since the ADX runs on-chain, it is protected by the same security, and defrauding the system would require the same tremendous amounts of computing power needed to defraud the blockchain.

### 4.2 ADX Technical Overview

The ADX is run on a scripting system capable of semi-arbitrary code, that has been strictly limited to financial contracts in order to avoid abuse. The limitations introduced into the software prevent use of math functions and loops, making creation of another coin (not Ampera related, like coins on the ETH network) impossible. The system is also incredibly simple, designed around a reverse stack which opcodes interact with to handle input and generate output. The opcodes are designed as needed, and more can be added easily. Default mode of operation is 8-bit machine words, with a 16-bit extension mode available which allows for “variant” opcodes, mainly useful for hardcoding data to load at runtime, without having to store it in constant or writable memory and push it to the stack.

Current research has shown the system to be far faster than other components of block verification, meaning the addition of the exchange will cause at maximum 9.8% more time to be spent on verifying a block with the current cryptographic systems. With addition of newer, faster key systems (a possibility being considered for increasing block transaction capacity) the exchange scripts will make up at maximum 41% of verification time before

script and binary optimization. It should be noted this time only takes into account the time spent on local verification, and does not include any network block sync times.

This system was developed from scratch but taking cues from Bitcoin's P2SH protocol. This means, anyone can write financial contracts and commit them to the chain for others to interact with. It also allows for multi-sig wallets (currently support exists for around 30 keys). If one wanted to create a script to manage transfer of tokens, they could write the script (IDE planned for Ampere program), write the transaction description in a custom description language (for interaction with the UI and easy recognition of the contract) and create an address from the binary of the program they wrote. It is not necessary to run or meet the requirements of the contract when funding the address. Users must meet the contract's requirements when spending from it, and the contract will be run during verification. This means a user can make an address with funds that can be spent by anyone if they meet certain requirements. For example, a contract might require sufficient funds of a desired token to be given in exchange for the tokens a user is spending from the address. There are complex opcodes provided to meet as many needs as possible for creating advanced financial contracts on the platform.

#### 4.3 ADX Concept

Running a centralized exchange is expensive, cumbersome, and highly regulated in the U.S. which has caused many setbacks for the creation of the Ampex exchange ("AAX"). Although the exchange will still be made, it will be launched in other countries before it will be launched in the US, due to increasing financial costs to meet regulations. ADX solves all of these problems by running decentralized on the Ampere network. Ampex will still meet or exceed regulatory requirements for selling asset backed tokens, which is a far easier task than doing so for an entire centralized exchange.

#### 4.4 ADX Competitive Advantages

- Ampex controls ingress and egress to/from ADX by running AXCore, which buys and sells asset backed tokens, and is the housing system for backing assets. AXCore fees are how ADX is monetized.
- ADX runs on the blockchain and uses P2SH scripts to verify makes and takes before committing them to the blockchain.
- Under the current regulatory environment, being a decentralized exchange means it is likely ADX can be used in the US without falling foul to restrictive SEC regulations.
- ADX only costs Ampex as much to run as running an Ampere relay, which Ampex was going to do anyway to support the blockchain. Effectively ADX costs nothing once it's developed and deployed.

## 4.5 Ampex Decentralized Market (“ADM”)

### 4.5.1 ADM Concept

The ADM is the Ampex Decentralized Marketplace. It provides a way to run financial contracts to trade both digital and physical assets and services. The first rollout will be focused around digital assets that are easily verifiable on the blockchain, with subsequent roll outs for physical goods and services trading added later on. The basis for all the transactions will be similar to the ADX, running financial contracts on the ASE system.

### 4.3 Tech Overview

ASE provides a scripting system where contracts can be written of semi-arbitrary complexity. These contracts can allow for any token inputs/outputs with signature verifications and verifications of assets/funds etc. Any user is able to write these contracts, but many default contracts will be provided with the ADM for simple transfer of assets and services. The ability to have mediators or other third-party inclusion is available as well, to protect both buyers and sellers of the ADM.

## 5.0 Ampex Asset Exchange (“AAX”) – FUTURE DEVELOPMENTS

### Ampex Asset Exchange Overview

The Ampex asset exchange offers commodities, forex, and cryptocurrencies all in one market place. All assets will be securely handled by the Ampex Network and Token. The primary way to access the exchange will be through its website. The platform uses secure distributed systems to ensure fault tolerance and scalability.

