HAB: The ‘Black Box’ of IoT Security Systems

A Distributed Platform notarizing sensitive data from Smart City & Smart Building connected objects

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SmartHab SAS
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The never-ending global innovation race gave us some of the most disruptive goods and services in the last decade but also tremendous inefficiencies in sectors like energy, insurance, real estate, facility management, otherwise known as slow-moving or rather reluctant to innovation.

Technology and new business models are transforming the way we manage homes, buildings and urban spaces to improve efficiency, sustainability, comfort, convenience, safety and profitability. Internet of Things technologies are paving the way to connect every bit of infrastructure in urban areas and integrate them into smart cities in a near future.

Connected sensors are now embedded in every possible device so they can monitor activity and relay information to other machines and ultimately to us. Today, there are billions of sensors monitoring data in all kinds of fields. There are sensors in agricultural fields (monitoring the growth of crops, soil salinity, etc.), factories (monitoring productivity), warehouses, smart vehicles, smart roads, smart homes, etc. These sensors all collect data on a daily basis which is used to manage, power and move our economic life.

But Smart City projects are taking on a more urgent issue due to the projection that, by 2050, over 80% of the population in developed countries and 60% in developing countries will live in cities. In the next decade, IoT systems will spread throughout the world and become ubiquitous in every urban areas.

Cities will undoubtedly be the first to benefit from the IoT, but reliance on these machines to make decisions has profound implications for trust. Trusting IoT systems refers to the confidence and belief in smart city installations being capable of operating securely, reliably and accountably.

This is why we believe the HAB blockchain-based platform will emerge as a major, vital and key feature of the future global IoT ecosystem.

Godefroy Jordan
Co-founder & CEO, SmartHab
The Internet of Things, also known as IoT, was first coined in 1999 by British technology pioneer Kevin Ashton to describe the omnipresence of the Internet in the physical world. IoT is a network based on the Internet that enables interconnection and communication between independent dedicated physical objects. These objects contain embedded technology to sense and interact with their external environment, allowing the capture of data. Since the development policies of IoT were brought up by the U.S., the E.U. and China in 2009, IoT has been developing at a fast pace. The U.S. research and advisory firm Gartner estimates that 5 million new IoT devices were deployed each day in 2016, totaling 8.4 billion IoT devices deployed in the world as of 2017, up 31 percent from 2016.

All factors tend to indicate that IoT will keep following an exponential growth trend driven by the booming penetration of connected devices. According to International Data Corporation, worldwide spending on the IoT will reach $773B in 2018, a 15 percent increase over the $674B that was spent in 2017. Gartner estimates that by 2020, 30 billion IoT devices will be deployed and the global market value of IoT will exceed $7,000B. A McKinsey study found that IoT could represent up to 11% of the world’s economy in 2025.
The state of IoT and its inevitable omnipresence

The fields of application of IoT are countless, including health monitoring, smart buildings and smart cities, transportation, public utilities, retail and manufacturing industries, among others. According to Statista, discrete Manufacturing, Transportation and Logistics, and Utilities will lead all industries in IoT spending by 2020, averaging $40B each. The fast pace of adoption of IoT is driven by numerous benefits and improvements, a few of them being listed underneath:

- In the healthcare industry, securing patients’ data and access to smart prescriptions improve patients’ outcomes and increase operational efficiency;
- Smart home appliances enable remote control of heating, security or maintenance, and increasingly improving quality of life for homeowners, among other things;
- Implementing IoT in smart cities helps improve the quality of life for citizens, cut spending and reduce risk in line with current regulations.

According to Cisco, only 0.06% of devices that could potentially leverage IoT are actually doing so, meaning there is still a lot to come in future developments of smart objects. The consolidation of IoT will lead to the growth of autonomous device-to-device interactions, such as transactions of bandwidth or energy resources, increasing the need for secure data and control over all connected objects.
2.2 Data at the Core of IoT

Recording, Storing & Processing

The ever increasing number of embedded devices has one direct consequence: a continued growth of the generated data, which is what makes IoT so powerful but also raises a certain number of concerns. International Data Corporation (IDC) forecasts that the world will generate 160 zettabytes (i.e. 160 trillion gigabytes) of data by 2025, ten times more than what it generates today.

The IDC report further notes that about 25% of all this data will be real time in nature, 95% of it being generated by IoT. This is why it is crucial to find reliable and scalable ways to store and interpret the masses of data generated by smart devices.

![Data creation by type in zettabytes, (source: IDC's Data Age 2025 study)]

Machine-generated data has traditionally been stored in data centers, or more recently in cloud-based solutions, that have demonstrated better accessibility and cost-efficiency. But the exponential amount of IoT data that needs to be stored, transported and processed can sharply increase the induced costs and reach storage capacities.

Although data generated by embedded systems is usually much more efficient than traditional machine-generated data, most IoT devices rely on quick data processing and require real-time analytics. Meaning that this data can not be be reliably processed on a stretched network but has to be located and processed close to the device.

That is why IoT operators are now looking at what is called Edge Computing, “edge” referring to the place where the cloud and the physical world of IoT meet. Edge Computing reduces the costs of cloud storage and transit by using the processing power of embedded devices to filter and aggregate IoT data, only transferring in the cloud key data that requires complex analytics. This way, data is processed in real-time close to the devices, optimizing reliability and cost issues.
But what can all this data be used for? Today, businesses are leveraging IoT-generated data to enhance marketing and sales performance, identify patterns in customer behaviour and optimize asset allocation. For instance, a McKinsey study outlined that for instance, an oil rig today could incorporate up to 30,000 sensors. A Deloitte publication reports that machine learning can help companies “make operational predictions up to 20 times earlier and with greater accuracy” than traditional business intelligence, and Gartner estimates that over 80% of business-related IoT projects will include artificial intelligence by 2020.

The next challenge for businesses and organizations will be to make an appropriate and effective use of the wealth of data generated by embedded devices, while keeping costs under control. As connected devices are involved in more and more crucial business and security processes, the data they have produced will become a genuine resource for ‘oracles’ that can feed smart contracts in blockchain operations.

But to allow external programs to be executed based on such oracles, it is crucial to industrialize the registration of IoT-generated critical data in the blockchain and to manage the integrity and the performance of such processes on a massive scale. On top of that, the stored data should be readable and offer an understandable format to be stored in the blockchain to ease smart contracts’ access to data.

2.3 Rising concerns behind data collection

The consolidation of IoT and the associated data collection bring along numerous challenges that we will need to overcome in the coming years, including technical, regulatory and security issues.

From a technical standpoint, interoperability between embedded systems will be critical to the development of a global IoT ecosystem. McKinsey estimates that 40% of the economic value created by IoT in the future years depends on interoperability between devices. There is indeed a need for standardization, particularly in communication protocols and data aggregation, to increase the scope of data available for analysis.

Regulatory bodies and public authorities will play a decisive role in the alignment of players in the IoT industry, especially on issues such as ownership, privacy and liability. Regulation can help promote best practices and global standards, and answer questions like who owns the data? Who defines the rights of use of this data? How can sensors be controlled?

We need to build a culture of trust and security in order to enable a global and efficient development of IoT, which is why governance is crucial. Shared responsibility between manufacturers and users can clarify liability over inadequate data use, incentivize manufacturers towards higher security and protect users in case of data breaches.
It is crucial to ensure secure transmission and storage of IoT data as maintaining data integrity will be key in a world relying heavily on IoT interactions and transactions. Data generated by embedded devices moves through numerous servers and applications before it is stored and analyzed, and each step along the way requires security and consistency.

Blockchain technology, by recording a ledger of all data exchanges, would provide a reliable solution for transparency and traceability. This is the approach of the HAB project, focusing on the most critical data, i.e. the datasets generated by security-related devices which represents 80% of all the existing IoT supply in Smart Buildings and Smart Cities.

2.4 Automating Home & Building Management

Early home automation began with labor-savings machines around the 90s with the introduction of electric power distribution, it then evolved with the progressive introduction of new technologies such as wireless network with proxy servers, artificial intelligence that controls electrical devices and robots and connected objects that interact with humans. These last few years, various new building automation products appeared on the market and coupled with the wider availability of connected objects, these protocols have allowed users to set up home automation systems.

