iExec
BB
Stable Outlook

TokenInsight Research
May 2019

iExec

bbb
Stable Outlook

Token | RLC
---|---
Tags | Decentralized Cloud Computing
Price (USD) | 0.58
Market Cap (USD) | 46,048,071
Ranking | 96

Analyst | Peng Jiang
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01. INDUSTRY OVERVIEW

Since the concept of “cloud computing” was introduced by Google in 2006, developments and services surrounding this technology not only became more advanced, but have also reshaped the way businesses operate. Cloud computing can be regarded as a platform that provides various kinds of hardware and software services, allowing users to transfer local data processing tasks to remote server clouds through the transmission of the Internet. With cloud computing, users no longer need to purchase and install complex hardware and software systems, and are simply able to purchase such relevant services through 3rd party providers. According to a research report released by IDC Research, the global cloud computing market is expected to reach $554 billion in 2021, and nearly double that of 2016. \[1\]

With new information technologies like 5G, AI, and IoT in development, new network environments have imposed heavier burdens on the transmission of data, computing and storage. As a result, this has drastically contributed to the increase of costs in these categories. Confronted by such challenges, the current practice of transferring computation tasks to remote data centers are longer economically viable. As mentioned above, the heavy network loads under new cyber environments operate will lead to heavy network congestion and data processing delays.

Faced with many problems, distributed computational technologies, such as edge computing and fog computing, have provided the market with new opportunities for more advanced solutions. When applications are initiated by clients, the closest access points to users will provide computation and storage resources to render near-end services. This method is much better suited to meet the basic needs of the industry in terms of network response, application intelligence, security and privacy protection, and more. Technically, both edge computation and fog computation can be regarded as the integration of virtual technologies and grid computing together. On one side, virtual technologies will collect idle IT resources from the Internet and filter them into a resource pool. On the other side, grid computing will divide the clients’ computational tasks into smaller workloads and assign corresponding IT resources from the resource pool. On the current market, there are several decentralized computational projects which exist to provide such solutions. As one of the representatives, iExec has proposed a solution that combines both blockchain technology with distributed computing.

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02. PROJECT INTRODUCTION

"iExec’s distributed computing technology aims to build a secure and private virtual computing market in combination with Ethereum"

iExec is a distributed computing project based on the Ethereum platform and aims to build a secure and scalable decentralized virtual computing power platform. The iExec platform will allow for Decentralized Application (DApp) developers, data providers, computing service providers, and users to exchange and process computation in a fair and free manner. With regards to the problem associated with network congestion, rising usage costs, and huge thermal energy losses currently faced by traditional and centralized cloud computing data centers today, iExec proposes the utilization of its Desktop Grid technology to collect underutilized computing and storage resources for users and conduct large-scale distributed computing in parallel and at a fraction of traditional supercomputer costs. The core of this platform is called - iExec Core, which is a mature, reliable and open source desktop grid computing middleware developed by iExec. Furthermore, in order to establish an open and traceable credit system for its ecosystem, iExec has also built its own Proof-of- Contribution (PoCo) protocol through blockchain technology. This allows the platform to reward those participants who look to contribute, and eliminates the ineffective members who remain stagnant. More specifically, whenever someone from the platform initiates a computing task, each participating node is required to pledge a partial amount of RLC tokens. If nodes choose to withdraw from the computation halfway through, it will lose the pledged number of tokens and overall reputation will be decrease. After computations are completed, PoCo will determine whether the results are valid based on the credit value of each participating node, and reward corresponding RLC token incentives to the operators who make effective contributions.

Figure 2-1 iExec Platform Diagram
Source: iExec Whitepaper
2.1 iExec Core

iExec Core has already launched with the release of its iExec V3 Enterprise Edition. This release is its middleware designed and optimized for desktop grid computing. The technology is derived from XtremWeb, which was published by the Company's founder during his instatement at the French National Institute for Research in Computer Science and Automation (INRIA). As the core middleware of its distributed computing system, iExec Core can successfully achieve functional features like network resource integration, high levels of operational fault tolerance, and the heterogeneity shielding of underlying resources. These are regarded as some of the essential functions for distributed computing. Combined with blockchain technology, iExec also provides the required security and auditing features needed for the computing industry. Lastly, these additions will allow individual computers to join the iExec ecosystem and become computing service providers, renting out their computing resources in exchange for rewards.