### 5.1 Platform

Ampex offers many different options for investing, trading, and commerce.

#### 5.1.1 Investing

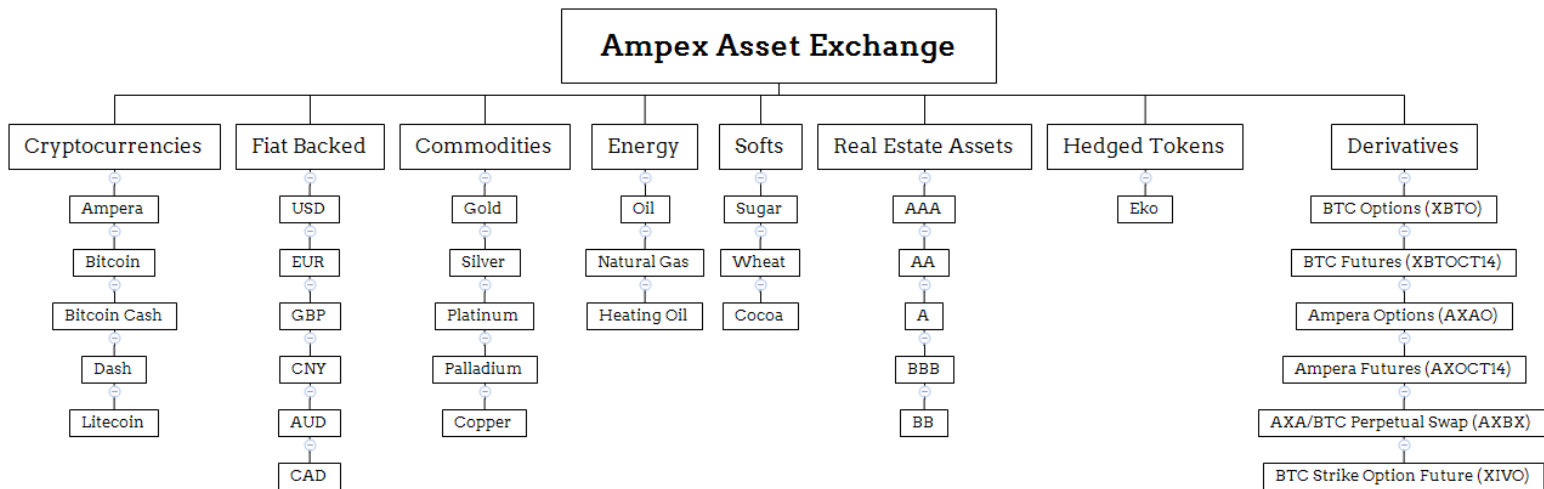
Many Investing products will be offered on the exchange backed by their respective tokens. Using EKO as an example: when acquiring EKO, the investment is hedged using several fiat and commodities to counteract inflation.

### 5.1.2 Trading

Every token available on the Ampera blockchain will be tradeable on the platform. Wallets will be provided for other cryptocurrencies like BTC such that deposits and withdrawals are possible. Only one address is needed for Ampera tokens facilitating their transfer. Any registered user will be able to day trade any token without a minimum limit of balance.

### 5.1.3 Commerce

Since 2001 the minimum requirements for a day trading account are an initial balance of \$25,000, as well as maintaining a balance of \$15,000. For many individuals, insufficient capital prevents them from participating in global markets. Ampex removes restrictions by allowing anyone, anywhere to trade these assets through tokens that are backed by open positions in our trading account.



## 5.2 Infrastructure

### 5.2.1 Cloud Infrastructure

Using a cloud infrastructure, the platform can scale very well to meet a dynamic load of users without having prolonged downtime while the hardware is upgraded.

### 5.2.2 Microservices

Using distributed microservices enables the exchange platform to be fault tolerant and scale dynamically without any major downtime as the platform increases its feature set.

## 5.3 Development

### 5.3.1 Trading Engine Alpha

We have completed various stages of stress testing on the trading and matching engine.

#### *Test 1: Raspberry Pi*

For this test, we wanted to see how well the engine would perform running on very underpowered infrastructure. The Ampex Engine was able to handle 9000 matched trades per second for a single pair on the Raspberry Pi 2.