The sheer amount of consumer interest generated by smart home technology means the world’s biggest tech companies and innovators have entered a race to outdo one another. That means bigger, better smart home tech is constantly being developed to match our digital needs and the industry is on a tremendous upward trajectory.

Generally speaking, Building Automation Systems (BAS) are computer-based control systems installed in buildings to monitor and control mechanical, security, fire and flood safety, lighting, HVAC, ventilation and so on. Buildings controlled by BAS are often referred to as “smart buildings” or “smart homes”. In other words, “smart homes” are homes that have built-in advanced automation systems to provide the occupants with sophisticated monitoring and controlling over the different functions of the building. By applying smart technologies it is possible to increase comfort, save energy and enable better security.

A decade ago, having such automatic control over all the infrastructure and appliances of a building would have been impossible. Fortunately, technological advances and the recent hype around IoT have led to the emergence of smart HVAC systems in which sensors are interconnected with the intelligent system via a network. This is where the IoT plays its essential role by providing the network with the means to maintain sensors and interconnected units at all times. In addition, in state-of-the-art smart buildings, HVAC Systems allow users to see and manage usage patterns. These systems can gather information, analyze it and define patterns to anticipate particular needs at all times, providing a greater degree of comfort.
Many studies on BAS indicate that facilities can save anywhere from 15 to 30% on their energy costs by implementing building controls and BAS. Building automation systems and their building controls are designed to make equipment run and operate in a more efficient manner. As a result, the prolonged wear and tear is reduced and extends the life of the entire heating and cooling systems. The automated controls help maintain even temperatures within buildings. Maintaining a consistent temperature helps cut down on wasted energy and reduces energy costs associated with heating and cooling. Real-time graphical interfaces make it easier to see exactly what is happening with the equipment throughout the building.

2.5 Securing IoT Data

A quick history of the black box

In the early years of aviation, when a crash occurred, investigators had close to nothing to find the source of the incident. Hence, in 1953, David Warren, a researcher at the Aeronautical Research Laboratories in Melbourne invented the Flight Memory Unit which later became the Flight Data Recorder or FDR and is now known to the public as the “black box” when it is actually orange.

The concept is fairly simple. Warren thought that if the pilots’ communications and key instrument readings were recorded, they would be of great help for investigators and aircraft manufacturers to find the cause of the crash and help enhance the quality of airplanes.

There are around 24,000 aircrafts currently in service in the world all equipped with their own black box. The device is strong enough to resist most crash situations but still has to be found by the investigators to start looking for the cause.

The next level

The recent advances in processors, sensors and chip size allowed us to put sensors in almost anything ranging from trucks, to unmanned vehicles and toothbrushes. All that data is recorded, stored, analyzed and used by various parties. What is missing from connected objects at a massive scale, e.g. a 30-story tower or a city inhabited by hundreds of thousands, is the possibility to store data securely in case of a critical event.

Among the 3 billion connected devices currently collecting and generating data, 80% of them are dedicated to security such as fire alarms and smoke sensors, leakage sensors, intrusion / presence detection sensors, pollution / air quality control sensors and all other categories of sensors related to detecting abnormal or emergency situations.

By 2025, there will be 8 billion connected devices in the world and 60 billion by 2030. The tremendous amount of data, sometimes generated in critical events where the device is destroyed after sending the signal, needs to be stored, secured and its integrity kept.
We believe a solution can be found in the combination of cloud, IoT technology and distributed ledgers by providing a single platform that would allow any facilities management organization to record, store and access reliable data after a critical event or in the purpose of analysis and predictive maintenance.

In this paper, we detail our vision for a comprehensive decentralized platform based on our historic expertise around IoT hardware, home automation and facilities management. Our ambition is to become a standard in IoT sensor-generated data security.

Massive usability

Connected devices do not just collect data in case of critical events, they collect data constantly. For instance, a smoke detector collects data when it senses smoke but also between 1 and 24 times per day. Data about the state of IoT devices are as important as measuring data (battery level, quality of service, accuracy of collected data...).

That same smoke detector generating one hash by collection may generate more than 3000 transactions per year. Given that there will be over 50 billion security-related connected devices in the next 5-10 years in smart buildings/cities, the potential transaction data supply might reach 100-200 trillion annually.

By connecting smart contracts to data vaults, the HAB blockchain-based platform can be the network of choice to answer the industry needs and disrupt third party management of the data.
3. HAB: A proposal to secure IoT transactions with blockchain

3.1 Red is the new Black

While commercial aircrafts rely on Warren’s black box to securely record and store critical data. Smart cities and the IoT sector will rely on the HAB Red Box: a blockchain-based registry recording datasets from Smart Building / Smart City connected device systems aiming to bring security to IoT Data Notarization. This will ensure real time collection of certified and immutable data accessible at all times. The HAB Data Vault is a set of data produced by IoT devices and sent by an IoT system with a total granularity freedom: one or several devices, one moment or the collection of different moments, device-level or building-level etc.

HAB Ecosystem: IoT data from devices to blockchain
DApp: Data Pricer

It is crucial in a wide scale data environment to be able for operators to quantify the number of HAB tokens that it takes to write or read data on the protocol. Projection of costs are required to bring stability and security for operators in their interaction with the HAB protocol. Therefore the first DApp that will be running on the HAB protocol will be the Data Pricer.

Depending on the network costs on the public chain and the HAB Microchain, the level of security required for the data to be written or read and the size of this data, the Data Pricer will specify as an output an estimation of the number of HAB tokens needed to read or write data.

In a nutshell, the Data Pricer is the following function:  

\[ f(x_1, x_2, x_3, x_4) = y \]

with

- \( x_1 \): Level of security required
- \( x_2 \): Writing or reading transaction
- \( x_3 \): Size of dataset
- \( x_4 \): Periodicity to push data from the Vault to the HAB protocol
- \( y \): Estimation of the number of tokens needed to use the HAB protocol

We believe this DApp is a necessity so that our network can grow steadily over the first months.
We aim to become the standard for data collection. The HAB platform will address all kinds of organisations operating IoT device-to-cloud information systems. The HAB platform will be used as an additional layer of data management, bringing a blockchain-based third party repository. All critical data originated by an IoT device are recorded in the User Cloud located, for example, inside a building. This data is then integrated into the Data Vault to be time stamped and referenced. The integration happens through a certain standard but operators can improve or propose a new standard for their specific data through a Standard Improvement Proposal (see p.17).

The IoT devices operated by these operators would be smart meters (water, electricity, gas), smart switches, fire sensors, gas or water leakage sensors in a wide range of sectors such as facility management (offices, supplies, residential), waste management, parking operations, Smart Lighting, energy supply, security control or even identity and access management.

3.2 Underlying Protocols

The general purpose of the HAB Platform is two-fold:

• Notarizing critical data sets produced by connected devices in smart buildings or infrastructures
• Using this data in smart contracts within business processes

In order to address these two strategic objectives, we are required to deal with two related operational issues:

• Building trust for the platform users around data integrity
• Providing a scalable architecture able to limit the transaction cost inflation in the context of massive adoption and vast data production by security IoT devices

Building trust with process coalescence

To address the need of the HAB Platform to be recognized as a trusted digital third party (which is a paradox based on the decentralized blockchain-based architecture it is built on), we introduce the notion of 'process coalescence', detailed in the first section of our Yellow Papers (see Document 1: Blockchain as a Process).

By coalescing their processes, willing parties can monitor each others’ behaviours and obtain better knowledge of each other’s doings (wrong or right). Parties compute the asynchronous product of their joint processes, which is then replicated among all parties.

