

SONM

Supercomputer organized by network mining
(v0.1)

www.sonm.io

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INTRODUCTION

If you'd like to skip everything and just jump to crowdsale – just click [here](#).

SONM is a Russian word for crowd, which also has meaning many, a bunch of. In the Bible there are phrases, where sonm is used for description of angels, like “sonm of angels”.

We selected this word, because it provides multiple meanings as abbreviation for our system of supercomputing organized by network mining, which eventually will transform into superintelligent omnipresent network mind (see RoadMap). Idea of SONM dates back to creation of DrugDiscovery@home project in 2009. After appearance of Bitcoin in 2009-2011 and Ethereum in 2014-2015, our core team members independently from each other got the ideas to combine these technologies with previously available Desktop Grid Computing technology. In 2016 other projects, promising to combine smart-contracts and Ethereum blockchain with grid computing have started to appear. This has urged our team to speed-up development of our project concept and focus on its development full time as primary goal.

The primary goal of SONM is to build distributed **blockchain - powered supercomputer with scalability, decentralization and energy efficiency** optimized by maximum achievable by free market. The maximum goal is to build superintelligent distributed computing system. This distributed supercomputer is going to be organized as a decentralized computing market and IaaS.

GRAND VISION AND CORE FEATURES

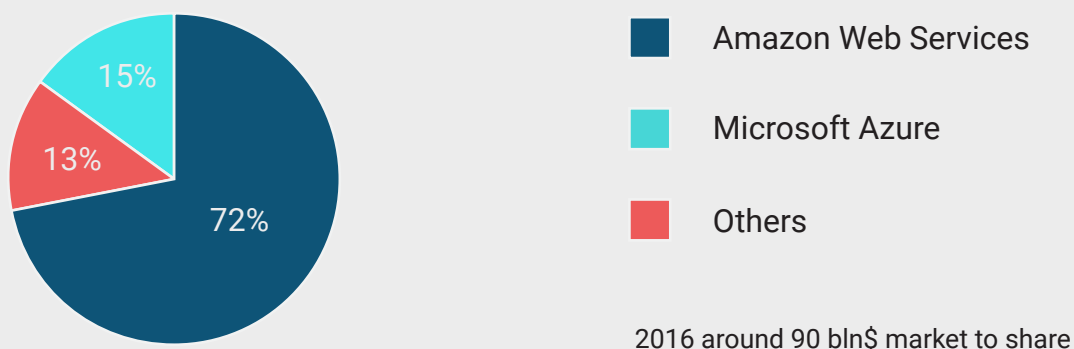
What is SONM? Goal of the system.

SONM will be the first active decentralized supercomputing platform, representing blockchain-based network for distributed general purpose computations and for creation of a **global distributed market** for computing power. SONM provides infrastructure for computing power owners for getting passive income, while clients, who need computing power will be able to get cheapest possible solutions. Software developers get an opportunity to sell their software solutions through SONM infrastructure. SONM platform can be used for providing decentralized services in heterogenic computing environment, which is expected to be cornerstone of the future of computing, internet and is expected to be dramatically boosted by machine learning and general-purpose artificial intelligence approaches. SONM infrastructure and its integration with other similar projects allows to provide the most competitive solutions for **computationally intensive tasks**, or computing purposes working with **big data analysis**. It can be used also for more traditional tasks like web site hosting, deployment of game servers and scientific research computing.

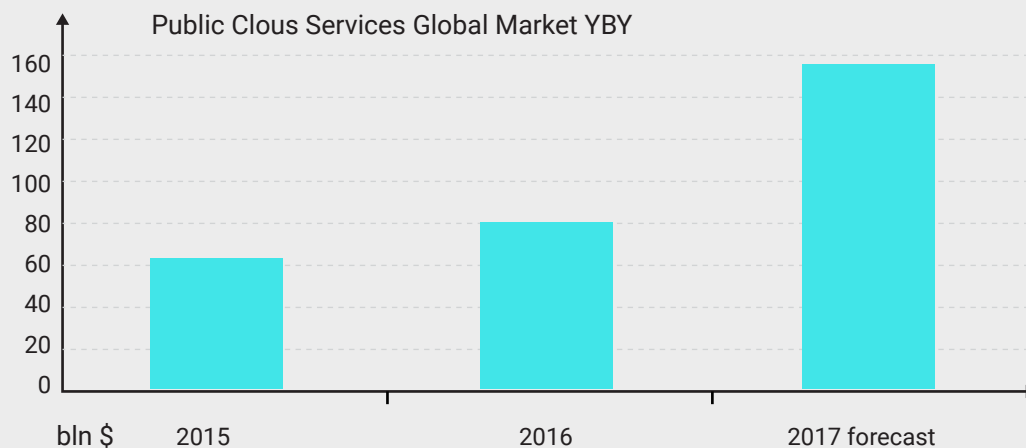
SONM will give an opportunity for people worldwide to get additional income, using their computing devices. Previously known technology as “desktop grid computing” is going to be managed and monetized by Ethereum blockchain-based smart-contracts. For many people, especially from developing countries, this may give an opportunity to get out of the poverty and will allow making stable income from renting out even simple general purpose computing devices..

Current computing power market and SONM ecosystem

The current moment is the most convenient for starting of SONM. Two major technologies are ready to be merged – **Grid Desktop computing and blockchain**. Today the market of computing power is not decentralized with biggest players such as Amazon, Google, Microsoft and IBM having main shares. This reduces pricing efficiency for computing services. This makes computing market not stable and easy to control. We are going to change this situation with contribution of millions of **Miners** worldwide. With SONM the supply of computing resources is based on contributions of individual and professional **Miners**, combined with an array of dedicated software solutions via SONM Application Pool.



Picture of the current computing power market shares.



Computing market growth and forecast. Market share value is expected to increase substantially after general-purpose AI introduction and superintelligent omnipresent network mind appearance.

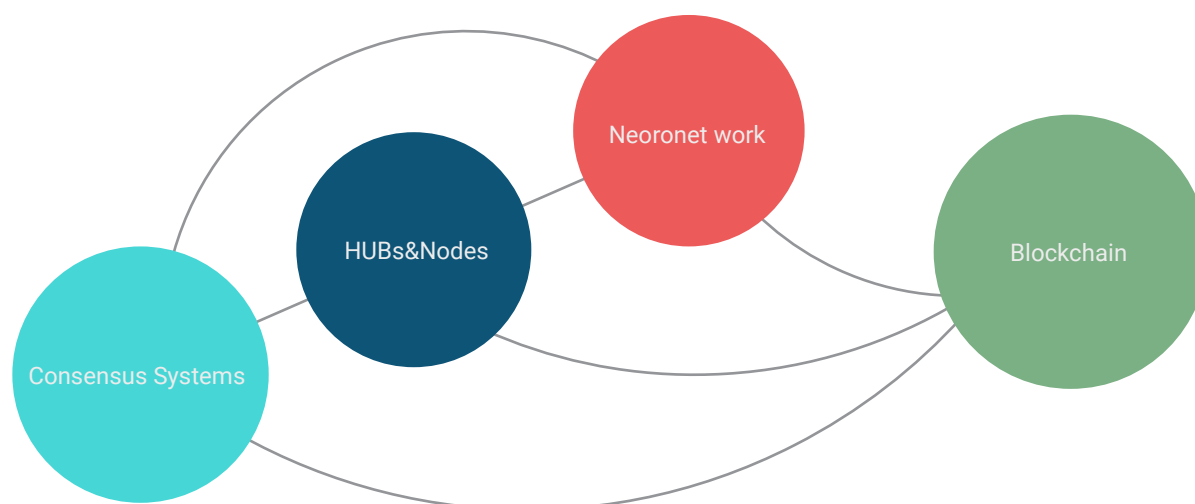
TECHNOLOGY

Our GRIB technology (GRId and Blockchain)

Computing network structure (GRIB technology – GRId and Blockchain)

There will be three levels of abstraction:

1. The decentralized computing network with clients and hubs.
2. The level of result testing/consensus adoption for some tasks at the supernodes. For example, it is possible to insert any voting about decision-making, such as the price setting for the works or selling of the result, or something else. Initially, we planned to do it on the basis of smart contracts, however, this can be connected to supernodes and we will see how it goes.
3. The neural network level (by its organization it is either p2p in pure form or supernodes, or something else. At the first level the client program can only, for example, ask a price for the work in any projects and nominally evaluate the profitability of participation in one project or another, but it is not able to assess the economic potential of **World**. Herein, at the neural network level, you can set specific rules for project analysis. For example, let us say there is **World** that is engaged in the organization of work in the field of biochemistry, and this **World** exists for a long time, its price for calculations is high, however there are a large number of such **Worlds**. On the other hand, there is **World** in the field of some other calculations, such as calculation of space objects trajectories (Hello Elon!); and this **World** has appeared recently, its price for the work is less and its capital for the payment of miners is low. However, it is the only one in its field and hence it expects a rapid growth of its capital, as well as an increase in payments for the work, and therefore in prospective this **World** is more beneficial for the miners/traders than the former project. The client software will not be able to solve this problem, but the neural network is completely able to do this.



