# SUPER EDGE
# Edge Computing Token(ECT)

## Whitepaper

*Verson*  *3.0*

*2018- 2019*

# WHITEPAPER HISTORY

| Version | Release | Contributors |
| --- | --- | --- |
| **V1** | 2018 3 21 | Albert Yu<br>Sky Blue<br>ZiShin Hu |
| **V2** | 2018 4 20 | Albert Yu<br>Sky Blue<br>ZiShin Hu |
| **V3** | 2018 5 8 | Albert Yu<br>Joe Chu<br>Edward Adam |

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## 1 BLUEPRINT FOR DECENTRALIZED CLOUD COMPUTING

**Edge Cloud computing, larger, faster and stronger, can be deployed to the cloud,Everyone is a node network. The edge computing has the following characteristics: distributed and low delay computing edge computing focused real-time and short period data analysis, which can better support the real-time intelligent processing and execution of local business, which is more efficient because of the edge computing distance to the user, and the filtering and analysis of data at the edge node.**

ECT leverages a set of research technologies that have been developed at the INRIA and CNRS research institutes in the field of **Desktop Grid** computing. The idea of Desktop Grid (aka.
**Volunteer Computing**) is to collect the computer resources that are underutilized on the Internet to execute
very large parallel applications at the fraction of the cost of a traditional supercomputer.

We support equality for all, and everyone can become one of our node
networks. Some nodes turn to a cluster. Full nodes run on cloud servers. Each cluster separate calculate to achieve the most efficient.

ECT is developing a new **Proof-of-Contribution (PoCo) protocol**, that will allow off-chain consen- sus. Thanks to the Proof-of-Contribution, external resource providers will have the usage of their resources certified directly in the blockchain.

**SuperEdge** allows open versions of such services to be created on its **public chain**, and then incorporated by private networks in the form of building blocks. Token holders ensure governance and allow developers to customize it to meet their own needs.

## 2. BACKGROUND

**The concept of ECT first appeared at the end of 2017. Our current lifestyle (clothes, food, housing, etc.) has been grasped by major companies using big data calculations. ECT is doing the same thing as them, but we hope that everyone can manage their own information data and not be taken over by others.**

**We will adopt a node election method to create a huge ECT community. Everyone can control the node and upload the data in the node to other companies' databases. However, it is anonymous and will not reveal our privacy, but it can provide More convenient service for our lives.**

**Maybe you don't believe in decentralization. We will have a more convenient, more transparent, yet more able to protect our privacy in the**

**future. Our lifestyle will undergo tremendous changes. This is also the direction we are working hard for!**

## 3. CURRENT LIMITATIONS

### 3.1. Blockchain Computing Challenges

Blockchains like Ethereum provide a new way to run decentralized applications (see DApps). Ethereum allows programmers to write smart contracts - code executed on a blockchain virtual machine. This represents a potential revolution in the design and implementation of services. Investment, finance, crowdfunding, the Internet of things, insurance, forecasting markets, gambling, distributed data processing, and so on have essentially disrupted a wide range of centralised and fairy regimes.

**Though they have a unique outlook of block chain calculation ability is very limited, it is difficult to run a meshless applications: little storage capacity and a very low efficiency of the virtual machine and very high potential threat. Eventually, blockchain technology will evolve to overcome some of these problems, but beyond the simplest applications, more capabilities will be needed for all applications. .**

### 3.2. Traditional Computing Infrastructure Challenges

The existing clouds cannot fulfill the requirements of DApps that need fully decentralized infrastruc- tures for their execution. Meanwhile, there is a **growing demand for computing power from indus-**
**tries and scientific communities to run large applications and process huge volumes of data.**

The computing power to run big data applications is most often provided by cloud and High Perfor- mance Computing (HPC) infrastructures. However, **cloud and HPC infrastructures are complex**
**and**
**expensive.** That means that innovative small businesses often don't have the means and the exper-
tise to acquire and operate HPC platforms, while traditional cloud infrastructure vendors like Amazon AWS are still very expensive for demanding applications (e.g. GPU rendering).

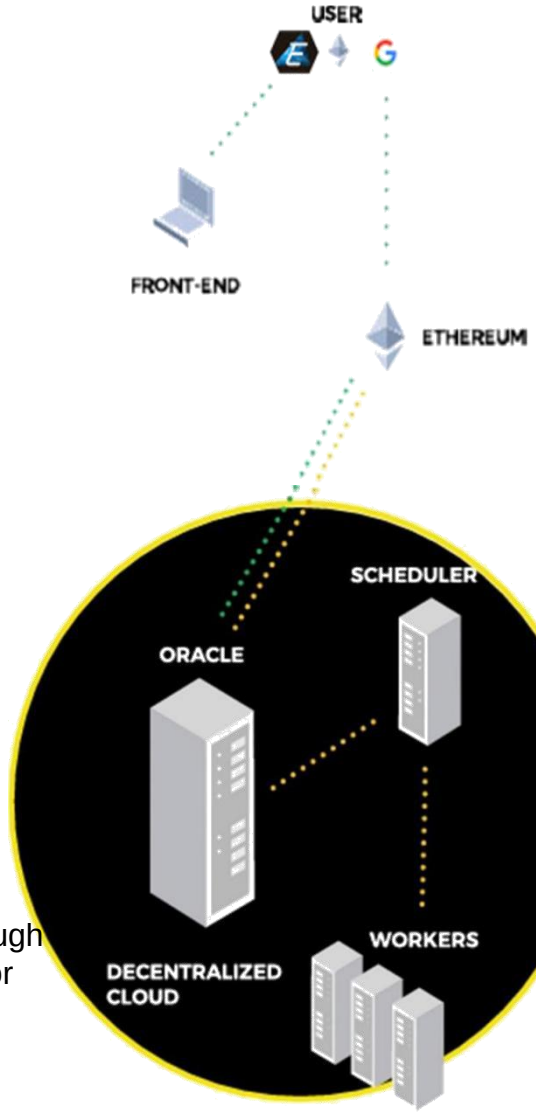
Furthermore, **data centers consume massive amounts of energy for running servers and the**
**coo-**
**ling systems. This is not only costly but can have a huge negative impact on the environment.** We
need a new form of decentralized cloud that can enable blockchain computing and lower the cost of
infrastructure usage.

## 4. THE ECT SOLUTION

### 4.1. Technical Overview

**ECT will support emerging blockchain based distributed applications.**

**The cost benefit is achieved by building a decentralized cloud framework to achieve high performance computing.**




A decentralized cloud based on a blockchain will be very low. Access to the most competitive computing infrastructure on demand, security, and low cost.Dapp will rely on esc to automatically search, find, provide, use, and release all composite resources. They need: applications, data sets, and servers.

