



CONSENSUS

Decentralized AI for Collective Governance

Crowdsale Whitepaper, v. 0.9.9

Table of Contents

EXECUTIVE SUMMARY

1. FUTURE GOVERNANCE LANDSCAPE

1.1 Economy and Governments

- General Perspective
- Moving to Decentralized Economy
- Electronic Citizenship and Identification
- Estonian E-Residency
- Cryptocurrencies

1.2 Technology

- General Background on Blockchains: Bitcoin
- Ethereum
- Smart Contracts

1.3 Consensus Vision of the Future of Governance

2. SENTIENT NETWORK

2.1 Network Overview

- Sen Coin
- Assembly

2.2 Electronic Identities

- Smart Contracts Signed with eIDs.

2.3 Decentralized AI

- Machine Learning On the Blockchain, Federated Learning
- Data Privacy Using Homomorphic Encryption
- Assembly Protection Service
- Synaptic Core
- Process Overview

3. RESEARCH PLATFORM

3.1 Datascope

3.2 Governance Modules

- Public Opinion Gathering Module
- Economic/Budgeting Module
- Legislation Module
- External Data Module

3.3 Consensus AI Advisor

3.4 Development Platform, Dapps

- Open Legislation

- Open Tender

- Open Budget

- Social Proposals and Crowdfunding

4. ROADMAP

4.1 Implementation Timeline

4.2 Consensus Pilot

5. CONSENSUS FOUNDATION

5.1 Objectives

5.2 Consensus Launch Partners

5.3 Team

5.4 Advisors

6. APPENDIX

Consensus Governance Principles

7. LEGAL DISCLAIMER

EXECUTIVE SUMMARY

Introduction

The main challenges our society faces today are, fundamentally, due to our inability to see the big picture. The world is too complex and the problems are too large for any individual, company or government to comprehend and address. To construct effective solutions to the problems at hand we need to see the interconnectedness and interdependence of all phenomena — we need to understand the full picture, the connection between entities, causality, influence factors etc. — and make decisions accordingly. To accomplish this, vast amounts of data need to be collected and processed to model the desired positive outcomes. The governance systems currently in use may no longer be adequate for the evolving societal and environmental complexity and may pose serious limitations in the near future¹ — we will need new systems, able to govern based on the interconnectedness of factors, able to collect and process very large amounts of input and provide access to the resulting conclusions for the complete information dissemination and acceptance. The goal of Consensus Foundation (“Consensus”) is to create and evolve this system.

Mission

The mission of Consensus is to achieve collective governance based on interdependence using advanced technologies.

Abstract

Consensus is the open-sourced, decentralized artificial intelligence platform, powered by native cryptocurrency and built with the vision to improve the governance mechanisms at all levels of organizational structures: community, startup, NGO, enterprise, city, county or the entire country. Once fully realized, Consensus AI will be able to offer automated, data-driven solutions to the most complex problems of our collective co-existence by modelling the potential outcomes of proposed changes. At its basis, it will contain a set of principles, which will guide its development and evolution. This paper discusses the approach, methodology, the network model, its governance and the underlying design principles, technology requirements, product roadmap and adoption strategy.

Product Direction

At the initial project stage the Consensus Foundation team will build and launch the Sentient network, a distributed ledger system powered by its own currency, Sen (denoted SEN), smart contracts and the implementation of Trusted Nodes. The two main features of the Sentient network are i) Trusted Nodes, verified with electronic national IDs, which allows for extended capabilities of the network, creation of governance applications and faster adoption by the public sector as a legitimate platform for data collection and decision making processes, and

¹ Our citizens are going digital and global. If the state doesn't keep up it will become obsolete, <http://www.telegraph.co.uk/news/2017/07/16/citizens-going-digital-global-state-doesnt-keep-will-become>

ii) decentralized machine learning, which, in the long term enables the creation of an artificial intelligent system that resides on the network, allowing for faster, more accurate and distributed data analysis. Sentient network further improves on the innovation of Bitcoin and Ethereum and introduces distributed machine learning on the blockchain.

Next, we will facilitate the adoption of the network by public and private entities interested in performing various public research — startups, individual researchers, communities, enterprise etc. Following that, we will begin building the Consensus AI Advisor to enable extended research being done using the Sentient network. These steps will serve as the basis for the Consensus AI ecosystem, and once this groundwork is complete, we will move into the collaboration with the government entities to help them execute specific research and modelling projects. Subsequently, Consensus Foundation plans to launch a number of applications built on the Sentient network such as the open tender and social projects funding platforms, initially servicing the smaller communities and gradually expanding the adoption. Starting with a relatively simple types of social projects we plan to cover, gradually, most of the governmental interactions within a country and offer advanced modelling capabilities to enhance the decision-making process.

This initial work will be developed in collaboration with the Estonian e-Residency team and will launch within Estonian e-Residents community as a pilot version.

The long term goal, inspired by the concepts of crowdfunding and swarm intelligence decision making, is to build and deploy globally the decentralized network that will be used to govern societies. Consensus will provide, first small communities and organizations and later, municipal and federal governments, with the ability to transparently propose, evaluate and finance various public projects; and community members with the opportunities for collective selection and funding mechanisms of the proposed initiatives.

1. FUTURE GOVERNANCE LANDSCAPE

1.1 ECONOMY AND GOVERNMENTS

General Perspective

We believe that with the introduction and the evolution of both state-issued electronic identities and cryptography-based currencies, governments in the near future will have to adopt new ways of interacting with their citizens, including policy feedback gathering and processing, collection of taxes and distribution of services, proposition and evaluation of various environmental solutions, interstate relationships, internal matters and many others. Consensus Foundation aims to build new systems that will be required to address these upcoming challenges and to achieve effective collective governance based on the interdependence and the interconnectedness of issues. We foresee that in a short number of years countries with the progressive outlook will a) issue electronic identities to their citizens and b) launch their own cryptocurrencies and allow citizens to use them to pay for goods and services. Estonia, being a forerunner of the digital society of the future, is already exploring the idea of the national cryptocurrency Estcoin, and is considering funding its development with a public coin offering. The electronic IDs have been in use in Estonia for over 15 years already, and are used to access 99% of the government services and a variety of private companies services (banking, telecom, etc.) in the country. We already observe a number of other countries discussing or developing similar strategies.

Additionally, the emergence of artificial intelligence and the automation of all human work that could be automated will significantly transform major aspects of daily lives, including governance.

In the next decade, we see these trends converge, and we are actively building what will become the fabric of the future digital world.

Also, the next generation, Generation Z, born between 1995 and 2010, account for more than a quarter of the world's population. These people are now entering the workforce and becoming taxpayers. According to a Gartner analysis, they are less inclined to trust companies and brands, they expect to be heard and involved, and often seek out employers and brands that offer authentic and transparent experiences. The generation before them, the Millennials or Generation Y, is not so different in these respects. Born between 1980 and 1995, they account for another quarter in the global population. Like Generation Z, they also increasingly expect their governments to offer authentic transparent experiences, and treat them as valued customers.

Moving to Decentralized Economy

Decentralized services that run on blockchain technology are at their dawn at the moment, however they are rapidly penetrating every global industry from financial operations and asset management to cloud computing and hosting. We predict that in a relatively short timeframe most intermediaries, like brokers, bankers, hosting providers etc. will be supplemented or outright replaced by the autonomous platforms on decentralized networks running smart

contracts and paid in cryptocurrency. The contemporary government bodies, in their current state, may not be prepared or equipped to manage this kind of shift effectively, and will actively seek new solutions once the imminence of these shifts becomes undeniable. Consensus Foundation aims to provide these solutions.

