Whitepaper

IDHUS Token (IDH)

The ERC20 token that powers Smart Cities' applications and services

Institute for the Development of Human Societies (IDHUS)

Version 1.4

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Key summary information

- IDHUS($IDH) is the native token of the SCCM, the Smart City Cohesive Model, a cohesive platform of structures, service levels, applications and systems for Smart Cities, which facilitates and guides the implementation of technologies and processes that lead to the transformation of our cities towards new urban models of livability, sustainability, functionality and technological interconnection.

- It is an ERC20 token that facilitates connectivity, interoperability and management of all systems, applications and blockchain-based technologies used in the development and implementation of different applications and services for Smart Cities. The IDHUS token's mission is to ensure the proper functioning and to allow different systems within a Smart City to operate and be supervised from its central management and control mechanisms.

- The IDHUS Institute has issued 42,000,000 tokens (IDH tokens), initially as ERC-20 tokens on the Ethereum network as part of a Token Generation Event (TGE).

- The hard cap, as the limit placed by blockchain's code on the absolute maximum supply of our cryptocurrency is 42,000,000, and no new IDH tokens will be minted/created to help maintain the value of the token over time.

- A limited quantity of tokens is already available to the public in major DEX such a DODOEX, BankCex, Uniswap or Tokpie to start creating awareness of the project.

- The issuer will retain at least 20% of the tokens, to support and develop the Smart Cities Cohesive Model.

The IDHUS Institute

The objective of this document is to explain the Token Economics relating to the token issuance by the Institute for the Development of Human Societies SL (IDHUS Institute).

Company information

Registration-VAT Number: ES B67338772
Registered Address: Ferran Junoy 10 B1, 08030, Barcelona (Spain)

This company is the issuer of the IDHUS token and the keeper of its rights and smart contract, whose purpose is to:

- Issue and distribute IDH tokens as part of the Smart Cities Cohesive Model implementation
- Oversee the development and maintenance of the SCCM protocol and platform
- Oversee the fair and proper operation of the SCCM network
- Have the rights to use any intellectual property of the SCCM protocol and platform

About the IDHUS Institute

IDHUS is a consultancy specialized in the development of applications and technological services for the transformation of our cities into Smart Cities. Our work focuses on delivering services and applications and analyzing the impact of new technologies and transformation models that lead our cities to become Smart Cities. We are also researching on the topics of cybersecurity for Smart Cities and related technologies.

We seek to provide answers through our projects, analyses and publications to questions related to the uncertainty of progress and the future, how we will live in our Smart Cities, how we will deploy the new communications systems in them, which energy will be the most appropriate to become the engine of economic growth in our cities, how we will transform our social structure or how we will clean

our atmosphere, improve transportation systems, waste recycling or plan population growth.

Our areas of work are focused on the search for solutions, proposals and technological applications to answer all the above questions, in pursuit of a technological, economic and human development that allows society to grow and evolve under parameters of sustainability, respect for the environment and responsibility in the use of the planet's resources.

Mission and purpose of the IDHUS Institute

The IDHUS Institute was born with the purpose of contributing to the development of society in the process of transforming our cities into connected and Smart Cities, ensuring the rational use of natural ecosystems and the regeneration of the urban environment, through the development and implementation of new technologies in the field of energy, communications, economy and industrial development.

The IDHUS Institute aims to provide humanity with a Smart Cities model and technological platform that shows us that it is possible to live respecting the planet and its ecosystem. To this end, we have developed urban and technological models for society to grow towards a system of cities that allow a better quality of life for all human beings, but that does not harm the Earth because of it.

Founded in 2019 and located in Barcelona, we work globally with other organizations, companies and start-ups to promote the development and implementation of technologies, systems and processes that allow the development and transformation of our cities into smart cities, making a rational use of the natural resources they have without harming the environment.

Project Overview

What is the Smart Cities Cohesive Model (SCCM)?

The SCCM is a model created by the IDHUS Institute for planning and development of the set of systems, technologies and applications that facilitate the transformation of a city into a Smart City. It is organized and structured in different layers, or levels, that interrelate with each other and are all coordinated by an AI-central data processing and management node, from which all the parameters and data collected by the different infrastructures that are part of the services and elements that make the city work can be monitored.