ECT envisions a new ecosystem that provides storage,computer farms, data support programs, network hosting, and SaaS applications, all of which are traded through ECT. A decentralized Zed cloud will open up newmarkets for active use of existing composite infrastructure.

**The amount of energy required to bring down**

**Operating servers and air conditioning systems, servers can be pushed out of the data center. Through simplified interview with household, distributed cloud computing.**

**In this way, a large or small number of data in the center of the environment, at the same time more data**

**Close birth and consumer.**

### 4.2. Core Value Proposition

ECT addresses the needs of all the decentralized businesses:

- DApp providers can perform off-chain computations on demand.
- Application providers can radically lower the computing costs of their decentralized applica-tions by using a safe, robust and reliable infrastructure.
- Data providers can expand their potential market size by integrating their services with the ECT marketplace.
- Server providers can monetize underused computing resources and increase the return on investment on their existing infrastructure, by seeking higher profits in providing

their servers in the ECT marketplace.

**Existing infrastructure providers**

ECT allows the rapid monetisation of existing computing resources for home users or additional monetisation for existing infrastructure providers like miners. **Functionalities like sharing spare cy-cles, using servers in a compensatory approach and usage of resources from different providers without the hassle of resource management allows new use cases** and simple additional moneti- sation.

**Decentralized applications or cloud infrastructure users**

ECT will provide computing resources to decentralized applications at a much lower cost than tra- ditional blockchain computing resources, helping them drive more value for their customers. **Transparent reputation of resource providers will reward reliable providers, with integrated Quality-of-Service controls** providing the required level of computing resources. Support for different resource providers and full visibility into partial contributions from each provider will also contribute to transparency.

### 4.3. Key Technological Advancements

Developing a strong decentralized computing market network requires several technological breakthroughs:

• develop a proof of contribution agreement that provides verifiable consensus, traceability and trust,

• develop smart contracts to obtain and provide computing resources and automatic payment after execution,

• develop a technology that allows DAPP access to disconnected computing resources on demand.

• develop an Internet technology that promotes and USES computer resources in the marketplace,

• support the service-level consultation on the use of resource agents through consultation with them on the status of their use and the provision of S L A certificates to clients and suppliers.

**ECT would make it the world's first decentralization platformdecentralized computing market by the proposed settlement programme!**

## 5. MARKET OPPORTUNITY

### 5.1. The Perfect Time In Market

The convergence of several trends has created the optimal business environment for a decentralized
cloud infrastructure.

1. The convergence of several trends creates the best business environment for decentralized cloud infrastructure.The advent of the blockchain proof device optimizes a large number of computing resources to seek the highest return on investment and provides sufficient resources for supply.
2. Smart contracts have reached the point where they can include all the complexity of a mar-
   ket network for decentralized computing resources, therefore vastly simplifying the in- frastructure.
3. In addition to traditional cloud computing users, a new breed of distributed applications is coming into prominence, disrupting the incumbents and showing potential great promise for the future.

**The sum of these trends justifies an imminent go-to market, in order to take the lead in cloud computing for dapps and be ready to scale with the increasing demand for cloud resources in the years to come.**

### 5.2. The Blockchain Market

As a team with the highest ideal goal of achieving self-worth, we did not conduct ICO financing like others, but used our own funds to support the development of the technical team.

Demand for distributed ledger technology, lower total cost of ownership, encryption in the money markets rose ceiling and first issued COINS, increased demand for simplify business processes, transparency and immutability, faster transactions, as well as BlockChaina - a - a service that is considered to promote growth. F is the market.

Royal bank of Canada (RBC) "capital markets analyst" Mitch Steve (Mitch Steves) in 2018, a report published on January 3, said confidently, encryption currency and chain block application maggie could increase of 13 times in 15 years, to $10 trillion.

Blockchain-based cryptocurrency will allow the creation of decentralized versions of value storage servers - vices such as Dropbox or iCloud. The $10 trillion figure represents a third of its current size. Value storage market.

At the same time, cloud service providers are likely to be most affected.

From blockchain technology, if they can't adapt, there will be a negative impact.

### 5.3. The DApps Market

In April 2018, ChrisMcCann of duper state university analyzed top-level decentralized applications (dapps) built on the largest distributed application platform.

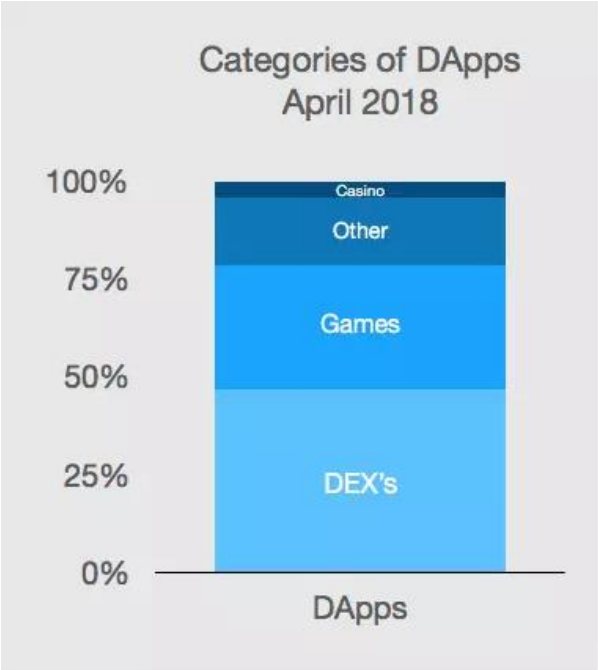
The 312 dapps currently deployed can be divided into four categories:If 312 dapps have been created globally, they are mainly divided into four categories:

I. Decentralized exchange

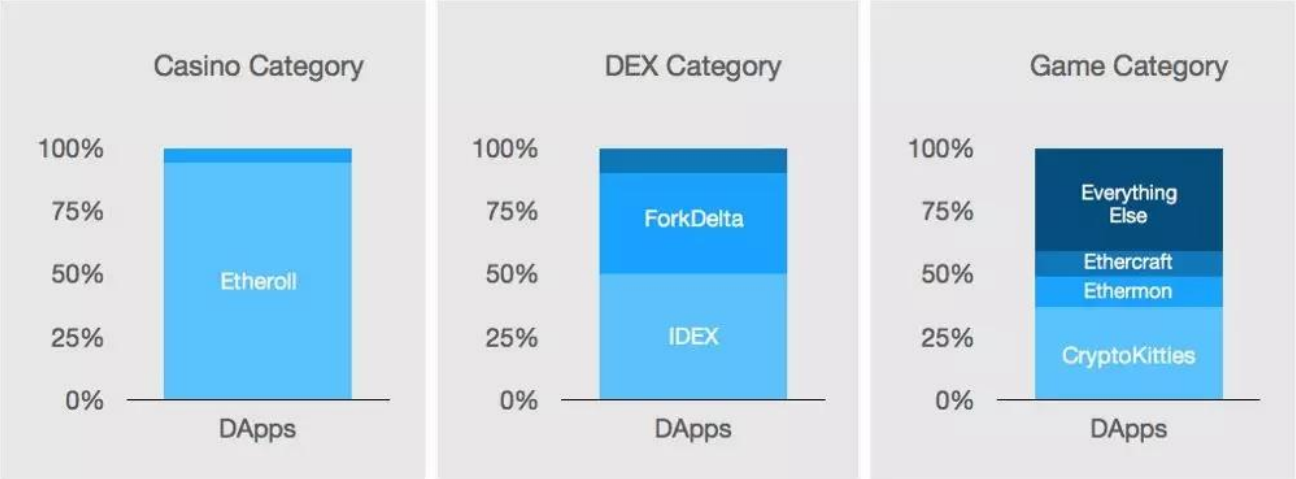
II. Games (mainly collectible games, excluding gambling and opportunity games)