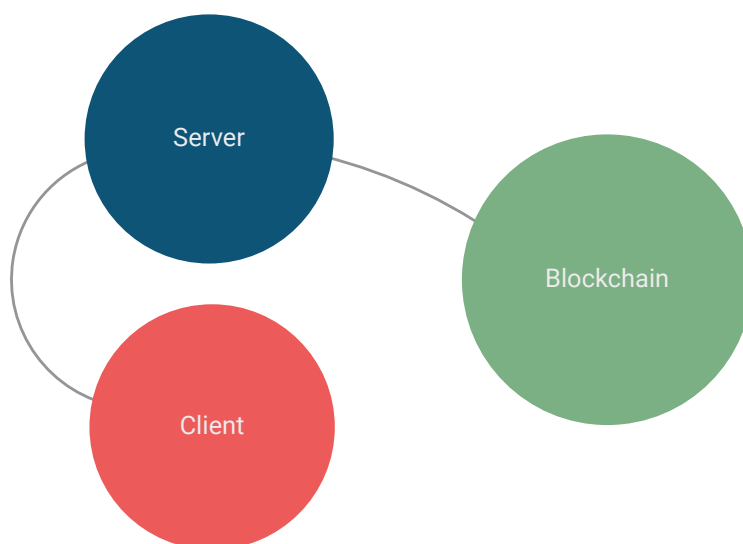
World – it's just a name, sort of a brand and so on. World is identical to a hub. Hub is a technical term, the same as a supernode. Let's imagine, for example, some pharmaceutical drug, which has the chemical name and trademark under which it is sold. We can invent any trademark, but chemical name must correlate to formula, because there is, for instance, a clear topology of substance names. We have the same thing here – **World** can be called whatever you like, but in fact it is merely a hub.

Actually, what is a hub? In terms of overall network topology, the hub is a node + infrastructure at the node, which is located at the intersection of a large number of lines or highways, and serves for some purpose.

Usually hubs in computer network topology are junction points, sort of routers and gateways, but not limited to this. Sniffers can also be placed there or anything else. Bitcoin Lightning network attributes the name “hubs” to nodes that organize the chains of fast microtransactions, getting a commission fees for each of them. In brief, there are a numerous variants of the use, but the main thing is that the hub is an intersection with established infrastructure. The server can also called “hub”. Our network will also have transaction fee for 0.3% of each transaction.

So, «revenons à nos moutons» (fr.), – let’s consider the current scheme and its evolution in the order to understand what and where it is.

IT IS A PRIMARY SCHEME:



Standard organization of network with client nodes and a server node (or several server nodes, but it does not matter). By the way, in this case the server can be also called “hub”, because it stands at the cross-roads of communication lines between the miner, customers and blockchain and it has a specific infrastructure in this bunch, which provides service of a given node, i.e., it is an example of hub-server.

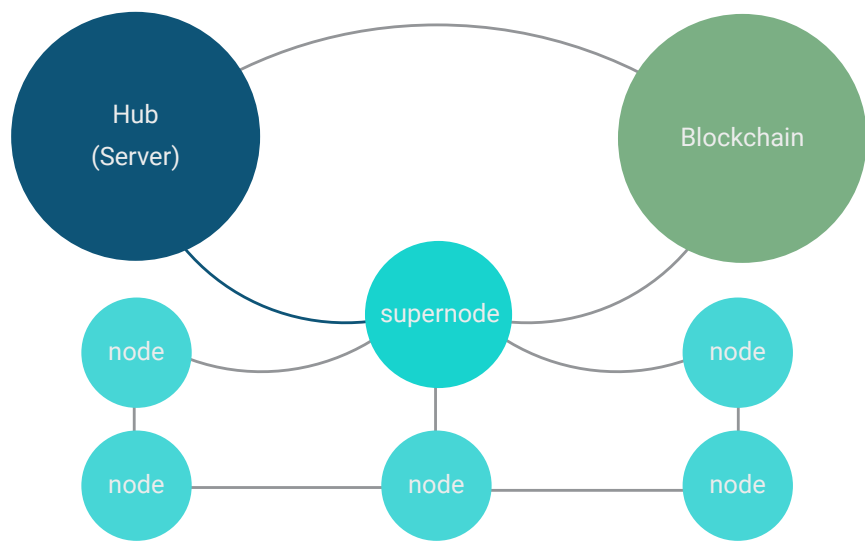
Herein, all of things, described here, constitute the first level. It is called “**the first**” simply because it already exists and can work. The next step is quite simple – we organize a communication between all servers and all users and organize the exchange of messages between them, thereby obtaining the standard MAS – Multi-Agent System. It can be built on the any basis, it will work even on obsolete Jade, but it does not matter. Finally, the united base of miners will be formed, who will easy switch between the servers, and the common space of servers that will be able to attract miners and interrelate to each other. This is a standard scheme, which is practically identical to the previous one, so we will not duplicate its description. By the way, at this stage, we can use blockchain, but we suggest to use here the standard tools, or, perhaps, Whisper protocol from Ethereum team.

At this stage, **the most important** from the point of view of the network organization is that we take function of discovery of peers and servers and “smear” it over the whole web, so at this stage, the user will no longer need to enter the server address. The user will need simply to select an application to run or execute. Thus, a part of the server functions is transferred to customers. After we add natural language processing and general purpose AI, there will be a need to only describe the task using natural language. We expect our project on its final stages to merge with general-purpose AI applications, which will be capable of self-modifying/programming.

Previous scheme has several disadvantages, one of which, as we have correctly hinted, is an abuse of the results, so some mechanism is needed, which is comparable to the verification mechanisms, applied

in cryptocurrency, in order for processing of the result verification and payments to be relatively honest. How to achieve this? The scheme of the network work should look like this:

THE FIRST NETWORK STRUCTURE



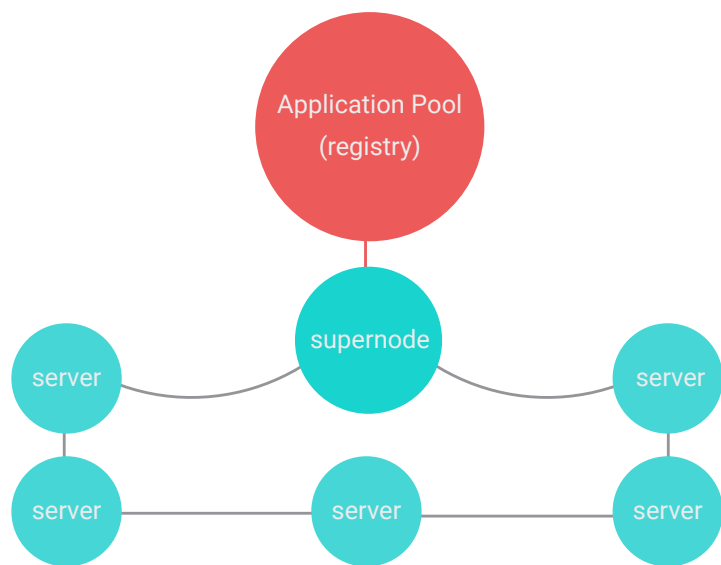
What do we see in this scheme?

All **providers (miners)** nodes check different results as long as they find a canonical one, after this the first client node, which has found such a result, announces this, **counting on a certain amount of funds**. After this, the remaining nodes check its result and express their consent or dissent. Finally, a consensus of all the nodes appears about the acceptance or rejection of the result, and if the result has been accepted, then the primary node becomes supernode and sends the result to the server, which pays remuneration to it. If the result was not accepted, the primary node gets a penalty, etc. This mechanism is named **Proof-of-Research** and it can be run on its own mechanism – a fork

[augur.io](#), –or a mere using [augur.io](#) service directly. In this mechanism, a supernode pattern is just activated that, generally speaking, has as its primary goal to reach a consensus and avoiding network split.

Further, another variant of the supernode use will be considered.

THE SECOND VARIANT



In this case, we consider (for example) verification of running applications – each server can consider the application and determine whether it is “bad” or not. Verification mechanism is the same: the first node, which in this case is a server, relies on the fact that this particular application is safe, while other nodes check it and agree or disagree with it, etc. Here, of course, it should be noted, that the Application Pool should actually work by two streams. All the applications will be downloaded into one stream, and only verified applications from the first stream will be downloaded into other stream. It is necessary in the order to meet the rules of integrity, freedom and decentralization, but in respect of other things the mechanism will be the same, and the server, which has first confirmed the safety of the application and the other servers have agreed with, will be announced as a supernode.

