DEEPCLOUD AI

NEXT GENERATION IN CLOUD COMPUTING

WHITEPAPER 2019

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ABSTRACT

DeepCloudAI is building an AI-driven decentralized cloud computing platform for running decentralized applications, specifically what we would consider IoT and Web 3.0 dApps. We believe that these are not just trends in the making, and are preparing technologies that will support both existing and upcoming use cases for technology. Our platform will provide a fully functional marketplace for computing and storage resources for companies and individuals - enabling them to share their excess capacity via our decentralized cloud.

More importantly, instead of leaving it up to users to perform p2p matching of the resource transactions, we are applying our expertise in AI technologies to create a Matching Engine that will easily and smoothly pair these resources for application developers. Applications will execute in a secure sandbox on the peer-to-peer resources, with transactions managed on the blockchain via automated smart contracts.

Our application marketplace for developers with pre-validated applications will speed up development of end-to-end solutions. We believe that our vision to democratize cloud computing and level the playing field for both resource providers and application developers will become one of the pillars of the next generation of internet technologies.

Stay tuned to our project as we will be releasing more details, especially technical implementations and our Minimum Viable Product (MVP) before our crowdsale.

"OUR MISSION IS TO DEMOCRATIZE CLOUD COMPUTING AND LEVEL THE PLAYING FIELD FOR CLOUD RESOURCE PROVIDERS AND APPLICATION DEVELOPERS"

DeepCloud AI aims to provide an AI-driven decentralized cloud platform for running decentralized IoT and Web 3.0 applications.

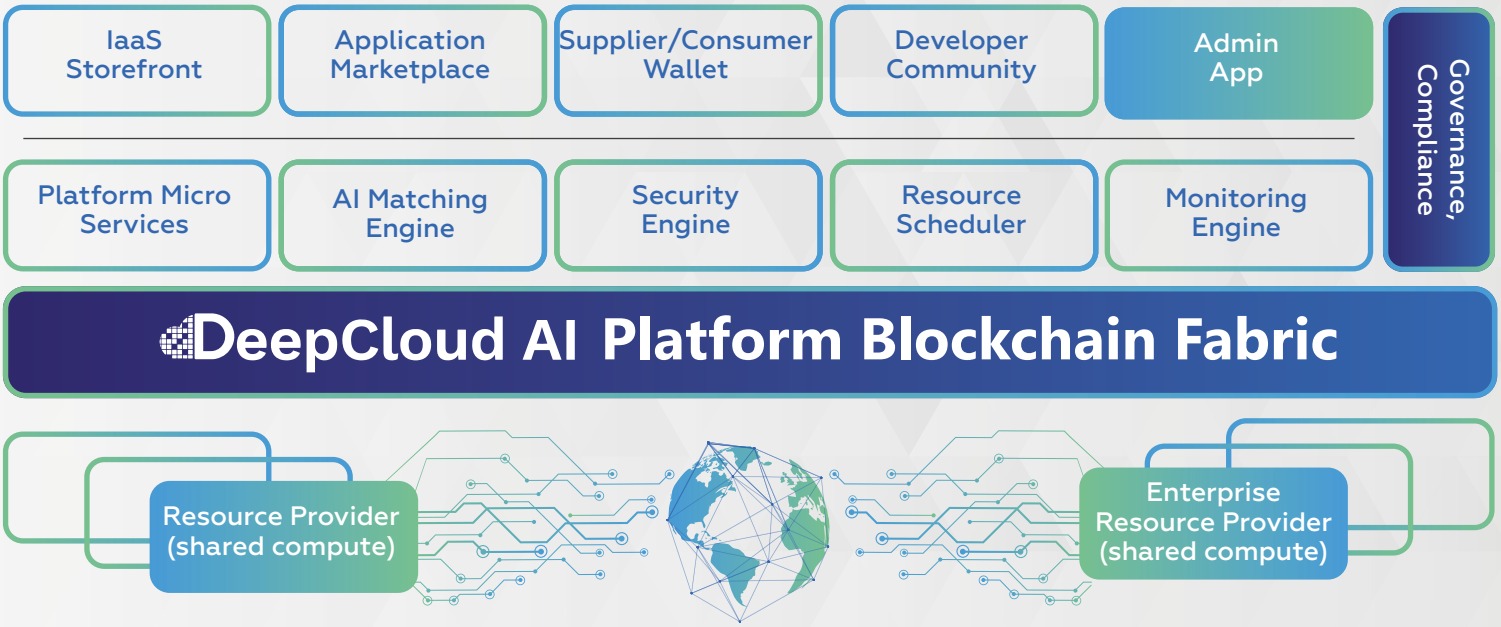

Figure 1: DeepCloud AI Platform – Decentralized cloud for IoT and dApps

While the cloud industry is already very mature with large players like AWS, Google Cloud and Azure, their cloud infrastructure is geared towards centralized applications where key resources are running in large centralized data centers. These solutions are not suitable for building decentralized peer-to-peer and IoT applications which have the requirement for computation resources running close to the edge devices for processing the growing volume of data generated at the edge, or a cost-effective, solutions for payment flow for micro-transactions executed automatically by the p2p IoT devices as they interact with each other and automate common tasks.

Similar problems exist for solutions involving complex multi-party integration across organizations for example in supply chains, government institutions, financial institutions. Current systems rely heavily on high cost intermediaries and proprietary interfaces which are very costly to build and maintain making it difficult for smaller players and companies to enter into market.

Many aggregation platforms like Airbnb, Uber etc. have emerged in recent years, with promise for a shared economy with sharing of wealth with the crowd but have soon evolved into centralized behemoths taking large cut and fees (often 30% or higher) for these aggregated services. Blockchain, the underlying technology behind Bitcoin, has emerged as a new disruptive platform to tackle these problems, ushering in a new era of "Internet of Value" vs the "Internet of Information". It is democratizing the internet and leveling the playing field for consumers and business to operate in an increasingly global marketplace.

DeepCloud AI will democratize the playing field [1] for cloud infrastructure and open-up the market for resource provides and application developers to run and deploy their decentralized applications in a cost-effective manner. Like Golem, SONM, iExec, we are building a decentralized cloud platform, and betting on blockchain based cloud solution as the future for decentralized applications. Our core differentiator is the use of AI for doing the resource matching between the network resource providers and application developers. Further, with the extensive industry knowledge and expertise of building Enterprise solutions, our core team, brings to the table deep insights and know-how for Enterprise customers.

Cloud platforms are enabling complex business models and orchestration of larger globally integrated networks surpassing all prior predictions by analysts. Leading market research organizations are revising their estimates for cloud usage/growth as they see more utility for new applications, along with higher than expected adoption by mid-tier and small and medium enterprises (SME).