Electronic Citizenship and Identification

As the world is becoming more interconnected, it is starting to move rapidly towards a single market and a global citizenship. Personal identities are becoming less tied to any particular location, leading to far-reaching implications for governments, corporations and societies. With these shifts in perspective, soon the traditional notions of citizenship, residency, work, taxation, government services will start to break down.

BBC World Services poll, conducted in 2016, indicated that nearly half (49%) of people surveyed across 14 tracking countries see themselves more as global citizens than citizens of their country², and this trend continues to rise.

According to the Global National eID Industry forecasts³, by 2021 there will be 650 million eID cards issued, which will replace traditional national IDs. Additionally, the United Nations plans to provide legal identity for everyone globally, including birth registration, by 2030 as part of the Sustainable Development Goal 16.9⁴.

Estonian E-Residency

Republic of Estonia, the first and the most advanced digital society in the world⁵, has run the country electronically over the past 15 years. There are a number of building blocks of the digital nation of Estonia, including secure national ID with the strong digital signature protected by PIN codes, blockchain-based government infrastructure that provides security and scalability of the operations and numerous government services built on top of it – from e-voting to population registry, to e-health records, to automated electronic taxation, electronic business registration and management and many more⁶.

This investment into the development of the digital society in the early 1990s has greatly paid off – currently the Republic of Estonia estimates saving over 2% of its GDP by relying on the electronic government systems instead of traditional offices, which still exist in the country, but serve as a backup, fallback solution rather than a primary one.

At the end of 2014, as an extension of the government digital services of Estonia, the country pioneered the concept of e-Residency, a digital ID similar to the one Estonian nationals used for years, issued by the state and available to virtually everyone in the world⁷. Anyone can

2 Global Citizenship a growing sentiment among citizens of emerging economies: Global Poll, https://www.globescan.com/images/images/pressreleases/BBC2016-Identity/BBC_GlobeScan_Identity_Season_Press_Release_April%2026.pdf

3 The Global National eID Industry Report: 2017 Edition

4 Sustainable Development Goal 16, <https://sustainabledevelopment.un.org/sdg16>

5 Concerned about Brexit? Why not become an e-resident of Estonia, <http://www.wired.co.uk/article/estonia-e-resident>

6 Building blocks of e-Estonia, <https://e-estonia.com/solutions/>

7 Republic of Estonia e-Residency – Join the New Digital Nation, <https://e-resident.gov.ee>

apply online, pay a state fee, get the card issued and pick it up in Estonia or at one of the embassies around the world. It has been transformational for the country, with over 25,000 people applying to obtain e-Residency since the start of the program. Currently these e-Residents can register an EU company in Estonia, conduct global business, access banking solutions, pay taxes — all entirely online, without leaving their home country. At the present moment, the number of new e-Residents joining the program already exceeds the number of newly born babies in Estonia⁸, and by 2025 Estonia estimates 10M active e-Residents, which will greatly outnumber the current population of the country of 1.3 million people.

Cryptocurrencies

With the emergence of the blockchain technology and cryptocurrencies the financial system, arguably, is the one experiencing the biggest shift at the moment. One of the new trends for some innovative projects is to raise financing through the initial coin offerings or token generation events — the lightly regulated instruments with none or hardly any involvement from financial intermediaries.

In parallel, a sizeable part of population is moving towards self-employment, running small businesses and freelancing, often collecting payments digitally and, increasingly, in cryptocurrencies, which bypasses the traditional state revenue mechanisms. In the not so distant future, sovereign states will need to create a new model of financial relations with their citizens, corporates and global partners to remain useful and even relevant. As part of this new model some forward looking countries are starting to discuss the idea of launching their own national cryptocurrencies run on decentralized networks.

In August 2017, Kaspar Korjus, the managing director of e-Residency program, published a blog post⁹ outlining ideas for Estonia to issue its own cryptocurrency, Estcoin, and fund its development via the ICO. The main premise of the article was proposing this idea for the public discussion and gathering feedback from various participants in private and public sector. The news spread quickly and a number of parties contributed to the discussion. One of the main questions arising during the debate was the utility aspect of the proposed Estcoin — the state can issue the crypto token, but without being used within an environment that promotes increased productivity and positive economic and societal change, the success of the token is limited.

Consensus Foundation, having support from the e-Residency program will build strong applications for the future Estcoin and other, inevitable, national crypto tokens. This aims to address the incredible opportunity to build new governance models for the future society and a new kind of country — a global, inclusive virtual entity, country as a service, a governance platform for the entire world.

⁸ Estonia's new e-residents are surpassing the country's birth rate, <https://thenextweb.com/eu/2017/07/25/estonias-new-e-residents-surpassing-countrys-birth-rate/>

⁹ Estonia could offer 'estcoins' to e-residents, <https://medium.com/e-residency-blog/estonia-could-offer-estcoins-to-e-residents-a3a5a5d3c894>

1.2 TECHNOLOGY

General Background on Blockchains: Bitcoin

In 2008 Satoshi Nakamoto proposed the blockchain technology in his whitepaper “Bitcoin: A Peer-to-Peer Electronic Cash System”¹⁰ and it was implemented the following year. Bitcoin network’s application of the blockchain technology is a ledger of the financial transactions which publicly records transfers of the network currency, Bitcoin. The innovation introduced by the Bitcoin network was a successful solution to the double spend problem using blockchain. This breakthrough, coupled with the network’s innate decentralized design, relative anonymity and open sourced codebase, facilitated its rapid wide adoption and support.

Despite the use of peer-to-peer technology and the absence of a central authority to operate the network, Bitcoin has successfully carried out over 150 million transactions and its current market capitalization is over \$100 billion dollars. This also allowed Bitcoin to become one of the biggest computer networks, with hashpower over 6 exahashes/sec. and the estimated annual power consumption of 13TWh, which is larger than the power consumption of some countries. Following the success of Bitcoin numerous other blockchain-based cryptocurrencies emerged. At the moment, monetary transactions remain the most common application of the blockchain technology, however, this is rapidly changing, with various new projects appearing, aiming to manage other digital and physical assets, such as financial products and services, logistics information, property ownership, identity and more.

Ethereum

Ethereum¹¹, proposed in 2013 and first released in 2015, improved on the transactional limitations of Bitcoin network by adding the ability to execute smart contracts on the blockchain with a decentralized Turing-complete virtual machine, the Ethereum Virtual Machine (EVM), which can run scripts using a network of public nodes. Ethereum also provides a cryptocurrency token – ether, which can be transferred between accounts and used to compensate participant nodes for computations performed. Ethereum also includes “gas”, an internal code execution pricing mechanism that is used to mitigate the halting problem and various abuse scenarios, as well as to allocate resources on the network.

Smart Contracts

The innovation of Ethereum was the introduction of smart contracts that allowed users of the network to write programs (or contracts) and have the network execute them on the blockchain. Similar to Bitcoin, Ethereum uses the blockchain and a consensus mechanism to ensure that if a malicious node attempts to forge the content of the contract, the forged contract will eventually be removed from the blockchain. While Bitcoin network ensures the integrity of the financial transaction – the amount of coins transferred between accounts, Ethereum, additionally, ensures the integrity of the contract being executed.

