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The Proof-of-Origin Based Cryptographic Location Network



# **BLOCKCHAIN JUST ENTERED THE REAL WORLD**

With the XYO Network, developers gain the power to interact with the real world as if it were an API

# THE FIRST CRYPTO-LOCATION NETWORK BUILT FOR THE WORLD OF TOMORROW

Today, smart contracts are increasingly being used to execute contracts automatically, transparently and trustlessly. This, in effect, means lawyers, middlemen and escrow are unnecessary and may someday become obsolete. However, smart contracts have one key limitation: they rely in most cases on centralized data sources for data input.

Additionally, there is often a limited offline application for them. The XYO Network makes it possible for smart contracts to access the real world by using XYO Network's ecosystem of devices to determine if an object is at a specific XY-coordinate. With this power, applications can be developed which execute transactions in the smart contract upon location confirmation.



# THE XYO NETWORK



Current blockchain technology leverages its own powerful properties, such as time-stamping and decentralization, and combines them with devices that are hard to trick. The weakness of smart contracts centers around oracles that use a single source of truth (and thus have a single source of failure), and crypto-location systems face the same problem. The vulnerability in current crypto-location technologies revolves around the devices that report back an object's location. In smart contracts, this data source is an oracle.

WE PROPOSE that the most important advancement necessary for bridging the present to the future rests on the world's ability to trust machines. This trust is best achieved through innovations in blockchain technology, and must be made available through the creation of a crypto-location oracle network that is resistant to attack and achieves unprecedented accuracy and certainty within the given restraints of the system.



# **KEY FEATURES**

# OF THE XYO NETWORK



TRUSTLESS

**IDENTITYLESS** 

Verification does not involve any large, fee based corporations or institutions. The XYO Network runs on a completely transparent and autonomous system. It is free to use (open source) and has no entrance barriers (fair competition). Power and trust is shared between the XYO Network's participants rather than concentrated in a single, fee-taking individual or entity. The XYO Networks blockchain technology eliminates the need for trust by making all transactions transparent, decentralized, and secure. Location data is stored anonymously, protecting the privacy and safety of all XYO Network users. This is achieved by combining a zero-knowledge proof with a cryptographic method we call Proof of Origin.



#### WHAT IF BLOCKCHAIN TECHNOLOGY COULD BE BRIDGED TO THE REAL WORLD?

#### SINCE THE ADVENT OF ETHEREUM,

the cryptoassets community has experienced rapid-growth in the form of **DApp development** and protocol improvements. However, up until this point, every platform (including **Bitcoin** and **Ethereum**) has focused almost entirely on **digital** channels (the online world), instead of **real world** channels (the offline world).



**PROGRESS** has begun in the physical realm with the introduction of offline-focused cryptographic platforms that concentrate on specific use cases, such as the intersection of blockchain and the Internet of Things (IoT). In addition, there are efforts being made to develop protocols that concentrate on the intersection of location and blockchain, which are being labeled **Proof of Location**. These platforms and protocols are useful components that serve as a spoke in the wheel of the XYO Network.



HOWEVER, we still find the majority of blockchain technologies confined primarily to the narrow scope of the Internet. Since its founding in 2012, XY Findables, the company behind the XYO Network, has been building a location network in order to make the physical world programmable and accessible to developers. In brief, XY has been working towards the concept of enabling developers (such as those writing Ethereum smart contracts) with the power to interact with the real world as if it were an API.



## HOW DO WE DO IT?

Traditional trustless systems rely on a private key for signing transactions or contracts in a system. This works very well with the assumption that the node on the network that signs the data in question is physically and virtually secure. However, if the private key is compromised, then the ability to prove origin falters.







## **INTRODUCING: PROOF OF ORIGIN**

PROOF OF ORIGIN is the key to verifying that ledgers flowing into the XYO Network are valid and relies on the concept of a Bound Witness. A unique ID for source of data is not practical since it can be forged. Private key signing is not practical since most parts of the XYO Network are difficult or impossible to physically secure, thus the potential for a bad actor to steal a private key is too feasible. To solve this, the XYO Network uses Transient Key Chaining. The benefit of this is that it is impossible to falsify the chain of origin for data. We determine the certainty that an oracle witness node in a trustless system gathered the data that it is sharing by calculating an Origin Chain Score:

$$Score = \prod_{i=0}^{i=n} \frac{PcL * PcD}{Pc'Pc''O}$$



### **INTRODUCING: BOUND WITNESS**

BOUND WITNESS is a concept which allows Origin Chains to be built for use in determining Proof of Origin. It is achieved by the existence of a bidirectional heuristic. Given that an untrusted source of data used to resolve a digital contract (an oracle) is not useful, we can substantially increase the certainty of the data provided by first establishing the existence of a bidirectional proof of location. The primary bidirectional location heuristic is proximity, since both parties can validate the occurrence and range of an interaction by cosigning the interaction. This allows for a zero-knowledge proof that the two nodes were in proximity of each other. All nodes (Sentinels, Bridges, Archivists, and Diviners) are considered "witnesses."