III. Gaming applications

IV. Others (to be reintroduced later)




**A key implication of his research is that the top Dapps in each category are still very small.**




When studying "other" categories, the largest individual dapps in this category are basically pyramid projects (i.e. pyramid selling) : **POWH 3D, POWM, POWL, LOCKEDIN**, etc.

Please be careful. All these items are actually pyramid selling.

Compared with traditional consumer networks and mobile applications, the number of these excellent dapps is stil**l small.**

| | Transactions (over the last 7 days) | Estimated Daily Active Users (DAU) |
|---|---|---|
| Etheroll | 18,322 | 53 |
| IDEX | 73,487 | 1,921 |
| CryptoKitties | 41,673 | 907 |

* Even **"Top Dapps"** are not very large: according to our rough estimation, CryptoKitties only have 14,000 independent users, with a daily transaction volume of 130,000

Compared with:

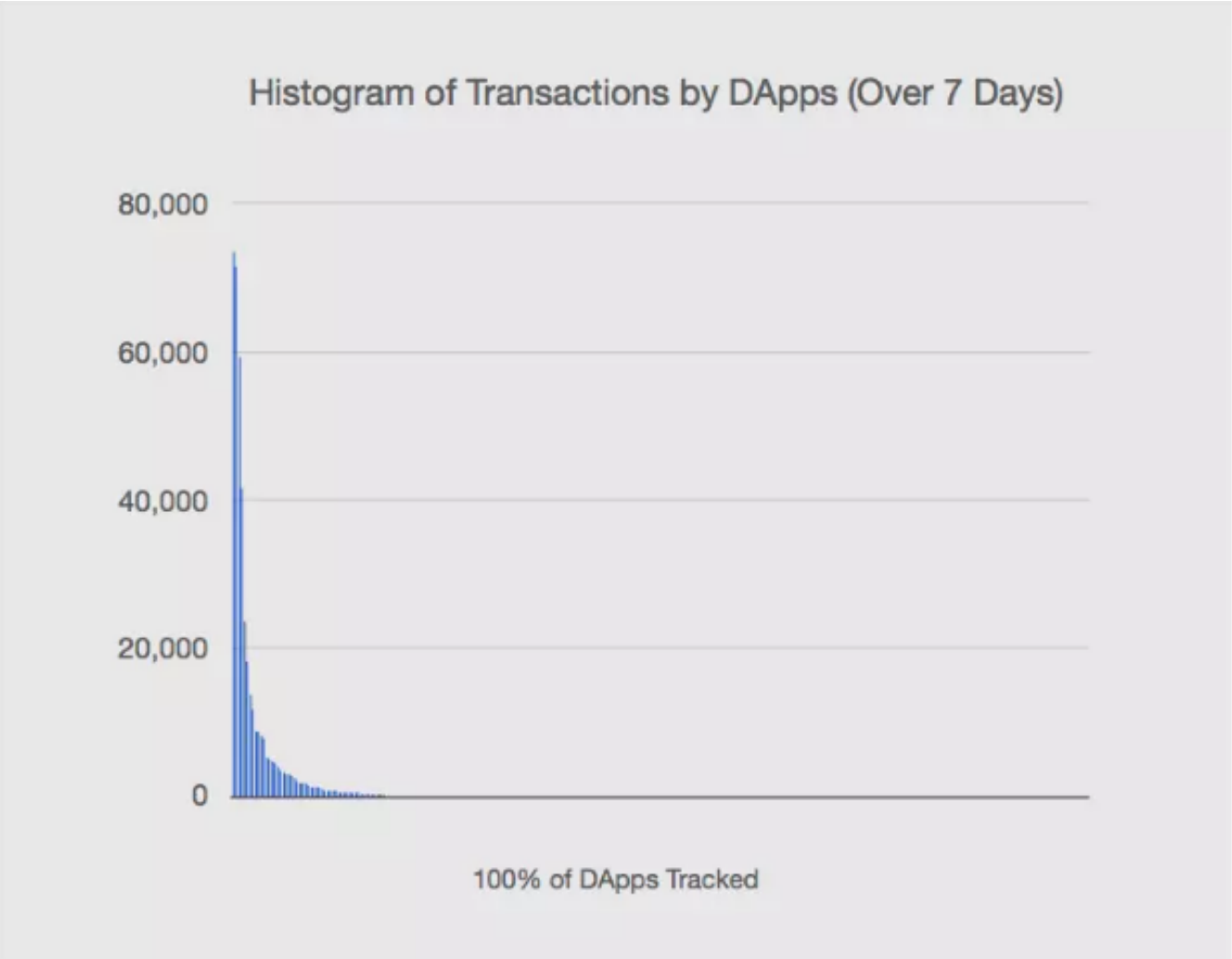
| | "Transactions" | DAU |
|---|---|---|
| Facebook | 300M photos uploaded per day & 700M comments posted per day | 1.4B |
| Twitter | 500M tweets per day | 157M |
| WeChat | 38B text messages & 6.1B voice messages sent per day. | 1B Monthly Active Users (DAU stats aren't shared) |

* Another comparison point, even for the top 50 apps in Google stores, there are more than 25,000 downloads per day. (it's just a download, not even a deal.)

A further review of DApp transactions tracked here also revealed some trends:

· more than half of DApp transactions last week were 0.

· only 25% of DApp transactions exceeded 100 within one week.




At what stage are we in, and what does that mean for protocols and ecosystems?

Based on these data, I personally have the following feelings:

We have a long way to go to get consumers to adopt DApp. Killer apps have not been created (except token and transaction). Moreover, it seems that the overall utilization rate of "big" dapps (such as IDEX, CryptoKitties, etc.) is low.

All good dapps are still focused on value speculation. Decentralized exchanges, gaming, pyramid projects, and even the current collection of games (I think) revolve around speculation.