As it can be seen, two mentioned above examples work on the level of abstraction of consensus mechanisms, i.e., almost DO NOT intersect with the level of the calculations themselves. The intersection should be observed only when the supernode would transmit the reached consensus to the appropriate level, but in respect of all other things, the levels **must** comply with insulation.

Besides, all the other mechanisms to support decision-making, which was described in the white papers, will be implemented at this level.

However, perhaps someone has the questions about the exact definition of supernode and how it differs from a hub-server, or something else? A response is followed below.

1. Firstly, hub is primarily a means of routing and network organization, which can be anything – whether a server or a client, router, node, supernode or even a dispatch telephone service of Old Sombretown.
2. Supernode and the server is actually almost the same thing, and almost identical concepts, BUT...
3. The server exists always, while the supernode exists only during a limited period. If the server is “a dictator”, then supernode is “a president”.
4. The server is used for a variety of tasks, while supernode serves as a rule for solving the **consensus tasks**.
5. Finally, the very most important thing, which negates all the previous comments and serves as the main feature of the site definition, is that the server can only exist in the organization of a HETEROGENOUS ENVIRONMENT, while the supernode can exist only within a HOMOGENOUS ENVIRONMENT.

That is, based on the mentioned above, we can make a weighty conclusion:

Supernode is a node, which has MAXIMUM UNLIMITED authority within a HOMOGENOUS ENVIRONMENT and, herewith, is selected TEMPORARILY and usually by the method of CONSENSUS.

Thus, supernode can organize the work of all customers, being herewith a node-client itself, or organizing the work of all servers, being herewith a node-server itself, but it can NOT organize the work of the CLIENTS, being herewith a SERVER, because it would be a HETEROGENOUS ENVIRONMENT.

Speaking very comprehensibly and figuratively, for example, GORILLA can command a bunch of gorillas, while the WOLF can command a pack of wolves. But a WOLF can NOT command a bunch of gorillas. Either a GORILLA or (by analogy to the client-server architecture) a man-tamer can really command a bunch of gorillas.

Role of BOINC as middleware solution.

SONM uses in its **GRIB technology** for mining the code from Desktop Grid computing platform **BOINC (Berkley Open Infrastructure Network Computing)**, which is a platform for distributed scientific volunteer computing. This platform will be used as a basis to develop our own decentralized SONM technology. Currently BOINC is used by majority of modern scientific distributed volunteer computing projects and we decided to use its technological principles for supernodes in our decentralized computing network. This will enable us to use validation procedures for cross-checking the results correctness..

BOINC (Berkeley Open Infrastructure Network Computing) platform provides possibility to create servers and distribute computing tasks between miners, which calculate their part of a job and return results to the server, where results are validated and statistics is calculated about each miner impact on the statistics. All statistic and input/output data is open and ready for check. Also BOINC supports clusterization of resources and therefore it is possible to create virtual private machines of any architectures. All of that means, that this platform can provide services, which are currently provided by cloud computing platforms (like Amazon WebServices, GPU clouds for example) and can be applied to any computing task from site hosting to calculation of BigData, and even work as service of Amazon Delta, which means that this project can work as PaaS (Platform-as-a-Service) and IaaS (Infrastructure-as-a-Service). We will use BOINC code as starting point to create decentralized network with supernodes managing computing distribution tasks. The current minuses of BOINC are that this is centralized platform, which is going to be changed in SONM into combined heterogenic and P2P homogenic networks

It is also important to note that our platform is essentially different from reward-based systems like GridCoin, FoldingCoin etc. and represents distributed supercomputer, organized as computing power market and in this way has similarities to other projects like Elastic project, Golem etc., but our middle-ware platform gives us possibility to be the first on the market

[See differences of our project from Elastic project and other similar projects section.](#)

Choosing the right distributed computing platform

In choosing of the right computing platform many factors were considered:

Common hardware: The hardware most commonly used for Bitcoin and Altcoin mining was AMD/ATI GPUs. AMD/ATI GPUs outperform Nvidia GPUs, when it comes to SHA256 and Scrypt hashing. DrugDiscovery@home (DDAH) also performs very well on AMD hardware as well as on consumer Nvidia hardware. Basically any hardware should be able to be attached to the computing tasks, including even ARM based OpenCL capable hardware like Odroid XU4.

What are the advantages of using BOINC computing platform?

Easy: Ease of setup for the general computer user was also evaluated. BOINC software was the most polished middlewar for Desktop GROM computing. Taking into account MIST browser-based wallet from Ethereum network, we expect that no blockchain download will be required for our currency. Therefore, we expect our project to solve one of the most irritating issues of blockchain wallets – the time, needed for blockchain download in order to get blockchain currency active.

Large user base: Besides the Bitcoin Network, BOINC is the largest distributed computing platform in the world, harnessing nearly 50 PetaFLOPS of computational power.

Strong development team: BOINC is superior, when it comes to overall production and security, large developers and users community. BOINC allows us to use secure sandboxing on Miners PC, which is used for storage and usage of the data for computing tasks.

Decentralization

Our project is not going to use the traditional centralized BOINC network solutions, but we are rather using this technology as a starting point for decentralized global supercomputer creation, using decentralized BOINC servers, running on supernodes in the network. Each node of the network with enough proof-of-work and proof-of-stake can become a supernode and manage tasks verification and validation for other nodes.

Decentralization and P2P system

As BOINC is very elastic we will also implement P2P communication and use trickler messages between servers and hosts to provide real time communication and instant results available as soon as they reached. Decentralization is very important in current world for, so we will create of different levels of nodes, all of them monitored and secured on highest possible level.

BOINC-based server and network represents just the initial architecture, which further is implemented into GRIB technology ([see GRIB technology architecture](#))

Safety and Security

Security for buyers (data protection)

For confidentiality and security reasons encryption will be implemented including SSL certificates on all stages of communication and end-to-end data encryption, where needed. Virtual machines will be used to separate on-demand computing from other processes on miners devices. We also consider to use high level homomorphic encryption to get highest security level and data confidentiality on all levels of data transfers in computation process.

Safety of sellers (miners) and server owners

Safety of sellers (miners) computers will be protected by using virtual machines and requiring minimum user rights for running the applications. However no technical solution can completely protect miners from running unsafe and malicious software.

So, in order to prevent this we introduce several levels of reputation system, from making white listed **Application pool** to ([see Table](#))

SONM infrastructure allows buyers to become miners and miners to become supernode owners, using the reputation system, based on purchase history.

Applications will have several levels of trust. SONM will have reputation system, based on FLOPS computed (tokens spent), which will be applied for all parts of the system.

Initially only buyers and miners set the prices for their requests/providing computing. Further system will start making for the suggestions for the optimized prices.

Each server administrator validates software. Each user(miner or buyer) can suggest software f or the black list.

TABLE. REPUTATION SYSTEM AND WHITE LISTS FOR APPLICATION POOL.

Reputation system	Measurement	System applies to
White list from SONM administrators	Yes/No	Applications, Sellers, Buyers, servers owners
White list from each supernode owners	Yes/No	
Applications, which got most of computing power allocated	Amount of tokens spent	
Most purchased applications	Number of purchases	

Differences of GRIB from BOINC

On server-node side there is 'GRIB' platform, which represents a modified BOINC server. On technological steck is a package of different components like web-server, db server, a several daemons, The Sheulder and Bridges.

Daemons are written on C++ do a lot of different tasks.

There are exist following daemons:

- Transitioner – service for proceeding states of sub-tasks. This daemon check condition of task.
- Validator – validating results. One task could be proceed through a several units to get a 'cannonical' result. The number about how much parallel sub-tasks must be done to verification is depend by hubs settings.
- Assimilator – check complete sub-tasks and procced output data.
- ile deleter – garbage collector
- Feeder – optimization tool for database.
- Sheulder – CGI-program which behavior lilke **tracer daemon**. This program is run where clients are connect to GRIB server-node. This program is **distribute tasks between Miners**. It can automatically distribute tasks in depend on how much resourses have provider.

Also there is two Bridges in GRIB system. First is a BOINC-Grid bridge, which can allow to compatible BOINC systems and Grid systems to work together, another one is connect with Ethereum smart contract through decentralized app (dapp) build on web3.js.

You can read additional info for BOINC system and how it works here
<http://boinc.berkeley.edu/>

Changelog and differences in BOINC and GRIB system and description about additional feauteres will be able in separate wiki.