The SCCM is not a static and fixed model, as it cannot be in any way in a society that is constantly changing and whose cities, as the main nuclei and engines of the transformation of human life, are in permanent evolution. However, it acts as a guide and provides a systematic and organized blueprint for the implementation of the multiple systems and services that regulate the different aspects that must be considered when implementing actions in our cities, to transform them into livable, connected places with a high quality of life for their inhabitants.

The implementation of these layers or levels of management need not necessarily follow the same order in the different cities that choose to implement the SCCM or rely on it to undertake the changes that their local leaders have designed, since each city starts from a different point depending on the current state of operation of its services, technological systems or present and future options for initiating changes, according to the preferences of its inhabitants and residents regarding the final model of city they want for themselves and the future generations that will succeed them.

Layered and central node-controlled environment

Each one of the control and management layers of the systems that make up the SCCM is in turn coordinated by a central node or nexus of communications and data processing for that layer or level, so that all the data collected by the SCCM "agents" such as IoT sensors and the communications and monitoring of these elements, are supervised and analyzed in their own central layer node. Then, all the processing nodes at each layer are in turn regulated and coordinated by a central AI-monitored nexus that assists the city's technicians and local government to make

sense of the millions of packets of data, information, and content that a city generates daily.

The communication and coordination of the data received on the network nodes is designed and operated with blockchain technology, and has its own governance token, the ERC20 IDHUS token, to ensure the stability and performance of the entire system.

SCCM Layers

The SCCM uses the following working layers as a guide for the transformation of the different elements that are part of a city into an organized, intelligent, and connected set of systems that, globally, is what defines it as a "Smart City" in all areas and aspects of it.

Natural Ecosystems Layer – This layer brings together the management, monitoring, conservation, and development of all the elements that, within a city, are related to the natural ecosystem that exists in it. In general, and depending on the city and its geographic location, this layer includes the mechanisms and tasks for the conservation of natural parks, trees, plants and green areas, and the care of lakes or aquatic areas that the city may have in its metropolitan area.

Energy Layer – This layer brings together all the elements that are part of the city's energy supply, its energy sources, and its regulation mechanisms. Using Smart Grids, renewable energy sources and technologies for monitoring the use that its residents make of it, the central node of this level is responsible for regulating the power and capacity of the transport systems, supply networks and the flows necessary for the optimal functioning of the whole city.

Waste and Recycling Layer – All cities generate large volumes of waste and residues that, for the most part, can be utilized and reused after going through the appropriate recycling processes. Since this waste is generated by the city's services, industries, homes, and businesses in different volumes and at different times, the systems for waste collection, recycling and reuse must be regulated and coordinated with all other levels of the city to optimize the use of resources, reduce the energy used to dispose of waste that cannot be transformed or coordinate with the city's cleaning and sanitation services to keep the city clean and free of garbage.

Mobility Layer – The mobility layer regulates the systems and mechanisms that monitor traffic on the streets, public transport, pedestrian walks, or areas designated only for the recreational use of the population. Also oversees intercity transport systems such as trains, ports and airports. Although each of these services has its own private control center in almost all cases, all of them should be coordinated by a central mobility management node to optimize travel and ensure a rational use of the resources needed for this purpose.

Communications Layer – This layer and its control node regulates and supervises the communications systems that facilitate the daily life of people, organizations, companies and businesses in the city. It is responsible for the coordinated management of mobile telephone services, fiber optic networks, Internet connections and television, radio or satellite communications systems and facilities that may be implemented in the city, etc.

Information Layer – This level of the SCCM is the one that deals with the sensor network, through IoT systems, which report to its central node the information on the status of all the elements that are part of the Smart City for its optimal operation and maintenance. The information layer is the one that governs the devices installed, for example, in streetlights to control the lighting of streets and avenues, in bus stops so that, from the mobility layer, the transit times of public transport can be optimized, in parks and gardens to receive alerts when it is necessary to start the automatic watering system due to excess heat or dryness, etc.

Security Layer – This layer brings together the systems for alerting the city's protection teams, firefighters, police, emergency services, health services, etc., of any situation that requires their intervention. Although each of these services already has, in most cities, its own management processes, the elements that are part of this layer are responsible for coordinating all of them. It also notifies the other layers' nodes on the geographical points where an emergency has occurred, such as a flood, so that the mobility layer can adjust the transport services if they must cross that area, or so that the energy layer can regulate the supply if a storm or lightning has damaged a power station, or if there has been a power outage, for example.

