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KHAN™

Subutai *平台代币*
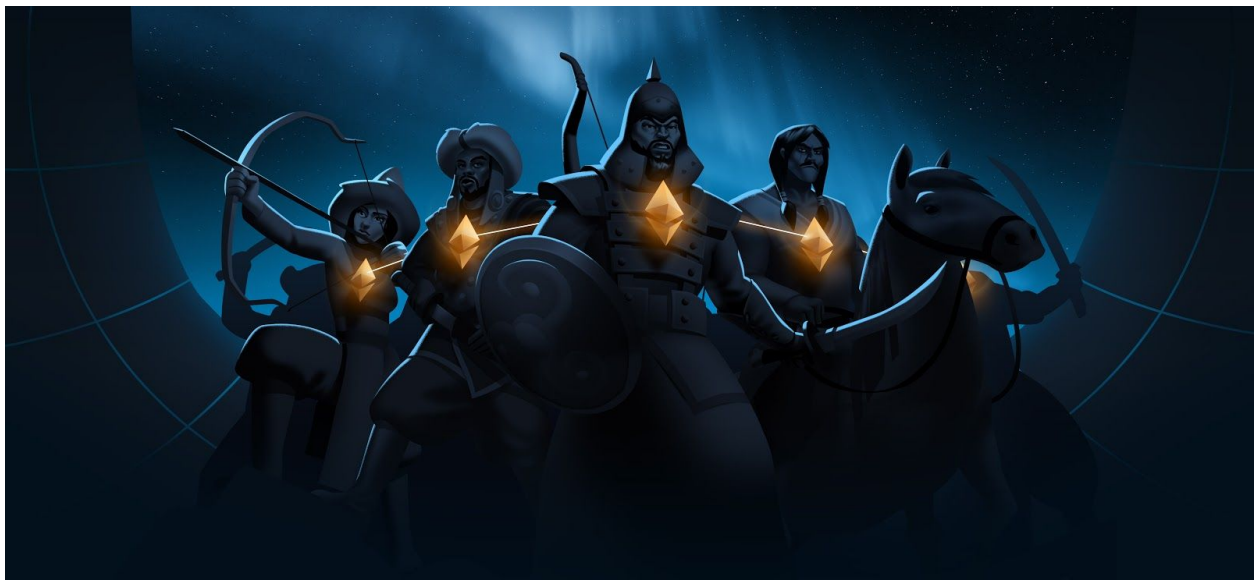
征服云计算

开源对等云计算
每个人的物联网和加密货币挖掘

v0.8

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[1] https://en.wikipedia.org/wiki/SEC_v._W._J._Howey_Co.

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Executive Summary

Subutai™, a turnkey Cloud solution aimed at the global $1.5T telecommunications industry, allows providers to instantly raise and operate a sharing economy using their own Ethereum Token with their existing Internet subscribers. The hardware and software product line includes:

- Subutai™ Blockchain Router: A "green" token mining cloud router and IoT gateway
- Subutai™ Peer Operating System: Open source P2P Cloud and IoT software
- Subutai™ Bazaar: Global marketplace for trading computing resources and applications
- KHAN™ Token: An Ethereum blockchain-based reserve currency token

Founded in 2013, OptDyn designed the Subutai product line to democratize, disrupt, and commoditize cloud and IoT services. Subutai reduces the cost of cloud utilities down to their absolute lowest limit and accelerates the "race to zero". Peer economics has the power to drop the price of cloud services to the cost of the electricity and communication services used.

OptDyn's business model pits the telecommunications sector against the "Big Three" Cloud service providers which have captured Internet subscribers using the infrastructure and communications services of the telecommunication providers. Telecommunications companies lost the first battle against the cloud providers, and many lack a competitive strategy to regain cloud market share even from their own consumers. Meanwhile, cloud providers have already begun to encroach on their primary market[2]. OptDyn specifically crafted Subutai to solve this problem. With Subutai, telecommunications providers will be able to recapture large swaths of cloud market share while simultaneously increasing their competitive advantages in the already cutthroat ISP market.

