SignalPop AI Blockchain

DESIGN DOCUMENT

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Summary

The SignalPop AI Blockchain is an architecture that brokers AI work packages built from data sets created by data providers, to AI Miners and AI Mining Pools that leverage the vast amount of computing power currently used to mine cryptocurrencies such as Ethereum.

Sometime in 2018, the Ethereum group is anticipated to change from a Proof of Work algorithm to a Proof of State algorithm, which will make mining Ethereum obsolete and leave a vast amount of GPU computing power looking for work. We see this as an opportune time to offer a solution that allows these miners to continue reaping the benefits of mining with their CUDA based hardware. However, instead of mining a cryptocurrency transaction, they will be offered the opportunity to mine an AI transaction that consists of an AI work package seeking an answer using artificial intelligence.

Each AI work package contains an API location (e.g. a REST+JSON API url) used by the Miner to collect the data, the answer sought, the accuracy requirement, and the maximum amount of time to work on the problem (e.g. the gas limit). Once a solution is found for the problem that meets the accuracy requirement, the solution (trained weights) is posted back using the work package API. If accepted, a transaction is added to the block chain that compensates for the work performed. To verify each transaction, the server posts another work package with a testing request (of the solution) is posted back to a trusted mining pool (e.g. internal pool) and if the accuracy received back matches or beats that of the original training work package, the original Miner and Verification Miner are compensated for their work.

A third type of work package involves running a trained solution against a live data item. For the sake of speed and scalability, this work is run directly in the cloud by the user, and incur a nominal cloud transaction fee on each run, a portion of which is paid to the cloud vendor used.

Design

The ZAI system is designed to decentralize the process of completing AI work packages which are based on a universal data/model format that can be solved by either running a full node or working with a pool that runs a full node.
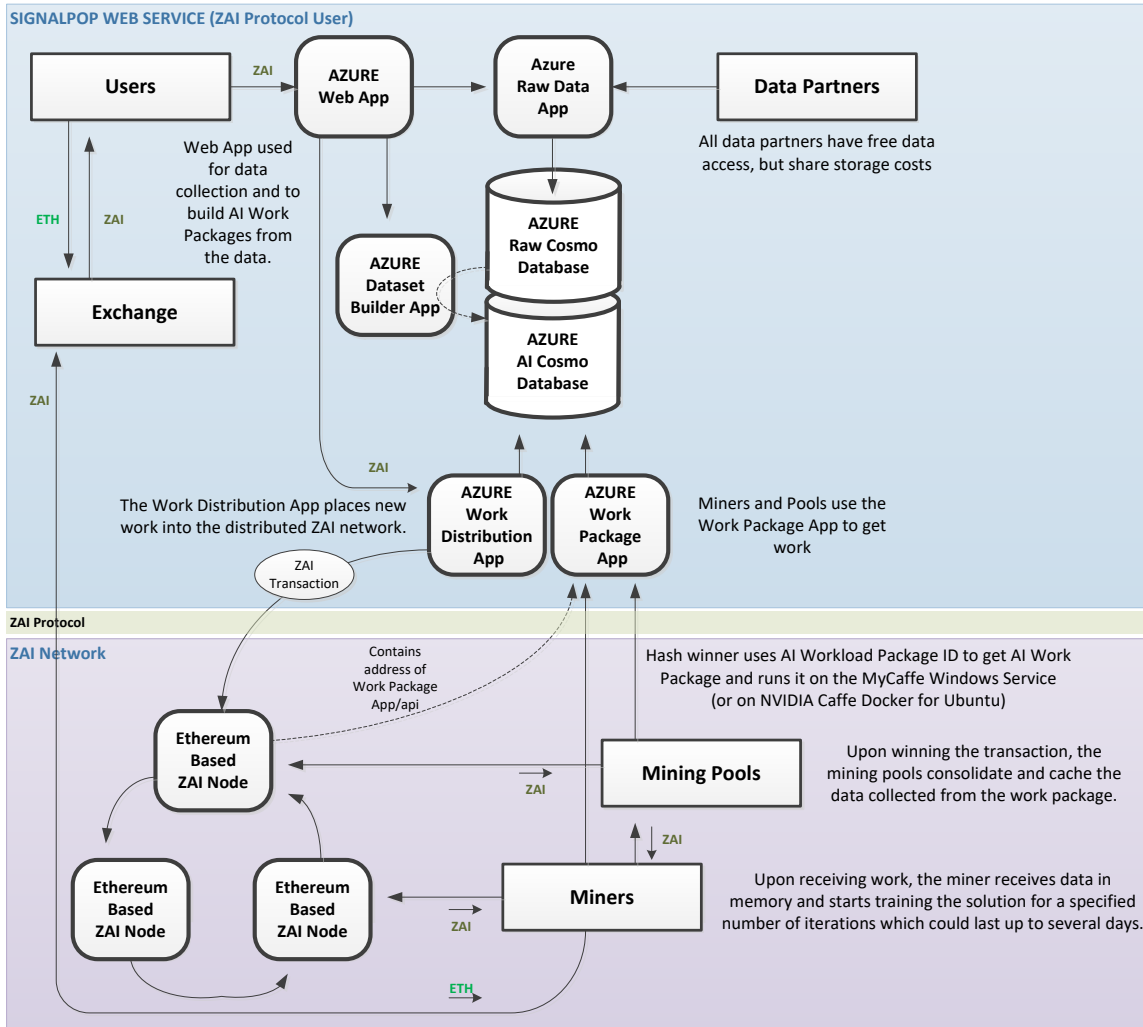