Which applications (other than value transfer and speculation) take advantage of the truly unique properties of the blockchain (getting rid of censorship, data tampering, etc.) and enable the real application of the blockchain?

Developers for the new agreement, don't try to convince the existing DApp developers in your new platform build DApp - try to think what kind of DApp agreement that suits you, and how to help them get to the real application.

As an ecosystem, we need to build better tools and infrastructure for widespread adoption of DApp.

Metamask is a great tool, but for most casual users, the initial step of Metamask is still difficult. The reason: a. the average user is not used to logging into an application by extension. B. if you are a new user, in addition to downloading metamask, you need to learn the basics of the wallet, the public/private key, and sign the transaction. C. the most important thing is that they need some in the wallet to store the etheric money can use the application, so they either need to go to the market to buy the etheric COINS, or turn into metamask purse the etheric currency. All this is a hindrance to trying out new dapps. I understand why most dapps now only cater to existing crypto-currency advocates, who probably already know all these steps. Toshi, Status, and Cipher are steps in the right direction, and I'm really looking forward to building other tools to simplify the user trial experience and improve general UI/UX for the average user.

supplement

Take the situation of DApp other than taifang DApp. Take LBRY and Steem as examples:

LBRY -- I'm not sure how much content they have on their network, but if you look at their block browsers, they've done 325 transactions in the last 24 hours. It's a bit unfair given that they're still in the early inner stage, but I still have to infer that their content networks are fairly small.

On the other hand, Steem is stronger than I expected. Here are some data:

- daily active users (DAU) 60,100

- 47,000 press releases per day

- daily comments were 120,500

Compared with the Reddit:

-monthly active users: 330 million (if the percentage has not changed since the DAU was announced in 2016, my guess is about 25 million daily active users)

- about 350,000 copies per day

- about 2.8 million comments per day

**ECT has chosen to focus on as a first step in its use strategy on Dapp, and imagine a more valuable and more diversified password field of application, the application will use its unique features. Growing up on their journey, competing with traditional consumers for online certification - applications.**

### 5.4. The Traditional Cloud Market

Over the past decade, cloud delivery and consumption patterns have revolutionized the IT industry, as evidenced by the sharp rise in public cloud services. In its first overall prediction of cloud opportunities, IDC estimated the entire world's cloud

**Revenues will reach $554 billion by 2021, more than double what they were in 2016. The past few years have seen a steady flow of innovative services from key citizens. Cloud service providers, including blockchain services, iot back-end data services, encryption services, serverless computing services, and even new computing hardware services.**

ECT will identify the areas where its decentralized cloud market network can best compete with existing cloud infrastructure providers, and focus its efforts on these potential competitive advan-tages.

**The team's speed-to-market due to a comprehensive existing technological foundation will grant ECT first mover advantage, positioning ECT as the go-to computing provider for the decentralized applications of the future.**

ECT will allow traditional cloud services to be run in a new fashion within its decentralized network, enhanced by the Ethereum blockchain and the ECT sidechain. **This unique infrastructure will give birth to the first global market for computing resources, in which these resources are provided by a mix of private data centers and public workers.**

### 5.5. The Edge and Fog Computing Market

The Internet of things is rapidly expanding its potential to transform the everyday lives of smart homes, cities, farms and manufacturing facilities. The market has huge growth prospects.

Gartner predicts that 20.4 billion internet-connected products will be available worldwide by 2020.

Developing solutions for the Internet of things requires unprecedented cooperation, coordination, each part of the system, and connectivity throughout the system. All devices must work together and integrate with all other devices. All devices must communicate. And interact seamlessly and securely with the connected systems and infrastructure. Unless there is a new way of thinking and

new ideas, otherwise it is possible to achieve, but it may be expensive, time-consuming and difficult iot security methods emerge from the current centralized mode.

FOG corporation, the Controland network, is more like a user's cloud-to-object continuity. The global foggy com-puting market has the potential to reach more than $18 billion worldwide by 2022. According to a recent study by OpenFog project 451.

451 Research anticipates that adoption of the Fog-as-a-Service model will initially trail product-oriented approaches among early adopters, but that FaaS will grow to represent more than one-third of all deployments by 2022, as the outcome-based lease model grows in familiarity and popularity.

**The cloud segment will grow from a 16.4% segment share in 2018 to a 35% segment share in 2022, to reach $6,3 billion in 2022.**

**ECT addresses both the edge and fog computing markets,** since our open infrastructure can also work with a private pool of workers. Fog and cloud complement each other to form a service conti- nuum between the cloud and things, by providing mutually beneficial and interdependent services.

**ECT actively participates in the elaboration of standards and contribute to building a frame of reference in the fields of fog and edge computing.**

To do so, ECT has joined the OpenFog Consor- tium, a thriving ecosystem of organizations who share a collective vision that fog computing is a key enabler to IoT and other advanced concepts in the digital world.

OpenFog includes ARM, Cisco, Dell, Intel, Microsoft, and Princeton University, and has since grown into a robust organization with nearly 50 members from across the globe. **ECT's goal and role within**
**this consortium is to accelerate the deployment of fog computing technologies, with a focus on developing blockchain-based open architectures that will support intelligence at the edge of IoT.**

### 5.6. Competitive Landscape

**We will limit our review of the competitive environment to activities related to blockchain, particularly**

**those that provide the following items: non-linked computing, data hosting, and computing resources. Several projects allow computing on untrusted resources, such as Enigma or Truebit. While these pro-themes are interesting from a research perspective, they tend to rely on heavily constrained solutions. Their applicability, such as multiparty computing. ECT, by contrast, has a low contribution and can be integrated with any legacy application or library.**

**ECT does not compete with blockchain based online storage solutions such as Storj, Filecoin, or Sia. Instead, ect allows the use of data sets to be monetized, that is, data access for specific applications. Oraclize ACTS as an intermediary between smart contracts and data sources to ensure that others do not push the wrong data in smart contracts. The most basic technique is to find synergies.**

**Few projects provide computing resources through blockchains. Grid creates an encrypted currency based on calculations provided to boinc-based volunteer projects, so it is largely limited to altruistic contributions to science projects.**

**G o l e m, S o N m and e C T have the same wish to apply the new interconnection network infrastructure for block chain initiation. However, their respective marketing strategies are slightly different. The objective of G o l e m is to set up a network first. For attract the issue of the 3 d adamantly dye users to their platforms, s o n m is nearly right from the beginning, from the side edge and e c t first concern is backing to d a p p to compose to build a full astern of cloud. In the end, there will be enough competition to attract cloud and H P C users.**

**An important feature of ECT is the interconnection of applications, services, and data. And computing resources. In this use case, eFAST USES data and computing resource providers. Through block chain technology.**

**Data provider**

**Data is an important source of business, technology and scientific innovation, which has led to the development of clock-based data warehouses such as Ledgy.com and Keiko.com, an archive called "CRY". Currency exchange data. ECT will enable application provider eFAST to connect to data provider Kaiko.com, enabling eFAST to run based on specific user-defined combinations.**

## 6. BUSINESS USE CASE: EFAST

**AW Sor Microsoft Azure**, distributed cloud service providers, such as calculation of **QarnotIm Ent ErorSgy**, or block chain mining companies, such as genesis of mining, they always seek to optimize their resources profitability, for example, Through the operation of H P C calculation and mining E t r u u u m block. A user may choose e, F, A, S, T as the sequence of applications to be used, K, e, K, O as the data source, and S, T, m as the source of funding. After that, the program sequence, data and source shall be expressed as the intellectual energy contract d e. On the block chain, insert our banner.