In general, smart contracts present an immense opportunity for the future of computing to be

¹⁰ <https://bitcoin.org/bitcoin.pdf>

¹¹ <https://github.com/ethereum/wiki/wiki/White-Paper>

a fundamental change in the development of decentralized applications. While these programs do not reside on a centralized server or cluster, they can run the same logic anywhere, and in the near future will be used for a wide variety of cases, e.g. for the development of decentralized marketplaces¹², currency exchange platforms, decentralized worldwide supercomputers¹³, global data and file storage systems (IPFS, IPDB etc.), various asset management applications and many more. In addition, blockchain-based smart contracts hold a great promise of the decentralized artificial intelligence applications, which is one of the main interests of Consensus Foundation.

1.3 CONSENSUS VISION OF THE FUTURE OF GOVERNANCE

Consensus is an open-sourced decentralized platform that will help govern communities, societies and jurisdictions in a more transparent, cost efficient and progressive manner. We envision this implemented via collective voting, initiatives proposal and funding, execution reporting and intelligent algorithms that will perform project analysis and model the potential outcomes, considering the efficiency, budgetary concerns, social, environmental and other factors. We see Consensus being used, effectively, as an artificial intelligence advisor to the organizations and governmental bodies, serving the greater good of all.

The goal of Consensus is to make governmental structures more effective and useful and ensuring a smooth transition from the current traditional structures to the ones the future will require, minimizing the transition phase difficulties and avoiding chaos in the process. Consensus Foundation aims to help advance the systems of collective governance that will meet the demands of the very near future societies, and to aid governments in adopting modern technologies for the greater good of humanity and to further help our collective evolution.

¹² <https://www.dex.sg>

¹³ <https://golem.network>, <https://sonm.io>

2. SENTIENT NETWORK

There are three main components to the Consensus system: i) the Sentient blockchain network that includes verified nodes and enables running decentralized machine learning, ii) the Research Platform with extended data collection and modelling capabilities, and iii) the AI Advisor — a standalone system, constantly monitoring and learning from the incoming available data, that is used to make predictions. Later stages of development will include internally and externally built Dapps for various governance applications.

2.1 NETWORK OVERVIEW

The majority of the work Consensus system will perform consists of data collection and processing. In the Information Age data is most valuable resource, human and non-human actors generate vast amounts of it all the time, but it usually ends up being centralized in large multinational companies, and people often don't have control over how their data is being used, packaged, sold and resold, and they certainly don't benefit from the data they generated the same way these corporations do. Governments also can make better use of this valuable resource to improve our collective co-existence, however the mechanisms and processes available to them remain outdated. This dynamic gives very few corporations a competitive advantage over smaller companies and sometimes even countries. Additionally, some raw data might be too sensitive for a general person to contribute to a corporate entity. One of the main promises the decentralized networks hold is the ability to build an autonomous software system that governs itself based on the internal principles, and is not controlled by a single separate entity. We believe that such a system will serve as a basis for the general purpose artificial intelligence and we are looking to explore the opportunities and the applications of this technology in the collective governance space. Therefore we propose, initially, the creation and deployment of the Sentient blockchain — a decentralized network with the implementation of the trusted nodes, verified with electronic national IDs, able to execute smart contracts and perform machine learning on the network, powered by the miners and not controlled by a corporate entity. In essence, Sentient builds on the innovation of Bitcoin, Ethereum and other decentralized ledgers by introducing a way to execute machine learning tasks as part of smart contracts. Sentient network preserves the control of the data and privacy of its users and ensures broader access to machine learning opportunities for a wide range of entities, including government bodies, and also small companies, individual researches, students, non-profit organizations. The network will become the core of the Consensus AI project and will be open-sourced, simplifying the future collaboration and partnerships, and assisting the network adoption and growth.

Sen Coin

The Sentient network includes a native platform currency, called *Sen* and denoted SEN. Sen coin provides the payment mechanism to network participants and is generated by the network during the execution of smart contracts, block mining and other activities including:

- Participation by the users in Public Research projects and providing their feedback data;
- Provisioning of compute resources by the nodes for running the algorithms that power the network, including Sentient blockchain, execution of smart contracts and AI training;
- Provisioning of the storage capacity for collection and analysis of open and internally provided data.

Sen rewards for participation in public voting and other decision making is envisaged to address the issue of voter apathy in the economy. Economically rational voters should not vote due to low incentives and costs associated with the process¹⁴. However, as more people are incentivized to participate in collective governance, the better decision outcomes are for the collective welfare¹⁵.

The Consensus Foundation will hold a reserve of Sen coins to be used for network governance, external data acquisition and further development. The contributors, developers and partners of the network who will help to improve, regulate and monitor the network will be rewarded from the reserve unlocked according to the network governance decisions.

Assembly

In order to overcome the issues of the network governance itself, we propose a decision-making entity called the Assembly, comprised of the trusted nodes, authenticated by the eIDs, starting with Estonia e-Residency IDs and expanding in the future as other eIDs become available and join the network – to fully decentralize and automate the system. Governance matters like the development of the source code, forks, mining rates, and decisions regarding the allocation of coin reserve within the network will be addressed by the Assembly.

Additionally, Assembly members will be able to provide the security services to the Sentient network, which will earn them extra mining rewards.

2.2 ELECTRONIC IDENTITIES

With the Estonian e-Residency ID built in, Sentient will be the first decentralized global computer to include the strong digital ID linking, the basis for building the society of the future. Support for other digital IDs will also be added as the network evolves, based on the availability of the IDs themselves and the electronic authentication methods developed by the respective countries and the private sector (Digi-ID, Aadhaar, SecureKey, WIN, Civik, etc.). Following the recent developments in this area – such as the eIDAS regulation adopted by the European Union in 2014 that will enforce the mandatory mutual electronic identity recognition by the member states in mid-2018, and the UN Sustainable Development Goal 16.9, that calls for legal identity for everyone in the world, including birth registration¹⁶ by 2030 – we

¹⁴ The Empirical Frequency of a Pivotal Vote, by Casey B. Mulligan, Charles G. Hunter, NBER Working Paper No. 8590, November 2001. <http://www.nber.org/papers/w8590>

¹⁵ DAOs, Democracy and Governance, Ralph C. Merkle, May 2016, <http://merkle.com/papers/DAOdemocracyDraft.pdf>

¹⁶ Goal 16: Peace, Justice and Strong Institutions, <http://www.undp.org/content/undp/en/home/sustainable-development-goals/goal-16-peace-justice-and-strong-institutions/targets/>

anticipate the electronic identities to be the global standard in the not-so-distant future. Estonia, the first digital nation, has successfully paved the way for the eID adoption and usage with incredible results to show for, and a lot of our work is inspired by the Estonia's success in this space. We envision combining the power of the smart contracts verified and signed digitally by national electronic identities to facilitate much faster adoption of Consensus by the public sector due to the increased transparency, accountability and efficiency.

There have been attempts to create decentralized identity verification protocols without relying on external trusted authorities with Open Pretty Good Privacy standard (OpenPGP) being, arguably, the most important one. However, OpenPGP has several shortcomings such as difficult key management, complex UI, limited adoption and high risks from key loss. We propose to implement eIDs verification via off-chain/on-chain hybrid mechanism with the only off-chain mechanism being the query for checking the ID revocation status. One potential solution has been explored by Oraclize in their EID Project proposing to use Estonian e-Residency KYC for Ethereum smart contracts¹⁷. The EID project enables users in possession of an e-Residency card to link any Ethereum address to their identity, represented by their personal serial number which is tied to the personal information as opposed to the smart card's certificate and to control funds transfers from a smart contract-based wallets. The verification system checks RSA signature, Digi-ID's certificate and status of the card in revocation ID list. We are considering taking a similar approach.