Figure 1 ZAI Ecosystem

The ZAI Ecosystem involves the ZAI Network of Ethereum based ZAI Nodes and the ZAI Protocol Users that use the network to solve GPU consuming AI problems.

All interactions with the ZAI network take place via the ZAI protocol which is made up of the ZAI transaction and a set of ZAI REST API calls used to get work and return results.

All Miners are paid in ZAI at the current exchange rate of ZAI/ETH whereby the conversion costs users less than the going rate to rent the same hardware in the Cloud.

EXAMPLE ZAI PROTOCOL USER

The SignalPop Analytics Web Service is an example ZAI Protocol user in that the service builds AI Work Packages to be solved which are then referenced in ZAI transactions for the Miners to pick-up and solve. This section describes the items that make up this example, however the only requirement to become a ZAI Protocol User is to just support the ZAI transactions and back-end ZAI REST API. With this support anyone can become a ZAI Protocol User and feed AI work into the ZAI network all of which further support the ZAI token used to purchase AI capacity. ZAI tokens are purchased with ETH tokens which are then passed along to miners performing the actual mining work.

Each of the items making up a Protocol User of the ZAI system have the following needs and roles.

Users – the ZAI system is designed to provide users with the lowest cost AI analytics across a wide range of uniform data sets. With this system, users can solve a wide range of problems that require artificial intelligence - from determining the most optimal Facebook audience, to discovering the most likely attributes to a given medical condition. To get started, the user first selects the data that they want to use, collect if not already collected, and then build and AI work package that finds the best AI model to solve the problem that they are seeking an answer to.

Data Partners – data partners are companies who have data to analyze that requires AI data analysis. However, data partners also have another more important need – cheap access to large amounts of data. By giving data providers full access to the raw data collected at the shared cost of storage in the cloud, data providers benefit from cheap access to very large community datasets.

Exchange – in order to accelerate the acceptance of the ZAI token, initially SignalPop will partner with a company to facilitate the ICO and act as an Exchange for the ZAI tokens and ETH. Initially we will mainly exchange our tokens in ETH for our target miners are mainly pre POS Ethereum miners and we would like to make their transition from ETH mining to ZAI mining as simple as possible so as to efficiently gain a larger Mining community.

Azure Apps

Users of the SignalPop Analytics system use Azure Service Fabric Apps to interact with the Web Analytics System. The following Azure Web Apps are used.

Azure Web App – each Web App is designed to solve a User's specific problem. For example, the Facebook Audience Analysis app provides the user with visualizations of their target audience, what they prefer and where they are. In addition, the app uses AI to determine the most important attributes of their audience and automatically builds populates their Facebook App with the best audience specification so that they can easily

and more effectively target their audience. Other Web App's are designed to solve other user problems, but each share the underlying raw database and AI Work Package builder that follows the ZAI protocol.