On client-node we have a standart BOINC manager written on C++, which represent a program which connect to a specifec hub and download a required software and input data from it. (software is a specified distributed-calulation application running inside safety wrapper.). Client is do a lot of job to do communica-tion with server nodes.

There is ingoing work to adapting this software to be more suiteable to our Miners. With steps to p2p system this program will work similar to a BitTorrent client program – download from tracer (which prob-ably will be implemented to a Smart Contract on Ethereum Blockchain) list of a knowing server-nodes and request info about their running projects, required power, price for tokens and job costs and e.t.c.

It could be automatically programmed to request all info from the network, define what project could effort a maximal profit and run it. That would be implemented to provide a most suite automatical applica-tion for automatical mining with automatical switching.

Also there will be work on other functioning of client-node software: Buyers will be able to upload their in-put data for some program running on the server-node and therefore start a new task. For example, if you work on render video – the source video will be input data..

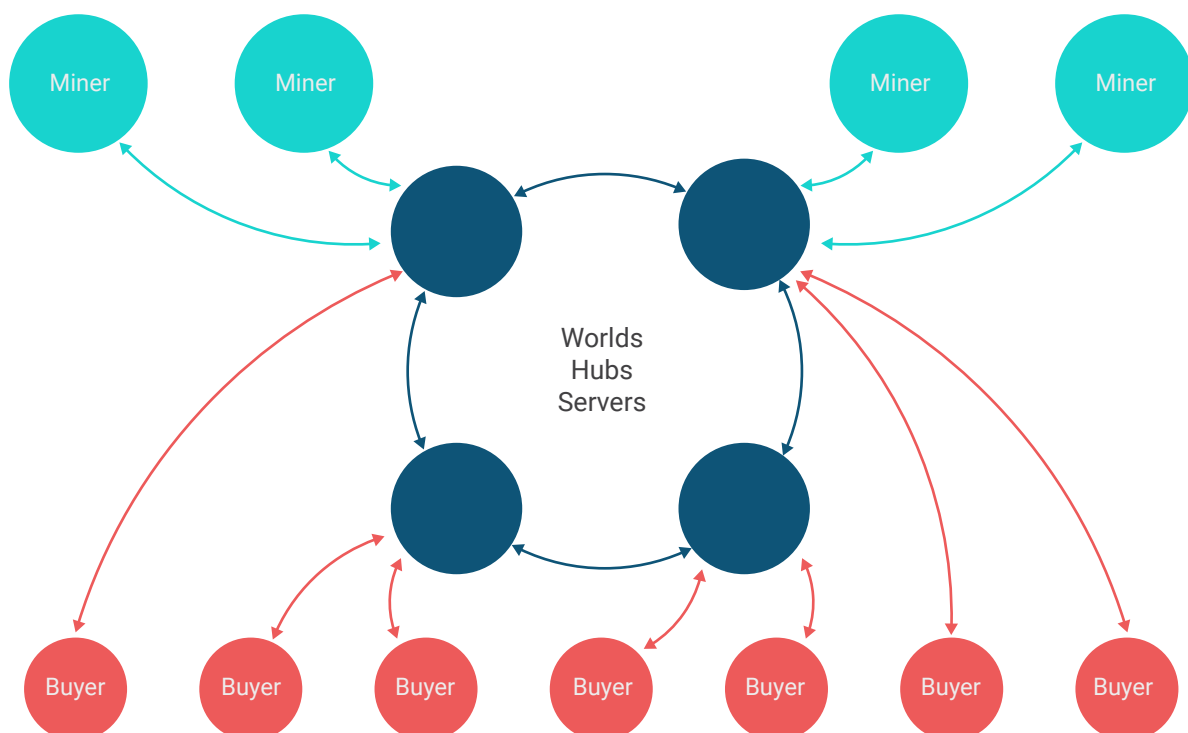
Supernode

Before submitting results to the server, community have to decide what result should be canonical throw consensys. **Supernode**, as a most trustful node decide what result is canonical and **bet** that result. Other nodes must agree with that or not agree, therefore **supernode** have additional income for submitting canonical result and suffer from penalty for wrong canonical result (lie). All other result in a specifec task just compare with cannonical result by hub.

In technology it will build on the same base as augur.io network , or, probably we will integrate this process into augur.io service, because there is no need to invent bicycle.

You can read more about future development at Roadmap section.

SCHEME OF THE NETWORK



Examples of the Use Cases

Scientific projects:

As written above, this network could be used to organize useful calculations projects, such as drug development, bioinformatics, social statistics and modeling, aerodynamic calculations, climate predictions, meteors trajectory modelling or other stuff. One of the case examples of Scientific research project – DrugDiscovery@home will be used further.

Site hosting:

Buyers, who want to deploy sites on the network, could do it also using our snippets on their sites to collect payments in Dilatones(tokens) or Ether cryptocurrency and automatically pay for hosting. Sellers will be providing resources to the 'world' cluster which will work as a 'cloud' service at this point.

Game servers cases:

There are many MMO games, which are using a different sort of in-game currency. With our technology we are offering solutions, when game servers could be deployed on SONM, therefore users could support services working by providing resources to the world and get some tokens as an in-game currency.

Neuro-network projects:

They usually require a massive computational power.

Rendering video and etc.

Rendering CGI video tasks can be distributed over the network for a large number of computing devices and can be achieved very fast (in a matter of minutes).

Overall we can suggest much faster times for computing **Buyers(Clients)** projects due to infrastructure flexibility. In contrast to rental one K80 Nvidia from Amazon, for example for 10 hours, one may rent 600 of K80 Nvidia from our network with total working time of 10 minutes for the tasks, which allow to use such distributed architecture. Any time of rental, any computing architecture and computing network structure can be used by **Buyers**.

Github

Project on GitHub:

<https://github.com/sonm-io>

Link on crowdfunding smart-contract code.

MARKET STRUCTURE

Smart-contracts and SONM tokens for renting in/out computing power and disk space

Our project creates possibility to convert GRIB points (at first stage equal to BOINC points), obtained in SONM system for the on-demand computing into the **smart-contract based tokens** (created on Ethereum platform), which can be then used as digital currencies for computing power market and other purposes. We are taking out middlemen for computing and storage solutions and therefore we create maximum profits for miners, providing their computing power and we suggest the most efficient solutions in terms of efficiency for Buyers of computing power.

In order to make computing power purchase buyers will need to either select hardware for their application, or let our network to do it for them (at superintelligence stage network will pose also tasks to itself). In case of our project users will be using system search for hardware/applications pool, entering world (hub) addresses or system will be assigning projects themselves according to analysis of devices properties and therefore maximizing miners profits. Further we plan to introduce intelligent optimization of the hardware for specific application and even intelligent selection of applications for the tasks specified by natural language at the latest stages of project development.

Machine learning and distributed artificial intelligence for network management

We expect to use machine-learning algorithms for optimizations of application-task-device combinations. So if the task of Buyers (clients) has best performance, for example, on GPU, then it will be assigned to GPU and system will decide itself which of the connected GPUs will provide the maximum efficiency.

Participants of the system

Further we define clients, ordering computing power as **Buyers**. Therefore Buyers can submit their tasks through virtual private machines and run any code they want (cause virtualization in this case allow to use 'save sandbox'). Developers will be able to create and run boinc-compatible projects for calculating Big Data through registration of their software projects in Application Pool.

Software engineers, scientists and developers specialists can unite into "worlds" – hubs of the network, based on our hybrid-boinc platform, where they could run different distributed applications or organize distributed virtual cloud. Each world would have a set of the specialized software (Application Pool) and even can issue own token. For example **DrugDiscovery@home (or DDAH)** - is a world of life sciences and new therapies development, so there is expected no applications connected with data base cluster optimization, UFO's search or some quantum physics calculations. For those, who are familiar with standard cryptocurrency mining, "worlds" have similar functions with "pools". Read more in "worlds" section

Application Pool – is a module for every world, where open source of distributed applications running on this world will be published. With evolution of SONM to full p2p system it will be a framework, where everybody could track what application on in which world and with what bounty is running.

Miners of resources get cryptocurrency's tokens (built on Ethereum) for their work from **Buyers**. SONM basically is functioning as a market for computational power.

Buyers will be providing computing tasks to the networks, which then will be distributed among nodes. The nodes are learning to increase their efficiency and will have specializations on certain types of devices and applications. We expect that **Miners and Buyers** also will connect to groups like **software developers** through "worlds", representing separate GRIB (hybrid BOINC) servers. Anybody can organize their own DAO and propose idea of cloning application (for example DrugDiscovery software infrastructure will be dedicated to solving computing problems in the healthcare field on systems level, but anyone, who wants to contribute to fighting diseases is welcome to do so) or developing absolutely new application and crowd-fund money to that purpose.