> ⊘ **The Subutai Advantage**
>
> *Subutai transforms the consumer's selection of an ISP into a conscientious investment decision. With up to 1083% more energy savings for the same hash rate over traditional GPU-based mining, the low power, cost effective, and environmentally friendly Subutai Blockchain Router effortlessly mines the ISP's cryptocurrency. Rather than exchanging their hard earned fiat currency for tokens, subscribers can earn additional tokens from renting out their existing idle computer resources (on a peer-to-peer basis). The dynamic closely resembles the rush of solar panel installations (the switch from carbon based to green renewable energy) mainly as an investment choice due to the opportunity of being able to sell excess power back into the grid. Many are curious about cryptocurrency wanting to own, use, and even mine it, however there are too many barriers for the common subscriber to overcome. As a tangible plug-and-play wallet and mining appliance, the router eliminates the complexity and risk of picking and using software wallets to participate in the crypto economy. These among others are very compelling reasons for Internet users to switch to service providers that offer The Subutai Advantage to their customers.*

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[2] Google Internet and telecommunications services started gaining telecommunications market share.

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Until now, Internet and cloud consumers could only buy services, but Subutai unleashes the market and turns it upside down using the power of peer economics with computing on the edge, where consumers are able to both buy and sell cloud services. Traditional boundaries and roles dissolve when every participant is an equal peer. Cloud and fog democratization is possible with the right business model where participants can take the role of buyer and seller even simultaneously.

> ⓘ **According to W. Xia, et. al. at William and Mary College[3]**
>
> ---
>
> "Fog computing cannot be prosperous without a sustainable business model. According to current research and proposals, the fog computing providers can consist of the following parties: 1) Internet service providers or wireless carriers, who can construct fog at their infrastructures. 2) Cloud service providers, who want to expand their cloud service to the edge of the network. 3) End users, who want to trade their spare computation, storage of their local private cloud to reduce the cost of ownership."
>
> Peer crypto economics is a key factor for feasible fog business models for Internet service providers, Subutai's economy operators mix scenarios (1) and (3), referenced by Xia, at the disadvantage of cloud service providers in scenario (2).

Collaborative consumption forms the basis of any sharing economy. However it has a profound impact on P2P clouds which now gain unlimited hosting options and can roam freely across ISP boundaries[4]. With clouds spread across ISPs, the KHAN (the default and ubiquitous currency of the platform) allows instantaneous exchanges between ISP tokens to seamlessly transact. The KHAN serves as the reserve currency of the platform across ISPs, much like the US dollar does across countries. The design of Subutai, its business model, and its crypto economics will make KHAN the king of all telecommunications tokens.

Realistic Strategy

In the past and current environment (Q2 2018), most projects around token distribution events promulgate idealistic visions of their distributed P2P systems leading to complete independence from oligopolistic markets and their actors ("the man", so to speak). Reality and its facts remain clear and concrete, "Blockchain architecture is mechanism design for oligopolistic markets"[5], and without telecommunications services there is no network, no edge, no IoT, and no cloud.

OptDyn's message, and Subutai's business model are brutally realistic. Rather than joining the chorus with noble yet unachievable claims, Subutai aims to reach a realistic compromise for greater freedom by changing intermediation mechanisms, even if it falls short of the absolute ideal. According to Christian Catalini of MIT Sloan Research, "Whereas the utopian view has argued that blockchain technology will affect every market by removing the need for

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[3] W. Xia, Y. Wen, C. H. Foh, D. Niyato, and H. Xie, "A survey on software-defined networking," IEEE Communications Surveys & Tutorials, vol. 17, no. 1, pp. 27–51, Jun. 2015. https://goo.gl/XwpHce
[4] The Subutai Platform's cloud service broker uses machine learning and predictive analytics to perpetually shop across available peers to balance cost versus performance while dynamically relocating application infrastructure across peers under different ISPs.
[5] Vlad Zamfir clearly shows that cooperative game theory used to model token economies rests in mechanism design for oligopolistic markets: https://goo.gl/mR4XwG

intermediaries, we argue that it is more likely to change the nature of intermediation.[6]" Compromise and realistic steps are the only path forward to reach the panacea we all dream of and hope to bring forth one day. Working together strategically with industry is crucial to achieve the greater freedom derived from changes in exchange intermediation.

Token Economic Model

Telecommunications providers wholesale purchase Subutai's Blockchain Routers and license OptDyn's Bazaar implementation to rapidly create their own token economies. OptDyn also offers routers for retail purchase and operates its own Bazaar to federate all ISP economies and provide global Subutai services.