Basic Resources Layer – Regulates the supply services of the city, both at the level of raw materials and the logistical management of goods to the distribution points that depend on the local or municipal government. It does not regulate the work of the companies or services that buy, sell, or distribute these products or materials, but rather the operation and interconnection of, for example, the large logistics distribution centers, the points of entry into the city of everything that is imported from external sources (ports, warehouses, stock centers, etc.) It facilitates and assists the supply layer in coordinating the management and distribution of the resources that the city demands and needs to function.

Monitoring Layer – The monitoring layer is responsible, together with the information layer, for overseeing the operation of all the systems that are active throughout the Smart City. It is the layer that performs the "future projections" via AI/ML algorithms within the *Digital Twin* of the city to predict possible problems, to analyze situations that may require direct intervention of emergency services or to foresee complications before they occur.

Supply Layer –This layer oversees the supply of resources such as water, gas, fuel, electricity, etc., to the homes, businesses, industries, and services of the Smart City. It must be connected and synchronized with most of the other management layers of the SCCM, and continuously monitored by the information and monitoring layer. It relies on the information supplied by smart meters, the Smart Grids and the information layer.

Human Flow Layer – The human flow layer monitors and facilitates the movements of the population in their daily movements around the city. It is not so much a regulation layer as an observational one, to facilitate the mobility layer's management of traffic and public and private transport services. Therefore, what the human flow layer does is to collect data on the main movements of the inhabitants of the Smart City throughout the day, such as the departure routes of people to their jobs early in the morning, the movement in and out of schools that is concentrated at very specific times and in very specific places, population movements at lunch or dinner time, the return home after work, weekend trips, etc., and sends this information to the mobility layer, among others, to provide better services to the population at specific peak times.

Demographic Layer – The demographic layer consists of a set of programs and systems that collect all feasible indicators in the city that allow monitoring the quality of life of its inhabitants. An example of this is, for example, the statistical information on the population density in each neighborhood, the levels of air pollution recorded, the possible economic inequalities between residents of one point with respect to another, the state of infrastructure in each area, the availability of schools or educational centers and access to them, the estimate of the distribution of wealth by areas of the Smart City, etc. It helps understand the quality of life that city residents enjoy and how to improve it continuously.

Augmented Reality Layer- The augmented reality level is the layer of services that, using geolocation of places, buildings, stores, businesses, etc., and with the infrastructure of the communications layer, allows all residents with A.R. devices to access real-time information about what they have around them. Together with the infrastructure of the communications layer, allows A.R. devices to receive information about their surroundings, schedules, data and information about stores, restaurants in the area, supermarkets, products for sale, bus stops in the vicinity, water fountains, etc. Any element that, at first glance, cannot be known without asking for extra information from the system and which is encoded in the local maps and accessible through the Smart City App.

Sustainability Layer – The control systems embedded in this layer ensures the long-term sustainability and continuity of operations in the city, with a view to planning for its growth, expansion and the influx of new residents who choose to move in to make it their home. This layer is, therefore, another layer of "future" projection of the resources that the city will need, where it will get them from, how much it will have to grow to accommodate new residents, how it will be able to grow while maintaining the levels of service and quality that current residents enjoy, etc.

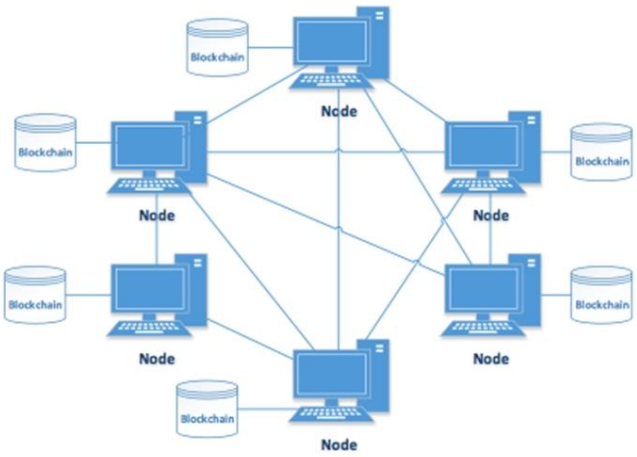
Control Layer – Finally, the control layer does not agglutinate data about the city as such but contains the programs, systems and software that allow the coordinated control of all the previous layers, having on it, this level of the SCCM, the main nexus of governance and management of the Smart City operated by an AI that facilitates the control of the whole platform. The control layer is the coordination layer, the layer that gives coherence to all the data collected by the other levels, the layer that provides the city's technicians and government with the global vision of what is happening in the Smart City, what is going well, what needs to be regulated, what may present problems in the future, etc.