Miners are nodes owners. The most powerful and trustful nodes can become servers and their owners will be getting additional % from computing incomes for checking results of calculations. Before submitting results to the server, community have to decide what result should be canonical throw consensys. **Supernode**, as a most trustful node decide what result is canonical and **bet** that result. Other nodes must agree with that or not agree, therefore supernode have additional income for submitting canonical result and suffer from penalty for wrong canonical result (lie). All other result in a specific task is just compared with canonical result by hub. This mechanism is called **Proof-of-Contribution**. In case of scientific computing it may be called also **Proof-of-Research**

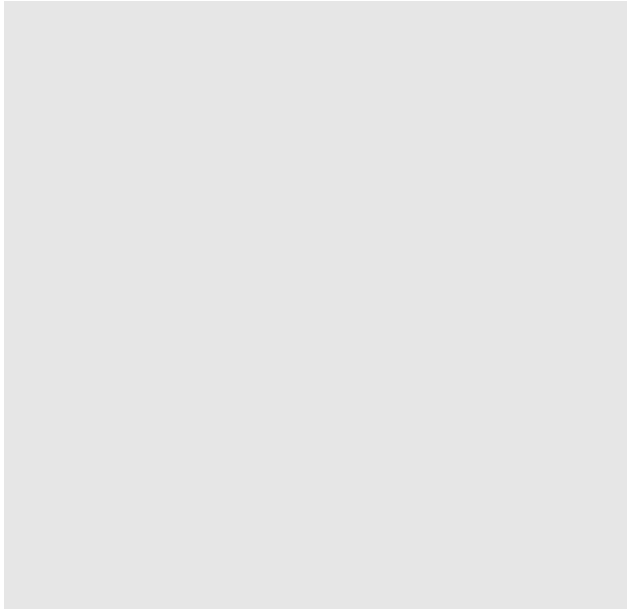
Users interface

Buyers interface (draft)

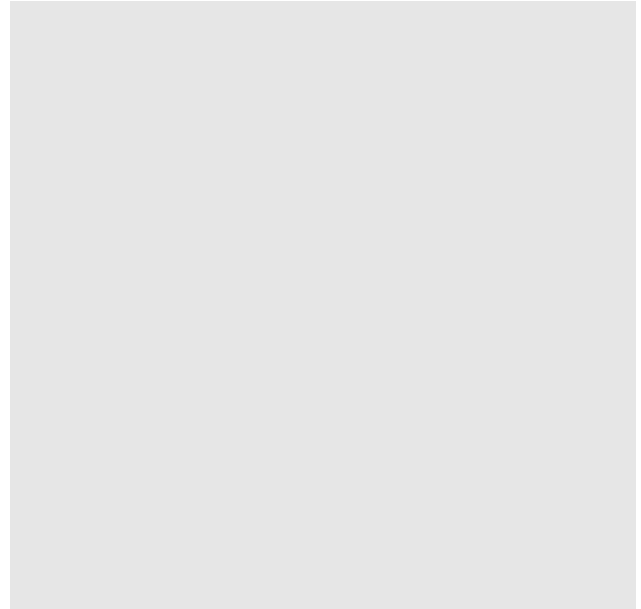
- Pre-purchase computing power
- Hardware selection
- Application from Application Pool selection
- Search for applications/hardware
- Servers selection
- Command line (Terminal interface) for running own application, setup running application on the server, before it is sent to miners nodes

Miners interface (draft)

- Select applications to run on the nodes (white list, reputation level , or any depending on price)
- Setup number of tokens for unit of computing power (FLOPS, time)
- Setup disk space allocation limits and price for it (can be used own space, or purchased from other integrated services, like [Oraclize](#), [Factom](#), [Storj](#), [Sia](#), [Filecoin](#) etc..).



SONM buyers interface



SONM buyers interface

API for software developers

Developers API will be made using BOINC and Ethereum API as starting points.

So the integration between these API will be performed and extended.

DrugDiscovery@home WORLD EXAMPLE

DrugDiscovery@home is the first of the “worlds” in SONM system, which is building universal infrastructure for life sciences computing and new medical therapies development by integration of the open source software solutions in this field. Each disease therapy development will consist of different software usage for numerous tasks, which will have their own price in SONM tokens.

Genesis of DrugDiscovery@home

By February 2016, a group of miners were looking for ways to use their legacy mining hardware for useful purposes, while staying part of the cryptocurrency movement at the same time. This became *modern* DrugDiscovery@home.

DrugDiscovery@home created an asset with a “Proof of Cure” concept to verify contributed computational power, where computing power results in models of high value medical treatments, resulting in reduced number of experiments, required for getting therapies into clinical trials.

Since smart contracts share the Ethereum blockchain, this allows the legacy mining equipment from Alt-coin mining to be redirected towards medical research, since the Ethereum miners are already covering the security and hashing rate of the Ethereum blockchain.

DrugDiscovery@home Mission Statement

Cheap computing power along with cutting edge modeling algorithms will allow DrugDiscovery@home to produce and sell new biomedical technologies at lower costs than any other research company and these products will be affordable and available to everyone.

The research will start from developing cures to different forms of cancer and anti-aging drugs, but then its scope will be enlarged according to the available resources.

DrugDiscovery@home workflow

(chemistry or biology background is recommended to read this)

The currently suggested DrugDiscovery@home workflow integrates together the classic in silico drug development methods, which were widely adopted by biomedical and pharmaceutical industries along with getting the most recent newly developed in silico drug design approaches.

For example, we suggest a workflow for preclinical drug development as a series of programs, acting as filters on each stage. This project funnel is going to start from largest chemical compounds databases (such as virtual spaces) and fastest programs (for example Lipinsky, ADME/Tox, physico-chemical parameters filtering) thus producing initial databases for targeted drug design. Next stage will include datasets enrichment using various docking (including consensus, biotarget-tuned, multiple-conformations) docking software, pharmacophore-based screening and QSAR models.

On the last stages we plan to use the most computationally demanding applications (like molecular dynamics, MM-PBSA, quantum mechanics) on the remaining datasets, such as molecular dynamics (in screening mode – for ligand-protein complex stability evaluation), molecular dynamics with thermodynamics integration, dynamic pharmacophore models.

Biological targets are selected according to the in silico models of the diseases and pathologies profiles. Metabolic and signaling networks analysis, adjusted to the gene expression level, biostatistics omics data processing can show us the most promising therapy targets and their combinations, including drug-drug synergy and polypharmacology possibilities.

In this regard we expect to collaborate with enterprises, working in this field, as well as to develop our own approaches. Our primary goal in this effort will be to make as much as possible data open to the public and all software resources to be open source as well.

DrugDiscovery@home Summary

- DrugDiscovery@home looks to redirect what some consider to be wasted computational power from alternative cryptocurrencies and spare computing time of different devices (PC, laptops, tablets, smartphones, GPUs, GPGPUs, gadgets and even clusters etc.) to valuable scientific research.
- DrugDiscovery@home pays for SONM computing facilities by its own token, which is converted to SONM token according to their market values and the corresponding smart contract.
- DrugDiscovery@home takes upon itself and obligation to promise to convert to our token all its incomes from therapies development process, from contract research, from patents selling and licensing.

DrugDiscovery@home token white paper can be found [here](#).

Presentation on DrugDiscovery@home can be found [here](#).

COMPARISON TO SIMILAR PROJECTS

The best matching analogues of our project are Golem, Elastic network, iex.ec etc.

Our key comparison to these projects is that we base our GRIB technology on already existing middleware with large supporting community – BOINC (Berkeley Open Infrastructure for Network Computing). This middleware now exists only in the form of server-centralized volunteer distributed computing project.

However, we expect to transfer this technology into decentralized P2P network.

Comparison to Golem Network

Advantages against Golem Network

Golem network hasn't yet demonstrated concept proof. Golem network hasn't yet demonstrated concept proof. Golem network does not exist yet for general purpose computing. Their network is available for CGI rendering only in the test mode. On the other hand we involve more common and standardised platform, which is similar to many ongoing distributed projects, therefore it is compatible with many of them. Also, because we are using many open-source adopted components we already have the core, platform and most common features of project, and, in fact, we are ahead of Golem project by at least two years of development.

Golem range of applications is still limited. The currently efficiently tested tasks in Golem are limited to rendering tasks in Blender only.

Golem has reduced functionality. Golem represents only a "peer-to-peer market" for computational resources and not the protocol, which is cryptographically secure and ensures distribution, validation of tasks and proportional correct payment for the computational power.