2.2 Proof Of Contribution

Although it is believed that distributed computing has the ability to collect idle computing resources from networks to complete large-scale computing tasks, in the past, such projects have generally relied on volunteers' who provide their own contributions, rather than through a reasonable incentive mechanism. As a result, this scenario has often led to problems seen in unstable qualities of computing resources or insufficient computing power. Furthermore, even projects that are decentralized also run into their own limitations, which merely focuses on the integration of idle resources to solve specific computing problems (for example, SETI@HOME, an internet-based public volunteer computing project). Without improvements, the shortcomings seen from decentralized computing renders this technique inadequate enough to meet the demands of diverse computing scenarios. In light of these problems, iExec has designed and developed its very own Proof of Contribution (PoCo) protocol, aimed at improving the quality, quantity and diversity of computational contributions.

PoCo can be regarded as a bridge between the virtual computing trading platform and middleware (iExec Core) of its distributed computing system. When a user initiates a computation request, the matchmaking algorithm pairs computational resources to satisfy the request demand. If the matching object is located in a worker pool, iExec's “Scheduler” shall decide whether or not to participate. After the computation is completed, PoCo will initiate a consensus validation for the computation provider from its iExec Core. If consensus is reached, PoCo initiates relevant transfers into the market in order to incentivize contributors.
PROJECT INTRODUCTION

There are six main roles in the PoCo protocol (Figure 2-2):

- **Worker**: They participate in iExec's ecosystem and can be an individual or enterprise. They contribute computing power in exchange for incentives. They can be compared to cryptocurrency miners.
- **Worker Pool**: The worker pool is composed of the computing power of all parties, which is managed by the Scheduler. The Scheduler maximizes overall efficiencies by allocating and optimizing computing resources, and charges fees based on the current state of the network.
- **App Provider**: Decentralized "DApps" or traditional Apps can be deployed on and be powered by iExec.
- **Data Provider**: Provides effective data in exchange for RLC incentives. iExec ensures privacy and security in data computing by combining with Intel SGX solutions.
- **User**: Users of computing power or data services in iExec ecosystem.
- **The iExec Hub & Marketplace**: Acting as the asset management center of participants, iExec smart contracts, can only initiate transfers when all participants concerned reach a consensus.

Source: iExec Whitepaper

### 2.3 Domain Specific Sidechain

As a general development platform, optimization for specific application scenarios was not something that was considered during Ethereum's construction and design. If the majority of iExec's computing processes are run off the Ethereum platform, significant problems such as high gas cost and low transaction processing speeds will occur. To better provide services for different business scenarios, a domain specific sidechain will be designed to meet more specific demands that may arise during the computing process, such as parallel computing, low latency interactions, and so on.
2.4 TEE/SGX

After the upgrade of iExec's V3 Enterprise Edition on May 15, the iExec platform now supports a trusted execution environment (TEE) solution in combination with Intel's SGX technology. In other words, data owners now have the ability to rent out the rights to use data without losing ownership, and this ensures data running on remote and untrusted computers to be securely protected. Even more valuable and sensitive data can now be rented out for proper incentives through this service, and such a technology can be widely adopted in medicine, 3D rendering, Internet of Things, data processing and other fields. Several "worker pools" who provide a trusted execution environment (TEE) have been deployed for selection, including options for operating within the trusted worker pools of Alibaba Cloud, IBM, TF Cloud and other enterprises who have deployed their machines on iExec.