Gartner's prediction for Cloud Computing Market [2] expects an increase for Infrastructure as a Service (IaaS) from 36.6 percent in 2017 to reach $34.7 billion by 2020. Per Gartner, IaaS is the highest revenue generating area in cloud computing space.

Worldwide Public Cloud Services Revenue (Billions of U.S. Dollars)

Source: Gartner (October 2017)

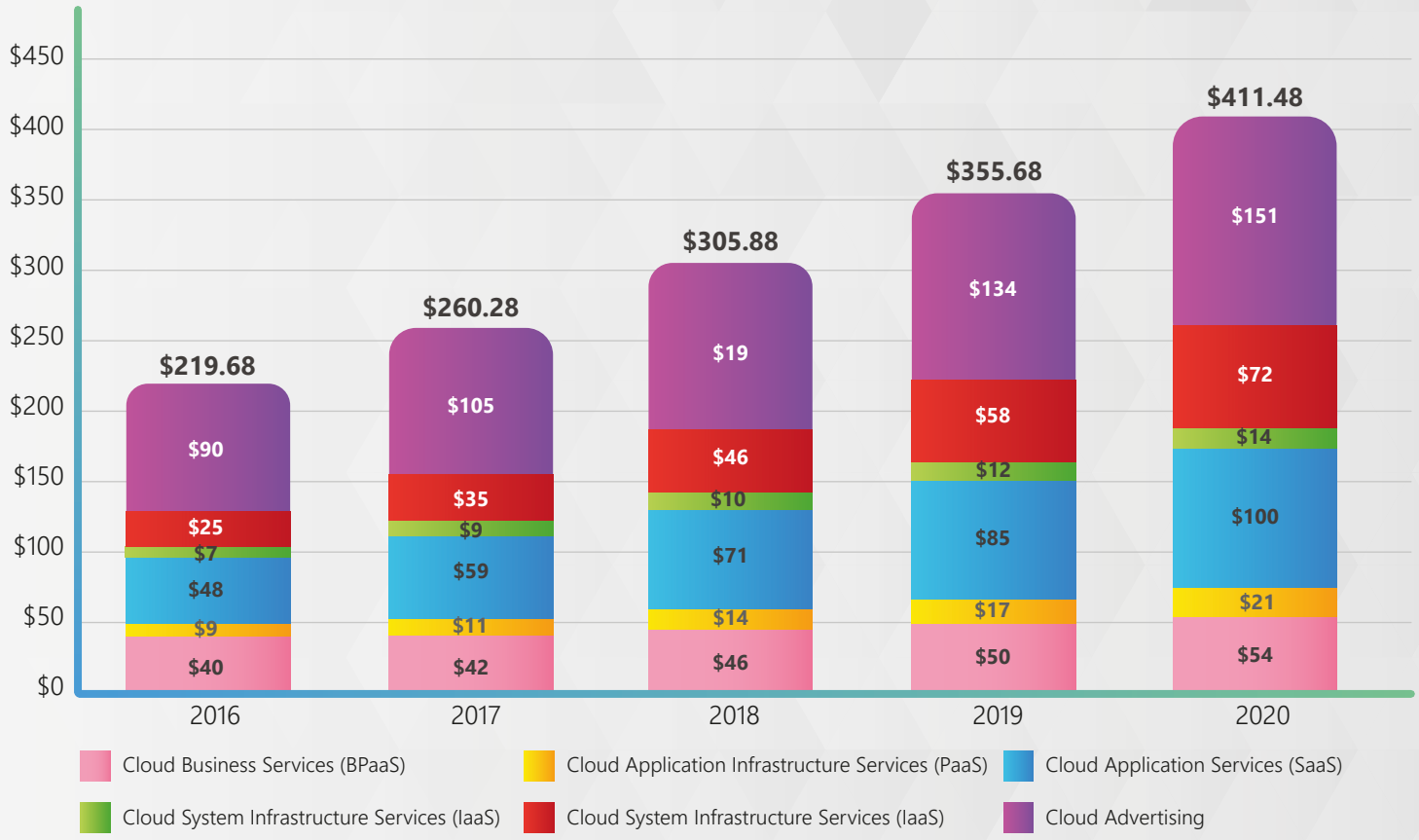

Figure 2: Cloud Computing Market

DeepCloud AI is exploring the new market of decentralized solutions by offering users a blockchain-based decentralized cloud service option. With the rise of Blockchain, Internet of Things (IoT) and AI at the Edge, we envision a great future ahead. And leveraging Artificial Intelligence (AI) for resource management allows DeepCloud AI to offer a revolutionary cloud infrastructure for decentralized applications.

The DeepCloud AI Platform is a decentralized IaaS Cloud provider with following services:

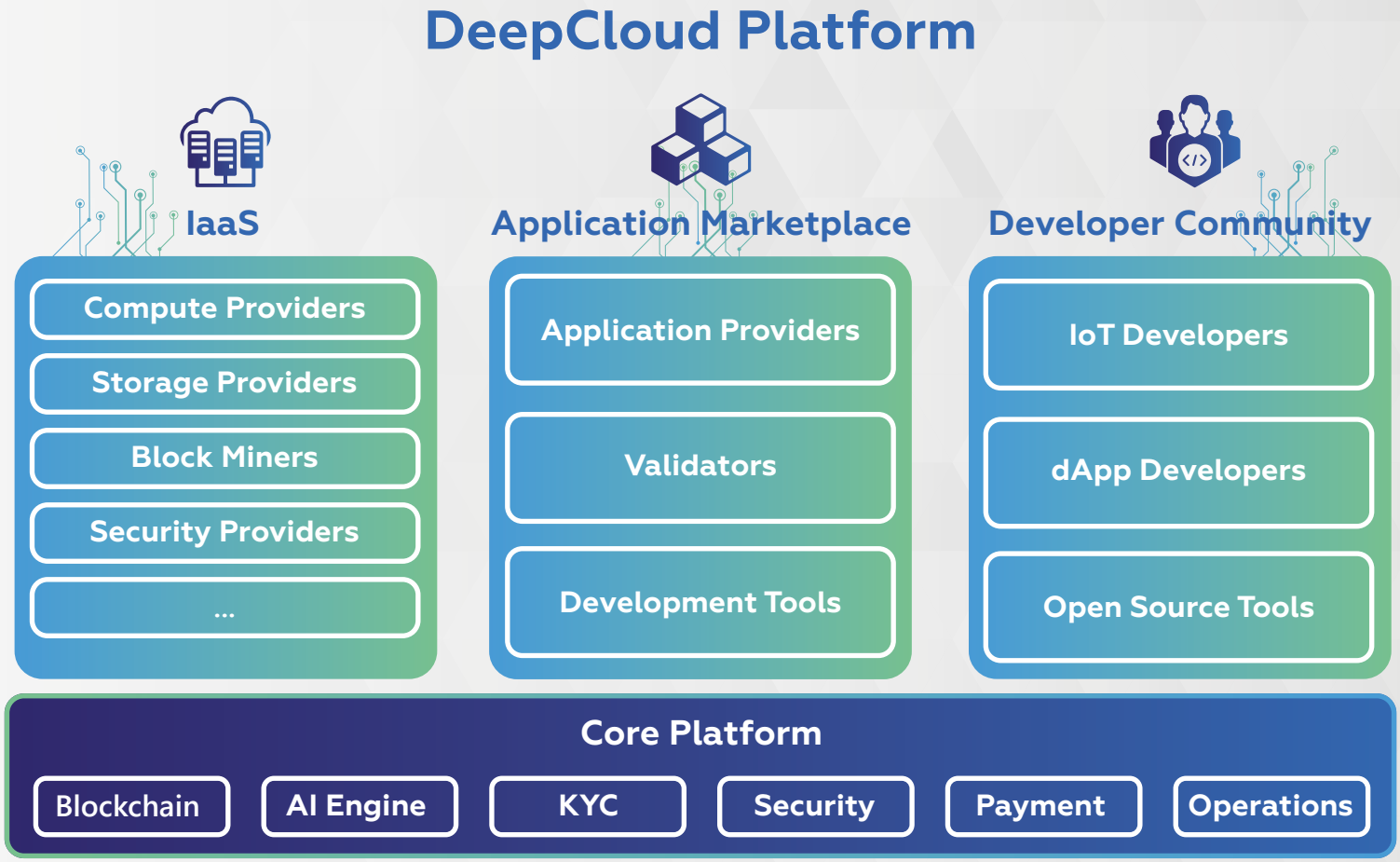

Figure 3: DeepCloud AI Platform Services

DeepCloud AI's Business Model is based on a two-sided marketplace, with "Network Resource Providers" on one side providing the compute and storage resources for decentralized applications, and "Decentralized Application Developers (IoT, dApp)" consuming the resources for running their applications.

DeepCloud AI relies on the **Network Resource Providers** and **Application Marketplace** providers for the services that it offers on the cloud. DeepCloud AI's Core Platform controller manages the resources and has the AI Matching engine for matching the Network Resource Providers and the Application developers.

- **Network Resource Providers:** People who provide resources to the network and earn DEEP tokens. A Network Contributor can share storage, specific computation power based on the node configuration in the network contributor's dashboard, and configure nodes in the network based on the resources they are sharing.

- **Network Users (ie application Developers):** Users relying on the on-demand services for running their decentralized applications in the distributed network. Every Network User in the platform can customize user-services for their applications (like data replication, streaming, encrypting, or computation power, hashing) through their user dashboard. In addition, users can select dApps from the predefined applications from the Application Marketplace. Based on these specifications, a specific gossip protocol will serve this application. This includes:
    - o IoT Developers
        - ▪ Businesses requiring decentralized compute resource close to IoT devices for local processing of data
        - ▪ Developers offering such IoT application services
        - ▪ IoT apps that require payment flow, micro-transactions
    - o Web3.0 dApp Developers
        - ▪ Seeking scalable blockchain
        - ▪ Deterministic Fast Finality of Transactions

- **Developer Community:** Provides open source tools for the IoT and DApp application developers. Some of these tools are provided by DeepCloud AI itself, other's will be contributed by the broader community.

4.1 Consensus Mechanism and Masternodes

DeepCloud AI is based on Proof of Service (PoSe). Masternodes for each cluster schedule tasks between nodes in the same cluster and arrange tasks dependency and execution time between nodes. Master nodes works as the brain of the network. They have complete visibility into all resources in the network. And using DeepCloud AI's AI Matching Engine the controller, dynamically configures and assigns the resources based on real-time analysis. Any consensus in the network would be through master nodes (i.e. Measuring network states, network traffic balance). If any network cluster requires additional resources, the allocations would be handled through consensus between master nodes. More details of our Masternode implementation can be found in Technology View Section.

4.2 AI Matchmaking and Controllers

A Matchmaking algorithm is a necessity for any distributed system, as decentralized applications require many resources close to the source. DeepCloud AI's AI Matching algorithm is based on several parameters including information from network user requests, location of usage, network contributors' states in master nodes. Each masternode will classify network contributors into clusters based on services. Every request will be handled based on the service, network states, and consensus between masternodes.

We follow predictive and reactive strategies. Reactive approaches measure the current system's state (i.e. the current transactions). And predictive approaches aim to predict the future behavior of the system based on the historical dataset. We apply statistical and AI models as predictive strategies. Most of these algorithms utilize Regression, SVM, and statistical time-series techniques such as ARIMA. We define the problem of predicting the resource usage for a given task to be provisioned. Several components are integrated with the model (i.e. scoring, task dependency, task cost). These are then compared to models suitable for classification using techniques like Bayesian classification.

Each node (network contributor) has a state in the network. The controller assign each request (network users) to the nodes. Some requests may have more complexity to run over the network; controller allocate these requests to run on sidechain, or master nodes. In addition, adjusting the scheduling between tasks to make sure that there is no dependency between the current tasks. The controller saves results, make sure that every request run on the right cluster, work on real time request matching. More details about matching, recommendation in the technical section.

The AI Controller will analyze every transaction in the network and its effect on the network (e.g. latency, task discarding). From these deep insights, the AI Controllers builds strategies for different usage scenarios. We use deep learning algorithms like RNN, CNN to analyze these scenarios along with Reinforcement Learning for a continuous learning feedback loop, with the main target to understand transaction behavior, work load patterns and remedy the bottlenecks in the system.

5.1 Use Cases

At DeepCloud AI our focus is on building decentralized cloud for decentralized IoT (Internet of Things) and dApps, which lend themselves to running in a decentralized environment.

IoT applications require edge computing close to the source, something vastly different from today's cloud computing paradigm which has a bigger focus on scaling the service or offering consistency. Like the case of specific license plate detection for tracking a criminal using the video camera on traffic lights as they are running in a high-speed chase. Such use cases are better handled by doing computation and detection at the edge and only sending the compressed insights back to the central servers, instead of flooding the networks with live video streams which can choke the entire neighborhood network. We enable resource providers close to the edge, such as retail shopping malls or apartment complex residents, to share excess capacity of their computer resources on the decentralized cloud, close to the city traffic lights, making it possible to do these local computations close to the source and enable such use cases. With our AI matching engine, we match the right resources to the right applications based on real-time analytics of the data across the network.

Other big problem for IoT and dApps is micropayment solution that is cost effective and viable to manage the machine-to-machine and peer-to-peer automated transactions on the shared blockchain infrastructure. Using our Sidechains and Decentralized Acyclic Graph layer on top of the existing blockchain we provide a mechanism for faster transactions with zero fees for transactions.