Validation of the computing results. Among Golem minuses is vulnerable reputation system, which is discussed here: https://www.reddit.com/r/GolemProject/comments/5iuvdv/what_do_you_think_of_this_critique_from_the/

Golem transaction fee is 5%. We consider traditional financial institutions as key competitors for blockchain-based currencies and decentralized organizations. While US interest The Federal Reserve interest rate all time low was 0.5% (this is basically what Federal Reserve charges for management of global financial system). We expect our transactions fee to be less than that (but it is also important to remember that transaction fee is not the same as interest rate, so in fact it will give more funds).

We expect lower fee network to be more stable and competitive and therefore in long-term more profitable for the investors, as it is mentioned here about Golem project: "it's just rent-seeking and will eventually be disrupted by someone copying the model without the fees": https://www.reddit.com/r/ethereum/comments/4wrvnx/golem_network_token_gnt_sale_the_golem_project/

Comparison to iex.ec Network

iex.ec use middleware similar to BOINC, however it is less tested and has smaller community and support behind it.

Both in comparison with Golem and iex.ec we expect to get to the market faster

Comparison to Elastic project

Elastic project seems to be frozen.

Elastic Project seems to be somewhat inactive, they have quite many non-active pages, like elastic-project.com/how_does_mining_work

elastic-project.com/safe_running_external_code

elastic-project.com/screenshots

Elastic project seems to be obscure.

Team is not shown on their web site.

Elastic programming language has limitations similar to C - with 64,000 predefined integers (m[0] through m[63999]) and 1000 floats (f[0] through f[999]). While compatibility is good to have remained, such limitation is better to avoid.

Both in comparison with Golem and iex.ec we expect to get to the market faster.

Differentces from GridCoin and CureCoin.

There are cryptocurrency projects such as CureCoin, FoldingCoin and GridCoin that had involvement in scientific distributed computing. However, these projects act on the basis of the whitelist selection for the scientific computing projects. They are not creating markets for computing power. In our project any **buyer** can purchase computing power for the task of any size and any **seller** can rent out his or her computing power. Therefore, the main comparison to these projects is that SONM is not limited to any specific projects, it will be an open decentralized secure market for computing power.

Difference between SONM and DrugDiscovery@home

DrugDiscovery@home is a specialized project, which currently runs its own server and has its own token. This project is dedicated toward development and implementation of new chemoinformatics and bioinformatics algorithms. Its crowdfunding purpose will be to raise money for computational chemists and biologists primarily. DrugDiscovery@home will be also first project, renting computing power from SONM using (through purchasing of SONM tokens by DrugDiscovery tokens). Also DrugDiscovery@home is centralized project, built around one server using classic BOINC technology with tasks defined by owners, while SONM is decentralized computing platform, using our GRIB technology, available for everyone.

Compatibility and integration with other decentralized on-demand computing services.

Although we have mentioned above differences from Golem and iex.ec networks and some advantages of our project, we consider compatibility and possibility for such systems integration as a big advantage of our network and as promising mean of computing power usage optimization. So, the goal is to create global computing integrated platform, where SONM, Golem, iex.ec and similar systems can be integrated together and computing power will flow toward the most profitable system.

There are currently some global electricity network plans, which will allow transfer of electricity around the globe according local market demand: [link](#)

In case of distributed desktop computing market we actively welcome merging of different computing networks and optimization of the computing power usage for applications management in order to create global computing network, where computing power can flow toward the most efficient and profitable usage.

Therefore one of the key goals of our project is development of intelligent, deep-learning based system, managing the efficiency of computing power usage for solving of specific tasks.

FUTURE VISION AND ROADMAP

Are you a dreamer?

Let's speak frankly, what dreams people have about 'supercomputers'? If you read something from sci-fi, like Asimov or Azimov, you can recall that people in some of their stories, dream about computer, which could be able to answer to any their question and solve different and complex economy and life problems. So, we dream about it too. And this is the final goal, which we want to succeed in this project. For example, you can say, that google can't solve questions and it only gives you a search results, and neuro-network could be able to solve only small task and it needs to learn first, and you will be absolutely correct. But, in fact, what if we will have neuro-network which will know how to distribute a big job to a different small tasks, calculate power, prices and all other stuff, which we are using in development of our marketplace of computer power? And what if this network will have a closely infinite calculation power? Does it solve the problem?

We think that yes, that network could probably be exactly the supercomputer, which could be able to solve almost any human question. Below in our ambitious and bold RoadMap we show steps on how humanity can do it. We foresee networks to become decentralized at the first stage with collective mind being behind them and collective wisdom driving their development. At the next stage the collective mind will get assistance with artificial intelligence, which will learn the way how to solve the most efficiently any possible task and superintelligence, which will learn how to select the tasks of the major need and will start posing tasks for itself. Collective human mind will be then a good reference point for machine learning analysis and then will compete with artificial intelligence, while **artificial superintelligence will arise from replacement of collective mind (task posing and task solving, efficiency analysis) by machine-learning (like deep learning) and general-purpose task solving artificial intelligence methods.**

SONM ROADMAP

Server Outrenting the Network Mining (20 000 ETH, ~200 BTC)

FEATURES	<ol style="list-style-type: none"> 1. Test server stage (only one server, starting supernode in the network) 2. Server, which we have now will be used to enable sale/purchase of computing power for tasks of different size, length and complexity 3. Solving data security issue for GPU and distributed GPU virtualization 4. Purchase-sale mechanism for miners (sellers) and buyers 5. Market for software developers 6. Matchmaking of applications with computing and/or storage resources
VALUE	ECOSYSTEM for selling and buying computing power and with robust reputation system using BOINC platform. Centralized (classic). Ethereum smartcontracts for automation of charging for computing process

Servers Organized into Network Market (200 000 ETH, ~2000 BTC)

FEATURES	<ol style="list-style-type: none"> 1. Multiplication of servers numbers 2. Creation of the network-based market for computing power 3. Heterogenic decentralization of the computing 4. Creation of the network of servers (supernodes) 5. Standardizing of the worlds creation by smart-contracts 6. Using Homomorphic encryption for CPU and GPU security of the data or technologies like used in http://www.enigma.co/project.
VALUE	Ecosystem for decentralized market for storage, computing power Security in transferring data. GRIB platform. Own mining pools worlds for better cooperation and higher valued contracts on market.

Self-Organized Network Mining (500 000 ETH – 5 000 BTC)

FEATURES	<ol style="list-style-type: none"> 1. Complete decentralization of the market 2. Automatization of the process of nodes evolution to supernodes 3. Market for supernodes creation, sales/purchases 4. Developers API for worlds creation, tokens creation 5. Integration interfaces with other networks (GOLEM, iex.ec, IOTA etc.).
VALUE	Further development of GRIB technology. Compatible with other networks and projects, supernodes rewards and penalties, own token creation compatible with whole system refereing to any deal
OPTION	Proof of stake to generate temporary license token for supernodes gate activation (2 BTC equivalent or more for reputation penalties or growth

SONM ROADMAP

Supercomputer Organized by Network Mining (funding needed – 1 000 000 ETH ~ 10 000 BTC)

FEATURES	<ol style="list-style-type: none"> 1. Heterogenic cloud computing (supercomputing) 2. Integration with supercomputing solutions 3. Management of mining and energy efficiency 4. Providing computing power to other blockchain projects 5. Integration with systems, capable for natural language processing (like IBM Watson and others), capable of posing computing tasks, using natural language with GRIB technology.
VALUE	Cut costs and time needed to deliver tasks changing from decentralized computer to Hyper Performance Computer managed by advance software. Decentralized supercomputing supercloud, integrated with other computing resources. Integration with all relevant blockchain technologies and platforms (iex.ec, Golem, Factom, IPFS, storj, factom, integration with relevant and complementary services cryptocurrencies
OPTION	Developing new architectures and or hardware management optimized for task (maybe similar thing is reachable in BOINC architecture mix) providing schemes for people with proper PoS

Superintelligent Omnipresent Network Mind (2 000 000 ETH ~ 20 000 BTC or more)

FEATURES	<ol style="list-style-type: none"> 1. Learn, which tasks are imposed on network by buyers. Computing tasks clusterization and classification. 2. The system teaches itself on which computing tasks are the most profitable and 3. Learn which algorithms and applications are the most efficient to execute standardized tasks. 4. Natural language processing in order to understand tasks in natural language and formalize them in the form of applications combinations for solving these tasks. 5. Learns from supernodes and servers profits the algorithms and applications for supernodes management 6. Starts posing the most profitable tasks upon itself, replacing buyers
VALUE	Optimized by every feature computing power to deliver as fast as cheap and as accurate results as it is available with global network resources
OPTION	<p>Proof of stake to generate temporary license token for gate activation to ML&A.I. optimization software (2 BTC equivalent or more for reputation penalties or growth).</p> <p>Optimized towards SONM software blockchain and/or sidechain.</p>

Singularity...Oops Nothing More...