In the meantime, iExec, in cooperation with Intel and the Enterprise Ethereum Alliance (EEA), has released V1.0, an off-chain trusted computing standard. iExec will also upgrade its TEE technology stack accordingly in order to meet these standards in the near future, and add support to other secure computing frameworks (such as MPC, zero-knowledge proof and attested oracle).
03. DEVELOPMENT PROGRESS

3.1 iExec’s V3 Enterprise Edition

iExec was launched in January 2016, and its development progress has been in line with its development roadmap. iExec’s V3 Enterprise Edition within its roadmap was officially launched on May 15, 2019 as planned. iExec V3 introduced ‘iExec Enterprise’, proposing custom offers for corporates to address their specific needs. This will involve paid support and consulting services with the option to adapt the iExec offering to private or consortium blockchains. In addition, with this new edition, iExec’s distributed computing middleware was comprehensively optimized and upgraded, now named “iExec Core”. iExec Core allows personal computers to join worker pools, in which individuals can be computing power providers and rent out their idle computing services.

As part of the V3 announcement, iExec revealed that they are ahead of schedule in the roadmap and will release iExec V4 earlier than planned. Coming at the end of 2019, V4 will be High Performance computing edition, with full integration of GPU computing power on the platform. The development of iExec’s technology has not only gained world-wide recognition with cooperation from companies within the industry such as Intel, IBM, but also gained attention and support from complies like Bpifrance and EDF (Electricite De France), which is the biggest electric utility provider in Europe and the fifth largest globally.

3.2 New Features

The Data Wallet is one main innovation in iExec V3, allowing for new business models through ‘data renting’. Data providers can list their valuable datasets on iExec platform, these can be used with an application combined with remote computing power. In the past, companies could only sell datasets or charge subscription fees, therefore losing ownership over their data. The innovation of data renting on iExec allows for business relationships whereby enterprises can execute code using specific data on a remote machine, with the guarantee that this machine will never be able to inspect, copy or tamper with the data. Meanwhile, data providers are able to choose who can have access to their data, and revoke this access when needed. All these compelling new features are based on iExec’s TEE solution, which greatly guarantees the security and effectiveness of project data on the leasing market, while increasing the possibility for enterprise business extensions. What’s more, the V3 Enterprise Edition also incorporates decentralized oracle technologies, enabling applications on blockchains to obtain trusted information from real world without the risk imposed by the third parties, which will accelerate the usability of DApps and fulfill the original vision of smart contracts.
## DEVELOPMENT PROGRESS

### Figure 3-1 iExec Main Events

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>May, 2019</td>
<td>iExec, Intel and Consensys have released the official ‘EEA Off-Chain Trusted Compute Specification V1.0’ together, which is the industry standard for Blockchain-based trusted and privacy-preserving computing.</td>
</tr>
<tr>
<td>May, 2019</td>
<td>EDF (Electricite De France) has cooperated with iExec to test the operation of its related programs through blockchain technology</td>
</tr>
<tr>
<td>May, 2019</td>
<td>iExec released iExec V3 Enterprise Edition as planned</td>
</tr>
<tr>
<td>Feb, 2019</td>
<td>iExec and Intel showed a collaborative solution for 5G network services in MWC</td>
</tr>
<tr>
<td>Feb, 2019</td>
<td>Bpifrance invested 2 million euros in iExec to support commercial applications of distributed computing</td>
</tr>
<tr>
<td>Jan, 2019</td>
<td>SDK - &quot;iExec Core&quot; was upgraded and its V3 GitHub repository was released</td>
</tr>
<tr>
<td>Nov, 2018</td>
<td>iExec integrated the IBM Cloud</td>
</tr>
<tr>
<td>Jan, 2018</td>
<td>iExec and Fog Computing Laboratory of ShanghaiTech University announced cooperation</td>
</tr>
<tr>
<td>Jan, 2018</td>
<td>The end-to-end solution was released for Intel SGX</td>
</tr>
</tbody>
</table>

Source: iExec Official Webpage
iExec’s core team currently consists of about 28 members, distributed between France, China, South Korea, Japan, etc. Several founders and core members have strong academic backgrounds and excellent work experience, providing great support to the development of the Project.