Replicas are run independently and kept in sync using a highly asynchronous agreement protocol which offers guarantees against byzantine players. At the limit, all processes can coalesce and run replicas of a unique sequential machine in a manner analogous to the blockchain.
This approach is critical to avoid the violation of the oracle condition related to the data set recorded in the HAB Platform and used by business participants for the execution of specific service smart contracts. Our communication model, whereby players in a contract can increase their knowledge on the flow of information and decisions made by their co-contractants, allows participants to the HAB Platform to swiftly know when a smart contract is not proceeding according to plan and to obtain evidence of any wrong-doings.

Designing a scalable blockchain architecture

To address our second challenge, we have decided to take a dual approach:

We therefore consider the replicas as running a dedicated side-chain (the HAB Microchain) and allow the players to log that additional data on a standard public blockchain (the Ethereum blockchain) in a dedicated umbrella contract. Thus one could combine a (mostly) sufficient level of trust on the HAB Microchain with stronger guarantees to recover from serious but infrequent breaches of trust (or even crashes). This architecture is detailed in the second section of our Yellow Papers (see Document 2: Dual smart contracts).

We propose to run smart contracts simultaneously on two contract-capable blockchains: a fast one – the HAB Microchain, and a trusted one – the Ethereum blockchain. The fast side contract is in charge of running a business agreement efficiently between players and reporting anomalies to the trusted side. We demonstrate how natural and useful the construct is with a series of use cases, and report about the actual deployment of a simple dual contract using the Ethereum blockchain on the large side, and an ad hoc small side blockchain such as the HAB Microchain, using a weak and highly asynchronous consensus algorithm.

Think of contracts stipulating revenue-sharing schemes, where each player has a log and a claim to a share of the other’s revenues, and imagine that one player has just received a very large sum. Then, maybe, his node running the contract could ‘crash’, and somehow conveniently fail to share the sum. One sees how storing the corresponding data on a big public chain could be dissuasive in this case.

A proof of concept publicly available

In the third section of our Yellow Papers (see Document 3: A proof of concept for ‘blockchain as a process’), we describe a proof of concept for the weak consensus mechanism exposed in Document 1.

The constructions exposed therein are expressed in terms of communicating sequential machines (cSMs) and describe an operation of coalescence which allows to finely tune a tradeoff between asynchronous, trustful execution of such machines on the one hand and synchronous, trustless execution on the other hand. Our PoC is built around a library for programming cSMs called HUXIANG and is publicly available on line at this address: https://github.com/smarthab/HAB.
Validating transactions on the HAB Microchain

The HAB Microchain uses a proof of stake algorithm to reach consensus and thus validate transactions on the network. We believe users should be encouraged to participate in the protocol security. Therefore the percentage redistributed to stakers will increase with the number of stakers, the percentage redistributed to the HAB Pool and to the Core Team will decrease with the number of stakers. With this mechanism we aim to ensure a minimum of decentralization inside of the HAB Microchain.

Fees on the network are distributed to the stakers, the HAB Pool and the Core Team in a way that will align incentive for decentralisation, open innovation and execution.

→ Stakers redistribution

The fees paid by operators and redistributed to stakers are therefore a function of the number of stakers as follows:

\[ \text{St.fee}(nb_{stakers}) = 30\% + \frac{(60\% - 30\%)}{500} \times nb_{stakers} \]

St.fee is a function where the output is the percentage of the fees paid to the stakers. \( nb_{stakers} \in [1,500] \) is the number of stakers.

→ HAB Pool redistribution

The fees paid by the operators and redistributed to the HAB Pool to allow open innovation in the network are therefore a function of the number of stakers as follows:

\[ \text{Fund.fee}(nb_{stakers}) = 43.75\% - \frac{(43.75\% - 25\%)}{500} \times nb_{stakers} \]

Fund.fee is a function where the output is the percentage of the fees paid to the HAB Pool. \( nb_{stakers} \in [1,500] \) is the number of stakers.

→ Core Team redistribution

The fees paid by the operators and redistributed to the Core Team to allow a smooth and quick execution of network decisions or improvements are therefore a function of the number of stakers as follows:

\[ \text{Core.fee}(nb_{stakers}) = 26.25\% - \frac{(26.25\% - 15\%)}{500} \times nb_{stakers} \]

Core.fee is a function where the output is the percentage of the fees paid to the Core Team. \( nb_{stakers} \in [1,500] \) is the number of stakers.
Simply put:

- Stakers will get 30% to 60% of the network fees depending on the number of stakers from 1 to 500 stakers. Starting at 1, every additional staker will increase the global stakers reward by 0.06%.

- HAB Pool will get 43.75% to 25% of the network fees depending on the number of stakers from 1 to 500 stakers. Starting at 1, every additional staker will decrease the HAB Pool reward by 0.0375%.

- SmartHab will get 26.25% to 15% of the network fees depending on the number of stakers from 1 to 500 stakers. Starting at 1, every additional staker will decrease the SmartHab reward by 0.0225%.

Below is an illustration of how distribution will adapt while stakers number increases:

<table>
<thead>
<tr>
<th>Number of stakers</th>
<th>1</th>
<th>500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stakers fees</td>
<td>30%</td>
<td>60%</td>
</tr>
<tr>
<td>HAB Pool fees</td>
<td>43.75%</td>
<td>25%</td>
</tr>
<tr>
<td>Core fees</td>
<td>26.25%</td>
<td>15%</td>
</tr>
</tbody>
</table>

The minimum number of HAB tokens required to be a staker is 3,5M HAB. For more information regarding the technical specifications, please check our Yellow Papers.

3.3 Governance

The HAB Pool

HAB fees paid by operators while reading their data are automatically partly redistributed to a smart contract.

As an open source protocol, we want to incentivize operators into developing and improving the ecosystem. The HAB Pool will be dedicated to reward the successful improvements and DApps so that the ecosystem can grow.

This smart contract will be programmed and enforced automatically when a set of successful events happens such as the success of a Standard Improvement Proposal or when a DApp becomes widely used. A DApp is deemed successful when 30% of the HAB Microchain users are using it.

The HAB Pool will automatically adapt the rewards in terms of HAB units depending on the HAB token price at the time of unlocking it in order to always provide a fair incentive for developers.
Standard Improvement Proposal

Every operator can propose a new standard or a change in the protocol (on the HAB Microchain). If enough operators show interest for this improvement, the proposal is retranscripted and formally voted on the network by HAB stakers.

The HAB Pool will reward SIP creators that reached consensus to incentivize protocol improvements and innovation with a percentage of HAB tokens available in the HAB Pool depending on the HAB token price.

Just like the Ethereum Improvement Proposal, a SIP can have at least four status:

**Draft:** The SIP is under consideration by the network

**Accepted:** The SIP is planned to be adopted and included in the next hard fork of the network

**Final:** the SIP has been adopted in the previous hard fork

**Deferred:** the SIP has not been considered for an immediate adoption but may be reconsidered in the future

Parliament Vote

We believe it is important to have a clear mechanism of governance to allow our protocol to grow by itself by stating here how decisions will be made.

We tend to think a parliament / government relationship is a viable way to implement our project. Indeed it allows quick execution by the Core Team while keeping the control on them thanks to a pre-coded set of decisions that only the Parliament can approve or refuse.

The HAB Parliament will be composed of Eligible Members. Eligible Members are participants to the HAB community having a dedicated focus and automatically nominated as members of the HAB Parliament and responding to the following eligibility criteria:

- Being in the top 10% most active operators in terms of transactions on the HAB platform and/or
- Being a Proof of Stake participants with more than 1% of the total supply of HAB tokens and/or
- Being in the top 10% users most rewarded by the HAB Pool.

This Parliament constitution assumes that the network is active and that the HAB Pool started to reward developers. However, at inception those assumptions are in fact not real. Therefore, a temporary Parliament needs to rule from constitution until it is possible for operators to be technologically elected based on the rules detailed above.

The temporary Parliament is composed of Pioneer Users Program (see Section 4.8).
3.4 Data Privacy

Privacy is an important matter for the operators business but also for the protocol itself as privacy is difficult to implement in a business with scalability necessity. For instance, zero knowledge is too slow to be implemented today in the IoT industry.

There is a clear trade-off between scalability and centralization while a project is pursuing privacy for its users. SmartHab’s approach is to create a second layer forked from Ethereum and communicating with the Ethereum Public Blockchain.