The lack of good marketplaces for reusable components and tools is also directly addressed by our Application Marketplace, where we provide a pre-validated set of reusable applications and components that dApp developers can use to quickly build their applications.

With DeepCloud AI, we are unlocking the potential of the decentralized application developers so that they can focus on building the core logic for their applications and leave the management of the infrastructure and right tools and components to us.

A wide range of use cases can be addressed using our platform. These include:

Smart Cities:

IoT and AI @ Edge scenarios for smart cities, so that local governments can focus on building the core infrastructure and rely on DeepCloud AI's resources close to the edge for running and deploying their applications.

Supply Chain:

Enterprises and shipping companies with complex supply chain tracking challenges, can run and deploy their blockchain based applications on DeepCloud AI fabric for tracking all the transactions with full audit trail, secure and tamper-proof.

TV Service Providers:

Service providers like TV/Cable companies can rely on DeepCloud AI's decentralized cloud fabric for ondemand decentralized services, such as local caching of media streams during Football season or largeaudience events like the Olympics.

Decentralized AI Algorithm learning:

For IoT applications with security and data privacy concerns, by running decentralized AI algorithms close to the edge devices themselves, one can generate the compressed insights on DeepCloud AI resources. This provides mechanism for IoT device consumer's to monetize their own data with all the transactions and encryption of the data and the algorithms via the blockchain.

5.2 Value-Prop for Network Resource Providers

Customer Pain Points	DeepCloud AI Value Proposition
Businesses: No easy way of monetizing excess spare capacity of hardware resources (compute, storage, networking), without spinning up own cloud like infrastructure. Can participate in Spot Market for spare AWS resources, but not outside this walled garden. **Individuals:** Can participate on Altruistic Grid computing solution like SETI@Home, but not for profit making. Can participate in Bitcoin / Cryptocurrency mining, but very energy inefficient and resource consuming with no real computational benefit.	Generate revenue from spare excess capacity of compute/storage/networking resources, by participating as "Network Resource Provider" DeepCloud AI's AI-based resource matching does proper matching for resources for Network Resource Providers and Consumers, close to the location of use. DeepCloud AI Secure Execution solution, combined with the Market Reputation based system, provides right incentives for application developers to prevent running malicious code. Provide peace of mind for businesses and individuals from malicious apps / hackers.

5.3 Value-Prop for Decentralized Application Developers (IoT, dApps)

Customer Pain Points	DeepCloud AI Value Proposition
IoT Developers: For Decentralized IoT apps requiring heavy compute requirements, need complex infrastructure rollout at each point of use / device deployment. Cost prohibitive and big barrier for deployment of such data intensive IoT applications. All data must be sent to central cloud / datacenter for processing, requiring heavy network bandwidth, thereby limiting the deployment scope. Too costly to do microtransactions on existing payment gateways for IoT use cases. Similar issues for micro-transactions on public blockchains like Bitcoin, Ethereum, were the "gas" for writing transactions per block is much higher than the microtransaction itself, plus the delays in finality of the block validation make is unusable for many use cases. No transparency and easy way of running audit trail for resource usage and billing.	DeepCloud AI's AI-based resource matching does proper matching for resources for Network Resource Providers and Consumers, close to the location of use. Application developers can focus on the core business logic for their application, instead of worrying about deploying compute resources close to edge device and save costs. Deterministic fast block finality makes the solution viable for microtransaction flows. DeepCloud AI's DAG based blockchain provides support for zero cost, fast deterministic transactions, making micropayments viable. All transactions done on immutable Blockchain with full traceability.
Web3.0 DApp Developers: Public blockchains Bitcoin / Ethereum not scalable, take too long for blocks to write and finalize. No easy mechanism for doing off-chain computation or pairing complex logic with smart contracts. Have to build and deploy complete solution by self, not many easy to use marketplaces of prevalidated apps and components that can be reused.	DeepCloud AI's decentralized cloud resource nodes provide the execution power / space for running complex computations off-chain. Marketplace of pre-validated Applications. Development tools to jump start application development and deployment.

Newly decentralized cloud networks (e.g. Storj, Golem, iExec, and so on) have sparked the proliferation of decentralized cloud platforms. These platforms offer a wide range of decentralized services and allow for the deployment of decentralized applications in a way that more cost-efficient than traditional vendors (e.g. GAE, AWS, and Azure). They achieve this by providing their platform users with decentralized computing, storage and networking resources at a fraction of cost by leveraging the idle resources of end-users, private data centers or enterprise infrastructure.

Even though, these platforms try to provide a distributed, cheap and reliable cloud computing alternative to the existing centralized cloud offerings, they are hardly providing any tangible value to their platform users that really differentiate them from the major cloud providers. The question is whether we just need more cloud computing platforms, or we seek a tangible added value to the users which are not provided by the existing platforms. In DeepCloud AI, we value the advances and breakthroughs achieved by leveraging the rich set of AI/ML techniques. And we find that the existing centralized and decentralized platforms lack the intelligence in resource allocation. More specifically, they do not leverage the rich set of AI/ML tools that could allow them to intelligently manage and optimize the resources used by their users. For example, when users provision cloud resources to deploy their applications, they usually do not know how much resources they are going to need to fulfil their application purposes (or usage scenarios) with the lowest cost possible. On the other hand, an AI/ML managed cloud would be able to provide the users with smart recommendations based on their requirements and rich set of historical data.

Hence, in DeepCloud AI, we leverage the rich set of academic and industrial experts in cloud computing, AI and blockchain technology to aim for filling the gap between traditional and smart cloud computing. This is based on a true need that has become very essential for a cloud computing platform to exist that gives the users with enough, timely and proactive information to improve cloud usage experience and allow them to have better inputs for efficient decision-making. In DeepCloud AI, we aim to satisfy this emerging need by building a cloud service that provides various AI/ML wrappers (or interfaces) that make available to our users a rich set of information and predictions for them to be able to take better and intelligent decisions.