Estimated project time frames for all stages: 30 months (taking into account complementary technologies development).

Dissemination of the information

- The project team takes responsibility to make results open for public and to use all available means to disseminate information about the project.
- At least once in a week report about current results and issues will be published.
- Report will contain current project needs and issues.
- All major breakthroughs will be communicated with all interested mass media and spread in major community forums like BitcoinTalk and CryptoCoin Talk.

In the end of development process we see the complete p2p market of calculations and result data's, managed by artificial superintelligence. Anyone can join to any project in network without need to find hub's and setting software/hardware and earn money on it. On other hand Buyers could request resources directly from the network and software developers could be easily unite into 'worlds'(hub's) or deploy their software on it. You can read more about it in following sections.

What happens when existence end?



World making would be as simple as possible – like deploy Apache2 web server nowadays. There will be strong standards to developing distributed applications (maybe framework's too). Submitting and administration of job's and tasks will be proceeded in a few clicks. Becoming of a new world economy.

Work on automatization job's processing in distributed applications and Universal program search algorithms will collocate with modern AI architectures and neuro-programming allow us to start building and deploying a HUGE AI system on our network. That's mean that it is not will be standard AI, which will be trapped in the sandbox, but unlimited AI as a part of the system. Like google search machine, but smarter, because it could operate with more complex data nether search tasks. (But same idea, yes – adapting search, analyse search data results, understanding human question etc). This platform will be running on a big array of computational resources from all over the globe and it is will be REAL smart and actually will able to answer to a most complex question of the humankind.

- What is a purpose of life?
- What is happening over the event horizon of the black hole?
- What character of “Game of Thrones” will be killed next?
- What will happens when existence end?

P.S. We called it Superintelligence Orchestrated by Network Mining (another meaning for SONM)

CROWDFUNDING AND FINANCIAL PLAN, SONM TOKEN

SONM has a special name for its token – **Dilaton**. Dilaton is a particle, associated with gravity in string theory and also a theoretical scalar field (analogous to the photon)

The Token account is a core component of SONM and is designed to ensure flexibility and control over the future evolution of the project. Token is created during the crowdfunding period (described in this white-paper). The supply of Dilatones will be limited to the pool of tokens created during crowdfunding period. Dilatone is provided for exchange of the computing power as a smart-contracts based system.

Dilatone is a token on Ethereum platform. Its design follows widely adopted token implementation standards. This makes it easy to manage using existing solutions including Ethereum Wallet.

The crowdfunding of SONM and the corresponding token creation process are organised around smart contracts running on Ethereum. Participants willing to support development of the SONM Project can do so by sending ether to the designated address. By doing so they create Dilatones (**DIL**) at the rate of 100 **DIL** per 1 ETH. A participant must send ether to the account after the start of the crowdfunding period (specified as the block number). Crowdfunding ends when the end block is created, or when the amount of ether sent to the account reaches the maximum.

CROWDFUNDING SUMMARY

DIL created for 1 eth	100 DIL
Minimum ether	20 000
Maximum ether	2 220 000
Approximate date of start (StartBlock)	01/03/2017
Approximate date of end (EndBlock)	01/04/2017
Maximum number of DIL generated	222 000 000
Bounty	2 000 000
of which crowdfunding participants	160 000 000
of which SONM team and Ecosystem fund	40 000 000
of which SONM team and Ecosystem fund	40 000 000

- Sending 1 ether to a token account will create 100 tokens (expected starting price for 1 token equals 0.01 Ether or 0.1 usd).
- No token creation, minting or mining after the crowdfunding period.
- Tokens will be transferable once the crowdfunding is successfully completed.

The crowdfunding address will be announced at the crowdfunding start through the following channels:

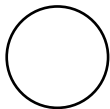
HERE IT IS SMM CHANNELS –

TOPIC

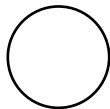
FACEBOOK

TWITTER

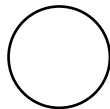
SLACK



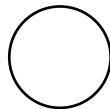
TOPIC



FACEBOOK



TWITTER



SLACK

ICO will be proceed through native SONM application on a base of smart contract (similar with FirstBlood ico).

The first hour of sale will be **power hour**. At this time tokens will be aviable at rate of 170 DIL for 1ETH. Then rate will change to 150 DIL for 1 ETH. Every **day** rate will decrease linearly until it hits 100 DIL for 1 ETH. The token sale will have a hard cup that, when reached, will immediately disable additional sales. The cup will be measured in Ether and set in the token smart contract to a value approximately equal to \$22 million USD based on ETH/USD price at the start of the token sale.

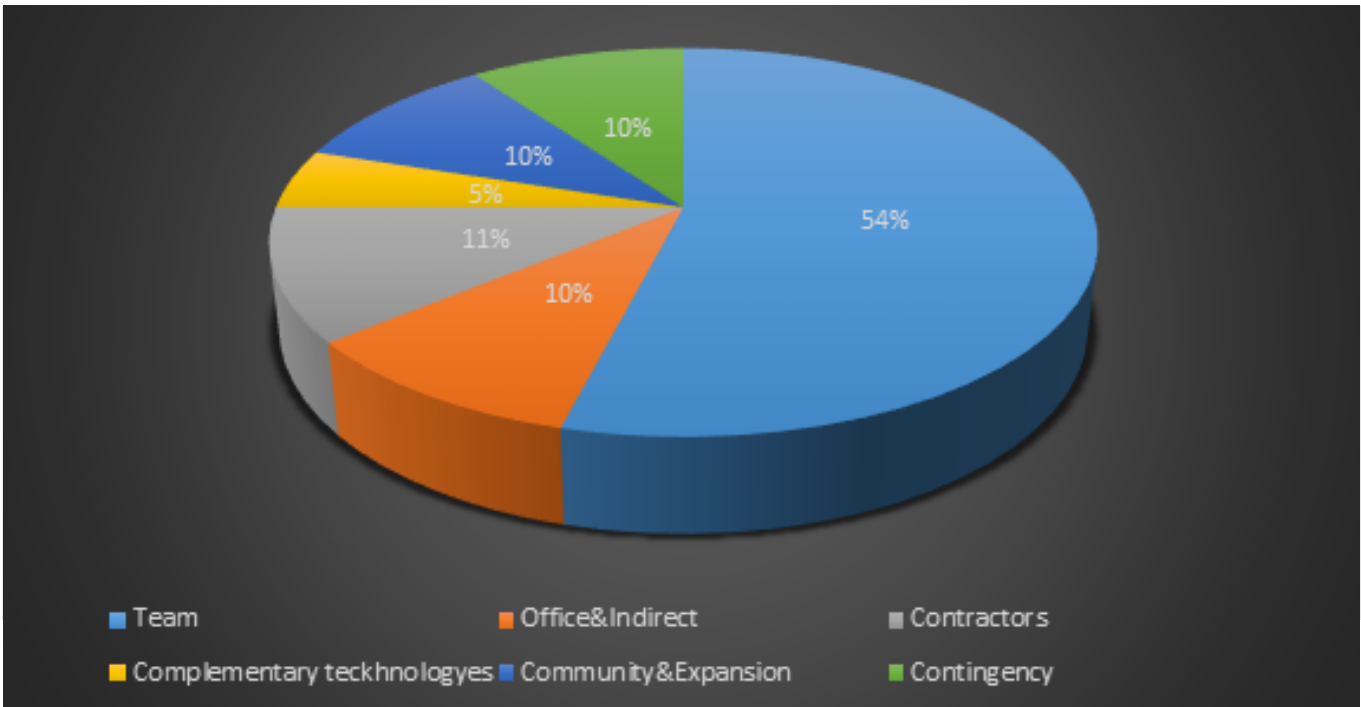
At the end of the sale, the founding team receive 10% of allocation of **DIL**, subject to a twelve month holding period. These tokens will serve as long-term incentive for founding team. An additional 15% will be allocated to a Ecosystem fund. At the end of ICO, token creation will be closed permanently. Tokens transfer will be restricted for one month after the sale ends. **(may be add small table or sheme?)**

ICO plan for distributions.