## 7.TECHNOLOGY OVERVIEW

### 7.1. Background: Desktop Grid Computing

Desktop grid computing includes several features that make it a good platform for a fully distributed cloud:

• recovery power: if the node fails, the calculation continues at other work nodes.

• efficiency: applications can achieve excellent performance even if the compute node is highly HETE.

• easy to deploy: allows the use of any node without a specific configuration, even those on the edge of the Internet

Resources are available from classic high-performance computing clusters, cloud infrastructure providers, and home PCS.

In the past decade, many distributed com-puting technologies have been developed: mpich-vfor parallel computing, BitDewfor large-scale data management, SpeQuloSfor pro-vid. Service quality meets application execution, first implementation of MapReduce Internet computing, and so on.

We have gained unique expertise to make desktop grid technologies work and can be used in a variety of scientific and start-up and innovation industries.

• the ECT team demonstrated the applicability of the technology in many scientific fields:

Physics, biomedical research, mathematics, financial algorithms, material research, 3D rendering, etc. .

Understand their needs and needs from biomedical and electronic health departments, design MVP and PoC.

The emergence of blockchain is the key factor that triggers our ultimate motivation. Eli led the ECT program.

• knowledge and experience gained through exploring, inventing and building the Internet

Distributed computing infrastructure is a key part of creating distributed clouds for distributed applications based on blockchain, and the basis of developed technologies ensures distributed computing infrastructure. A quick marketing time and timely project completion.

### 7.2. The ECT Sidechain Infrastructure

ECT relies on blockchains to coordinate computing resources' access to distributed applications. This approach has led to some innovations in classic blockchain technologies - in particular, consensus agreements to prove contributions and side chains in a particular area.

### 7.3. Proof-of-Contribution

#### 7.3.1. Consensus Protocols

Traditional blockchains, such as **BTC** or **ETH**, rely on work certification protocols, and the token transactions that occur on the blockchain between participants are made up of a large number of nodes that use password challengers. That happens outside of the chain block (e.g., to provide the data set, transfer files, execute COMPUTING give human expertise) will lead to a symbolic transactions between participants.

This means that a new protocol is needed to prove that contributions do occur - and that corresponding token transactions can occur in the blockchain. We call it some kind of consensus proof of agreement - contribution.

There are several similar protocols [Filecoin, Grid COIN, Fatcom] that allow the establishment of a protocol between a primary chain and an off-chain resource. Gridcoin, for example, offers proof. The research program rewards volunteers who donate part of their computer time to a great scientist. Calculate [BOINC], such as biomedical research.

#### 7.3.2. The Need for PoCo

**ECT is building a decentralized cloud platform with application providers, data set owners, and owners. For computing resources (workers) and users, the ECT token can be used to evaluate their assets. Although the platform can be compared with the existing platform, ECT, completely decentralized nature means that don't need to trust any single agent, the agent need incentives to participate in - is straightforward. In this context, poco(used to prove contributions) is a protocol developed by ECT.**

Describe the interactions between different agents and take advantage of features such as incentives for builders and incentives.

#### 7.3.3. The Role of PoCo within the ECT Platform

The ECT platform requires two entities to work:

• a market where agents present their resources and trade in ECT tokens.

• a distributed computing infrastructure based on middleware, xdiveweb-hep.

**POCO ACTS** as a link between the two entities. Once a deal is reached, poko will reach a consensus. It will verify the different contributions of the staff in the middleware. When consensus is based on the calculation results, poco triggers related transactions that occur. In the market.

As mentioned earlier, different agents have different roles and different incentives. The protocol itself allows the following agents to be listed first:

• **Workers:** They are individuals or companies who own computing resources and are willing to make them available for the computation of tasks against payments in RLC. Similarly to blockchain miners, they want a simple solution that will make their computer part of a large infrastructure that will take care of the details for them.

• **Worker pools:** Worker pools organize workers contributions. They are led by a scheduler, who organises the work distribution. They can either be public and federate resources from anyone or private and try to optimise the management of specific hardware. While not doing the actual computation, they receive a fee for the management of the infrastructure. They compete to attract workers, which they do by achieving an efficient management which guarantees the income of workers.

• **App providers:** They deploy applications on the ECT platform. Those applications can be

Dapps using the full potential of blockchain-based decentralized Cloud or legacy applications which could benefit from the ECT decentralized Cloud. They can make their applications avai- lable for free or ask for a fixed fee for each use of their application.

• **Dataset providers:** They own valuable datasets and are willing to make them available, in a secure paradigm that protects their ownership, against payments in RLC.

• **Users:** They are individuals or smart contracts paying for the execution of tasks, with or without specific datasets, using the computing resources of workers. They want to make sure that the results they receive are correct.

• **The ECT Hub & Marketplace:** This is a smart contract, deployed by ECT, and without pri- vileged access. It acts as an escrow for the different agents' stake and ensures the security and transparency of all transaction in the ECT ecosystem.

**The ECT Hub &Marketplace decentralization, security and confidence are ensured by the blockchain technology. All others agents are considered as potentially malicious. The design of PoCo's oversight of all transactions between the agents is done in such a way that it creates strong economic incen- tives to behave correctly. This makes ECT much more than other conventional cloud providers by giving it the capability of organising a trusted computing platform on top of an infrastructure of untrusted agents. Not only is this trust building process an interesting feature to have, it is essential to providing any result to blockchain users and smart contracts.**

### 7.4. Domain Specific Sidechain

Ethereum allows code to be executed on the blockchain using smart contracts - a great advance for blockchain technology. However, the DAO attack [HackDistrib] has shown that dealing with smart contracts is a complex issue, especially when everyone is allowed to deploy them. To prevent poten- tial security issues, ECT will follow a more restrictive approach: a Domain Specific Sidechain.

Domain Specific Sidechain also means that we will adapt the blockchain to meet the requirement of distributed infrastructure management. There might be the case where transactions would arrive "en masse" (i.e. tasks submissions) or case where low latency (communication/acknowledgement) is re- quired. In this case, relying on a sidechain with specific capabilities can allow to process these events.