The KHAN token is used by all bazaars: those operated by economy operators and by OptDyn itself. Local token economies erected by economy operators are federated into a greater global token and cloud economy with OptDyn's Bazaar instance. Regardless of the token used by a local economy operator, only KHAN can be used for Service Level Agreements (SLA), implemented as Ethereum Smart Contracts, backed by KHAN escrow accounts. Bazaars act as authoritative witnesses between parties. They confirm the quality of services rendered by providers to consumers. Providers put KHAN into escrow to back up SLAs for accountability to be ranked higher by the Bazaar's reputation system. By holding KHAN in SLA escrows, this reputation staking mechanism increases the demand for KHAN. Reputation drives the cloud service broker built into the Bazaar to make provisioning and resource allocation decisions. Economy bridging across ISP networks and their tokens occurs via an automated market maker using a platform asset called Subutai™ "GoodWill". GoodWill will be implemented[7] as an Ethereum contract similar in functionality to Bancor's Smart Token backed by at least two reserve currencies. The KHAN is always one of those reserve currencies.

Subutai Cloud Platform participants produce and trade GoodWill in exchange for two or more reserve tokens, and, as mentioned, the KHAN is always one. Other reserve cryptocurrencies may be an ISP's own Ethereum-based token. GoodWill enables automated exchanges between the KHAN and local economy operator ISP tokens without involving third party exchanges. The automated market maker and OptDyn's Subutai Bazaar globally federates geographically localized ISP economies with liquidity between all ISP tokens and the KHAN. The automatic exchange of ISP tokens allows cloud infrastructures to freely traverse across several communication networks while enabling single currency billing between parties. By connecting networks the cloud sharing economy grows, while the transaction volume and demand for the KHAN increases.

Telecommunication providers can instantly create and operate their own token economy by licensing the platform from OptDyn. As users increase by large numbers with more economy operators adopting Subutai to compete with cloud providers, the market capitalization, and the

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[6] Catalini, Christian and Gans, Joshua S., Some Simple Economics of the Blockchain (September 21, 2017). Rotman School of Management Working Paper No. 2874598; MIT Sloan Research Paper No. 5191-16. Available at SSRN: https://ssrn.com/abstract=2874598
[7] Currently GoodWill is not implemented as a contract but as a platform asset backed by the blockchain. Over time, as participants and economy operators increase, different interactions should naturally drive the evolution of GoodWill.

overall demand for Subutai's KHAN token, with fixed money supply, should only keep increasing.

How it works

Subutai's competitive advantage derives from its innovative Peer-to-Peer (P2P) Cloud and IoT technology and its low power cryptocurrency mining Blockchain Router. The technology was originally developed with multi-million dollar advanced defense research contracts. A built-in decentralized identity management system enables participants to easily and securely exchange computing resources using the Container-as-a-Service (CaaS) cloud model. These capabilities lay down the groundwork for an edge computing revolution with a crypto-economic business model.

With P2P consumption on the Subutai platform, the same disruptive forces Uber used for ride sharing, and Airbnb used with rental homes now applies to the Cloud and to IoT. From central peers in data centers, to residential edge peers on the periphery of the network, all resources appear homogenous to allow the formation of adaptive virtual private cloud environments to run self-managing application infrastructures. Anyone can buy and sell resources from anyone else.

To optimize consumer preferences, the platform dynamically migrates application infrastructure across providers on the edge and in the cloud. The Bazaar, a reputation aware cloud service broker, tracks the availability, quality of service, and prices of peer resources. Analytics and machine learning algorithms optimize the search for resources to satisfy consumer needs including cost[8] and other preferences and cloud owner criteria. With the increased quantity, variety, and geographic distribution of available peers providing cloud services, consumers use the platform to automatically hedge provider benefits against their disadvantages. Consumers avoid vendor lock-in, and benefit from more choice, fault tolerance, performance, and quality of service while reducing costs without the overhead of migration and management.


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[8] Several algorithms and approaches curated by Nguyen C. Luong, Et. Al. have been used. They're documented here https://arxiv.org/pdf/1701.01963.pdf

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The Subutai Platform is online, in use, and ready to drive revenue by inviting users to create, utilize, and rent their computing assets. OptDyn aims to raise funds to grow its engineering team and start aggressively marketing to capture these opportunities through ISPs interested in becoming economy operators[9] using Subutai.