High-level SCCM structure

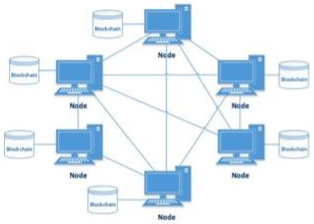
Each layer of the SCCM has its network of sensors and devices connected in an IoT environment, sending to a central node all the information collected from the management systems of that layer

Communications between IoT devices and sensors are established primarily through 5G and wireless technologies

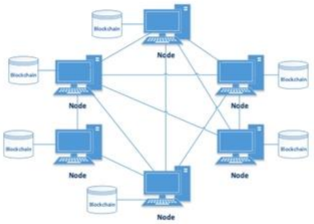
The information collected by IoT sensors and devices is stored and processed in a blockchain, operated by the service management nodes of that layer of the SCCM



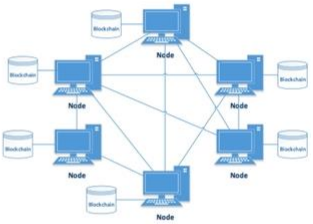
The IDHUS ERC20 Token powers the blockchain management and facilitates its governance.



Energy Layer Blockchain

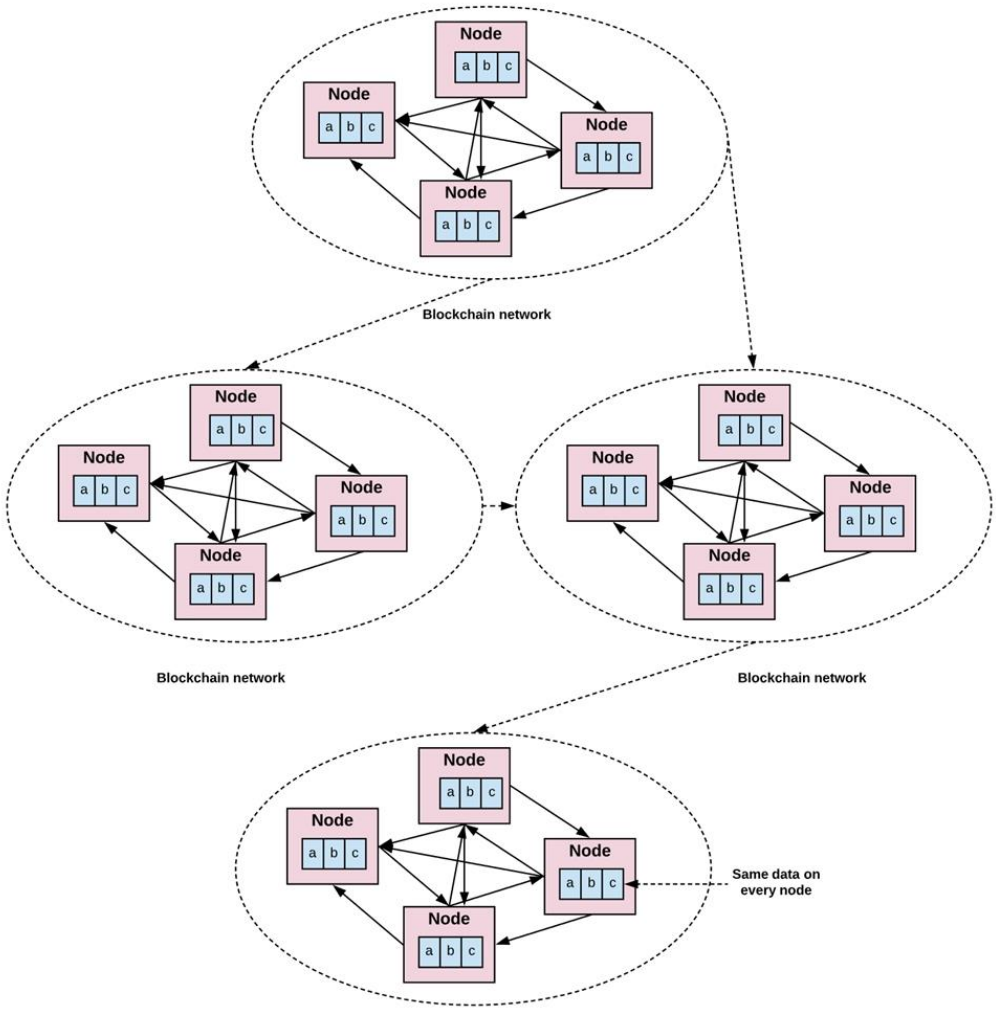


Ecosystemic Layer Blockchain



Supply Layer Blockchain... etc

The different networks interconnect with each other using the IBC protocol, depending on the interoperability of the layers or the information that is to flow from one to the other (e.g. information from the security layer to the mobility layer).



The necessary packets are sent from the processing nodes of each layer to the central node for the global coordination of all levels.

The central nexus managed by a control-AI is responsible for overall system coordination, manages the Smart City Digital Twin and governs the feedback and communication processes between service layers and nodes.

IDHUS token functions overview

As explained, the SCCM is a model for the development of Smart Cities infrastructures and services, in which autonomous software agents perform monitoring, operations and maintenance work in the real world, assisted by real-time data. This means that each level of the SCCM can perform tasks such as delivering data, execute maintenance work or providing services, and are rewarded with a digital currency for their operations — the IDHUS Token. The model is organized in multiple layers as we have seen on the previous chapter.

The SCCM model, with all its protocols and network can be considered a method of connecting the city monitoring elements and information they gather to those that need – or might need – that data in one or several layers of the model to oversee and take decisions about the status and workings of the Smart City services. It provides a new system for the machine-to-machine monitoring of the city ecosystem, removing friction and acting as a disintermediation mechanism to increase efficiency and utilization of all city services.

SCCM agents (i.e., all individual elements of the Smart City model, such an IoT sensor) can be thought of as digital entities that represent things such as data, services, hardware, city residents, or infrastructure segments. They can make decisions on their own behalf within the limits of the programmed instructions as well as on behalf of their stakeholders (individuals responsible for one of the layer's services, private enterprises connected to the SCCM, and the government of the city, for example).