Therefore, we use state-of-the-art privacy-enhancing technologies: pseudonymisation, compute-on-encrypted data and privacy-preserving multi-party computing protocols, without obstructing functionality. From the node/user/consumer side, we provide a pseudonymous access to services (to prevent data silos), using e.g. anonymous identity attribute providers, allowing for the fine-grained management of which data is revealed to whom, and audit of usage of one’s own data. From the service/analyst/business side, we provide generic approach to process data in a privacy-preserving way across multiple local storages.

HAB tokens will serve as a key to decrypt the data the operator is allowed to consult. In a nutshell, the HAB token is the key to the Data Vault.

3.5 DApps

Contributing Developers

The HAB protocol aims to become a standard in the industry. Many use cases can be implemented on top of the HAB two-layer protocol. SmartHab existing business partners are already interested in exploring some of the following fields. The Pioneer Users Program is in place with pre-existing industrial partners willing to test the protocol with their connected devices. A certain number of pre-existing tools will be available to the network.

Promoting Specific Vertical Markets

We have developed strong partnerships with A-list players in the sectors listed in section 2.1. SmartHab’s goal is to provide guidance and help leading firms create new products and services based on the HAB platform.

The Pioneer Users Program is a great framework to bootstrap the first projects and improve our platform over the first 12 to 18 months. After that, we foresee numerous products and services launched independently on the HAB platform by brand-name companies and leaders in their fields.

The DApp use cases detailed below will be in-house projects co-developed with our historic partners. However, there are countless projects waiting to be launched on the right infrastructure by pan-European industrial groups. SmartHab is in discussion with some of them and will announce strategic partnerships over the course of the coming year.
DApp Use Case: Insurance Claims

The inviolability of the records in the blockchain guarantees insurance companies and policyholders greater transparency and agility in insurance claims. In addition, in case of damage to IoT devices caused by damages or natural disasters, the data is securely stored and still accessible.

DApp Use Case: Damages & Litigation

In the case of damages to property, the information registered in the blockchain can be used as proof in trials, curbing the need of third parties, avoiding the payment of “trust-fees”.

DApp Use Case: Smart Service-Level Agreement Monitoring

SLA sets out what levels of service are acceptable and - crucially - explains what compensation you will receive if suppliers fail to meet these levels. The HAB Platform enables to adjust smart contracts to monitor service level and compensate parties automatically.

DApp Use Case: Security Systems

HAB Platform registers critical data from security systems, allowing City Authorities and Smart Home residents to improve standards of security in their properties and cities.
3.6 A token-based circular economy

The HAB Ecosystem

GOVERNANCE

Parliament
10% users most rewarded by the HAB Pool
10% most active operators in terms of transaction
Stakers holding more than 1% of HAB token total supply

Core Team

DAapps proposal
Proposal acceptance / rejection
SIP proposal

PROTOCOL

HAB Pool

SIP

DAapps

Public Blockchain

Microchain

Working with HAB token

PAYMENT

Microchain

USERS & DEVELOPERS

Pioneer Users
Stakers
Users

Proposal & Development

Successful DAapps & SIP released in HAB

Payment in HAB

Writing Data
Reading Data
Governance

The SmartHab Core Team is constantly proposing new Standard Improvement Protocols (SIP) and developing decentralized applications. They also receive DApps proposals from the Parliament. DApp development is open to everyone and encouraged by the HAB Pool reward scheme. However, participants with good ideas but limited resources can submit their project to the Parliament and the HAB team can assist or lead the project.

Protocol

The protocol at the base of the HAB Microchain is improved by proposals of the SmartHab Core Team and developers of the community. The DApps are running on top of the HAB Microchain. The public chain can be used to maximize the security in data storage.

Users & Developers

They are the most valuable assets of the HAB ecosystem. Aside from using the platform to read and write data in the HAB Microchain, they make proposals to improve the protocol and develop new decentralized applications. The most successful are rewarded in HAB and become members of the Parliament.

The HAB developer team, more info on that in Section 4 of this paper, is composed of IT veterans from various fields: software, hardware and mobile developers, network architects and security experts. They are led by Olivier Pastorelli, our CTO and cybersecurity expert. We plan to strengthen the dev Core Team with the proceeds of the Token Sale.

Furthermore, developers from all around the world are welcome to work on the platform and contact us for any collaboration project.

Token features

In short, users will need to own HAB tokens to:

- Pay the protocol fees related to:
  - Create and record a Data Vault recording data provided by IoT device cloud systems
  - Reading and sharing the datasets stored in a Data Vault
  - Triggering a third party service DApp by using data stored in a Data Vault as an oracle
- Vote as participant of the Proof of Stake mechanism
- Be rewarded for successful protocol improvements
- Be rewarded for successful DApps created on the HAB platform
3.7 The HAB network value in a world powered by IoT

Valuing a decentralized network is a difficult endeavour, especially at an early stage. In this section, we try to show the economics of the HAB platform based on business forecasts and in the assumption of a perfect market ridden of free loaders and speculators. This section aims at giving guidelines and reference points regarding the distribution of value between the different functions of the HAB token in regards to the IoT market worldwide. It is a tool to assess the future HAB economy.

Using the equation of exchange of the quantitative theory of money, we try to estimate the aggregate value of each token feature and provide the reader with insights as to how value is created on the HAB platform.

In order to understand the mechanisms and the economics of the HAB token, it is necessary to have an exhaustive view of the key players and token features:

<table>
<thead>
<tr>
<th>Features / Participants</th>
<th>Users</th>
<th>Stakers</th>
<th>Developers</th>
</tr>
</thead>
<tbody>
<tr>
<td>M1 - Writing Data</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M2 - Reading Data</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M3 - Staking</td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Receive rewards</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

There is no proven economical model to assess the valuation of a token. Since each crypto-asset serves as a currency in the protocol economy it supports, most of the attempts are based on the quantitative theory of money: \( MV = PQ \) with

\[
\begin{align*}
M &= \text{Size of the currency base (USD)} \\
V &= \text{Velocity of the token} \\
P &= \text{Price of services or assets (USD)} \\
Q &= \text{Quantity of services or assets}
\end{align*}
\]

The velocity of the token refers to how much a unit of currency is used in a given period of time.

The purpose of this section is to give as many information as possible to those willing to challenge our model using the equation of exchange.
Starting with Q

The estimate of the number of IoT devices for Smart Cities and the market share of the HAB platform is instrumental to estimate Q. We built the model using 3 assumptions from the low case scenario to a mass adoption of our platform. The penetration rate of the HAB protocol for security IoT devices for Smart Buildings and Smart Cities is ranging in 2025 from 1% in the worst case scenario to 4% in the best case.

For each IoT device securing its data on the HAB platform, there is a number of dataset recorded in a given timeframe. This will be the Q in our equation of exchange.

<table>
<thead>
<tr>
<th>Security IoT devices for Smart Buildings / Cities</th>
<th>2025</th>
<th>2030</th>
<th>2035</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market share of the HAB platform</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypothesis 1 (Low estimate)</td>
<td>1,00%</td>
<td>2,00%</td>
<td>3,00%</td>
</tr>
<tr>
<td>Hypothesis 2 (Base case)</td>
<td>2,00%</td>
<td>3,00%</td>
<td>4,00%</td>
</tr>
<tr>
<td>Hypothesis 3 (High estimate)</td>
<td>4,00%</td>
<td>5,00%</td>
<td>8,00%</td>
</tr>
<tr>
<td>Average datasets recorded on the HAB per IoT device</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weekly</td>
<td>1,00</td>
<td>1,50</td>
<td>2,00</td>
</tr>
<tr>
<td>Annually</td>
<td>52</td>
<td>78</td>
<td>104</td>
</tr>
<tr>
<td>Total data sets recorded on the HAB (Base case)</td>
<td>26 000 000 000</td>
<td>70 200 000 000</td>
<td>166 400 000 000</td>
</tr>
<tr>
<td>Number of data read per year per data vault</td>
<td>16,00</td>
<td>20,00</td>
<td>24,00</td>
</tr>
<tr>
<td>Number of readings (global)</td>
<td>8 000 000 000</td>
<td>18 000 000 000</td>
<td>38 400 000 000</td>
</tr>
<tr>
<td>Cumulated total of data sets</td>
<td>203 682 000 000</td>
<td>273 882 000 000</td>
<td>440 282 000 000</td>
</tr>
</tbody>
</table>
Price of services, P

P should not be seen as the price of the crypto-asset but instead as the value of what is needed by the crypto-network to operate.