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[9] ISPs offering Subutai to their subscribers using their own cryptocurrency token essentially operate their own token economy. Economy operator is a shortened term given to such ISPs.

🗅 P2P Container-as-a-Service Cloud
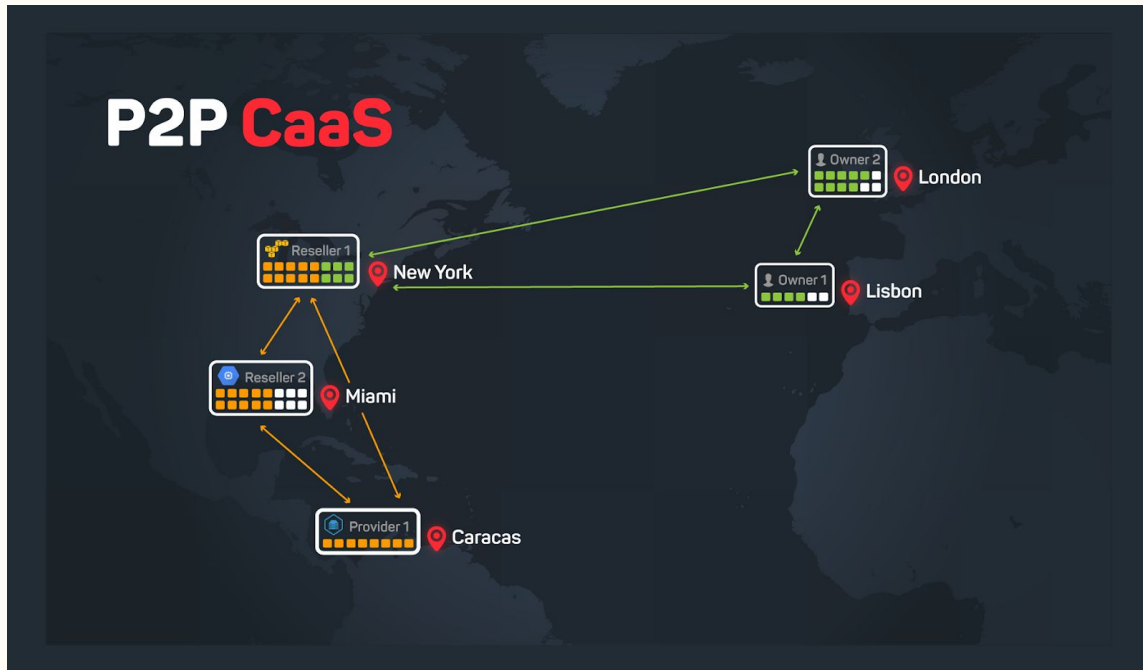
The Container-as-a-Service (CaaS) Cloud Model, a form of Infrastructure-as-a-Service (IaaS), uses lightweight containers instead of cumbersome and heavy resource consuming Virtual Machines (VM). Like physical machines or VMs, CaaS incurs hourly charges for metered resources.

With enhanced P2P CaaS, consumer infrastructures span several peers, transacting with each peer owner. Anyone can sell CaaS Cloud Services with peers registered in the Subutai Bazaar. Authorized peers mutually authenticate with certificates using its unique decentralized identity management system designed specifically for P2P resource sharing. Authorized peers are those which satisfy governance rules provided by the cloud owner. Once authorized and authenticated, these peers swarm together, to establish an n-way virtual private network. The environment appears as one virtual data center, where containers inside appear attached to a single switch. The diagram above shows 2 small environments on 5 peers:

Environments	Peer Locations	Peer Infrastructure
Green	New York, London, Lisbon	AWS and two non-commercial peers
Orange	New York, Miami, Caracas	AWS, GCE, hosting provider

P2P CaaS, machine learning, predictive analytics, and a platform broker allow participants to provide, consume, and transact over resources fluidly and adaptively. Consumers obtain a breakdown of all the cost savings benefits gained with each change made on their behalf. Providers sell unused resources through the automated exchange built into the Bazaar with little to no effort.

Provider reputation in the Bazaar increases if they opt to provide smart contract based Service Level Agreements with KHAN-based escrows to pay out consumers in the event of a breach of contract. The Bazaar provides the services needed to verify the quality of services rendered according to the SLA. This establishes accountability and responsibility on the part of platform providers.