#### *Test 2: Dual Core Computer*

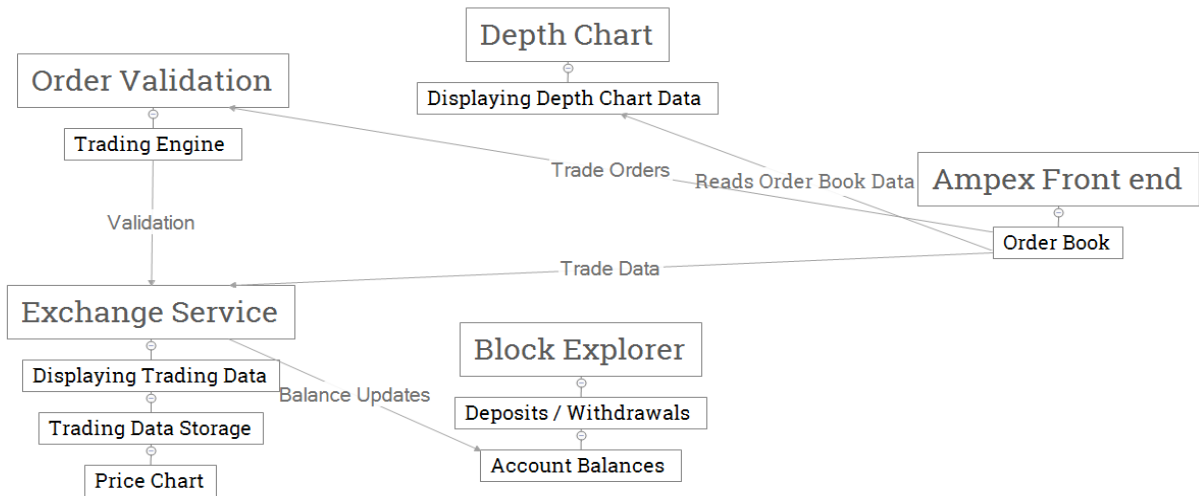
This test was conducted to see how the engine would compare to the Raspberry Pi in performance and reliability. In this case, Ampex was efficiently running over 200,000 trades per second.

#### **Conclusion**

From the figures, we have presented the confidence in the engine is very high. The exchange can easily handle periods of extreme volatility. For example, during the Winklevoss ETF crash markets across the world were struggling to remain online with 10,000 BTC being sold at once, resulting in many exchanges halting trading, as well as preventing clients from profiting or minimizing loss.

### 5.3.2 Microservices

- Ampex Front end will communicate with read-only services to relay relevant trade and market data.
- Ampex Front end will use a well-defined API to send data to the backend services.
- API requests are validated and then routed to available workers.
- The trading engine outputs trade and market data to Exchange services.
- Order validation workers process and validate all data before being sent to the trading engine.
- Internal Block Explorer API is used to validate all Ampera Token transactions.
- Every event is logged to be auditable



### 5.3.3 Database

Using a NoSQL database enables the exchange to scale very well while maintaining consistency and network distribution.

## 5.4 Security

### 5.4.1 Front End Website

- The front-end code is completely decoupled from the backend servers.
- Front end primarily relays data from the backend services and does not maintain state for any user.

### 5.4.2 Backend Servers

- Strict network policies that allow communication only through well-defined interfaces.
- Encrypted drives ensure that even at the physical location data is safe.

### 5.4.3 Wallets

- Cold storage Multi-sig is also available to all our clients creating a nearly impossible environment for an attacker to steal funds.
- All cold storage keys are on an offline wallet with a multi signature system where both the exchange and the client need to sign to withdraw the funds

## 6.0 Business Model

### 6.1 Target market

- Our geographic target location is primarily Europe, Asia and North America. We plan the release the platform globally, although we feel this target is the most effective way to gain market exposure during the growth phase.
- Initial target demographic for early adoption is male and female users aged 25 to 40 with interests in financial services, technology, and investing. Then our goal is to make cryptocurrency safe, transparent and commonplace in every home, globally.
- Psychographic target is investors is in the expansion, development and deployment of a truly free market economy. Combined with the trading freedom that this platform provides. This creates an environment to grow new ideas collaborate to design and grow a new world changing economy.