For Josh Stark, co-founder at L4, the projects working to build the Ethereum infrastructure and ex-pand its capabilities are commonly referred to as scaling solutions.

These take many different forms,and are often compatible or complimentary with each other.

"Cryptoeconomic consensus gives us a core hard kernel of certainty—unless something extreme like a 51% attack happens, we know that on-chain operations—like payments, or smart-contracts—will execute as written. The insight behind layer 2 solutions is that we can use this core kernel of certainty as an anchor—a fixed point to which we attach additional economic mechanisms. This second layer of economic mechanisms can extend the utility of public blockchains outwards, letting us have interac- tions off of the blockchain that can still reliably refer back to that core kernel if necessary", explains Josh Stark.

Many layer 2 scaling solutions are currently being developed, each offering a specific tradeoff between speed, finality, and overhead. Among these, we can cite state channels,

0x, Plasma, Raiden,PoA and Parity Bridge, Cosmos, etc.

**ECT will leverage a Domain Specific Sidechain to lower the costs of gas on Ethereum, while choosing a solution differentiating itself by its applicability to other main chains.**

### 7.5.ECT Smart Contracts:Matchmaking

A Matchmaking algorithm [Matchmaking] is used in distributed systems to pair a resource request with a resource offer according to their description. When designing a distributed Cloud, the Matchmaking algorithm is an essential building block in resource provisioning. It basically answers the question: can I run this task on this machine? We envision the ECT blockchain to store smart contracts describing the computing resources characteristics, such as for example amount of RAM, CPU type, disk space. That means that some contracts will describe the requirements for running a task or deploying a VM instance (minimum amount of disk space, RAM, GPU runtime requirement,expected hypervisor etc.). A Matchmaking contract will do the pairing, possibly implementing different kind of policies.

Several Matchmaking description languages have been described in scientific articles and implemented in software. ECT team plans to design and adapt a simplified version of the well-known and tested ClassAd [ClassAds] that powers the CondorHTC distributed system, developed at the University of Wisconsin.

### 7.6. ECT Smart Contracts: Multi-Criteria Scheduling

In distributed systems, a scheduling algorithm distributes a set of tasks to execute on a set of computing resources. The scheduler is a key component of any distributed computing systems, as the performance of the application execution mainly depends of its effectiveness. In particular, a challenge is to design multi-criteria scheduler, i.e. an algorithm that has several strategies to select the computing resources and schedule the tasks. For instance, one customer may want to minimize the price even if the computation takes a longer time, while another customer may want the best performances even at a higher cost.

The ECT team has developed an advanced multi-criteria scheduler [MulticritSched], which allows customers to define their own preferences based on criteria such cost, performance, trust, reliability, and energy efficiency. ECT will adopt a simplified version of this scheduler.

### 7.7.ECT Smart Contracts: A Market Management Framework

There is still no Ethereum framework to manage a market, allowing the users to put offers and demands to be stored and updated dynamically. ECT will develop a simple API to register bids and a set of template contracts to easily deploy customized markets. ECT will also provide web user interface and the JavaScript code that allows interacting with the contracts and easily placing orders.

### 7.8.ECT Smart Contracts: Result-Checking on the Blockchain

Result checking is a process that verifies that a result has been correctly computed by an untrusted node [Sarmenta], and there exist several approaches to implementing it. However, existing methods (replication and voting, spot checking, reputation etc.) have been designed with the assumption that the computation were done for free (ignoring the economic perspective). ECT will develop a new result checking algorithm that leverages the blockchain and the smart contract features. By this approach, users will be able to choose business partners from the market based on their provable reputation and on the established budget.

This will enable for example escrow type mechanisms, where payments for the execution will be de-

ferred until the result has been certified. This mechanism can also be coupled with a reputation system that is stored on the blockchain and enables the platform to only run redundant computations for the less trusted nodes, greatly reducing the required resources and price of computing.

### 7.9. Verified File Transfers

It is likely that commercial content distribution will be one of the biggest functions of distributed applications using the ECT blockchain. This would for example mean customers paying for high value datasets (like genetic or financial data) using smart contracts that would give them access to data.

ECT will guarantee that a content provider was actually able to provide the file, and confirm that the file has actually been downloaded before processing the payment, therefore protecting the data recipient. ECT also protects data providers against malicious downloaders, who could pretend that the file transfer didn't succeed in order to reclaim the payment.

### 7.10. Governance

Because ECT will only authorize signed smart contracts to be deployed on the blockchain, a form of governance is necessary to consider, such as peer reviews, and sometimes revoking smart contracts. A smart contract should include:

- A proposition describing the contract, written similarly to RFC standards,
- The code of the smart contract associated with the description.

Eventually, a distributed standardization body will collaboratively evaluate and elaborate the smart contract propositions.

### 7.11. Proof-of-Concepts

**In order to demonstrate the potential of the platform and demonstrate its technical feasibility, we have prepared several proof of concept on the basis of the technology we have developed.**

**There are a number of commercial and research distributed applications that are well suited to the ECT platform that provide not only low cost but also high scalability performance. The following are just some new examples that have been integrated into the PoC platform that can be used immediately:**

• **video transcoding:** ffmpeg, a complete cross-platform solution for recording, converting, and streaming. Audio and video.

• **physical simulation:** the high energy beam - beam interaction analog electronic collider in plop, guinea.

• **digital signal processing (DSP) :** university of Westminster.

• **physical calculation (ISDEP) :** fusion, solving the dynamics of fusion plasma.

• **audio analysis:** DART, a distributed audio analysis and music information replay framework -

• **optimization algorithm:** BNBSS, different types of deterministic and heuristic optimization

**An algorithm for solving global optimization problems.**

**We will test the principal architecture using blockchain-based cloud computing, off-chain computing, and its high scalability.**

# 8.THE MARKETPLACE FOR CLOUD RESOURCES

## 8.1. The Cloud Computing Marketplace

### 8.1.1. Cloud Computing as a Commodity

**ECT introduces a new paradigm in cloud computing: it will allow the trading of computing resources as commodities; in the same way we may observe with resources such as oil, gold or rice.**

To understand the benefit of a global market for computing power, let us draw comparisons with the
oil market. When you are stopped at a gas station, filling your car with oil, you have little to no idea
where that oil comes from or how it arrived at that gas pump. There is an entire industry behind the scenes, that has standardized the whole process from petroleum extraction, to processing, to trans- port and delivery, and eventual utility being consumed by vehicles.

Now take the example of an application developer. A developer needs resources too, in the form of computing power from cloud vendors to 'fuel' his applications. However, in contrast, they do not have the luxury of benefiting from an organized and global market with abundant choice of vendors and competitive prices.