There are two kinds of transaction fees payable with the HAB token:

- Writing encrypted data
- Reading decrypted data

These transaction fees will decrease over time as the protocol will mature and the network grows.

Below are the prices in USD of the services that the HAB network will provide:

- $0.00035 to record a dataset;
- $0.000466 to read existing encrypted data;

As an indication of the price paid for different data services, the following price examples of existing massively used BtoB data services demonstrate the accuracy of the HAB Platform transaction pricing:

- Google Maps:
  - $0.0012 by call for 500K calls/month for a static map

- Algolia (search engine technology):
  - $0.00052 by record with 100K indexing ops

The set up cost for commercial fire alarm systems in large buildings, including fire sensors and sprinkler systems, goes in average up to $25 per square meter. The annual maintenance and monitoring fee usually represents 10% of the set up cost, e.g. $2.50.

The highest average connected devices density is around 1 device per 5 square meter. With the assumption that the HAB will price 1% of the annual maintenance and monitoring fee for the services, the price of reading and writing is as follows in the table.

This additional cost could be easily integrated in the cost structure of any operator using the HAB Platform or be charged with a margin to the clients, justified by the service improvement carried by the HAB Platform.
Velocity

Velocity shows the number of time the token changes hands in a defined period of time.

To give more perspective, we calculated an index based on some of the most popular crypto-assets and the most advanced protocols, in our view, focused on IoT. The idea is to give relative figures and determine a realistic market-based assumption of velocity.

\[
V = \frac{\text{Number of transactions per day} \times \text{Price} \times 365}{\text{Market Cap}}
\]
<table>
<thead>
<tr>
<th>Token</th>
<th>Transaction / day</th>
<th>Price</th>
<th>Market Cap</th>
<th>Velocity (1 year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethereum</td>
<td>750 000</td>
<td>420</td>
<td>42 635 171 983</td>
<td>2,70</td>
</tr>
<tr>
<td>IOTA</td>
<td>717 120</td>
<td>0,916403</td>
<td>2 547 171 066</td>
<td>0,094170</td>
</tr>
<tr>
<td>Binance Coin</td>
<td>862</td>
<td>13,66</td>
<td>1 304 272 622</td>
<td>0,0033</td>
</tr>
<tr>
<td>OmiseGo</td>
<td>1 056</td>
<td>5,84</td>
<td>818 668 754</td>
<td>0,0027</td>
</tr>
<tr>
<td>0x</td>
<td>737</td>
<td>1,06</td>
<td>566 641 360</td>
<td>0,0005</td>
</tr>
<tr>
<td>MakerDAO</td>
<td>363</td>
<td>579,64</td>
<td>387 332 473</td>
<td>0,20</td>
</tr>
<tr>
<td>Augur</td>
<td>316</td>
<td>30,65</td>
<td>337 099 359</td>
<td>0,01</td>
</tr>
<tr>
<td>Civic</td>
<td>161</td>
<td>0,16</td>
<td>56 365 000</td>
<td>0,000167</td>
</tr>
<tr>
<td>SALT Lending</td>
<td>376</td>
<td>0,82</td>
<td>53 724 000</td>
<td>0,002095</td>
</tr>
<tr>
<td>Ambrosus</td>
<td>38</td>
<td>0,21</td>
<td>30 939 000</td>
<td>0,000094</td>
</tr>
<tr>
<td>IOTChain</td>
<td>75</td>
<td>0,364197</td>
<td>22 426 448</td>
<td>0,000445</td>
</tr>
<tr>
<td>OriginTrail</td>
<td>50</td>
<td>0,07</td>
<td>19 821 000</td>
<td>0,000064</td>
</tr>
<tr>
<td>GRID+</td>
<td>2</td>
<td>0,22</td>
<td>8 920 000</td>
<td>0,000018</td>
</tr>
</tbody>
</table>

| Standard Deviation | 1,00 |
| Average            | 0,43 |

These numbers show that, right after the ICO, projects need time before reaching a significant level of utility.

In our model, we did not take into account the volume traded on platforms. We took the assumption that these volumes are not related to the utility of the token.

**M1 - Writing Data**

The most important feature of the HAB platform is the ability to write data on a trusted platform for later use. Smart Buildings operators need to own HAB to write data on the chains and will pay in tokens depending on the volume of data stored on the platform.

Amount of data written on the HAB platform is one of the most important metric to measure adoption. During the first months, participants to the Pioneer Users Program will be the only writers and constantly onboarding new writers will be our primary focus after the launch.

Based on the growth of connected devices and a conservative market share target, we estimate M1 = PQ/1,50 or $6M in 2025.

*Source: [coinmarketcap.com](https://coinmarketcap.com) and network data, August 3rd 2018.*
M2 - Reading Data

The second most important feature, and accessible to a wider range of users, is the ability to access the data generated by sensors. Users need to own HAB to access datasets for analysis and will pay depending on the volume of data they wish to access.

This feature brings a different kind of partners (insurers, analytics firms, etc.) and allows us to provide value to the IoT market further up and down the value chain.

Based on the assumptions detailed above, we estimate M2 to be $58.5M in 2025.

M3 - Staking

The HAB platform will offer the possibility to anybody to be rewarded for their participation in the network security as the HAB Microchain uses a proof-of-stake algorithm, as per section 3.2 of this document.

The monetary aggregate must represent 25% of the total value of the network at all times.

By our calculations based on the limited number of stakers and the projected rewards, we estimate M3 to be $21.5M in 2025.

ΣM - Aggregate monetary base

Based on the assumptions detailed above, we estimate the HAB network has the potential to reach $86M by 2025.

Scaling will be key and we believe our dual chain system will be instrumental in reaching critical size rapidly.

25% of the value of the platform is in the HAB staking system. Developers and users participating in the network’s security are rewarded for their contributions thus guaranteeing decentralization on some level.
4. The HAB Token Sale

4.1 Quick Overview

<table>
<thead>
<tr>
<th>Ticker</th>
<th>HAB</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staking</td>
<td>Yes</td>
</tr>
<tr>
<td>Standard</td>
<td>ERC20 (Ethereum) / ERC223</td>
</tr>
<tr>
<td>Total Issuance</td>
<td>8 000 000 000</td>
</tr>
<tr>
<td>Soft Cap</td>
<td>USD 3M</td>
</tr>
<tr>
<td>Hard Cap</td>
<td>USD 13M</td>
</tr>
<tr>
<td>Token Price Currency</td>
<td>USD</td>
</tr>
<tr>
<td>Token Price (HAB / USD)</td>
<td>0.005$</td>
</tr>
<tr>
<td>Currencies Accepted</td>
<td>ETH, BTC, EUR, USD</td>
</tr>
</tbody>
</table>

4.2 Duration & Process

The HAB Crowdsale will start on Q4 2018 after a Private Sale lasting until the 30th of September 2018.

The Crowdsale will be organized in two phases starting with a Presale with a 50% bonus. Every updates about phasing, launch dates and information regarding the Crowdsale will be published on www.hab.global.

HAB tokens will be issued on the Ethereum blockchain and will comply with ERC20 standards. The token issuance smart contracts are available on our GitHub.