Figure 4-1 Core Team Members

<table>
<thead>
<tr>
<th>Name</th>
<th>Occupation</th>
<th>Experience</th>
</tr>
</thead>
</table>
| Gilles Fedak      | Co-founder, CEO                   | • Permanent INRIA research scientist at the ENS in Lyon, France  
• Ph.D degree from the University of Paris Sud  
• Postdoctoral fellowship at the University of California in San Diego in 2003-2004 |
| Haiwu He          | Co-founder, Head of Asian-Pacific Region. | • Postdoctoral researcher at the INRIA  
• “100 Most Talented Professors” at the CNIC (Computer Network Information Center), Chinese Academy of Sciences  
• M.S. and Ph.D. degrees in computing from the University of Sciences and Technologies of Lille, France |
| Oleg Lodygensky   | CTO                               | • Ph.D. degrees in computing from the University of Sciences and Technologies  
• Senior research engineer at LAL/CNRS  
• Main developer of XtremWeb-HEP |
| Jean-Charles Cabelguen | CMO                        | • PhD in Science from ENSAM ParisTech  
• 12 years of experience working on international business development interacting with big players like EDF (Electricite De France), Areva, Cegelec |

Source: iExec
05. COMMUNITY POPULARITY

"Community popularity has increased in a short amount of time after the release of its V3 Enterprise Edition and then declined"

According to TokenInsights data monitoring of iExec’s community, the number of Telegram users in iExec’s group chat and the proportion of active users both increased in a short amount of time after the release of its newest update. The analysis of iExec’s twitter content indicates that the overall mood within its community is neutral.

‣ Figure 5-1 Analysis of Telegram Active Users
Source: TokenInsight

‣ Figure 5-2 Analysis of Telegram's Sentiment Index
Source: TokenInsight
### Appendix 1 Symbols and Definition of Risk Ratings

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AAA</strong></td>
<td>The technical foundation is extremely solid, the status of operations is extremely stable, the extent of influence on the project by unfavorable changes in the environment or uncertain factors is extremely small, and risk is extremely low.</td>
</tr>
<tr>
<td><strong>AA</strong></td>
<td>The technical foundation is very solid, the status of operations is very stable, the extent of influence on the project by unfavourable changes in the environment or uncertain factors is very small, and risk is very low.</td>
</tr>
<tr>
<td><strong>A</strong></td>
<td>The technical foundation is solid, the status of operations is stable, the extent of influence on the project by unfavourable changes in the environment or uncertain factors is relatively small, and risk is relatively low.</td>
</tr>
<tr>
<td><strong>BBB</strong></td>
<td>Technical feasibility is very good, the status of operations is stable, influence on the project by unfavourable changes in the environment or uncertain factors exists to a certain extent, and risk is controllable.</td>
</tr>
<tr>
<td><strong>BB</strong></td>
<td>Technical feasibility is good, the status of operations is relatively stable, the possibility of influence on the project by unfavourable changes in the environment or uncertain factors exists to a relatively large extent, and risk is basically controllable.</td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>Technical feasibility is moderate, the status of operations is relatively stable, the possibility of influence on the project by unfavourable changes in the environment or uncertain factors exists to a very large extent, and risk is to a definitely limited extent controllable.</td>
</tr>
<tr>
<td><strong>CCC</strong></td>
<td>The technical foundation or idea has certain problems, the application scenarios are limited, the project is susceptible to influence by uncertain factors, both internal and external, and has relatively large risk.</td>
</tr>
<tr>
<td><strong>CC</strong></td>
<td>The technical foundation or idea has considerable problems, and application scenarios are highly limited, which makes for a project that has few internal or external factors to consider in the context of sound development, and carries a very large risk.</td>
</tr>
<tr>
<td><strong>C</strong></td>
<td>The technical foundation or idea has substantial problems, and lacks deliberation upon possible application scenarios. The token has almost no usage value, and the project suffers from extremely large risk.</td>
</tr>
<tr>
<td><strong>D</strong></td>
<td>The project is riddled with problems and carries an extremely high risk of failure.</td>
</tr>
</tbody>
</table>
Tokeninsight Inc.
Global Token Data & Rating Agency

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Cooperation | bd@tokeninsight.com

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