Let's imagine you are a driver in the same situation, with no choice but to fuel a car in the same way developers fuel their apps. Being a driver in this case, you would have to call a specific Iranian or Ve- nezuelan extractor to organize oil transported directly to your car. What's worse is that, because each oil company produces its specific oil without standardization, the driver would probably have to pro-
cess or 'transform' the oil so that it is compatible with his car. Today, this is the situation developers
find themselves in, in the current age of cloud computing.

Therefore, the entire infrastructure must be changed. **Our vision with ECT is to create the first
global market for computing resources.**

### 8.1.2. Workers Pools

Computing resources will have the possibility to be integrated into the ECT network, making it the first decentralized cloud that is able to execute any type of applications using (almost) any type of resource. Any machine will be able to become a "worker", i.e. getting paid in RLC for executing appli- cation tasks.

Workers will be organized in **worker pools.** Each worker pool is managed by a **scheduler**, whose responsibility is to distribute tasks to workers. Thus, a worker pool is somewhat similar to what we know as 'mining' pools. An individual miner often joins a mining pool to maximize their chances of getting reward computations. Similarly, as a worker, you would join a public worker pool that will make sure that it has sufficient workload to distribute.

An interesting feature is that several **public worker pools** will compete, therefore allowing for the best possible quality of service. As a worker, if you switch to a different worker pool, you will still be able maintain your reputation, bringing it 'with you' to the new pool, as this is all recorded on the blockchain.

In the marketplace, you will also find what we call **"private" workers pools**, where all machines are provided by a single cloud provider running his own scheduler. We already have sealed agreement deals with several cloud companies in the area of 'Green IT' that offer more sustainable approaches to data centers.

What does it change for developers? A piece of 'work' is now defined as triplet: an application, a dataset, and a worker pool. It means that **every dapp can now have access to unlimited off-chain computing resources** just by specifying this triplet. Developers simply have to deploy their legacy applications (as Docker containers) and datasets, and to connect to an existing worker pool.

#### 8.1.3. The ECT Marketplace

**Thanks to the ECT Marketplace, users will be able to view all the different worker pools, the available resources, the prices for using them, and so on.**

Based on these different offers, users and developers will select the corresponding pool to execute their task. **The marketplace is implemented as a smart contract and is already part of our 'PoCo' protocol. The marketplace provides an easy-to-use interface so that users and developers can see how the market and ecosystem is dynamically evolving.**

#### 8.1.4. Pay-per-Task (PPT)

To make this market possible, we have to change the way pricing is done in traditional cloud computing. With AWS for instance, you use a particular instance, which have known characteristics for some time. Hence, the common way of pricing the usage is the renting of an instance per hour, depending on the zone. Such method cannot be used to build a global marketplace, because the resources will come from many providers (including Internet users) and thus will be very heterogeneous.

To address this issue we are **introducing a new method for pricing that we call Pay-per-Task**, and we have defined several task categories that describe the execution boundaries. We'll start with a very simple definition for task categories, namely wall clock time on a reference machine and amount of data transferred. We'll setup a test infrastructure so that application developers can evaluate the category of their submissions. Conversely, **worker pools will be able to benchmark their infrastructures against the reference machine.** Later, we'll refine the categories, and provide more advanced tools for helping developers to maximize the usage of the infrastructure.

### 8.2. The DApp Store

The decentralized cloud opens the way to a whole new generation of applications based on the Ethereum blockchain. These decentralized applications are referred to as 'dapps'. By design, the capacity of the Ethereum blockchain is limited to applications with very low computation requirements; ECT increases the computing capacity for all these new decentralized applications.

On the journey of becoming a cutting-edge cloud network, **ECT has launched the first-ever DApp Store** for decentralized applications in mid-December 2017. Targeted sectors will be artificial intelligence, big data, IoT and fintech-based applications that require intensive computing power.

All the applications built on top of ECT will be listed on the DApp Store. **Users will be able to browse through the existing dapps and use their favorites, while developers can submit their own dapps**
**and earn money if they wish to monetize them.**

The DApp Store can be seen as a collection of applications spanning all use cases. These apps are curated and classified into multiple categories. Applications are ranked following their reputation, and users can discuss and leave comments on each dapp page.

This Dapp Store is connected to the Cloud Computing Marketplace, as well as to the Data Market- place, realizing the triptych that will power a new generation of powerful dapps. Providing a platformfor dapps with an open marketplace model is an important step towards a decentralized economy. We are proud to be a strong actor being able to deliver products to feed this trend.

In order to boost the development of applications on the blockchain, ECT will organize regular challenges aimed at funding the most innovative and impactful applications relying on the ECT cloud resources. The first edition of the DApp Challenge has reserved a prize pool of $150,000 to support the most promising proposals received.

### 8.3. The Data Marketplace

Today in the world of Big Data, massive datasets are waiting to be turned into value. Facebook and Google do it well, but we at ECT believe this can be done by anyone, which is why we will build a marketplace to connect those that have data to those that don't have it, but would like to leverage it. Applications running on ECT will be able to make use of an ocean of data at their disposal.

The Data Marketplace allows anyone to sell data, whether it is an application that accumulates data, big corporations or individuals. Data can span from a wide variety of fields such as financial data from stock markets, user behavior data from an e-commerce website, or anonymized medical data from a hospital. Applications can then buy and run algorithms on this new tap of data, by relying on the decentralized computing resources provided on the Cloud Marketplace.

Together, the ECT Cloud Marketplace, DApp Store, and Data Marketplace represent the three bricks of the triptych that will power blockchain-based decentralized applications and beyond.

## 9.ROAD MAP

To achieve our goals, we developed the following implementation roadmap according to several fun- ding levels.

With the minimum funding (100 BTC), ECT will deliver an initial market network that allows to mo- netize applications and servers. With a maximum funding (1,000 BTC), ECT will gradually develop the market network including data providers and HPC applications, then establish recurrent sources of revenue to ECT.

### 9.1. Go-To-Market Strategy

We will develop 5 versions of the product (V1to V5) that correspond to 3 steps in terms of go-to- market strategy.

- **Community Edition (V1)**
  Features to create an open-source software that allows to build the decentralized cloud. •
**Enterprise Edition (V2, V3, V4)**
  Features to establish a full market network profitable for a wide range of businesses.
- **Research Edition (V5)**

  Features to make serious advances that can address wider topics than cloud computing (IoT, Fog/ Edge computing).With the minimum funding **(1 0 0 BTC)**, ECT will deliver an initial market network that allows to monetize applications and servers. With a maximum funding **(1 ,0 0 0 BTC)**, ECT will gradually de- velop the market network including data providers and HPC applications, then establish recurrent sources of revenue to ECT.