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Appendix A: Leadership

The OptDyn team is uniquely positioned to onboard everyone around the product to gain a first mover grass roots advantage. Having deep roots in several Open Source foundations as recognized leaders in the industry and in Open Source, the team has the ability to influence other key industry leaders. This advantage will be used to rapidly spread mindshare and bootstrap the platform.

Jon Hall - Chief Executive Officer

Jon "maddog" Hall is the Board Chair for the Linux Professional Institute. Since 1969, Mr. Hall has been a programmer, systems designer, systems administrator, product manager, technical marketing manager, author and university educator. Mr. Hall has worked on many different operating systems but concentrated on Unix systems since 1980 and Linux systems since 1994, when he first met Linus Torvalds and correctly recognized the commercial importance of Linux and Free and Open Source Software. Mr. Hall obtained a DEC "Alpha" system for Linus Torvalds and organized a DEC engineering team which helped the Linux community to port Linux to the world's fastest 64-bit microcomputer. He helped several companies (both large and small) create complete lines of business utilizing Free and Open Source Software and Hardware.

Alex Karasulu - Chief Technology Officer

Alex Karasulu is an entrepreneur with over 25 years of experience in the software industry and a recognized leader in the Open Source community. He is widely known as the original author of the Apache Directory Server, used by IBM both as the foundation of the Rational Directory Server and also integrated into the Websphere Application Server. Alex co-founded several Apache projects, including MINA, Felix and Karaf, among others, which, along with their communities, thrive independently past his day-to-day involvement in the projects. He is the founder of Safehaus, where he authored the first low-resource mobile OTP algorithms in Open Source with the OATH community that was later adopted by Google in their Authenticator product. In addition to IBM, Atlassian, Cisco, and Polycom are just a few of the many companies that sell commercial hardware and software solutions that bundle or embed software and products that Alex has created.

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Sally Khudairi - Director of Marketing / Media

Active in the Web since 1993, Sally Khudairi is the publicist behind some of the industry's most prominent standards and organizations. Sally is a long-time champion of collaborative innovation, notably as the former deputy to Sir Tim Berners-Lee and Head of Communications for the World Wide Web Consortium (W3C). She helped launch The Apache Software Foundation in 1999, and was elected its first female and non-technical member. Sally is Vice President of Marketing and Publicity for The Apache Software Foundation, and Chief Executive of luxury brand communications consultancy HALO Worldwide. She joined OptDyn in Q1 2016 to oversee marketing, outreach, and engagement.

Niclas Hedhman - Director of Fintech

Niclas Hedhman has been a serial entrepreneur since his early years and the founder of Headtronics, XS Control, Bali Automation, CodeDragons, Jayway Malaysia, and Bright Things UN Ltd. Niclas joined OptDyn from Morgan Stanley, where he spent 4 years as Vice President in the Equity Risk Technology and Enterprise Application Infrastructure teams. He is CEO of CodeDragons in Malaysia, which provides consulting services for FinTech startups. When Niclas was consulting Chief Architect for eWarna.com, the Labworks online color management system won the "Best of Software Applications" and the "Best of the Best, Prime Minister's Award" at the 2002 MSC-APICTA Awards. He is heavily involved in the Apache Software Foundation, and has been contributing to Open Source for over 20 years, with plans to continue to do so.

David Drake - Advisory Board (Blockchain/Cryptocurrency/ICOs)

David Drake is Founder and Chairman at LDJ Capital, a multi-family office which deals in worldwide funds accessing over $1.5 trillion in assets and maintains over 50+ global directors and family office partners. More recently, Drake is also recognized as a leader in blockchain and cryptocurrency. He saw the value of digital assets when everyone was avoiding it. It all started in 2011 when Drake collaborated on the JOBS Act to create new laws underlying all fundraising in the U.S. for all ICOs. He runs a $200M LDJ Cayman Fund focused on cryptocurrency, mining, and ICO acquisitions. LDJ Capital Credit also offers middle market bridge financing to seed upcoming ICO's. Previously, he held a majority stake as a Managing Partner with Robert Hambrecht in an Alternative Energy Fund NewCommons Capital

2009-2010. Drake was born in Sweden and is fluent in six languages. He holds an MBA in Finance and an MA in International Law and Economics from George Washington University in DC where he was awarded the Wallenberg Scholarship for academic merit.