The HAB Token Sale will take place in 3 stages:

<table>
<thead>
<tr>
<th>Private Sale</th>
<th>Presale</th>
<th>Crowdsale</th>
</tr>
</thead>
<tbody>
<tr>
<td>End date: Sept 30, 2018</td>
<td>Q4 2018</td>
<td>Q4 2018</td>
</tr>
<tr>
<td>Duration: Maximum 60 days</td>
<td>Duration: 2 weeks</td>
<td>Duration: 4 weeks</td>
</tr>
<tr>
<td>1 HAB = 0.01 USD</td>
<td>1 HAB = 0.01 USD</td>
<td>1 HAB = 0.01 USD</td>
</tr>
<tr>
<td>+100% bonus</td>
<td>+50% bonus</td>
<td>+30% bonus during Week 1</td>
</tr>
</tbody>
</table>
The bonus will be immediately added to the number of tokens received as a result of one investor’s token stake. The total investment will be visible on the investor’s balance. Subscriptions to the Token Sale will be accepted in ETH, BTC, EUR and USD only. Progress and funds raised will always be available on our website.

HAB tokens will be transferrable as soon as possible after the end of the Crowdsale. This process may take a few days after the end of the Sale, since SmartHab will have to make sure, after an external audit, that the process to release tokens is secured. Be sure to follow us on our social media (see Section 7) for updates regarding the token and our development.

The Token Sale Soft Cap is set at $3,000,000. Should the funds raised through the Sale amount to less than the Soft Cap, the funds shall be returned to investors as per the smart contract available on the SmartHab GitHub. However, if SmartHab deems the platform sufficient to sustain business and growth based on funding levels and product capability under this amount, SmartHab retains the right to continue operations at lower funding levels. The Hard Cap is set at $13,000,000. Any transaction sent after this amount has been raised will not be credited.

### 4.3 Token Distribution
A majority stake of HAB tokens (51%) will go directly to crowdsale subscribers while 22% will remain with the founders and management team and 27% will go to the HAB Pool.

Some existing business partners of SmartHab will participate to the HAB Pioneer Users Program. Corporate clients will subscribe to the Token Sale in order to test the platform and start integrating it in their existing business model. Among them, two Fortune 500 companies have already expressed interest and registered as Pioneer Users. Follow us for updates on our partners and future clients.

The HAB Pool aims to reward the developers of successful SIP and DApps. As a keystone of the HAB ecosystem, the HAB Pool will also retribute 650 millions of HAB tokens to stakers for the first three years:

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of HAB tokens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year 1</td>
<td>325 Million HAB tokens</td>
</tr>
<tr>
<td>Year 2</td>
<td>250 Million HAB tokens</td>
</tr>
<tr>
<td>Year 3</td>
<td>75 Million HAB tokens</td>
</tr>
</tbody>
</table>

43.75% to 25% of the HAB tokens distributed in this phase will, at some point, come back to the HAB Pool.

The token stake attributed to the team and advisors will be locked as per below:

<table>
<thead>
<tr>
<th>Vesting Phase</th>
<th>Duration</th>
<th>Vesting %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermediate</td>
<td>Anytime</td>
<td>25.00%</td>
</tr>
<tr>
<td>Initial Phase</td>
<td>12 months</td>
<td>50.00%</td>
</tr>
<tr>
<td>Secondary Phase</td>
<td>18 months</td>
<td>17.50%</td>
</tr>
<tr>
<td>Final Phase</td>
<td>24 months</td>
<td>7.50%</td>
</tr>
</tbody>
</table>

The token stake attributed to our advisors is locked for 6 months.

We want operators, users and developers to spread the word and constantly use and challenge our platform. We will allocate 27% of what we raise to the HAB Pool to reward the successful Standard Improvement Proposals and the developers of successful DApps, see HAB Pool on p.16 for more details regarding successful DApps.

The HAB Pool will automatically adapt the number of HAB tokens allocated as rewards depending on the HAB price at the time of payout in order to always provide a fair incentive for developers.

4.4 Post-Token Sale Budget Allocation

We have developed an operational budget of roughly US$10,000,000 to kickstart the HAB Platform during the first 36 months. Additional funding from Token Sale and transactional revenue from operations will be escrowed at Caisse des Dépôts et Consignations (CDC) and used to sustain the project after startup phase.
48% Expansion

Developing the HAB community is critical and will require marketing and sales activities to promote efficiently the adoption of the HAB Platform by BtoB clients, including online activities, talent development & hiring, meetups and events, brand campaign and international sales. We expect to grow the team up to 6 employees.

30% Management & Admin

SmartHab will dedicate a professional team to management, operations, client support and administration. This budget also covers administrative and overhead expenses dedicated to our offices in Europe, Northern America and Asia, including services, insurance, equipment, accounting and legal fees.

22% R&D and Tech

The R&D and Tech Team budget required to secure the HAB technology development will be ringfenced just after the token issuance in order to secure a team of up to 10 senior developers for 3 to 5 years.
4.5 Financing and Token Liquidity

HAB is working with Woorton to ensure:
• Smooth regular cash out of the Token Sale proceeds funding to finance HAB’s operations
• Steady liquidity on trading platforms once the HAB tokens gets listed

Woorton is a Paris-based liquidity provider launched by industry experts and backed by French institutional investors. Woorton provides digital asset investment professionals with easy pricing and seamless execution on large trades.

OTC Trades

Woorton works with dozens of trading platforms and OTC desks to provide liquidity and can easily fill our sell orders with better pricing than exchanges on a regular basis. Working with Woorton allows us to optimize our cash management by getting the best price available against fiat and easy settlement with banking partners in Europe.

Market Making

Woorton will manage market making once the HAB tokens is listed on exchanges by developing proprietary algorithms tailored to our liquidity needs.

During the first weeks of trading, our main concern is bid-ask spread reduction to ensure velocity of trades for HAB holders. Woorton deploys capital on trading platforms to help build an order book with reasonable spreads.

When trading is smooth, we can focus on increasing volumes. Volumes will increase naturally if the bid-ask spread is well-managed and there are enough traders on the HAB tokens. Woorton will then widen the order book by adding new orders to the market, thus increasing liquidity and volume overall. Woorton’s algorithms take into account risk management (market impact, inventory management, trading fees optimization) and provide us with regular post-market analysis on the HAB liquidity.

4.6 Security & Cyber Threat Prevention

Our CTO will constantly conduct in-depth monitoring of our network activity during the Token Sale and ensure the funds are sent to our vetted address.

The funds will be stored on a hardware wallet provided by Ledger and kept in a bank vault until the funds can be transferred to our operational accounts. The hardware wallet allows multi-sig control by 6 authorized signatories, 4 out of 6 signatures are necessary to transfer funds above 20 ETH per day.

SmartHab is working with top-notch security providers to ensure security during the crowdsale. Our providers monitor and find trademark infringements, counterfeit sales and brand abuses on multiple platforms. They monitor all our social media and will, to the best of their ability, block and ban identity theft, false addresses and websites.
4.7 Timeline

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1 2017</td>
<td>Company Foundation in Paris (France)</td>
</tr>
<tr>
<td>Q2 2017</td>
<td>First Clients</td>
</tr>
<tr>
<td>Q3 2017</td>
<td>Tech Team Operational</td>
</tr>
<tr>
<td>Q4 2017</td>
<td>€1.3m Seed Fundraising</td>
</tr>
<tr>
<td>Q1 2018</td>
<td>Building HAB Task Forces</td>
</tr>
<tr>
<td>Q2 2018</td>
<td>HAB Token &amp; Blockchain Design</td>
</tr>
<tr>
<td>Q3 2018</td>
<td>Private Placement Fundraising</td>
</tr>
<tr>
<td>Q4 2018</td>
<td>Crowdfunding via Token Sale</td>
</tr>
<tr>
<td>Q1 2019</td>
<td>HAB Tech Workforce Recruitment</td>
</tr>
<tr>
<td>Q4 2019</td>
<td>HAB Platform Release in Beta Version</td>
</tr>
<tr>
<td>Q1 2020</td>
<td>Final Platform Public Release</td>
</tr>
</tbody>
</table>

4.8 Pioneer Users Program

Up to ten corporate clients will be testing the platform and help SmartHab build it over the months. As Pioneer Users, they will be offered 2,500,000 HAB at the time of the crowdsale. They will be contributing to the HAB development with technical support and strategic advisory. Furthermore, they will be communicating about the use of the HAB platform, contributing to its adoption in the relevant fields.