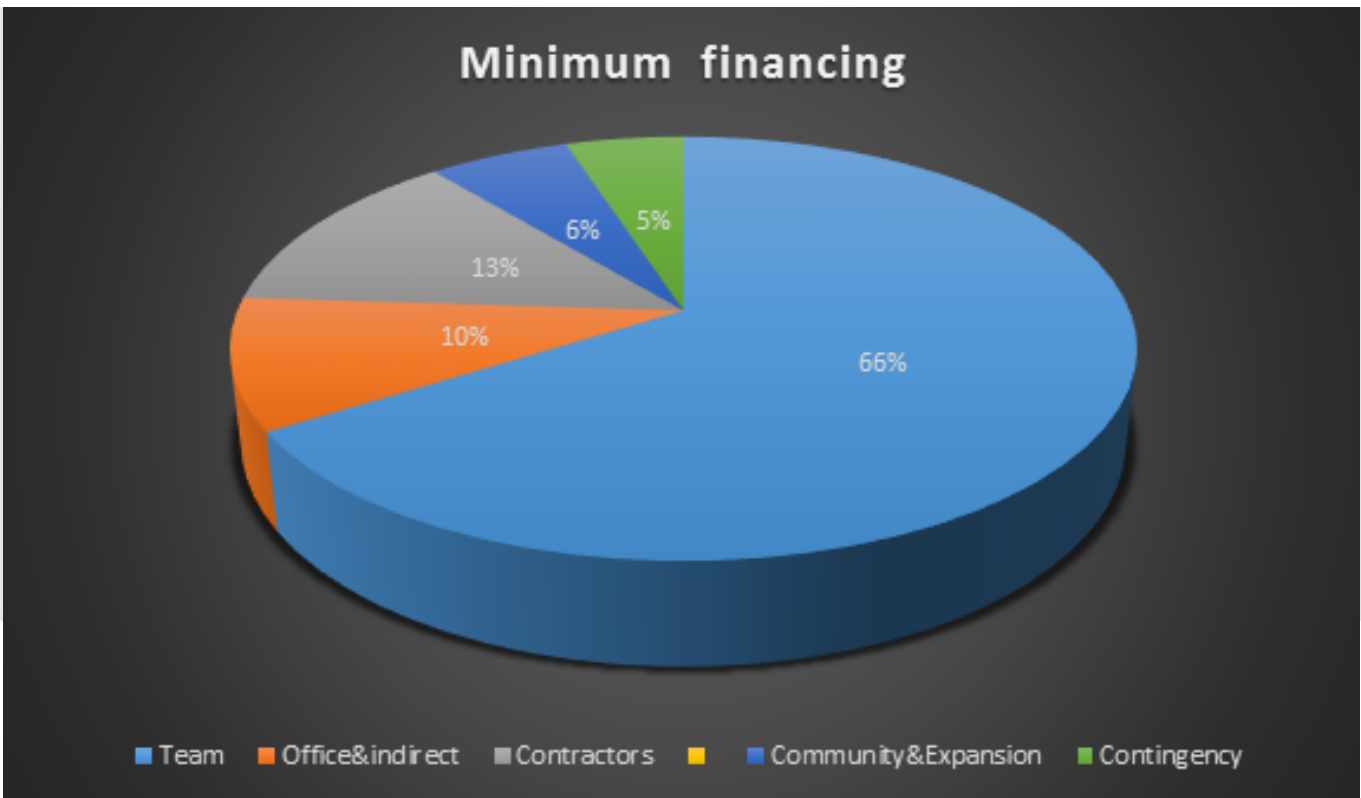
Smart-Contract for CrowdSale: <http://sonm.io/ico/>

Financial plan

MAXIMUM



MINIMUM



Financing and RoadMap

Levels of crowdfunding raised will allow us to progress according to the RoadMap presented above. The main spending of funding will go to sustaining team of developers with also smaller part going to community and marketing managers. The minimum funding will go to Desktop Grid Computing specialists

Team Salary

Main part of funding is needed for full-time financing of team work and for involving new team members, when needed. Also, external contractors and complementary services are expected.

The team, listed in the team section is expected to be the core, but project expects more hiring in the process of project development. As far as we expect to come to the market as fast as possible (probably the first from the similar projects), part of funding is going to come from the profits of the network (0.3% transaction fee for any transaction in the network.). We already have experience of fusing Desktop Grid computing for DrugDiscovery project and coupling it with smart contracts.

In the 'minimum financing' scenario, the ultimate deliverable is a working SONM is creation of the decentralized computing power market along with tools for developers to implement their applications on SONM infrastructure. In particular, the minimum financing will be sufficient to introduce a basic version of SONM Ecosystem.

In the 'maximum financing' scenario, we are making a commitment to deliver software we describe much faster due parallel development program. Also this could allow us to get an additional focus on 'singularity' and AI section. , Machine Learning and optimisation algorithms in general to provide super effective software. Making computing faster, easier, more scalable , effective and lowering cost the more you use it. As system learns you and make your computing more effective. Making this software system be very special and dedicated just for your needs. Predict your costs easy and cut time delivery to minimum.

SONM team spending consists solely of employment costs. With minimum scenario we expect to hire teams of developers for Grid Desktop Computing as well as for the blockchain smart-contracts. With maximum scenario this will also involve hiring professionals in the fields of cryptography (cipher text reading, running computing for encrypted data) and artificial intelligence.

Offices and indirect costs

Office and indirect costs include costs of offices rental (minimum offices space – Moscow and Warsaw, maximum – also offices in Zug, San Francisco and London), as well as other indirect, employment-related costs. This is expected to make us more available to the community and clients actively selling their computing resources on the market.

Third-party contractors and complementary services

By contractors we mean all third parties we are willing to work with. The number here is high largely because of security audits. Legal and accounting services are also included in this category.

Community management and expansion

We expect expansion of SONM community in multi-language and multi-cultural environment. This will include community management, communication, marketing and promotion.

The goal is to bring Clients (Buyers-Requestors) toward network and will include direct sales activity and making self-sustaining decentralized sales network, which may get direct benefits and % from the buyers. This will also include creation of SONM foundation. We plan that at part of this money will go on market to re-buy our tokens and financing our servers, hubs and worlds by them.

The Complementary technologies means integration with technologies, needed by SONM. Mostly we will rely on open-source and distributed applications. It will mostly be spent for funding integration work for these technologies with SONM system.

Contingency

Contingency fund is calculated as 10% of the total budget (5% for minimum financing).

SONM TEAM DESCRIPTION



Andrey Voronkov has wide experience of startups in IT and biomedical fields, working as CEO of Digital BioPharm Ltd. Graduated Moscow State University, defended PhD in the field of computer-based drug design. Works as scientific director of IVAO inc. investment company. He has experience in preclinical drug development using molecular dynamics, docking, virtual chemical spaces processing, usage of BOINC server for distributed computing, which was implemented in DrugDiscovery@home volunteer computing project since 2009. Long experience of using of supercomputing and distributed computing environment for solving tasks in biomedical field. Bitcoin, Ethereum and blockchain enthusiast since 2013, successfully invested in bitcoin, litecoin, emergcoin, ethereum and other crypto. Became actively involved into crypto-community after evaluation of power of the smart-contracts in 2014-2015. Programming in Python and R.



Sergey Ponomarev is experienced with smart-contracts development, Java, C++, C#, php, node.js and Solidity programming. Has a big background in p2p network organization and research projects. Has a very deep knowledge about program architecture and p2p networks.



Krzysztof Piszczek, lead developer. Krzysztof is software developer and Linux administrator. Since early 90's computer addicted s-f literature fan. As BOINC administrator of few projects Krzysztof is responsible in our organisation for BOINC server maintenance and applications development. Krzysztof is also Radioactive@Home and Universe@Home projects administrator and developer.



Krzysztof Faryna is experienced BOINC administrator, who manages BOINC Poland foundation.

Barnaba Pawełczak, marketing and business development

At studies I have been in team building a plugin for medicwave software used for tasks related to cancer detection in early stage. I have created prototypes of few start-ups under NDAs.

At work 2010-2014 at Gemalto which is leader in security technology and software and manufacturing security devices. I have created software for dynamic allocation of data into microprocessors with tight control of

its architecture capability. I have coordinated a regional campaign for small party and we have met our leaders expectations for region. My education background. Graduated Gdansk University of Technology in Electronics, Telecommunications and Informatics where also studied

Management and Economics.

Since 2014 works as consultant and technology broker through

barnabapa.pl and working on developing Ethereum smart-contracts and Dapps.





Zhu Lianbing. Chinese community manager. Blockchain enthusiast.



Denis Rysev, marketing and evangelist. Denis has experience of being producer at Nival Network and game designer in Finam. Also participates as delegate (witness) in Golos. ai platform.



Zaslavskiy Mikhail, PhD is biostatistician, who is one of the winners of Dream Challenge competition from AstraZeneca and one of the top100 kaggle ratings participants.



Oxana Lorie. Graphic designer - solves your problems using pictures. Also can do everything that graphic designer has to do and much more. Oxana has suggested Logo of SONM.



Anastasia Yakovleva - Working on users interface design.



You can find information about project here:

[Reddit](#)

[BitcoinTalk:](#)

[GitHub](#)

[Slack](#)

[Twitter](#)

[Facebook](#)

[Google Groups](#)

[VK](#)

[Telegram:](#)

[Project wiki:](#)