Simon Cocking - Advisory Board (Blockchain/Cryptocurrency Market)

Simon Cocking is the top-ranked individual of the 23K-member "People of Blockchain", and is regularly named in Twitter "influencer" lists. He is Senior Editor at Irish Tech News (726K unique monthly views), Editor in Chief at CryptoCoinNews, and writes for Sunday Business Post, Irish Times, Southern Star, IBM, G+D, and others. He has co-founded seven companies, and serves as a business mentor and advisor with 100+ successful ICOs to date. Simon is an accomplished and in-demand public speaker at events that include TEDx, Web Summit, Dublin Tech Summit, and overseas in Dubai, Singapore, Moscow, Tel Aviv, Madrid, Tbilisi, Riga, Porto, Dublin and Helsinki. He has been based in Ireland for over 22 years.

Jeff Carr - Advisory Board (Cloud Computing)

Free software advocate and entrepreneur Jeff Carr is the Founder of the stealth startup, Wit. Prior to Wit, Carr was the co-founder and Chief Architect of cloud infrastructure provider DigitalOcean, and the co-founder and CEO LinuxPPC. He is an active philanthropist, investor, mentor, and advisor to numerous industry-disrupting companies and emerging social initiatives.

David Rusling - Advisory Board (IoT)

David founded Linaro and is its CTO while working at Advanced RISC Machines as an ARM Fellow. David always enjoyed mathematics, but America's space program together with 'Star Trek' made him think that computers were really interesting and so he graduated in 1982 with a degree in Computer Science. At Digital Equipment Corporation he got involved in the port of Linux® to the Alpha processor. This gave him an abiding respect for the power of Open Source in general and Linux in particular. He worked on StrongARM before moving to ARM where he added tools experience. At ARM he continued to be involved in Open Source and as a reward for his meddling was made an ARM

Fellow. He helped create Linaro, becoming its CTO in 2010. David enjoys photography, hiking, cooking, fine wines and friends.

Benedict O'Mahoney - Advisory Board (Blockchain Law)

Benedict O'Mahoney is a corporate and intellectual property attorney with over 25 years experience in the high tech industry. He has been in private practice for 10 years helping startups get started and building out their intellectual property portfolios. He also represents high-technology clients in filing and prosecuting patents domestically and internationally, licensing intellectual property, financing transactions, and mergers and acquisitions. Prior to private practice, he served 15 years as Senior Vice President and General Counsel at a Silicon valley software company specializing in artificial intelligence where he oversaw all administrative, legal, patent, corporate and M&A functions. Contracting functions included enterprise software for data aggregation and DARPA R&D for expert systems. Benedict also coded and launched the first online copyright registration service which has processed thousands of copyright registrations with the U.S. Copyright Office. He has been a frequent speaker at the National Association of Broadcasters (NAB) convention on such topics as sampling, music and media licensing, digital rights management, and fair use.

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Appendix B: Competitor Comparisons

Similar Successful Initial Coin Offerings

There is no direct technically comparable offering to Subutai. However somewhat similar offerings claiming to implement similar technologies *some day* in the future have been successful. This section lists them, discusses the dynamics to expect, and their nature while pointing out Subutai's differentiators.

Quick Breakdowns

Product	ICO Raise (USD[10])	ICO Duration	Market Cap	Final Milestone
iExec	$12M	6 hrs	~85M	Inaccessible[11]
Golem	$8.6M	29 min	~250M	48 months
SONM	$42M	3 days	~72M	5 years

Subutai's Breakthrough Difference

Subutai is in a category of its own. Subutai is a fully functional P2P cloud and IoT commerce platform based on collaborative consumption with hardware and software. These other products are paid grid computing systems and most are vaporware at this point. They operate on a task basis if at all. A big task is broken down into parts and distributed to a pool of computers. These computers in the paid grid execute the smaller tasks and send back their results for reimbursement.

Not every problem can be broken down this way, so these systems are limited to a specific set of problems. Golem demonstrated this by focusing on 3D rendering which is an ideal task for such grid systems. This is also evident from their slogan as the "Worldwide Supercomputer". SONM and iExec directly use BOINC (a grid computing platform used for SETI@Home). They've merely turned the BOINC volunteer grid into a paid grid and added one off features to differentiate themselves.