# THE XYO NETWORK COMPONENTS

The XYO Network is made up of four sets of distinct components that are designed with efficiency and scalability in mind. In some cases, a device can serve more than one role.

Each XYO Network device is provided a cryptoeconomic incentive when the data it provides is utilized.







### SENTINELS

are location witnesses. They observe data heuristics and vouch for the certainty and accuracy of the heuristic by producing temporal ledgers. The most important aspect of a Sentinel is that it produces ledgers that Bridges, Archivists, and Diviners can be certain came from the same source. They do this by adding Proof of Origin to a relay chain of cryptographic proofs.





### BRIDGES

are location data transcribers. They securely relay heuristic ledgers from Sentinels to Archivists. The most important aspect of a Bridge is that an Archivist can be sure that the heuristic ledgers that are received from a Bridge have not been altered in any way. The second most important aspect of a Bridge is that they add an additional Proof of Origin.



#### DIVINERS

answer a given question by analyzing historical data that has been stored by the Archivists. Heuristics stored in the XYO Network must have a high level of Proof of Origin in order to measure the validity and accuracy of the heuristic by judging the witness based on its Proof of Origin. Given that the XYO Network is a trustless system, Diviners must be incentivized to provide honest analysis of heuristics. Unlike Sentinels and Bridges, Diviners use Proof of Work to add answers to the blockchain.



### ARCHIVISTS

store location information from Bridges in a decentralized form in order to make data available to Diviners. Archivists also index ledgers so that they can return a string of ledger data if needed. Each time data is handed off from one Archivist to another, additional Proof of Origin is appended in order to track payment, since all Archivists get paid. Archivists store raw data only and get paid only for retrieval of the data.

# THE XYO NETWORK PROVIDES INFINITE SOLUTIONS

FROM STRAIGHTFORWARD TO COMPLEX, the XYO Network's usage has vast applications that span a multitude of industries. For example, take an eCommerce company that could offer its premium customers payment-upon-delivery services. To be able to offer this service, the eCommerce company would leverage the XYO Network and XY Platform (which uses XYO Tokens) to write a smart contract (i.e. on Ethereum's platform). The XYO Network could then track the location of the package being sent to the consumer along every single step of fulfillment; from the warehouse shelf to the the shipping courier, all the way into the consumer's house and every location in between. This could enable eCommerce retailers and websites to verify, in a trustless way, that the package not only appeared on the customer's doorstep, but also safely inside their home. Once the package is confirmed to be in the customer's home (defined and verified by a specific XY-Coordinate), the shipment is considered complete and the payment to the vendor gets released. The eCommerce integration of the XYO Network thusly enables the ability to protect the merchant from fraud as well as ensure consumers only pay for goods that arrive in their home.





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# CRYPTOECONOMICS: THE CURRENT PROBLEM

THERE IS AN ELEPHANT IN THE ROOM when it comes to modern cryptoeconomics: many coins have become more useless than the assets they were seeking to displace (fiat currencies). Most cryptocurrencies today focus almost exclusively on incentivized systems that reward miners; they do not focus on building incentives for token users. Over time, this imbalance creates an undesirable ecosystem for every participant involved (miners, token holders and tertiary entities who build upon its platform).

In any healthy economic token system, there is a balanced ratio of liquidity. In the case of Bitcoin and even Ethereum, a very small minority of mining pools controls the majority of the ecosystem. This creates a problem each token system aims to solve: centralization.

The XYO Network believes that the value of a token should remain in direct proportion to its utility, which to some degree relies on the number of transactions it participates in.



# CRYPTOECONOMICS: OUR SOLUTION

**IN AN XYO CRYPTO-LOCATION MINING POOL** there are XYO Miners (e.g Sentinels, Bridges, Archivists, Diviners) who take part in answering queries to the XYO Network. In this pool, if a majority of XYO Miners are of low quality, the entire pool of XYO Miners can vote to set the location-verification bar low.

However, as soon as more competitive machines are introduced to the pool, the system votes to increase its ideal-state for the system.

Thus, instead of relying on the computing technology of a few centralized mining pools with access to the most powerful resources, the progression of the XYO mining system stays in direct proportion to the advancements in computing technology of the world. This is one of the many ways the XYO Network addresses implementation shortcomings and proposes solutions that recalibrates cryptoeconomic dynamics and revolutionizes blockchain cryptocurrency technology.

# **CRYPTOECONOMICS: HOW WE FIX IT**

**WE USE XYO TOKENS TO INCENTIVIZE** the desired behavior of providing accurate, reliable location heuristics. XYO Tokens can be thought of as "gas" needed to interface with the real world in order to verify the XY-coordinate of a specified object.