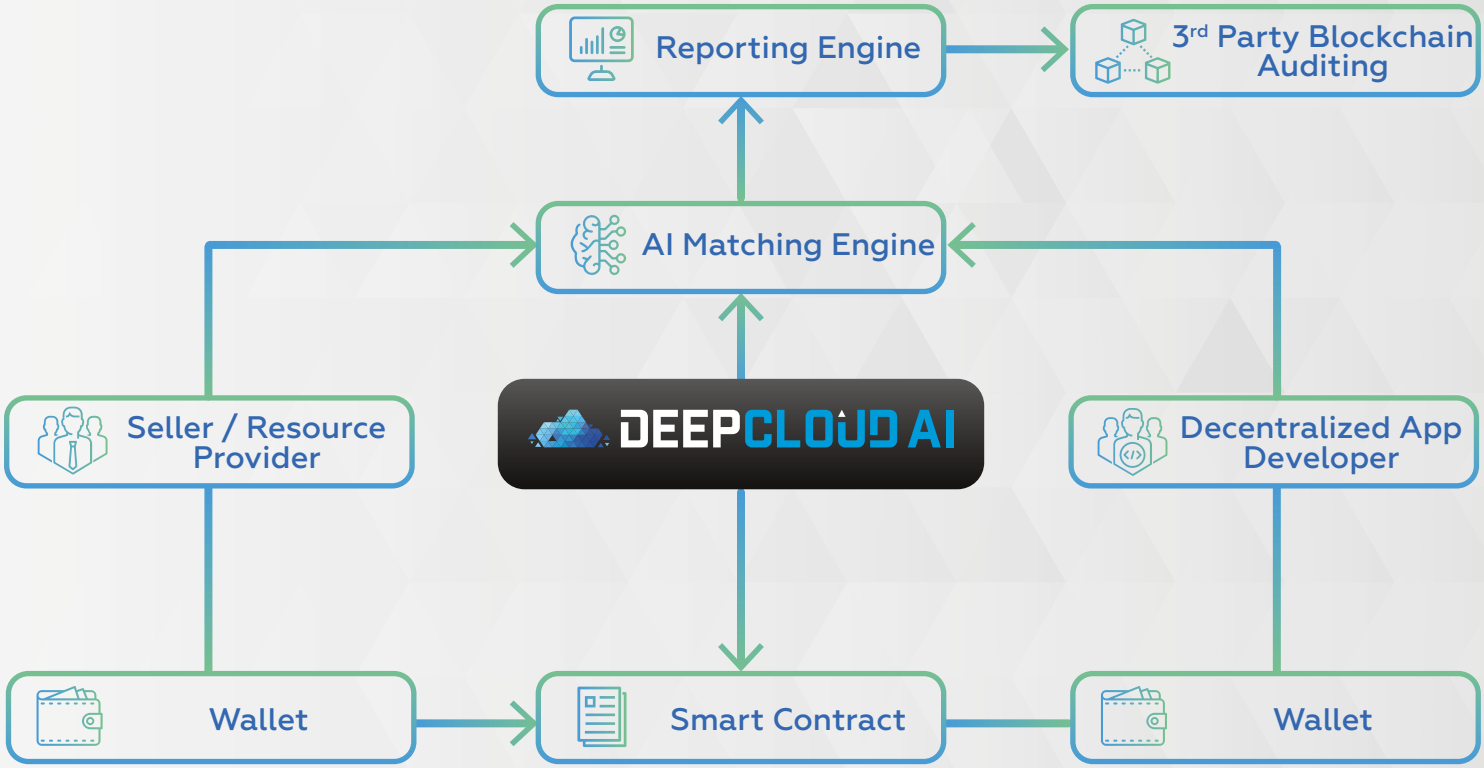

Figure 4: DeepCloud AI Marketplace

All transactions on the DeepCloud AI as processed using Smart Contracts, with full audit trail of the transaction on the DeepCloud AI Blockchain.

DEEP Token are used for all transaction payments. DEEP token is ERC20 compliant Utility token. Network Resource Providers and Application Marketplace Providers earn DEEP tokens for the resources they provide on the DeepCloud AI Platform. Block Miners generate new DEEP tokens based on validation tasks they are given by the DeepCloud AI Platform for validating new block transactions. And, Decentralized Application Developers, use DEEP tokens for consuming the resources to run their applications on DeepCloud AI.

Our consumption model will be thoroughly researched and detailed in a future technical showcase as more details of our platform are solidified. As of the ICO, our focus is on ensuring that the product MVP is fully functional and our architecture is built. Economic Modelling will be brought in later to ensure that all token holders and users will have fair and incentivized participation mechanisms.

DeepCloud AI applies the core concepts of blockchain and data decentralized make sure DeepCloud AI's network is operating on a network or people. Desktop Grid Computing technology (utilization of nodes) will be implemented on our platform. Data will be managed and processed through the nodes that are running on the network, in return node holders will earn DEEP tokens.

Network Resource Providers

• Network Resource Providers are the people who provide resources to the network and earn DEEP tokens. Network Resource Provider is required to stake (lock) up a certain number of DEEP tokens to run the nodes and offer the services to the users who require them. This strategy encourages competitions among the network contributors, as DeepCloud AI envision an enterprise-graded service on our platform. The higher the quality of the services of Network Resource Provider, the higher the lock up scale and the DEEP they will earn.

Network Users (Application Developers)

• Network Users (i.e. Application Developers) are the people who use our services on DeepCloud AI's platform by spending DEEP tokens, they are the main target audience. There is a large variety of services the platform provides, such as database usage, software usage, and processing power usage. Most importantly, all the customers will be provided with a customizable AI functions when utilizing the computing usage.

Application Marketplace Providers

• Application Marketplace Providers are the people who provide reusable components for building the decentralized applications and earn DEEP tokens. Application Marketplace Providers are required to stake (lock) up a certain number of DEEP tokens for providing reusable components. The more the number of developers reusing their components, the higher the lock up scale and the DEEP they will earn.

AI controller

• Each node (network contributor) has a state in the network. The controller assigns each requests (network users) to the nodes. Some requests may have more complexity to run over the network; controller allocate these requests to run on sidechain, or master nodes. In addition, adjusting the scheduling between tasks to make sure that there is no dependency between the current tasks. The controller saves results, make sure that every request run on the right cluster, work on real time request matching. More details about matching, recommendation in the technical section.

8.1 DEEP Tokens

DEEP tokens is going to be launched as an ERC-20 tokens in the beginning. Since our development is not going to be implement on Ethereum network due to scalability issues, DeepCloud AI is going to carry out a 'transition process' with the tokens when we have integrated with a much faster and scalable blockchain. Nebulas has been selected as the first blockchain. The value of DEEP does not represent our development progress; its price is driven and set by the market.

There are several usages of DEEP tokens on DeepCloud AI's platform:

1. Access to the DeepCloud AI's network system
2. Utilize premium features for High-End Users
3. Payment means by Network Users and Application Developers
4. Payment method to Network Resource Providers and Application Marketplace Providers

Users can acquire DEEP tokens in three ways for the access of DeepCloud AI platform:

1. DeepCloud AI's Initial Coin Offering Campaign
2. Cryptocurrency Exchanges
3. Or by becoming Resource provider, users can earn tokens from the resources they make available on the platform, which they can use as a user for using other services.

To ensure the liquidity of DeepCloud AI's DEEP tokens, a certain number of DEEP tokens is reserved for all the Cryptocurrency Exchanges and Airdrop events. This way, we can ensure Network Users can access our network in a reasonable price and our tokens will not be dominated by a certain group of users.