Regular, unidentified nodes can also be participants of Sentient network, they will be able to perform basic mining, store encrypted data and earn low tier rewards. The trusted nodes, authenticated and linked with electronic IDs will have access to an extended set of functionality, will earn greater mining and verification rewards and will have access to future services and features of the network. Furthermore, eID-authenticated user wallets will have signing smart contracts and voting privileges. Previously, there were a number of attempts to approximate the one person one vote mechanism, but the introduction of the electronic IDs will solve this issue.

Smart Contracts Signed with eIDs.

We plan to build a GUI user wallet with eID integration for general, non-developer participants (regular citizens) could create a customized smart contract for virtually any type of deal or transaction. The smart contracts will be able to be signed by the holders of the eIDs, creating the additional level of security and trust. In addition to the transactional history the user wallet will include voting history and requests, ongoing and proposed projects/initiatives relevant to eID, interests and preferences of the user and smart contract templates.

2.3 DECENTRALIZED AI

Machine Learning On the Blockchain, Federated Learning

One of the innovations we are proposing is to build an artificial intelligence layer that is hosted

¹⁷ EID - Final Report Estonian e-Residency-based KYC for Ethereum Smart Contracts, http://www.oraclize.it/papers/eid_report-rev1.pdf

by the network participants and is training on data contributions from the network and other available external datasources. The dynamic we envision is akin to a marketplace, where an entity such as a researcher, a data scientist, a startup or a government organization (“Requestor”) interested in collecting and analyzing data will be able to perform public opinion data collection via voting and surveys, external data processing and various machine learning tasks, such as neural network training funded by Sen. Following the initial adoption of Sentient, we envision growing this decentralized research platform to be used by private and public entities to gather and process data related to modelling any kind of decision outcomes.

Currently, most of the machine learning is happening in centralized locations that are controlled by closed corporate entities. Beyond Google and Apple using decentralized model training on their respective mobile platforms, there is no openly available network for everyone else. Our approach for training models is inspired by the federated learning method, which is appealing due to a number of factors, primarily because of privacy considerations – the distributed training data remains on the nodes, and a shared model is learned by aggregating locally-computed updates¹⁸. A key advantage of the federated learning approach is the ability to decouple the model training from the necessity to access the raw training data directly. According to McMahan et al. federated learning has distinct privacy advantages compared to datacenter training on persisted data since holding even an “anonymized” dataset can still put user privacy at risk via joins with other data. In contrast, the information transmitted for federated learning is the minimal update necessary to improve a particular model. Furthermore, we introduce additional privacy protection mechanisms, so that it is possible for nodes to carry out the necessary computations without the risk of their local data being compromised by, or stored in and transmitted to the requestor.

Data Privacy Using Homomorphic Encryption

In machine learning, the goals are often similar to the goals in private data analysis. The party performing machine learning generally seeks to reveal a pattern – some rule that explains a given dataset. Researches look for patterns to be general, so that these patterns not only correctly describe a given dataset, but that they could also correctly describe new data that is drawn from the same distributions. In general, this means that a researcher wishes to find a rule that captures the distributional information about the given dataset that is not specifically dependent on any single data point. The goal of private data analysis is the same – to discover distributional information about a private dataset, without revealing too much about any individual data point in the set. This is not feasible working with raw data, however, homomorphic encryption allows for privacy-preserving computation performed on the datasets¹⁹ and presents an opportunity we are looking to take advantage of, and Sentient network will be applying the principles of homomorphic encryption to protect the requestor and user data. In later stages, once the datasets get sufficiently large, we intent to combine the differential privacy approaches²⁰ with homomorphic encryption to further enhance user data privacy and to achieve greater scalability and improve performance.

18 Communication-Efficient Learning of Deep Networks from Decentralized Data, <http://proceedings.mlr.press/v54/mcmahan17a/mcmahan17a.pdf>

19 MLConfidential: Machine Learning on Encrypted Data, <https://eprint.iacr.org/2012/323.pdf>

20 Dynamic Differential Privacy for Distributed Machine Learning over Networks, <https://arxiv.org/pdf/1601.03466.pdf>

Assembly Protection Service

Assembly Protection Service is a container service, provided by the Assembly members, that holds the encryption keys to ensure data and model integrity. Assembly Protection is a guarantee of the safe transfer between the entity requesting the transaction and the user nodes that execute the request, as well as the model integrity during the training. APS is provided by the Assembly nodes collectively and requires the nodes not only to be eID authenticated, but to also lock a collateral security deposit of 10,000 Sen, as insurance in case the encryption keys are compromised, in which case the nodes would forfeit their collateral and it will be transferred to the reserves held by the Foundation. The collateral amount is subject to change, depending on the number of active Assembly nodes willing to provide the service.

Synaptic Core

One of the main parts of the Consensus system is the smart contract system that acts as a dispatcher service between the machine learning service requestors and the user nodes. To facilitate the secure interactions between the entities requesting the particular data processing, Synaptic Core builds a research-related smart contract, encrypts using Assembly Protection Service and makes it available for distribution. It also assigns Sen rewards for the successful execution.

Process Overview

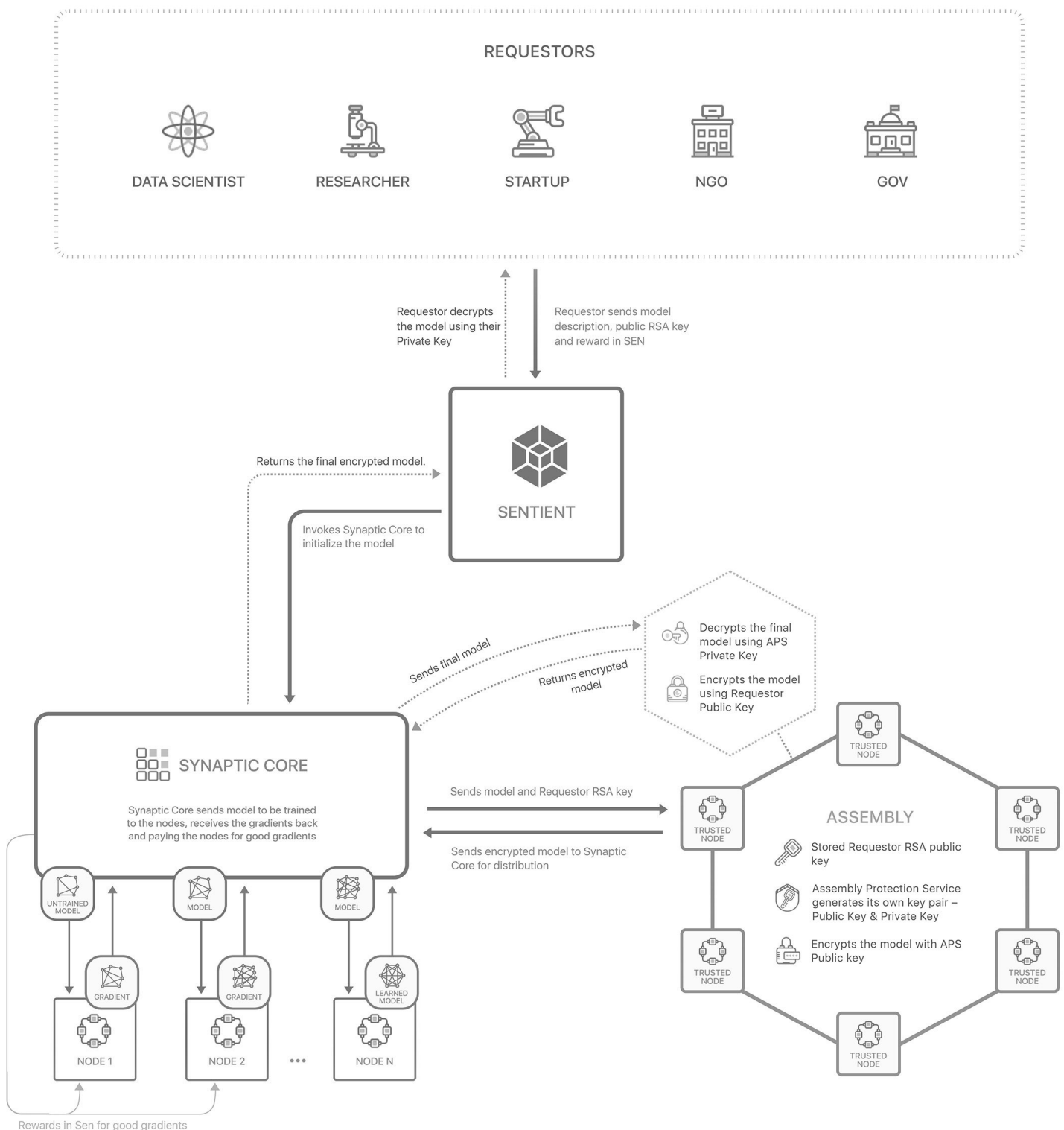
The entity wishing to train the model, Requestor (this could be a researcher, a data scientist, a startup, a non-profit organization, a government organization), sends the model (e.g. neural network) specification — a general description of what the model being trained is to the network and sets a reward in Sen for the computation performed by the miners. The Requestor is also required to send their public RSA key for model encryption, explained below.