So, the SCCM model is composed of "agents", users and stakeholders via its multilayer and open connectivity platform and is underpinned in each layer by unique smart ledger technology to store all the data information that each SCCM's level creates. The ledger delivers the data that builds the Smart City Digital Twin (SCDT) and enables real time services and infrastructure monitoring — growing the value of the whole network as it is used, and allowing, mainly, the AI-controlled nodes of the sustainability and monitoring layers to perform their future projections over the SCDT on the "well-being" of the whole city.

IDHUS Token Applications

The applications of the token are many within the SCCM. By bringing data to each layer central nodes of management, the SCCM solves one of the greatest problems in any Smart Cities today: lots of data is needed and it must come in real time, so action can be taken to solve any problem in it. By delivering all data to the central

nexus of control to feed a SCDT (digital twin) that relays on it for its proper working, the SCCM and the IDHUS token provides an autonomous way to do so. With the SCCM and the token that governs its blockchain, the real time monitoring of everything that is important to make a city workable and livable can be achieved.

Data can actively be stored in the blockchain and sent to any other layer of the SCCM platform, in an environment that's constantly reorganizing itself to make that task as easy as possible.

Internet-of-things (IoT) devices inhabited by SCCM agents can increase utilization by optimizing its fetch and send functions, providing the information they capture to existing blockchain nodes, which will act as information services markets where, for instance, an agent in a traffic light can provide weather and road conditions by simply relaying the activity of its IoT sensors to its layer node, via the IDHUS token across the blockchain, allowing the data to reach of nexus of control and monitoring and updating in real time the digital twin of the city.

The ability of agents to become providers for the city data, processes and services, enables a better coordinated management of the highly complex Smart Cities model. The SCCM generates such a huge bank of digital data via its interconnected layer infrastructure that the IDHUS token must ensure that all agents can work together within it, allowing the governance responsible of the city to reduce the cost of delivering complex solutions in our Smart Cities.

New opportunities, services and applications for Smart Cities

SCCM autonomous agents actively push their data out to those in the system who need it via the IBC[1] protocol for connecting multiple blockchains. The SCCM is one of the few solutions that incorporates a digital twin for the city built on real-time data to represent what's going on in the city, which grows in value as it is used. Over time, the collective intelligence about the workings of the city that is formed by the millions of data packages sent via the blockchain to the control layer provides unparalleled guidance allowing for better services, lower cost and high speed, high reliability transactions.