8.2 Revenue Model

DeepCloud AI core service will be free for users. Our revenue will be generated from the intrinsic value of the DEEP tokens, with the expansion of the user base. Additional revenue will be generated by the network resources provided by DeepCloud AI itself for the infrastructure. In future, we also plan to have tiered service model for Enterprise customers requiring higher levels of SLAs and Security. Both the Network Resource Providers and Application Developers will stake DEEP tokens for using the platform services, thereby have a built-in incentive for honest use and promoting the growth of the network.

The main idea of DeepCloud AI is to build a self-organizing distributed network through AI. DeepCloud AI focus on building a distributed cloud infrastructure based on the blockchain instead of building a specific service such as unused storage, AI computing platform, or Database as a service. Which were applied in Filecoin, DeepBrain Chain, and Bluzelle respectively.

Many challenges affect the performance of a decentralized cloud infrastructure. Beginning from syncing between nodes, matchmaking algorithm, scheduling criteria, and fair incentives for any network contributors. Moreover, load balancing in the network and cost effective in terms of the market supply.

DeepCloud AI are facing these challenges in different architecture levels. The network is built using membership protocols, and proof of service to meet user dApps, services, and node configurations. The purpose of choosing membership protocol, it allows nodes to discover one another, disseminate information quickly, and maintain a consistent view across nodes within application cluster. In addition to membership protocols, the AI controller is based on several aspects (i.e. sharding, sidechains, matchmaking algorithm, task scheduling, load balancing, etc.).

The main aspects for the controller is sharding, and sidechains. As the network is self-organized and based on the AI. The more information one can get from each node; the better the network would be. These functions do the following tasks:

1. **Get node State:** Every node in the network share it is state to controller.

2. **Collation Analysis:** The main task to get collation from nodes in different shards (clusters).

3. **Network analysis:** The main purpose is to analysis running smart contracts in the network. What network users do in the network. In other words, what is the current application running in the network. This is reflected to master nodes.

4. **Sidechain analysis:** Based on the above step, specific application could run on sidechain, to handle specific issues. It is important to keep sidechains states updates with controller.

As a result, we categorized some applications types into several clusters that could be run in each shard in the network like:

- **Sharing computation power**
- **Multimedia streaming**
- **Storage**
- **IoT Applications**
- **Games**
- **Decentralized Exchange**

Figure 5 Introduces the master node (controller) manage requests to several shards based on the network users' application. Shard A cover computation power application, Shard B for Multimedia dApps, etc.

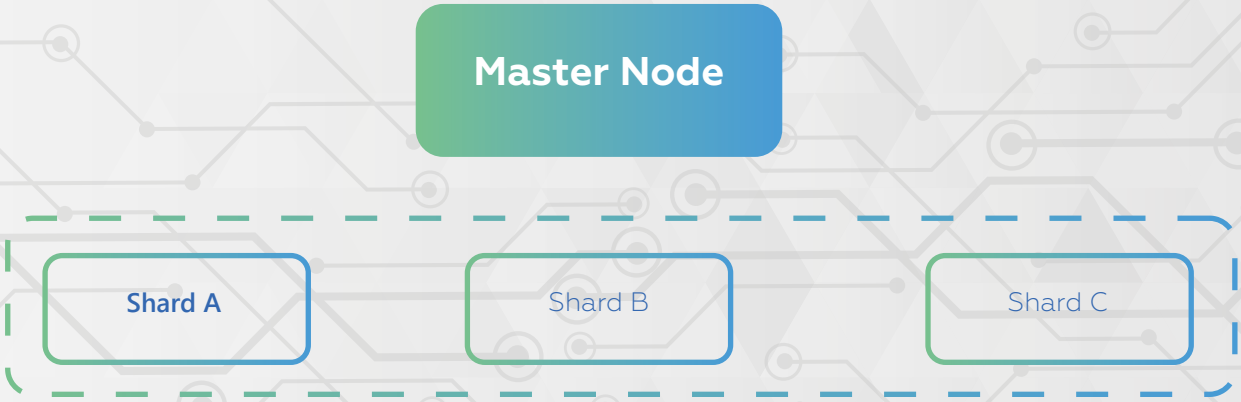

Figure 5: Each node shard works on a specific application based on consensus between master nodes.

The network consists of three main nodes (Master nodes, network contributor (worker) nodes, and sidechains). Master nodes have the controller and more computing power than normal nodes. You can consider them as command centers. The master node concept was firstly presented in DASH architecture. The Network Resource providers contribute resources which are added as worked nodes to the network. These nodes are managed and updated by controller according to network users' requests. At last, sidechains are used for scheduling and handling issues in case of any bottlenecks in the network. As seen in figure 2, for on-demand request; several parameters are calculated to choose the best node to do the request. Network (worker) nodes would be classified into clusters based on the DApp.