Sentient invokes a specialized smart contract on the blockchain that initializes the model. We call this smart contract Synaptic Core and it performs a number of tasks. At the point when Synaptic Core receives the machine learning model specification, it initializes the model to be trained and sends it to the Assembly, along with the Requestor's public key. As previously described, Assembly is a subnetwork of trusted nodes within the Sentient blockchain that can provide the Assembly Protection Service (APS), ensuring the integrity of the models being trained and the privacy of the user data used for federated machine learning. Upon the receipt of the model and the Requestor's public key, APS performs the following operations:

- Stores the Requestor's public key
- Generates its own key pair, APS Private Key and APS Public Key, used for homomorphic encryption
- Encrypts the model using the APS Public Key, sends it to Synaptic Core for distribution to the miner nodes

Assembly also collects a fee as part of the reward posted by the Requestor. We anticipate this fee to be flat, but this is subject to change based on the network performance during the initial testing stage and the anticipated load.

Synaptic Core makes the model available to the miner nodes which, in turn, request the descriptions of available models, pull them and perform the computations locally, on their local datasets. The resulting gradients are then sent back to the Synaptic Core that verifies them and rewards the miners for good gradients received. This is repeated while the set budget allows, and the once the reward budget has been entirely allocated to the miner nodes, Synaptic Core finalizes the model and sends it to the Assembly. Assembly decrypts the final model with the APS Private Key, encrypts it with the Requestor's public key and returns it to the Synaptic Core, which in turn returns the final model to the Requestor. The Figure 1 diagram below visually presents the process.

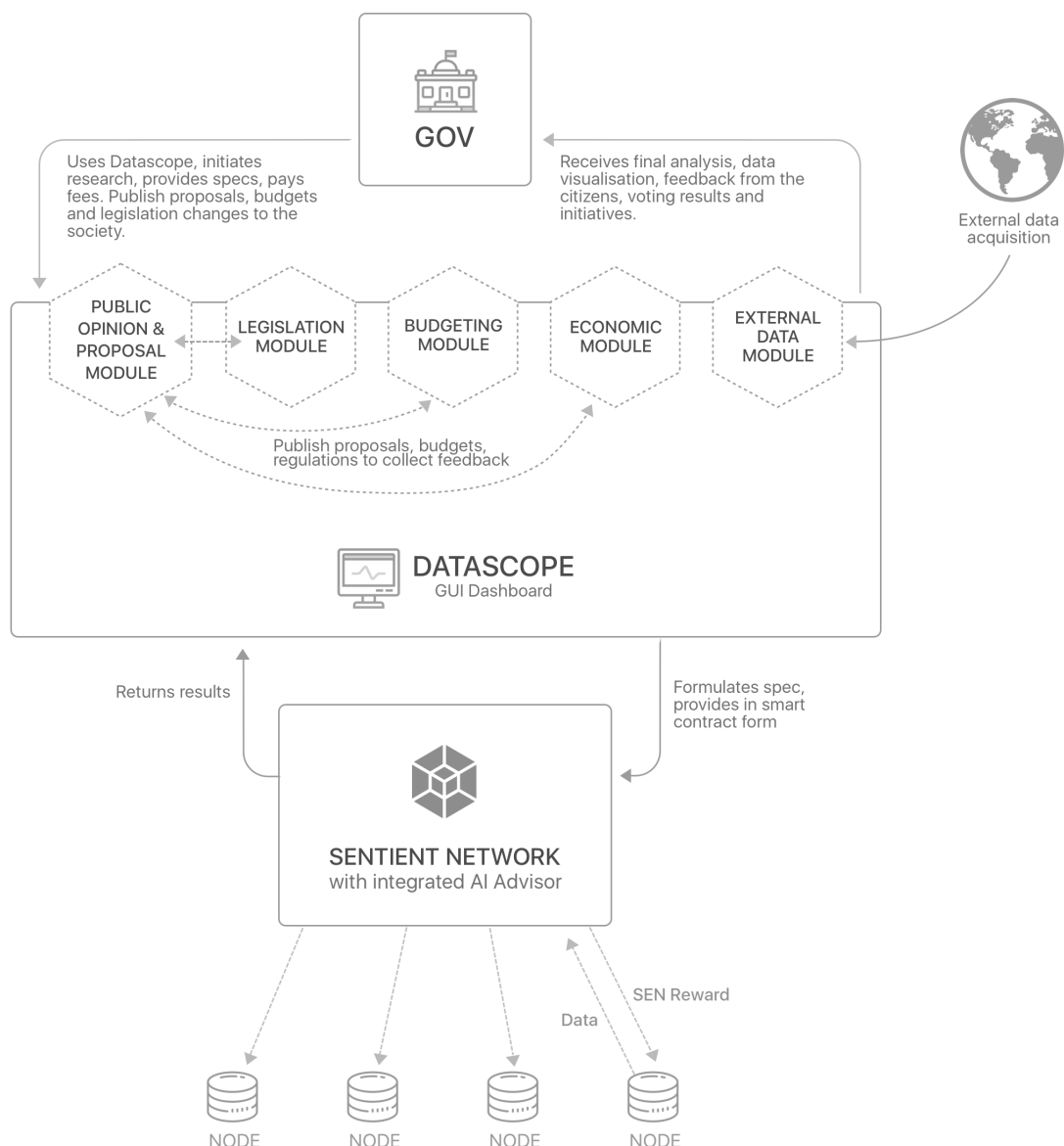


3. RESEARCH PLATFORM

Following the release of the Sentient network, its initial adoption and user growth, we are planning to launch the Research Platform — a system to enable conducting extended research, working with various data sources, including proprietary data acquired by the Foundation and contributed by the participants, data from open sources, public voting and opinion data gathered from the members of the network in exchange for Sen. We anticipate the initial growth phase of the Research Platform to take several years, which will allow us to attract and retain repeat customers from the private and public sector, and to accumulate a large enough datasets to build, iterate, enhance and evolve the Consensus AI algorithms.