### 9.2. V1: Essential (Community Edition)

**The Essential version aims to provide DApps running on the Ethereum blockchain an access to off-chain computing resources.** This is an essential step in blockchain computing as it allows a broader range of applications to run on the blockchain.

**At the moment, the gas mechanism provided by the Ethereum blockchain makes the execution of algorithms with computation and/or memory requirements rapidly costly and performance prohibitive. Thanks to the Essential version of ECT, DApps will have a simple, secure, and prac- tical way to reach off-chain computing resources to execute their applications.**

To this end, the Essential version will provide a smart contract API for task execution. In our proof-of-concept, we have already bridged Ethereum with the XtremWeb-HEP Desktop Grid middleware. The bridge monitors the Task smart contract, and when a transaction is detected, it triggers the computation on off-chain computing resources. When the computation is over, the result is sent back to the smart contract. To avoid a part of the security risks, the infrastructure will only include trusted computing resources. Also, in this version, no resource payment scheme will be considered yet.The Essential version will target an initial number of dapps, whom we consider our future early adopters. ECT will provide a set of in-house applications, and will provide support for early adopters that want to deploy their applications on ECT.

### 9.3. V2: Market Network (Enterprise Edition)

In this version we build the Market Network, firstly addressing the Application providers and Server providers. We introduce a Pay-per-Task scheme that allows the payment from the Task smart contract to the Application and the Server providers. ECT users can access the Market Network to launch compute intensive applications in different ways, e.g. an API, a GUI or a CLI. Application pro- viders can decide on a payment scheme through a smart contract API.

This version will target the classic compute intensive open-source applications with a very large user base - particularly 3D rendering (like Blender, Luxrender), biomedical research (like Blast, Autodock), mathematics (R) and finance for which we already have significant experience. With respect to Ser- ver

providers, the focus will be on establishing partnerships with infrastructure providers, such as smaller Cloud providers, individuals and miners interested in renting their server farms, mining rigs or home servers.

Through its Pay-per-Task scheme, this version opens the first revenue stream through agreements with the approved resource providers. This is the very beginning of doing business between providers by monetizing their resources. The usage of the ECT computing service will expand, making the business within the Network Market to grow.

### 9.4. V3: Hybrid Public-Private Infrastructure (Enterprise Edition)

This version includes key features for the enterprises to widely adopt the ECT market network by providing them with full control over the private/ public employment of their resources.

To be well grounded in the needs of industry, in 2014 we designed an MVP (Minimum Viable Product), interviewing 20 startup companies from the Lyon Biopole healthcare innovation competitiveness cluster to understand how they would interact with a distributed Cloud. Thanks to this study we identified three mandatory requirements:

- **Data must be treated with at least the same importance as computations,**
- **A clear distinction between public/ private access** of resources. For example, a private resource can only be accessed by the proprietary company or by a restricted set of trusted partners. Conversely, a public resource can be handled by any hosts.
- Have a clear **vision of cost vs. performance** when provisioning computing resources.
- At a first glance, designing a system which provides these three features is challenging on fully decentralized infrastructures. Fortunately, we already have strong research results and practical experience in each of these three areas.

This version will target Data providers, allowing them to join the Market Network. Moreover, a broader range of enterprises will be able to start shipping their applications and DApps through ECT. With this version, the market network will allow several direct connections between different resource providers. This version strengthens the revenue stream of ECT by allowing new revenue models conceived for DApps requiring a higher level of trust and quality-of-service. These applications will benefit from dedicated environments using selected resource providers, as well as specific QoS features through a performant SLA.

### 9.5. V4: High Performance Computing (Enterprise Edition)

This version allows miners to join the ECT market network as Server providers, and provide their customers with true supercomputing capabilities.

At the moment, the mining farms monetize their GPU resources by computing blockchain consensus. Through ECT, these providers will gain access to a new market of blockchain-based HPC applications. By this, the providers will be offered the opportunity to better exploit their vast amount of computing power and extend their businesses.

For instance, Genesis Mining operates the largest Ethereum mining farms, which are composed of tens of thousands GPU cards, all together representing a considerable computing power (>15 PetaFlops). For the first time at the Supercomputing Conference (SC16), along with key actors of the domain (JenHsun Huang, CEO of nVIDIA and Marco Streng, CEO of Genesis Mining), we initiated clear synergies between HPC and blockchain computing. This ECT version will provide all the technology building blocks to make this happen.

In addition to miners, the ECT HPC version will extend the Application providers pool to GPU-based applications. These applications address deep learning, 3D rendering, computational fluid dynamics, molecular dynamics, finance, and many more. We'll put a focus on Deep Learning applications because of its

incredible fast growing usage, and because actors are already keen on using GPU Cloud computing for that.

This version aims to extend the previously existing revenue models based on the integration of advanced enterprise features that bring higher value to providers.

### 9.6. V5: Beyond the Distributed Cloud (Research Edition)

The goal of this edition is to allow new usage of ECT beyond the Distributed Cloud. This will be a clear step further in Blockchain computing, as DApps will be fully autonomous applications, able to provision resources, data, and applications directly from the blockchain in a fully decentralized way.

To this end, it's necessary to integrate several software and protocols that are emerging now, or that may be developed during the course of the project, like devp2p, swarm, uport etc. Combined with a full development of the Proof-of-Contribution, this will open new areas in the field of serverless services, directly hosted on the blockchain. It will also be necessary to design new consensus protocols able to handle the ECT workload. We plan to lead those researches in partnership with recognised research labs in Europe and in China.

This will open the Market Network to new applications specifically deployed on ECT to take advantage of the distributed Cloud: IoT, Fog/ Edge computing, Smart City. For instance, a recent study shows that telecom companies (AT&T, Verizon, Huawei, Orange ...) can halve their infrastructure costs by distributing small data-centers along their network point-of-presence. ECT will be the building block for such approaches.

As the platform increases in complexity, ECT will provide advanced method for deploying ECT ready DApps, making it the "Heroku/ Docker for blockchain computing". Thus, new revenue stream will be gained by offering a hassle free deployment and development platform on top of the Market Network.

## 10. FINANCIALS

### 10.1. Revenues

ECT will generate revenues from different sources:

- Partnerships with resource providers (V2) and application providers (V4)
- Providing a private mode for applications/ data/ servers (V3)
- Providing advanced services for DApps (V5)
- Monetization possibilities from the ECT DApp Store
- Advanced financial services on cloud resources

### 10.2. Costs

The funds are planned to cover four years of development and operational costs and will have three main operational divisions:

**• development and maintenance of ECT platform,**

**• the marketing and expansion of ECT marketing networks,**

**• academic cooperation to support the most advanced research projects in this field.**

### 10.3. Air Drop

ECT tokens will be used to access the resources provided by the market network. It will be the unique way of payment for application providers, server providers and data providers.