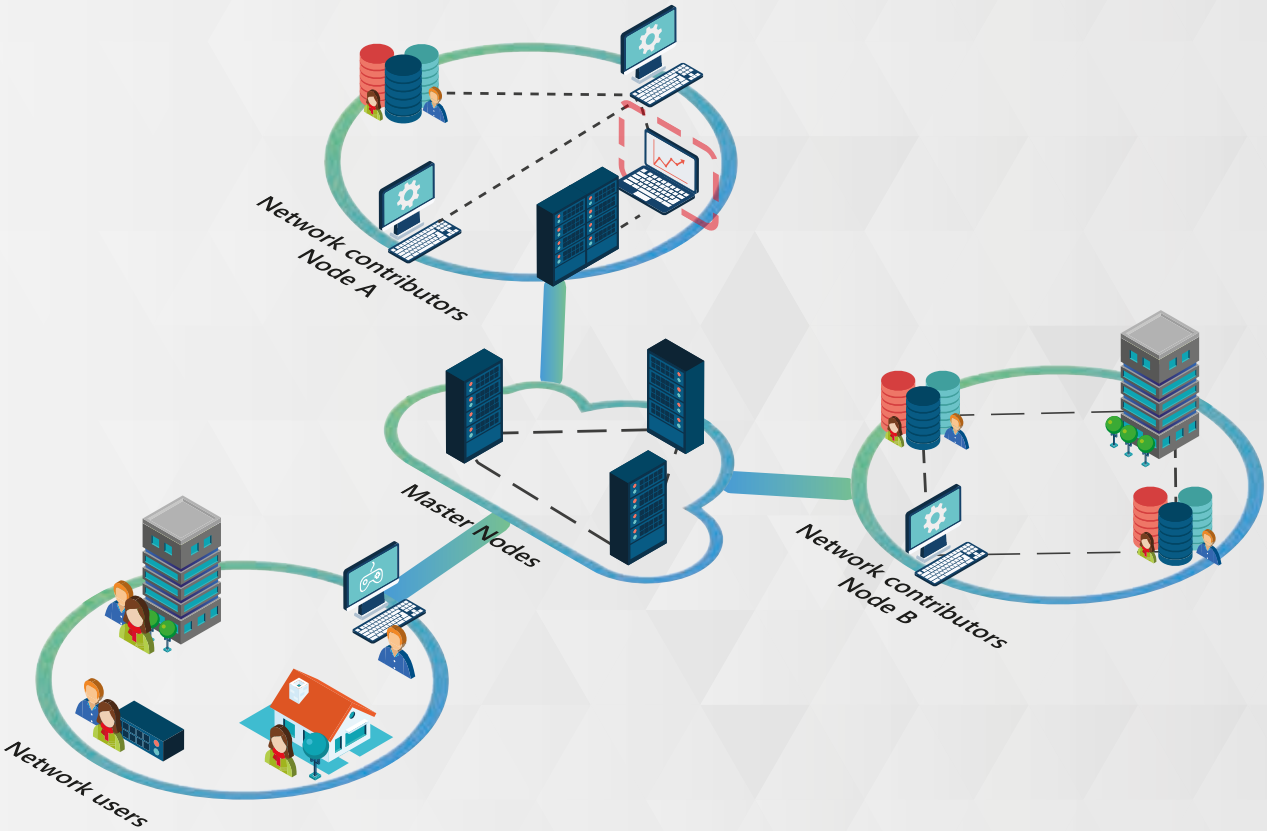

Figure 6: Each node-color represents a specific application in the network

9.1 Main Technical Features

9.1.1 Network participants

Network User (Application Developer)
Network Users (i.e. application Developers) use the on-demand services for running their decentralized applications in the distributed network. Every Network User in the platform can customize user-services for their applications (like data replication, streaming, encrypting, or computation power, hashing) through their user dashboard. In addition, users can select dApps from the predefined applications from the Application Marketplace. Based on these specifications, a specific gossip protocol will serve this application.

Network Resource Provider
On the other side, a Network Resource Providers (contributors) are the people who provide resources to the network and earn DEEP tokens. A Network Contributor can share storage, specific computation power based on the node configuration in network contributors' dashboard. And using the network resource provider dashboard, contributors can configure nodes in the network based on the resources they share.

Master nodes
Master nodes works as the brain of the network. They have complete visibility into all resources in the network. And using DeepCloud AI's AI Matching Engine the controller, dynamically configures and assigns the resources based on real-time analysis. Any consensus in the network would be through master nodes (i.e. Measuring network states, network traffic balance). If any network cluster requires additional resources, the allocations would be handled through consensus between master nodes.

9.1.2 Fair Incentives

In any distributed systems, it is challenging to derive bandwidth from Network Resource Providers who operates independently. Creating dynamic on-demand incentives based on all peers to contribute resources and sharing bandwidth becomes imperative. We adopt peer-wise proportional fairness scheme to achieve this objective.

9.1.3 Failure Detection

Network resource providers join the network by sending a request to the platform with the detailed node contribution through the dashboard. And they are assigned to the right cluster based on the configurations and load in the network. The master-nodes coordinate the network ping across the nodes in the cluster and maintain a heart-beat to detect failure conditions. When a node becomes unreachable, it is removed from the cluster and all the application jobs running on it are automatically deployed onto other worker nodes in the cluster.

9.1.4 Sharding and sidechains

Sharding is a commonly used in databases to partition very large database into smaller, faster, more easily managed parts called data shards. In DeepCloud AI, sharding is an important factor for the network performance. It is heavily used in partitioning complex queries in the network to make it smaller, and faster in the distributed network.

A global trend in emerging in blockchain/crypto-currency space to build sidechains that tie into main chain. The properties of sidechains are different for each project. We use AI to configure and adjust the roles for sidechains based on real-time monitoring for the network, and historical data. The master nodes for each of the shards are linked with sidechains. Defining the role of the sidechains in the network lies on the master nodes, for handling any bottlenecks or other issues with the network.

9.1.5 Data Replication and Integrity

DeepCloud AI is building an API for data storage, to make it easier for application developers to take backup of their data and integrate with other decentralized storage options. Additionally, we are also simplifying the data migration between centralized storage into distributed storage system.

9.1.6 Load balancing

The core of the decentralized cloud is based on AI. Real time data is recorded for each transaction occur in the network. As mentioned, sharding and resource allocation are dynamically configured based on the network status. Moreover, adjusting running services queues with priority to balance the network traffic.
Furthermore, nodes are classified into clusters, if there is an issue in any cluster, master nodes manage network traffic. Usually there are two scenarios: The first scenario, master node use nodes from sidechains to handle the load imbalance issue. The second scenario, master node rely on the Network Contributors. when network contributor share resources in the network, Network Contributors have the option to specify the node for a specific purpose. Alternatively, the nodes can be set to dynamic and hence more return. This guarantee that the nodes in the network, would be configured based on the network requirements in real-time.

9.1.7 AI Controller & Matching algorithm

A Matchmaking algorithm is a necessity for any distributed system. Further, Decentralized applications require many resources close to the source. DeepCloud AI's AI Matching algorithm is based on several parameters including information from network user requests, location of usage, network contributors' states in master nodes. In addition, each masternodes classify network contributors into clusters based on services. Every request will be handled based on the service, network states, and consensus between masternodes.