Being the second main component of Consensus, the Research Platform will enable effective data collection, processing, visualization and actionable insights. The platform consists of three components.

1. Datascope — the research dashboard, the main interface for working with data.
2. AI Advisor — the prediction and decision modelling engine.
3. Governance related modules.



3.1 DATASCOPE

Datascope is the GUI for working with data, with on-chain and off-chain elements, that allows Requestors to perform a number of data collection and analysis tasks. The Datascope modules include:

1. **Data Collectors**, gathering data from various available sources, both open and proprietary and **Data Fusion** mechanisms
2. **Data Transformers** (turning unstructured data into structured data objects and creating associations with real objects)
3. **Data Intelligence** — visual representation, dashboards, graphs, tables, etc
4. **Multiuser Collaboration system** with various access levels

In addition to the off-chain data preparation and analysis tools, Datascope will provide interface options to run simulations and perform public opinion research via sending requests into the Sentient network, using the AI Advisor backend capabilities.

3.2 GOVERNANCE MODULES

During the this stage of the Consensus project development the additional application modules will be built to be used for effective collective governance and decision making. The types of modules we propose to be developed are outlined below.

Public Opinion Gathering Module

Different types of Requestors — enterprises, non-profit groups, government agencies — will have the ability to present a proposal for evaluation and collect public opinion data from the users of Sentient network via the Public Opinion Gathering Module. The proposal will be valued at a *pay-for-success* basis when the Requestor pays a fee once the data collection results meet certain criteria. There will also be a *back data contribution* option that will waive this fee if the Requestor is releasing the results of the research for open use.

Use Case

The city officials are assessing the impact of the proposal to prohibit the entry of cars into the city centre. After the initial assessment of the consequences and costs of this new initiative in Datascope, the officials send it in the form of a ticket to the Research Platform. The city residents using their eIDs vote and comment on the proposal. The collected feedback is processed and returned to the research initiator.

Further request is made to the AI Advisor, which predicts externalities, such as the economic losses from the ineffective delivery services if this initiative is adopted, and suggests optimizing the parking spots instead. If the redesign of the parking spots is selected as an active initiative, it could be published on the Open Tender platform with the budget details, and the contractors for execution could be publicly selected.

Economic/Budgetary Module

Economic/Budgetary Module is the Datascope subsystem that enables the community, city, region or country budget formation. The new proposals that require funding will be created and managed in the module, where experts will be able to analyze a particular proposal and dedicate a team of researchers, with various access levels (to enable the involvement of both internal and external experts), models the consequences of the initiative implementation, estimate the financial requirements, future benefits and profits, influence on the environment, public opinion, public health and safety, and consider other factors and outcomes.

This module will enable the formation of the optimal budget from the multitude of separate proposals, taking into considerations the desires and preferences of the citizens (including the electronic voting on the items of budget allocation) and the recommendations of the AI Advisor as to where the funding should be directed or increased, and what programs should be scaled down or stopped. The final proposal will be available for publishing, adoption and implementation.

Following this, each proposal that requires an outside contractor to execute can be listed in the Open Tender subsystem as a smart contract, stating the terms of the proposal, requirements, implementation details etc. The tracking of the execution will be attached to the proposal for transparency.

Use Case

In order to attract innovative companies and create new jobs in the sector, regional government plans to introduce a new incentive that will reduce corporate tax for IT startups to 0% for the first 3 years.

The module simulates this situation with the given input: "What will happen if in the first 3 years the corporate tax is 0%, increasing by 3% per year after that".

The budgeting engine predicts the outcome:

- A subset of the current IT companies in the region will be tax exempt, and the tax revenue will drop by \$3.5M per year.
- In the long term, the region will attract X new companies, and Y skilled specialists will move from other regions.
- In 5 years this development will contribute to additional \$5M in tax revenue annually.

Legislation Module

This Datascope subsystem enables the proposal and formulation of legislative initiatives, such as introduction, change or repeal of laws, regulations and policies. Any legislative initiative coming to Datascope to be evaluated and processed by experts.

We foresee that a sizeable part of the proposed initiatives will be rejected for obvious reasons, but a subset of the proposals, appearing to have potential and deserving further study and analysis, will be sent to the Legislative Module.

This module will contain all active laws, regulations and policies and the AI Advisor will monitor the current state of matters and indicate what should be adopted, changed or repealed. An example will be a proposal to lower the speed limits within the city due to the rising number of accidents.

The new proposals will come to the Legislation Module in the form of tickets and will be assigned a team to review and execute if deemed acceptable and useful. The team will evaluate the details such as impact and cost, gather feedback from citizens and model the consequences and outcomes of the proposed policy with the help of AI Advisor.

In the event of successful analysis of the proposal, the project implementation is planned and set in motion. To effectively disseminate the proposed change, it can be additionally made publicly available through the network to its participants.

Use Case

The mayor of the city is exploring ways to increase the municipal revenues and proposes to extend the liquor sales hours, in order to increase the income from the alcohol sales in bars and nightclubs. However, there is a concern that this may increase the number of incidents of drunk driving, causing discontent among the residents and may have a negative impact on the public safety.

The inquiry goes into the Legislation Module to simulate the situation — "What will happen if the region extends the liquor sale hours until 3am, instead of the current 2am?"

The AI Advisor analyzes key indicators, such as the similar policies of other cities and the current rate of incidents, models the scenarios and produces a prediction:

- Additional revenues to the budget: \$2M per year
- The cost of maintenance will increase (additional load on the law enforcement, ambulance, hospitals): \$500K per year.
- Increased cost of city cleaning: \$200K per year.
- The city's public safety index will decrease by 3% per year.
- The health index of the population will decrease by 1% per year.

External Data Module

This is the subsystem that allows collection and processing of the data that may not be available to the Requestors or may not be structured to be immediately usable. This includes data from open sources as well as proprietary data that the Foundation will help acquire for Requestors, to supplement and enhance the research capabilities of a particular projects. We anticipate working closely with the initial Requestors to understand their projects needs, and we will assist in external data acquisition and preparation.

3.3 CONSENSUS AI ADVISOR

As the platform will grow, evolve and mature we foresee certain entities to require customized research performed, going beyond training a single deep learning model or launching a single opinion poll. For this purpose, we plan to construct an environment that will allow these longer term initiatives to be carried out. We are planning to initially work with the groups willing to open-source and/or make publicly available the results of their research. As the resulting outcomes of these projects accumulate and gain a certain critical volume, we will be able to move to the next phase of the roadmap and proceed to the development of the AI Advisor subsystem.

We plan to introduce it as an extension of the Datascope that will begin as a separate module, initially functioning independently, gathering and processing various available datasets and training its internal algorithms to build patterns. We envisage working closely with the government bodies at this stage to help shape this subsystem and adopt the use of AI Advisor to supplement and enhance the decision making process of the existing governing bodies, to help them conduct research related to various public service initiatives, aiming to comprehensively model the outcomes of policy changes, with the participation of the constituents of a given jurisdiction, as well as using other available data. However, we don't foresee limiting its use solely to the public sector — in our view, there are a number of private companies and other entities that would benefit from AI Advisor as well.

Our vision for the Consensus AI Advisor is to give organizations and governments the ability to instantly model the outcomes and analyze any particular proposal and/or decision prior to taking them to the public, effectively acting as a test environment for any proposed change.

3.4 DEVELOPMENT PLATFORM, DAPPS

The final step of the development the platform is to open it to building governance applications using the Consensus infrastructure — algorithms, smart contract templates, reputation system, polling system, registries integrations etc. to internal developments and external third-party developers. Below are some of the applications the Consensus Foundation is planning to build internally or in collaboration with external parties.