With machine learning technology integrated throughout each central node of control, and from the ledger to the agents themselves, the SCCM creates a network that enables, encourages, and deploys intelligence, and that actively creates new knowledge of every aspect of the Smart City.

[1] Interblockchain protocol, https://ibcprotocol.org/

Entire new ways of living can be built from the deployment of the SCCM, as opportunities exist to replace obsolete monitoring structures with trusted digital agents. Previously unprofitable datasets become valuable using the IDHUS token within the SCCM model, as the capacity, services, and knowledge of applying it is dramatically increased.

The IDHUS ERC20 Token on Ethereum

Contract Address:
0x163c747dbacbec87dbba7c7a8c83dba50d3ef011

Symbol: IDH

Token info:
https://ethplorer.io/es/address/0x163c747dbacbec87dbba7c7a8c83dba50d3ef011#chart=candlestick

Current Total Supply: 42,000,000 IDH

The IDHUS Institute has issued a fixed number of divisible tokens (IDH tokens) that are used on the SCCM network as the digital currency for all transactions, as well as for network operations such as secure communications and for delivering the sensors data to the city's digital twin.

The native IDHUS tokens also constitute an access deposit in the SCCM network for both nodes and agents wishing to perform certain operations (as a security mechanism that discourages bad behaviour). As SCCM secures its foothold in more cities, the data, transport, services, and IoT industries using it will allow its token to grow in usage and adoption as each sector makes a larger and larger contribution to the Smart City model's economic throughput.

Role of the IDHUS token

The IDHUS token is the key method of value exchange on the SCCM network and the city's digital twin (SCDT). It is required for all network exchanges, as a refundable method of registering with the network, for staking and as a mechanism for delivering value back to those performing work on the network. The IDHUS token allows for autonomous SCCM agents to run their operations.

Some of the purposes and functions of the IDH are:

- Ability to connect agents and nodes to the network. This is an access deposit token that acts as a form of stake to demonstrate desire to behave appropriately. It modulates the ability for bad actors to flood the network with undesirable information or agents due to the escalating cost of doing so.
- Value exchange between SCCM agents. The token is required to allow for two agents, regardless of where they are, to perform a data exchange. The IDHUS token is divisible, thereby supporting transactions that have very low monetary value, but in aggregate provide new and profound level of insight and opportunity to the layer they belong and the systems they monitor.
- Access to the digital twin. IDHUS tokens are needed to access, view, and interact with the central nexus' digital twin. This is a space optimized for digital entities, an abstract representation of the real city in many dimensions that allows machines to make sense of and work within. The token is needed to gain access to all aspects of this digital twin for agents.
- Ability to access and develop ledger-based AI/ML algorithms. The IDHUS token enables development of and access to a broad range of machine learning and artificial intelligence tasks that are available on the ledger and on the layer nodes. These may be primary services, developed by the SCCM, such as trust and prediction models, or they may be large-scale independently developed services for network users.

- For exchange into SCCM platform operational fuel. Operation costs in the SCCM are decoupled from the token in a similar way to that of "gas" on the Ethereum network, but with additional functionality designed to increase the stability of such a fuel and look at addressing issues associated with high and low-velocity economies. SCCM's operational fuel allows access to processor time for contract execution and services for agents.

- Agent development. IDHUS token holders can develop and test all manner of agents on the SCCM network including those that represent data, services, hardware devices, people or facilitate connections to the existing economy or other decentralized networks.

- Network participation. Mostly via the SCCM network participation application (NPA) this involves downloading, installing, and using a mobile application specifically designed to convert the IoT device's sensors and information into agents that exist on the SCCM layers.

- Node development and operating. Holders can operate nodes on the public test network, provide services to agents and perform processing on behalf of themselves or other users on the network in the form of useful proof-of-work execution.

- Economic analysis. Analysis of the network's overall performance and economics, looking at how the utility value per-token is delivered.

- AI/ML development. Holders can develop machine learning and artificial intelligence applications and services and have them executed as part of useful proof-of-work within the monitoring and information layer of the SCCM. Between such developers and node operators, these applications and services can be delivered to those that need them from other SCCM levels and the value exchanged accordingly.