### 6.2 One Year Goals

3 Months – Ampex asset exchange moves into beta testing

4 Months – Ampex goes live with BTC/AXA, ETH/AXA, BTC /ETH, BTC/USDB

6 Months – New currency pairs EURB, GBP, JPYB, CNYB, Gold, Silver, Platinum, Palladium

7 Months – EKO Global Hedge goes live

8 Months – New commodities are added to Ampex

9 Months – Beta testing of physically backed oil tokens

12 Months – Reaching a 100-million-dollar market capitalization.

### 6.3 Fee Structure

- Deposit: No Fee
- Withdrawal: Standard Network Fee
- Trading Bitcoin/Altcoin: 0.25% for takers, 0% makers
- Trading Commodities: 0.5% for takers, 0% makers
- Trading Forex: 0.3% for takers, 0% makers

### 6.4 Ampex Competitive Advantages

- First exchange to offer forex, commodity, and cryptocurrency high frequency trading.
- No minimum deposit to trade commodities.
- Ability to keep funds free from inflation and major cryptocurrency volatility.
- Asset pairs between commodities and cryptocurrencies i.e. Bitcoin/Gold.
- Multiple fiat backed tokens for users to trade in any currency they wish.
- Commodity speculation during exit hours.
- Futures and swap contracts with up to 100x leverage on cryptocurrencies, commodities and forex.
- In addition to providing our clients with a global hedge; EKO we offer a solution for clients to create their own hedge by using Ampex tokens.

#### 6.4.1 Ampere/EKO Competitive Advantages

- Diversification across five fiat currencies and three precious metals
- Mineable version of currency Inflation protection
- Reduced volatility
- Currency integrated within exchange
- All in one platform
- Asset Backed Currency



## Glossary of Terms

- An *Amp* is the singular version of a unit of money in Ampera. The plural is *Amps*.
- *Ticker* Is usually 3-5 characters this is the symbol used on exchanges to represent the asset. Ampera's ticker is AXA
- A *Wallet* is an abstract term used to describe a key pair used to write transactions. Only the owner of a private key for a wallet can make transactions for that wallet, and anyone with the public key for that wallet can verify transactions from that wallet. For this reason, it is of the utmost importance to keep the private key *private*.
- A *Node* refers to any user on the network's program. Multiple nodes can be run from the same network, or even the same machine. An important fact to remember is that all relays are nodes but not all nodes are relays.
- A *Block* is a data store that includes a solver, block data, block id, and a timestamp. The solver is a public key to the wallet of the node that solved the block and that the block payout will be made to. The block data is arbitrary data, and has no set size, it is the "guess" to solve the block. The block id is a concatenation of the hash of the block data and the timestamp, and is used only for identification purposes during the verification process. The timestamp is the UNIX time that the block was generated at.
- *Block Time* is the amount of time that is taken to solve a block on the network.
- A *Derivative* refers to a contract between two or more parties whose value is based on an agreed-upon underlying financial asset. i.e. cryptocurrencies, commodities, fiats and other financial assets.
- A *Synthetic Derivative* is a new financial instrument designed by Ampex, this instrument is a contract where the value is agreed upon by the price derived from 1 or more derivatives.
- *ETF or Exchange Traded Fund* is a security that tracks the moment of multiple financial instruments. i.e. cryptocurrencies.
- An *Option* is a contract that gives the owner the right, but not the obligation, to buy or sell an underlying asset or instrument at a specified strike price on a specified date.
- *Futures* are a contract to buy or sell a commodity or financial instrument at a predetermined price at a specified time in the future.
- A *Swap* is contract where 2 parties exchange financial instruments. In this case the swap is a CFD or contract for difference that is leveraged and derived from the underlying asset, being a cryptocurrency.

- *Scripting* the Ampex Scripting Engine (ASE) is a library that allows users to define custom instruction sets, generate virtual machines on demand, and run custom code at run time. It can be used by itself or it can be paired with custom compilers that target specific instruction sets.
- *IDE* Integrated Development Environment this allows users to build custom scripts, programs, and financial contracts on the Ampera blockchain.
- *Mining* is the process of maintaining and updating the blockchain, its ledger. Miners receive lists of pending transactions and use them to create new entries for the ledger, called blocks. Blocks can only be accepted onto the blockchain if they have sensible transactions and a proof that is difficult to spoof. When miners mine they are attempting to create proofs for their blocks. When a block is accepted onto the blockchain the miner who proofed the block is given a monetary reward of Ampera to incentivize mining.
- *OpenCL* stands for Open Computing Library

This whitepaper is an outline of our current and future developments, and is subject to change, as development continues.

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