Open Legislation

One of the long-term goals of Consensus is to enable transparent legislation proposals and voting on domestic and foreign policies, enabling any interested citizen to contribute to the creation of policy and employing network's collective wisdom to discuss and vote on the policy for government's consideration. The proposals will go through several stages: ranking, evaluation with support from the domain experts, voting, policy execution review. The system will run the simulation of the proposed change, assess the complexity of implementation and predict the impact on the budget, operations, natural environment and other factors.

Open Tender

Consensus platform will allow government bodies to post social projects and invite residents to discuss, vote and take part in the execution application process. The Open Tender extensions such as Social Grants system will work in a similar manner but with different transaction terms and execution monitoring. The projects will be submitted to the network with the necessary information such as impact, importance and advantages to the society, permit and license requirements, execution timelines and other relevant details.

The system will track the responses and engagement, help rate the proposals by feasibility, importance and timing. Once the tender or research grant is awarded, the terms of the transactions outlined in a smart contract are signed by the involved parties and the allocated funding is transferred. The network participants subsequently monitor the execution of the tender or grant giving the rating to the responsible party and participating in other decisions required for successful execution of the tender.

Open Budget

Similarly to Open Tender, the Open Budget application will allow relevant participants verified by digital IDs to participate in the decision making processes with respect to community/municipal/jurisdiction budget allocation and perform public audits of the budgetary spending.

Social Proposals and Crowdfunding

Individuals, communities and organizations can invite its members and residents to participate in launching project initiatives for collective voting and discussion. Natural and legal persons can apply as executors for these initiatives and, if required, offer plans of implementation, timelines and budget. The network users then can cast their votes, influencing the awarding of the project to the most suited proposal. The effective execution and management will be achieved through higher level of transparency, faster adaptive processes and reputation system developed through the track record of executed transactions. This will allow for the selection of the most suitable stakeholders, domain experts and network observers to ensure the highest level of success of the proposed projects.

The projects could also be crowdfunded by the relevant public subgroup and the selected network observers will monitor and rate the execution. Consensus AI Advisor will assist with the budget modelling and allocation, assess the complexity and implementation of the projects and provide recommendations for the stakeholders.

4. ROADMAP

4.1 IMPLEMENTATION TIMELINE

In this section we present the planned milestones for Consensus project development. This plan should be considered preliminary, as Consensus is using cutting-edge technologies, and is itself a very complex project.

Genesis release (1 year)

- Launch of the Sentient blockchain, the distributed ledger system with trusted nodes, verified with electronic national IDs
- Connecting the known eID providers (starting from 25K e-Residents of Estonia) and linking eIDs with mining, voting and network governance
- Decentralized machine learning, initial release

Awakening Release (1-2 years)

- Research Platform launch
- Consensus AI Advisor launch

Evolution Release (2-4 years)

- Consensus AI adoption by government bodies
- Initial launch of the Governance modules
- Further AI training for initiative evaluation and analysis
- Collective funding of projects
- Dapp development platform for third-party developers

Unity Release (4+ years)

- Further enhancements to AI Advisor for budget modelling, implementation assessment and improved efficiency

Global Consensus (future)

- Integration with government registries
- Global adoption of Consensus

4.2 CONSENSUS PILOT

The initial release of the platform will be developed in cooperation with Estonian e-Residency team and launched in Estonia. Initially, over 25,000 Estonian e-Residents will be able to join the network, and later the eIDs of other countries as they become available. Each e-Residency card holder will get the 1000 Sen coins upon joining the Sentient network for the first time.

5. CONSENSUS FOUNDATION

5.1 OBJECTIVES

Consensus Foundation is intended as an independent and democratic governance body that oversees the development, adoption and growth of the Sentient network. The main objectives of the Foundation are as follows: i) open and fair democratic governance of the network's activity and resources, ii) development and advancement of technology for collective welfare, iii) fostering the environment of innovation and fairly rewarding the developers and partners of the network.

5.2 CONSENSUS LAUNCH PARTNERS

Government of Estonia e-Residency program, Estonia

Republic of Estonia is a global pioneer and a known e-Government leader, having the most advanced electronic governance systems, digital identities and online government services. Consensus AI pilot version be developed and launched in Estonia, with e-Residents becoming the initial users. Named "the most advanced digital society in the world" by Wired, Estonia has set the goal to onboard 10 million e-Residents by 2025.

Creative Destruction Lab, Canada

Creative Destruction Lab is a Canadian program for massively scalable, science-based ventures, and is particularly suited to early stage ventures with links to university research labs. CDL that provides access to world-renowned experts and chief scientists from leading academic institutions, including University of Toronto, McGill University, University of Montreal, Rotman School of Management and others. Consensus joined CDL in October 2017.

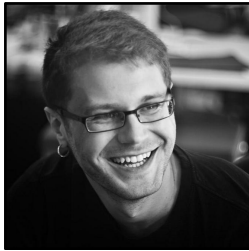
Mothership Exchange, Estonia

Mothership is a digital asset exchange and a token market platform established in Estonia with a goal to make digital assets accessible to EU businesses and e-Residents. The goal of Mothership is to make Estonia a leading country for blockchain companies streamlining their registration, development and providing access to funding and incubator-type services.

Ocean Protocol, Germany and Singapore

Ocean Protocol is the decentralized data exchange protocol that lets people share and monetize data while guaranteeing control, auditability, transparency and compliance to all actors involved. Data Providers and Custodians need to feel safe before they will comfortably share data and Ocean Protocol is the solution.

5.3 TEAM



Oleg Gutsol

Founder

Software developer, entrepreneur. Prior to founding Consensus, Oleg was the founder and CEO of 500px, a photo distribution platform, powered by image recognition technology and machine learning algorithms. Oleg created the initial source code and discovery algorithms of the platform, and to this day 500px remains the biggest library of the high quality photos on the internet. As the CEO, Oleg led 500px from inception through hyper growth, with his help the company raised over \$25M in VC funding from leading firms like Andreessen Horowitz, FFVC, Visual China Group and others, established major partnerships with Google, Adobe, Microsoft, Sony, Airbnb, Lonely Planet etc., and the 500px consumer platform grew to millions of users globally. In 2016 Oleg turned his interest to the problems of collective governance and artificial intelligence applied to solving societal issues. He also served as a Head of Global Growth at the Republic of Estonia e-Residency program, which provides the basis for the Consensus AI implementation. Oleg studied Applied Computer Science at Ryerson University in Toronto, Canada.



George Bordianu

Technology: Blockchain and AI

Software developer, founder of several startups, crypto currency expert. Founder of Paradiso, a crypto currency index fund. Previously, VP of Engineering at Deep Genomics, a medical AI company. Before that, George was the Director of Engineering at 500px, responsible for building major products and the highest performance technical team. George has a Masters degree in Computer Science from McGill University in Montreal and a Bachelor in Computer Science from Universitatea „Alexandru Ioan Cuza” din Iași in Romania.



Artem Loginov

Product, AI, Governance

Chief Product Officer with 10+ years of experience and focus on mobile and artificial intelligence. Product, UX, analytics and monetization expert. Founder of several AI, EdTech and eSports startups. Previously VP of Product at Lingualeo, a foreign languages learning company with over 17M users. Prior to that, served as a Director of Product at Yandex (\$YNDX), responsible for mobile maps, the local competitor to Google Maps, 30M active users. Artem holds double Master's Degree in International Law and Government Management from the Russian Presidential Academy of National Economy and Public Administration, and is a PhD candidate in Economics from the same university.