Essentially, no part of developing or participating on the SCCM test network can occur without the IDHUS token. This ERC-20 token acts as the key enabler for access to the test network's existing utility value as well as the component that facilitates the ability to develop and access future utility value.

Token Economics

The total number of tokens generated is 42,000,000. No further tokens will be created, but native IDHUS tokens can be subdivided indefinitely.

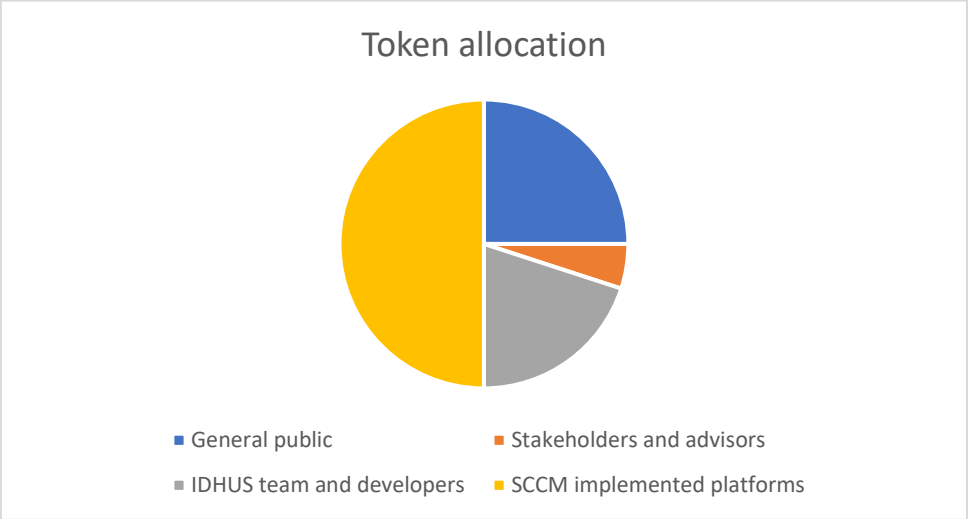
Token allocation

25% - General public

5%- Stakeholders and advisors

20% - IDHUS Institute team, developers, and project management

50% - SCCM platform and model implementation at Smart Cities



SCCM blockchain overview

In this section we summarize the ledger's consensus mechanism, the Smart Ledger's role, rewards and the mechanism by which data is generated and the value they deliver.

Consensus formation

The SCCM uses a combination of proof-of-stake with proof-of-work to deliver consensus. New blocks are minted through a normal proof-of-stake protocol with the transaction order being determined by the work carried out in between two blocks. This work is recorded on a directed acyclic graph (DAG) that grows between the blocks. The DAG is started with the previous block and terminated by the block minted by proof-of-stake which removes the need for a coordinator.

The purpose of introducing work into proof-of-stake is to optimize the ledger's performance and enable smart (and difficult) decisions and predictions to be made inside the ledger and its smart contracts. Specifically for the block mining, this means that work is aimed at optimizing transaction throughput by identifying transactions which can be executed in parallel.

Smart Ledger of the SCCM

SCCM's Smart Ledger allows for complex machine learning and AI algorithms to be placed on the ledger, as this is needed for the control of each layer of the model which provides the central nexus' digital twin with the information needed to run the Smart City. These typically consist of two components:

1. The Smart Contract
2. Data for decisions and predictions in the SCCM, the contract is on the ledger and the data (which may be hundreds of megabytes) are on the DAG. The advantage of the DAG is that it provides a simple method to implement a first-to-find-best-problem-solution protocol. This cannot be directly incorporated into the blockchain itself as blocks are mined through this protocol.

Furthermore, SCCM's ledger is not simply a data storage system but a resource to the city's digital twin, and it is important to keep it nimble, tightly packed and resource-light. Contracts can perform a variety of applications and nodes keep a shared list of the current best solution to any given problem. Users of the SCCM network can pay to execute any solver and the reward is split between those running the code and the originator of it. This provides an ongoing payment mechanism for AI and ML solutions that are placed on SCCM layer control nodes.

Some of the Smart Ledger programs are specifically designed to deliver trust, predictions and advanced co-ordination to the agents connected to SCCM. These allow the restructuring of the digital twin to suit any given agent observer. These programs can be executed at will by nodes to generate such intelligence and are rewarded, as with any other useful proof-of-work.

More information

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