Their feedbacks will allow SmartHab to spot technical glitches, potential security breaches and therefore improve the protocol before launching to the MainNet. Pioneer Users will also be the first participants of our Proof of Stake mechanism, securing the first wave of decentralization of the HAB platform. They will be the first to write and read data on the HAB platform.

Eventually, Pioneer Users will be the first to test the DApps of the protocol. At the time of writing, two major clients have already been signed and committed to test the platform. They will be announced in due time, so be sure to follow us for updates regarding the Pioneer Users Program.
5. SmartHab

5.1 Our Story

SmartHab was founded in 2017 in Paris (France) by a team of seasoned veterans from the real estate and internet sectors with a shared ambition of conceiving IT native infrastructure apartments.

SmartHab develops an end-to-end solution to the European new multifamily building developers and landlords. Along with home automation IoT devices and gateway networks, SmartHab provides a mobile app to residents allowing them to control their apartment.

SmartHab operates a scalable, secured, resilient integrated IoT platform dedicated to residential smart building projects, allowing its real estate clients to address the growing demand by residents for smart home services.

SmartHab Technology Platform

SmartHab integrated IoT platform allows multifamily real estate developer to easily integrate and support embedded smart apartment systems in every unit of a new residential project. SmartHab platform covers the largest end-to-end set of technology.

Smart Home, Sweet Home

SmartHab’s mission is to deliver great resident experience. With SmartHab, owners and tenants have the benefits of a smarter home. From SmartHab mobile app, they have access to a large scope of useful functions such as:

- Heating / AC control
- Energy metering
- Environment information
- Inside temperature / humidity
- Intruder alarm
- Energy saving mode
- Lighting / shade control
- Video doorbell
Since the start of the company, SmartHab has unlocked a number of achievements:

- Grew team from 2 to 15
- Signed first contract with a French real estate developer in May 2017
- Secured a backlog of +10,000 units with 20 BtoB clients for 2018 - 2020
- Raised €1.3M seed funding with Vinci Immobilier, Anaxago, Groupe Duval and leading business angels in October 2017
- Onboarded leading organizations as clients and business partners such as Vinci Immobilier, CDC Habitat, Eiffage, Groupe Duval, Coffim, Emerige, Constructa, Ween, Avidsen...

In a very short time, SmartHab has managed to secure major partnerships and commitments to implement its smart apartment technology platform and is now recognized as a leader.

By adding a second business line to its initial residential smart home systems with the development of the HAB Platform solution, SmartHab will accelerate, being able to both expand globally and leverage its business footprint.

The HAB Platform business line will allow SmartHab to go beyond residential IoT operations and leveraging opportunities in the field of office and retail Real Estate, Smart Cities, urban infrastructure.
5.2 Team

Management Team

Godefroy Jordan, President & CEO

A French serial entrepreneur and Internet pioneer, Godefroy cofounded SmartHab after a career lasting over 20 years as an entrepreneur working in internet, communication and real estate media.

He founded four companies which led to successful hand-overs and is a business angel and advisor of various tech startups. Godefroy has contributed to the development of the “new generic Top-Level Domains” framework and was the Vice Chair of Renaissance Numérique, a French think tank.

Godefroy holds a Master’s Degree in Strategy and Marketing from Sciences Po Paris, the French leading school in political science and public affairs.

Olivier Pastorelli, CTO

Senior expert in electrical engineering, IT systems and network security, Olivier joined SmartHab in 2017 to launch the project and develop the technical architecture.

Before that, he had a long career in media as Chief Information Officer & Chief Information Systems Officer in a major media company and also held a position of Chief Information Officer & Chief of the General Staff in a luxury brand to design IT and security systems. Olivier has developed an interest in blockchain and cryptocurrencies since 2015 and has been operating an Ether mining rig since 2016.

He graduated from Supinfo International University and holds an Executive MBA from HEC.
Jefferson Correia  
HAB Project Management Officer

Jefferson is a Corporate Communication professional with 15 years of experience in multinational companies, leading public relations, marketing communications and stakeholder’s engagement for sustainability projects.

He has advised clients in the US, Latin America and is currently based in Europe. Fluent in five languages, he holds a degree in public relations and a Master in Social Sciences from the School of Political Sciences of Sao Paulo and is currently undertaking the EMBA program at Celsa-Sorbonne in Paris.

Technology Team

Thibaut  
Smart Building Operation Manager

Thibaut joined Smarthab in early 2018 to lead the research, conception and follow-up of smart home projects with our clients. Before joining SmartHab he was a consultant at IE Conseil where he managed construction projects and realized energy audits.

He then joined SEDP, a French real estate engineering and management player part of RATP Group, where he, among other missions, led the Smart Building consultations. Thibaut holds an Engineering Degree from the Val de Loire National Institute of Applied Sciences where he focused on energy and risks.

Alain, Lead Developer

2017 - Today: Cross-platform Lead Developer at SmartHab. Built the data storage engines and the database architecture for SmartHab platform.

1996 - 2016: Senior multilanguage lead developer with experience in managing development team around major BtoB ecommerce and transactional websites.
Philippe, Lead Back-End Developer

2017 - Today: Lead Backend Engineer at SmartHab. Built the entire SmartHab API for client apps and worked on SmartHab IoT commissioning platform.

1998 - 2016: Senior JS/PHP backend developer on several web finance, media and gaming mass usage platforms.

Adrien, Engineer

Adrien joined SmartHab after studying engineering in France and Australia. Since then, he has helped us develop our temperature control systems for smart apartments.

Adrien is a graduate of Ecole Centrale Marseille and University of Queensland.
Camille joined the SmartHab team at the end of 2017, she brings deep experience and knowledge as a business and marketing analyst in France and abroad in various fields such as oil & gas, insurance and the airport industry.

She has helped numerous clients with their transformation strategy and holds a Master’s Degree in International Marketing from the Toulouse Business School and a MSc in Smart Cities from Paris Leonard de Vinci University.

Stanislas joined SmartHab in early 2018 to strengthen the sales team. Previously, he was a financial analyst in real estate investment funds (UBS, Ilion Partners) in France and Brazil.

After that, he was appointed Head of Real Estate Programs at Woodeum, a Paris-based company specialized in real estate promotion and building operations. Stanislas is a graduate of HEC Paris.
5.3 Advisors

Pr. Vincent Danos, Scientific Advisor

For the last 30 years, Pr. Danos has been a researcher in computer science, mathematics and biology. He is the head of the computer science research division of the École Normale Supérieure lab affiliated with the French National Center for Scientific Research (CNRS).

He has led research as Chair of Computational Systems Biology and Director of Synthesis of the Center for Synthetic and Systems Biology at the University of Edinburgh. He has been a Visiting Professor at the Harvard Medical School and a Faculty Member at the Interdisciplinary Research Center. Pr. Danos has a deep understanding of distributed systems and cryptography and has published over 140 research papers in cross-disciplinary activities and convergence on algorithmic/mathematical structures for modelling (social systems, economical systems, etc.). He has advised various projects on token design, tokenomics, blockchain architecture and complex ecosystems.

He is a graduate of École Polytechnique and École des Ponts and has a PhD in Mathematics from the Université Paris-Diderot. Pr. Danos has developed the scientific approach of the HAB platform which he has explained in details in the Yellow Papers available on www.hab.global.

François-Xavier Thoorens, Blockchain Technology Advisor

François-Xavier is a full stack developer and the co-founder and Head of Development of Ark Ecosystem which aims to create an entire ecosystem of linked chains and a virtual spiderweb of endless use-cases.

François-Xavier has primarily served as scientific officer for the European Union architecting the use of satellite observation for maritime surveillance, his work being referenced by the European Commission, NATO, Black Sea Commission and ESA.

Since 2010, he has been working as a consultant for different organisations to help them organize around data collection.
Éric Besson, Industry Advisor

Éric Besson is a French politician & businessman. He has held numerous government offices and electoral mandates and is the former French Minister for Industry, Energy and the Digital Economy (2007-2012).