Julia Ivanova

Growth, Marketing

Co-founder of Parla.ai, an artificial intelligence language teacher. Marketing, PR, advertising and business development specialist. Previously, an investment analyst at eValue Investment Fund. Prior to that, an Account Director at Smartclip and COO at Click District. Julia has a Masters degree in Business Informatics from Higher School of Economics in Moscow, and Masters degree in Sociology, Specialist in Social Science, from Saint Petersburg State University of Economics and Service.

5.4 ADVISORS



Yin Cao

Founding Partner and Chief Strategy Officer of the Energy Blockchain Labs, the world's first company focused on blockchain technology energy and green finance application. Principal Expert of Blockchain and the Principal Energy Analyst of China Cinda Securities, the investment bank of China Cinda Group — the biggest financial asset management company in China. Author of several books, including "Development of Energy Internet", "Introduction of Energy Internet". He has also written a book <Internet+: National Strategic Action Roadmap> with Mr. Ma Huateng, the Chairman of Tencent Group.



James Stewart

Technology leader with extensive hands-on experience building capability, setting direction, developing and operating digital services, and leading organizations through substantial change. Previously, co-founder of the UK Government Digital Service, playing a wide variety of roles in the digital transformation of the the UK government, from hands-on technology lead through to Deputy CTO for UK Government.



Trent McConaghy

Founder of Ocean Protocol, CTO of BigchainDB, a scalable global blockchain database. Founder of IPDB, a shared public database for the internet and CoalalP, a blockchain-ready, community-driven protocol for intellectual property licensing. Veteran of the machine learning/AI field, author of Variation-Aware Analog Structural Synthesis. Trent holds a PhD in EE from KU Leuven, Belgium and BE EE and BSc CS from University of Saskatchewan, Canada.



Yury Selivanov

Technology advisor, specialized in data, algorithms and scalability. Expert software engineer with the primary focus on data storage, system scalability and performance. Founder of EgdeDB, the next generation object database. Core Python developer, author of uvloop, asyncpg, asyncio. In the course of his work Yuri consulted numerous companies like Cisco, Pinterest, ABB, Nintendo and others, and his software is used to improve performance at companies like Facebook, Instagram etc. Yuri studied Computer Science at the Bauman Moscow State Technical University.



Alkarim Nasser

Technology entrepreneur with over ten years experience in mobile and internet technologies. Currently running product and growth at Facebook. Previously co-founder and Managing Partner at BNOTIONS, where he was helping brands, investors and young entrepreneurs create and monetize business models driven by disruptive technology (acquired 2015). Also, co-founder and Chairman at Gallop, a radically innovative data science company creating tools in the mobile marketing / growth marketing / customer acquisition / mobile advertising / marketing automation industry (acquired 2016). Named 30 under 30 in 2012 by the Marketing Magazine.



April Rinne

April is a consultant to startups and established companies, local and national governments, policy makers, think tanks and investors, working across for-profit and nonprofit models. Her areas of expertise include policy reform; global expansion; the future of work; sustainable development; cities; and emerging markets.

April holds a J.D. from Harvard Law School, an M.A. in International Business and Finance from the Fletcher School at Tufts University, and a B.A. summa cum laude from Emory University. She is a Fulbright Scholar and has also studied at Oxford University, Harvard Kennedy School of Government, and the European University Institute.

April is a Young Global Leader at the World Economic Assembly where she leads the Sharing Economy Working Group and is a member of the Global Futures Council for the Future of Mobility and the Urbanization Advisory Group. She is a member of China's National Sharing Economy Committee and serves on the Advisory Boards of the Sharing Cities Alliance, Seoul Sharing City (South Korea), Amsterdam Sharing City (The Netherlands), Sharing Economy Denmark (SEDK), the National League of Cities (USA) and World Pulse (global). She is also a founding member of BBPDX.

6. APPENDIX

Consensus Governance Principles

One of the aims of Consensus is to create efficient governance of different organizational bodies. Some of the areas for improvement targeted are set out in the following table:

| | Traditional Governance | Consensus Governance |
|--------------------------------|--|---|
| Engagement | Subdued public engagement in elections and decision making due to low incentives and costs associated with the process. Economically rational voters should not vote | More people incentivized to participate in collective governance leading to a more inclusive process and better decision outcomes for collective welfare. We will test governance concepts such as liquid democracy and reward mechanisms to fix “voter apathy” |
| Decision Making | Lack of a sufficient information on positive/negative externalities and interconnectedness of different issues often prevents the exhaustive economic and financial analysis, efficient allocation of budget, infrastructure development and social services provision | Decentralized network allows to perform better analysis with more factors and correlations visible, and also facilitates public discussion, proposals and voting on the different initiatives, while assisting governments to model different scenarios and outcomes in a sandbox |
| Use of Public Funds | Bureaucracy and heavy managements structures can result in inefficient use of public funds | Decision processes are streamlined minimizing the intermediaries involved |
| Bias & Human Factor | Traditional government bodies are sometimes prone to human errors, conflicts of interest and skewed incentives creating bias and inefficiencies in the decision making process | System that allows to remove bias and assess decisions from a common good perspective assisted by autonomous AI Advisor algorithms and network participants to ensure the fairness, transparency and efficiency |

| | | |
|--|---|--|
| Tender Auctions | The application and selection process for the governmental subcontractors may not be fully transparent and aligned to the fair market value | Open Tender will enable quicker proposals, transparent selection process, higher number of applicants and lower pricing requirements due to increased competition |
| Monitoring and Reporting | The incentives for thorough and complete monitoring of the project execution may not be sufficiently strong resulting in insufficient and fragmentary reporting | Network participants can monitor, rate and report on the execution with Reward Incentives creating a reputation system for future transactions |
| Adaptability | Slow and encumbering to accept structural changes that require implementation of new processes, introduction of digital services, dissolving inefficient divisions etc. | Network awards contributors and developers to continue upgrading the systems and applications leading to a self-improving iterative governance platform |
| Voting | In many global regions political and community elections are still not fully transparent and/or require significant resources to conduct, collect and process polls | Transparent and radically open voting and elections without unnecessary financial overhead |
| Timing | Social proposals are lengthy processes affected by complex research, preparation of public surveys and analysis | Quicker collective decision making using extended data analysis to aid the process |
| Accountability and Record Keeping | Public records are still paper based in many sovereign states making them vulnerable to neglect and loss. Imperfect record keeping results in weak accountability | History is stored on the blockchain. Digital services processes on the network allow for secure record keeping and open access |

7. LEGAL DISCLAIMER

This whitepaper is for information purposes only. Consensus Foundation (“Consensus”) does not guarantee the accuracy of or the conclusions reached in this whitepaper. Information contained in this whitepaper, on www.consensus.ai website, or any other materials produced by Consensus and its affiliates constitutes forward-looking statements on the expected development and performance of Consensus and the actual performance and progress of Consensus might differ from these expectations. You are advised to seek your own legal advice and to thoroughly assess the risks and uncertainties involved before acting upon any information. This whitepaper is not intended to present a proposal, an investment advice, solicitation of any kind, nor an endorsement. To the maximum extent permitted by any and all applicable laws, regulations and rules, not Consensus nor any party associated with any of them shall be liable for any indirect, special, incidental, consequential or other losses of any kind, in tort, contract, equity, common law or otherwise (including but not limited to loss of revenue, income or profits, and loss of use or data), arising out of or in connection with any acceptance of or reliance on this whitepaper or any part thereof. Sen tokens are not structured or sold as securities or any other form of investment product.