These other offerings are not infrastructure cloud platforms. Generic infrastructure cannot be installed on them so they cannot be considered true infrastructure as a service cloud computing platforms. An administrator cannot install application servers, databases, and web servers on these platforms. They cannot keep a virtual private cloud up and running as they do on Amazon and Subutai. The problems solved by Subutai are orders of magnitude more complex and involve a considerable software investment already made over the past five years. Subutai is not comparable and is a completed product: these examples represent ICOs closest in proximity to Subutai's subject matter to date. Subutai enables participants to provide and consume cloud

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[10] This is the rough amount in USD based on the value of Ether on ICO close.
[11] For some reason the iEx.ec roadmap is no longer accessible here: http://iex.ec/?page_id=483/

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services much like Amazon's EC2 and Google's Compute Engine cloud services using similar if not exact APIs[12]. As for the task oriented capabilities of these other projects, this feature already comes freely in Subutai. See the feature by feature detailed comparisons in the matrix below.

Comparison Matrix

Platform	Subutai	Cocaine / BOINC	Golem	iExec
Status	Complete	**	ms1	unknown
Anti-fraud	planned	yes	no	no
Game Server Support	agnostic	yes	no	no
Services	yes	yes	no	no
Hybrid P2P	yes	yes	no	yes
IaaS	P2P CaaS VPC	no	no	no
PaaS	AppEng API	Cocaine	no	no
SaaS	Built-in SaaS	yes	no	no
Messages API	yes - Roger That™	yes - next release	no	no
IoT and Edge Cloud (SW)	yes*	no	no	no
Container Protection	yes	yes	no	no
Container Validation	yes	yes	no	no
Non-deterministic tasks	yes - Subutai Λ	yes - BOINC	no	no
Blueprints	yes	no	no	no
Browser E2E Security	yes	no	no	no=
Intelligent Installers	yes	no	no	no
Load Balancer	yes - Universal LB	yes - round-robin	no	no
Managed Clustering	yes	no	no	no
Managed Services	yes	no	no	no

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[12] Subutai's PaaS layer is an exact clone of Google's AppEngine. Applications in the Google AppEngine marketplace can be run on Subutai without requiring code changes. All the tools, books, and forum posts for AppEngine automatically benefit the Subutai developer community interested in writing AppEngine applications on Subutai's PaaS layer.

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Managed Stacks	yes	no	no	no
AI Broker	yes	no	no	no
Network Tomography	yes	no	no	no
Dynamic Cloud Mobility	yes	no	no	no
Self Administration	yes	no	no	no
Docker Images	yes	yes	no	no
P2P CDN	yes - Subutai CDN	no	no	no
Domain Management	yes	no	no	no
For Mass Consumption	yes	no	no	no
General Purpose Cloud	yes	no	no	no
Data Stream Pipelining	yes - Apache Big Data Stack	yes - with BOINC	no	no
Adaptive Multi-Cloud	yes - GCE, AWS, OpenStack	no	no	no
DevOps	yes - Ansible	no	no	no
DNS + Proxy Services	yes	no	no	no
Incentive Program	yes	no	no	no
Hypervisor Support	yes	no	no	no
Marketplace	yes	no	no	no
Uninterrupted Upgrades	yes - Karaf OSGi	no	no	no
Hardware	yes	NA	NA	NA
Cloud Router Appliance	yes	NA	NA	NA
Router Firmware	yes - Snap Based	NA	NA	NA
Mining Rigs	yes - IP Core	NA	NA	NA
Hardware Wallet	yes - Router TPM	NA	NA	NA
Software Wallet	yes - Lin/Win/Mac	NA	NA	NA
HMS Support	yes - Yubikey	NA	NA	NA

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96Boards Endorsed	**Planned**	**NA**	**NA**	**NA**
TPM + Network HSM	**yes**	**NA**	**NA**	**NA**
DIFT Coprocessor	**In progress**	**NA**	**NA**	**NA**
IoT and Edge Cloud (HW)	**Pi, PMOD, Arduino**	**NA**	**NA**	**NA**
Ready to Use Product	**yes**	**no**	**no**	**no**

* - Executing functions on the edge does not always mean IoT/Fog (BSCA)

** - Idea and/or prototype with years to use