He retired from politics in 2012 to start his own consulting firm. Since then, he has advised various energy and industrial production companies.

He is a published author of political essays and a dozen economic reports during his time in the government.

Bertrand de la Chappelle, Governance Advisor

Bertrand de la Chapelle is the Executive Director of the global multistakeholder policy network Internet & Jurisdiction.

He is a former member of the Board of Directors at ICANN (2010 - 2013).

From 2006 to 2010, he was France's Thematic Ambassador and Special Envoy for the Information Society, participating in all WSIS follow-up activities and Internet governance processes, including in particular the Internet Governance Forum (IGF), and was a Vice-Chair of ICANN's Governmental Advisory Committee (GAC).

Between 2002 and 2005, he actively participated in the World Summit on the Information Society (WSIS) to promote dialogue among civil society, private sector and governments, including as Director of the collaborative platform WSIS-online.

An engineer, diplomat and civil society actor, he also has nine years of private sector experience, including as co-founder and President of Virtools, now a subsidiary of Dassault Systèmes.
Thibault Dutreix, Co-founder and Strategic Advisor

As a co-founder of SmartHab, Thibault Dutreix is the vice-chair of SmartHab Strategic Committee. Thibault is the general manager of Coffim, a €150M residential developer after 10 years in the bank industry (Goldman Sachs, IEB). He is graduated from ESSEC business school and INSEAD.

Diego Harari, Strategic Advisor

Diego Harari is a member of SmartHab’s Strategic Committee since October 2017. He is the Head of Innovation and Sustainable Development at VINCI Immobilier, a French leading real estate developer part of VINCI Group.

He launched in 2017 Vinci Corporate Venture arm which has invested in SmartHab as their first venture project ever. Before that, he was the Head of Business Development of the Green Building department at Bureau Veritas.
5.4 Partners

Industry

Anaxago

Founded in 2012 by Joachim Dupont, François Carbone and Caroline Lamaud, Anaxago is a crowdfunding platform dedicated to startups and innovative SMEs. More than €100M have been collected since then and 80,000 members registered on the platform.

Anaxago is a shareholder of SmartHab through a dedicated holding, Objectif SmartHab, representing 100 private investors and owning 5.10% of SmartHab. Anaxago will organise the first ever Token Sale crowdfunding campaign in France starting end of August 2018 and promoting the HAB token to its community in order to boost the subscription to the HAB Token Sale.

VINCI Immobilier

VINCI Immobilier is the real estate branch of VINCI Group. VINCI is a global player in concessions and construction, employing more than 194,000 people in around 100 countries.

VINCI Immobilier has over 20 years of experience in the fields of residential real estate (housing and managed residences) and real estate corporate (offices, hotels, shops). VINCI Immobilier is thus a recognized and trusted partner of local authorities, developers and investors.

As a shareholder and key business partner of SmartHab, VINCI Immobilier has initiated business meetings and workshops with different VINCI entities interested in using the HAB Platform, with potential POC to be defined with VINCI Energies and VINCI Facilities.
Duval Group

The Duval Group conducts large-scale projects at the heart of the challenges of the world of tomorrow. It was built under the impetus of entrepreneurs active throughout the territory. Its decentralized organization is unique in its sector.

The Duval Group is the leading golf resort operator and retail park developer and operator in France, and the n°2 European tourist residence operator. SmartHab has started to explore opportunities with Duval Group in order to implement the HAB Platform in relation with Duval Group facility management operations, especially for recording the IoT data from its large malls and over 5,000 sqm office buildings.

Technology

IoTeX

IoTeX will support SmartHab technology and footprint. The two organisations are at the forefront of IoT Security innovation and have decided to cooperate to develop the usage of blockchain-based technology in the IoT ecosystem.

With headquarters in San Francisco (USA), IoTeX is a leading blockchain IoT startup which has successfully closed a 35m$ Token Sale in Q1 2018, backed by leading blockchain investment funds such as #Hashed, Kenetic Capital, Cypher Capital etc.

IoTeX is solving many existing problems of the IoT such as lack of scalability, privacy concerns, lack of functional values by building an auto-scalable and privacy-centric blockchain infrastructure, leveraging the blockchain in-blockchain architecture for heterogeneous computing, fast and robust Roll-DPoS consensus scheme, and lightweight privacy preserving techniques.

IoTeX will provide to SmartHab the following inputs:

- Insight into IoTeX blockchain and various innovations
- Advice on application design within the context of SmartHab's data strategy and long-term vision
- Access to IoTeX large network of potential users and developers in Asia
- Cooperation on co-marketing to blockchain community
Ark Ecosystem

Ark provides users, developers, and startups with innovative blockchain technologies. They aim to create an entire ecosystem of linked chains and a virtual spiderweb of endless use-cases that make ARK highly flexible, adaptable, and scalable.

ARK and SmartHab will cooperate to explore and develop technical synergies, with the aim to ease the adoption of ARK smart contract architecture by business leading organisation, on top of the HAB Platform and the use of the data recorded in the data vaults as oracles.

Memberships and accelerators

SmartHab was awarded as a member of Paris & Co accelerator program for 2018/2019 and is part of two influential accelerator programs dedicated to real estate and led by Impulse Partners.

SmartHab is a proud member of:
• Smart Building Alliance
• Enocean Alliance
• Tech in France
• France Digitale
• Fédération Française de l’Internet Immobilier (French Federation for Real Estate Internet)
• French IoT

SmartHab R&D is supported by the French Government:
• Young Innovative Company status awarded in 2017
• €0.5M of funding granted by the Banque Publique d’Investissement (Public Investment Bank, French government arm for private financing)
6. Legal Disclaimer

6.1 General Warning

This White Paper does not constitute an offer or an invitation to sell shares, securities or rights belonging to SmartHab or any related or associated company.

None of the information or analysis in this White Paper is intended to provide a basis for an investment decision, and no specific investment recommendation is made. Accordingly, this White Paper does not constitute investment advice or an invitation to invest in any security or financial instrument of any nature whatsoever.

This White Paper does not constitute or form part of, and should not be construed as, an offer for a sale or subscription, or an invitation to buy or subscribe securities or financial instruments.

This White Paper, or any of its component parts, does not constitute the basis for, or should not be used as a basis for, or in connection with, a contract for the sale of securities or financial instruments or a commitment to sell securities or financial instruments of any kind.

6.2 Liability Disclaimer

SmartHab expressly disclaims any liability for any direct or indirect loss or damage of any kind arising directly or indirectly of or in any way related to the use of, or inability to use, or the purchase of, or inability to purchase, HAB tokens, or arising out of any interaction with the smart contract implemented in relation to HAB tokens or otherwise related to these terms, regardless of the form of action, whether based in contract, tort (including, but not limited to, simple negligence, whether active, passive or imputed), or any other legal or equitable theory.
6.3 Sales Restrictions

Participation in the Token Sale is restricted to natural or legal persons acting within the scope of their professional activities.

HAB Tokens are not being offered or distributed to U.S. persons or Chinese persons (as defined in our Token Purchase Agreement available upon request).

HAB Tokens are not being offered or distributed to persons or legal entities whose address or registered office is located in a country identified by the Financial Action Task Force (“FATF”) as having weaknesses in their Anti-Money Laundering (“AML”) or Counter-Terrorism Financing (“CTF”) system, namely the Democratic People’s Republic of Korea (DPRK), Ethiopia, Iran, Pakistan, Iraq, Serbia, Sri Lanka, Syria, Trinidad and Tobago, Tunisia, Yemen.

The funds used by the Purchaser for the purchase of HAB Tokens shall not be derived from or related to any unlawful activities, including but not limited to money laundering or terrorist financing.
If you are interested in participating in our token sale, please visit our official website at www.hab.global.

Be sure to follow us on our social media to stay tuned:

→ Telegram: t.me/HAB_Global
→ Slack: hab-global.slack.com
→ Twitter: https://twitter.com/smarthab1