The process works like this: A token holder first queries the XYO Network with a query (e.g. "Where is my eCommerce order package with XYO Address 0x123456789..."). The query then gets sent into a queue, where it waits to be processed and answered. A user can set their desired confidence level and XYO gas price at query creation.

The cost of a query (in XYO Tokens) is determined by the amount of data required to provide an answer to the query as well as market dynamics. The more data needed, the more expensive the query and higher the XYO gas price. Queries to the XYO Network have the potential to be very large and expensive. For instance, a trucking and logistics company could query the XYO Network to ask, "What is the location of every single car in our fleet?"





**ONCE THE XYO TOKEN HOLDER** queries the XYO Network and pays the requested gas, all Diviners working on the task call out to the relevant Archivists to retrieve the pertinent data needed to answer the query. The data returned is derived from the Bridges, who originally gathered the data from the Sentinels.

If the data provided by a Sentinel device (such as a Bluetooth Beacon) is used to answer a query, then all four components involved in the transaction receive a portion of the XYO gas paid by the token holder: the Diviner (who searched for the answer), the Archiver (who stored the data), the Bridge (who transmitted the data) and the Sentinel (who recorded the location data). The distribution of the gas between 3 of the 4 components of the XYO Network is always given in the same proportion. The exception is that of Diviners, whose involvement in the process of providing an answer is more extensive. Within each component, gas gets distributed evenly.



### WHO WE ARE

**THE XYO TEAM** is comprised of seasoned engineers, business development professionals and marketing experts located in downtown San Diego, California. Arie Trouw solely founded XY Findables in 2012. Scott Scheper and Markus Levin joined as co-founders of the blockchain initiative in 2017 to assist in building the XY Oracle Network.

The XYO Network will be built upon an existing infrastructure of 1,000,000 devices that have been distributed throughout the world via our consumer-facing business, XY Findables. XY's Bluetooth and GPS devices allow everyday consumers to place physical tracking beacons on the things they want to keep track of (such as keys, luggage, bikes and even pets). If they misplace or lose such items, they can see exactly where they are by viewing their location on a smartphone application. In just six years, XY has created one of the largest consumer Bluetooth and GPS networks in the world.

# **XYO ROADMAP**

XY has been building towards an open world of location-verification since 2012 by launching a successful Bluetooth-GPS consumer business critical to understanding and building a real-world location network. Today, XY has over 800,000 beacons across the world.



### 2017

#### XY Releases Ground-breaking GPS Tracking Device: The "XYGPS":

XY launches the world's first hybrid GPS and Bluetooth technology enabling the XYGPS to report location anywhere in the world where Cellular and GPS data is available.

#### XY Releases The XY4+ Device:

XY releases the XY4+ device which makes it capable of operating as an XYO Network node via firmware update.

#### XY Releases Crosses the 1,000,000 Beacon Mark:

The one-millionth XY device is born.

#### XY's Blockchain-Based Oracle Network Is Born:

Development of moving the internal XY location network platform to an open blockchain implementation begins; the XY Oracle Network is born.

### **2018** Q1 & Q2

#### XY Mints The First "XYO Token" to Be Used For Smart Contracts to Access the XY Oracle Network:

The first XYO Token is created and represents the official currency to be used throughout the entire XYO Network.

#### XY to Complete XYO on Test Network ("XY TestNet"):

XY will complete the development of the XY Oracle Testnet and begin rolling out its location-focused blockchain protocol to its Sentinel devices.

# XYO ROADMAP

### 2018 Q3 & Q4

#### XY to Launch XY Oracle Main Network ("XY MainNet"):

The first XYO Token is created and represents the official currency to be used throughout the entire XYO Network.

#### XY to Complete API for Smart Contract Developers to Interact with the XY Oracle Network:

Release of the XYO Network API that enables smart contract developers to write contracts to interact with XY's network; libraries to be developed: Ethereum Solidity library, Ethereum Viper library and JavaScript library for websites to interact with XY's Oracle Network (similar to the Web3.js integration with MetaMask).

#### XY to Release XY Sticker-Based Beacon Trackers, Which Can be Added to eCommerce Packages:

Launch the "XY-Stick" product which enables eCommerce retailers to track every single one of their products in realtime.

#### 2019

### XY to Grow Global Network of Diversified Location Sentinel Devices:

Grow coverage of XY Sentinels (location data providers and verifiers) as well as other components of the XY Oracle Network (Bridges, Archivists, Diviners)

### XY to Launch SatoshiXY and VitalikXY LEO Satellite Sentinels:

Stakes will be sold in the XYO Network's Low Earth Orbit satellites; stakes represent ownership in the piece of the XYO Token rewards.

#### XY to Onboard Larger Businesses, Organizations and Retail Companies That Have Use-Cases for Location Verification:

Formalize business partnerships with enterprises and larger entities, which can benefit from a decentralized, trustless location oracle (e.g. logistics, supply chain, work hour tracking, eCommerce and countless other niches).

### 2020+

XY to Expand Global Reach of Entire XYO Network