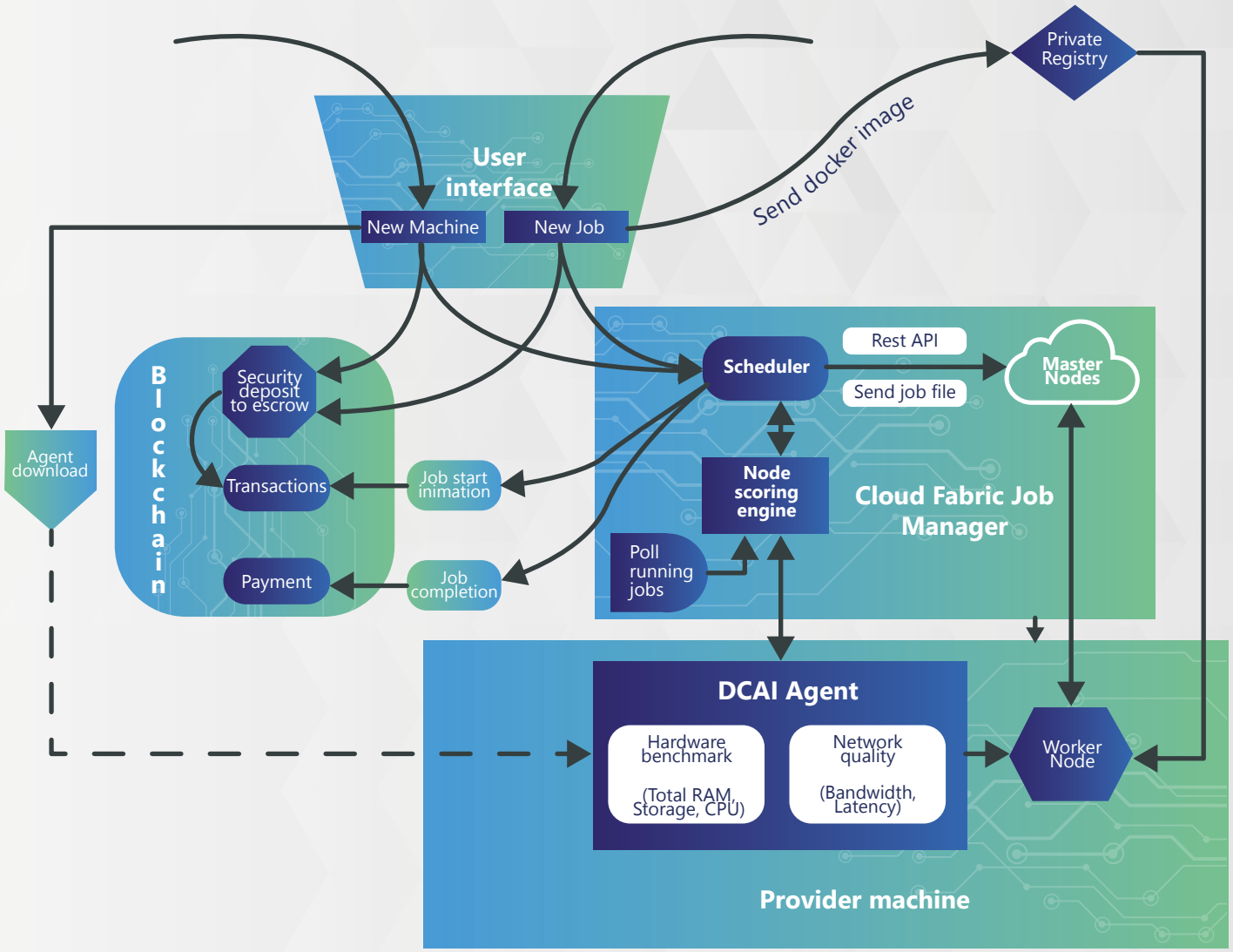

Figure 7: Pipeline for AI Matching Engine

When a network resource provider adds their resource to the DeepCloud AI platform, an agent in downloaded and deployed on the server. This agent process collects periodic information about the usage statistics for both the server resources and deployed application behavior. The AI engine makes it predictions based on this data, using ensemble learning techniques with a combination of traditional feature learning linear regression, k-means clustering with expectation maximizing algorithms and deep learning algorithms based on time sequence analysis.

9.1.8 Multi-criteria scheduling

DeepCloud AI is based on Proof of Service (PoSe). Masternodes for each cluster schedule tasks between nodes in the same cluster and arrange tasks dependency and execution time between nodes.

9.1.9 Security

To address the security needs for Enterprise customers, DeepCloud AI is building a secure layer around Intel's SGX technology. We are also developing selective partnerships with Security providers on our Application Marketplace to provide a range of services for different types of application needs.

For Enterprise customers, DeepCloud AI intends to use Intel SGX based security for providing software accreditation that helps make sure DeepCloud code is running on the system without compromise. DeepCloud is partnering with Hardware providers to enable this. DeepCloud Integrity code is uploaded via the Linux kernel into a seperate Enclave - whose memory is protected from the kernel and all other system software. DeepCloud runs the monitoring code in user space which calls SGX Enclave code, that itself monitors the integrity of the monitoring code. All requests to the DeepCloud backend uses TLS and requires the SGX Enclave code to sign the request. Thus making sure the Deep application data that is with DeepCloud is not compromised.

9.1.10 Application Registry

Reusable application components speed up the development cycle for application developers. Application Marketplace providers publish their components on the Application Registry which makes it easy for developers to search and deploy these components for their applications.

Several decentralized cloud computing platforms shined last year. Most of these projects do not compete with each other but rather complement each other. First, Golem was aiming to become the world's first Decentralized Super computer, with an initial vision to attract 3D artists, animators, and designers. iExec came after, with vision to create a cloud marketplace for users and dApps, built on Ethereum and relying on offchain computations. At last, SONM shine as an alternative work provider through running services in the marketplace.

DeepCloud AI share's the same vision of the future of decentralized cloud computing. We believe in integration with existing computing resources for existing infrastructure like Storj, Filecoin, etc. Meanwhile, we are defining the purpose of each node in the network, to serve in the application according to the shared resources. This guarantees fair incentives. On the other hand, we serve the decentralized cloud for several purposes (i.e. Sharing storage, running AI codes, data streaming, etc). All the nodes in our cloud are configurable and we using our AI Matching Engine for proper resource matching between the providers and the application developers (consuming the resources).

	Deepcloud AI	iExec	Golem	SONM
Deepcloud AI	AI-Driven Cloud Infrastructure	Cloud Marketplace for dApps	Global Decentralized Supercomputer	Universal Gog Supercomputer
Platform	Deepcloud AI's Network	XtremWeb-HEP	Golem's Network	Cocaine
Master Nodes	yes	no	no	Hub nodes
Configurable nodes	yes	no	no	no
SaaS	yes	yes	yes	yes
IaaS	yes	yes	no	no
Fog Computation	no	no	yes	yes
Non Deterministic Tasks	yes	no	no	yes
AI Fair Incentives	yes	no	no	no
Marketplace AI recommendaton	yes	no	no	no

2018 - 2020 3 Years Plan (updated: 02-11-2018)

Q1 2018 – Market Study // Concept formation

Q2 2018 - Public Whitepaper // Company formation

Q3 2018 – Huron Release // Private MVP, ICO, DeepTransfer

Q4 2018 – Tahoe Release // Public MVP - IoT, dApps, DeepTransfer Plus

2019

Q1 2019 – Salton Release // Enterprise MVP, DeepChain Testnet MVP

Q2 2019 – Erie Release // Application Marketplace, DeepProperty

Q3 2019 – Yellowstone Release // Scalable Enterprise

Q4 2019 – Falcon Release // DeepChain Mainnet Developer Community, Ecosystem

2020

Q1 2020 – Wheeler Release // Foundation Formation, DeepChain Developer Tools

Q2 2020 – Klamath Release // Global Enterprises

Q3 2020 – Beaver Release // DeepChain Analytics

Q4 2020 – Grenada Release // DeepChain Fraud Prevention Engine

2021 and beyond

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