Azure Raw Data App – the raw data app is responsible for collecting data and storing it in the Azure Raw Data Cosmo database. Facebook data is collected using the Facebook Raw Data App. Each raw data app must support the underlying Attribute database schema of the Raw Database.

Azure Dataset Builder App – each AI work package comprises a dataset and a proposed initial AI model description. The Azure Dataset builder creates each dataset by collecting all required data from the raw database and using it to construct the uniformly formatted dataset that makes up an AI work package. All datasets are stored in the Azure AI Cosmo Database.

Azure Work Distribution App – the work distribution app is responsible for taking unsolved work packages from the Azure AI Cosmo Database and placing a request to solve them into a ZAI transaction which is then placed into the ZAI network by adding the transaction to a set of nodes. Using the Ethereum base network technology the transaction is the propagated to the block chain of all nodes in the network.

Azure AI Work Package App – the work package app fully supports the REST API portion of the ZAI protocol to fulfill work requests, receive results and verify the results. Each result received is verified by creating a new ZAI transaction requesting a test result. If the test result meets or exceeds the original result, the work is compensated for using ZAI tokens.

ZAI NETWORK

Up until now, we have been discussing an example of a ZAI Protocol User. Next we will discuss the ZAI Network that uses the ZAI Protocol itself to dole out AI work.

ZAI Protocol – the protocol defines the contents of each ZAI transaction payload (typically the gas limit + the AI Work Package url). In addition, the protocol defines the API implemented by each AI Work Package App to dole out work, receive results and verify the results. Only results verified by trusted Miners are then accepted and compensated for to ward of hacking attacks.

ZAI Transaction - the basis of passing work into the ZAI network is the ZAI Transaction. Each transaction is an Ethereum based smart contract that facilitates an amount of work (specified in gas) to be performed on an AI work package. Each transaction is placed in the ZAI block chain allowing operating nodes to pick-up and complete the work using the transaction payload which contains the url to the Work Package App that hands out the actual work package.

Ethereum Based ZAI Node – each node contains the Ethereum based block-chain of all ZAI transactions. Given that the ZAI transactions do not occur nearly as often as those in a standard Ethereum ETH based network, the current Proof-of-Work algorithm is preferred for this is a proven mechanism of facilitating transactions and executing smart contracts. The smart contract of the ZAI transaction is performed in such a way that it has a minimal impact on the Ethereum architecture thus allowing the use of the Ethereum Virtual Machine. The Ethereum Events are used to interact with the MyCaffe Service that runs in parallel on the same machine, awaiting AI work packages to run. Upon receiving a transaction, the Node first hashes the transaction to see if the node itself wins the opportunity to actually do the AI work. If so, upon a successful submit, the Node fires an Ethereum event which when caught by the MyCaffe Windows Service starts load the Work Package data into the MyCaffe In-memory database. Once a sufficient amount of data is loaded, the MyCaffe Service begins training on the suggested model description.

Miners – in the same way that miners are used to mine Ethereum, the ZAI miners are used to mine the ZAI token. However, with each token mined, the miner not only receives the rewarded ZAI tokens discovered, but also must complete the ZAI AI work package contained within the transaction payload in order to keep the tokens. The work performed to solve the AI work is also compensated with additional tokens. Miners may operate in a solo manner or with a pool. One advantage of working with a pool is that the pool may dole out multiple models to learn on the same data for pools often search for an optimal solution.

Mining Pool – each mining pool cashes a set of full work packages in memory giving each miner even faster access to the data. Miners then query each mining pool for data even in the situation where the Miner can only hold a portion of the data. The MyCaffe In-Memory database takes care of input balancing while the Miner trains on the MyCaffe In-Memory data. In addition to providing a fast memory cache of the data, the Mining Pool plays an important role in using AI to 'learn' the best model for a given solution. By sending the data to a set of Miners with slightly altered model descriptions, the pool performs a search for the best model used to solve the problem. Once found the solution is passed back to the Azure Work Package App for verification. All verified results are then compensated for with ZAI tokens.