

DataBroker DAO

A peer to peer marketplace of IoT sensor data.

WHITE PAPER

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Abstract

This paper introduces DataBroker DAO, a peer to peer marketplace created to provide IoT sensor owners with a clear path to data monetization and data consumers with a decentralized market to buy IoT sensor data.

With DataBroker DAO, we aspire to unleash long-tail creativity with the use of sensor data to facilitate the conversion of incredible ideas into value adding services. By providing a distributed foundational layer for the buying and selling of IoT sensor data, we expect that unimagined uses of data that exist in the hearts and minds of entrepreneurs, researchers and organisations around the world, will emerge to create incredible value adding services that enrich the quality of life in our cities and our societies as a whole.

The global market for IoT sensors has surpassed 600 billion USD per year¹ including the purchase, installation and maintenance of sensors and the acquisition of software packages to interpret and enrich the data. The data resulting from this investment is for primary usage by the sensor owner or enhanced with value-added insights and resold.

Whether for primary usage or for enrichment and re-sale, the data remains grossly under-utilised and the utility for society locked away in organisational silos. By connecting data owners with 3rd party data consumers directly, DataBroker DAO provides a marketplace where IoT sensor data can be fully valorised outside of the primary silos in which it is locked today.

In this sense, DataBroker DAO can be likened to a “secondary market” for IoT sensor data and has been referred to as an “eBay” or “Amazon” for IoT sensor data.

In this paper we also introduce the DATA Token, the utility token deployed in DataBroker DAO. The DATA Token is used by data consumers to purchase access to sensor data available on the DataBroker DAO platform.

¹ State of the Market: Internet of Things 2016, Verizon

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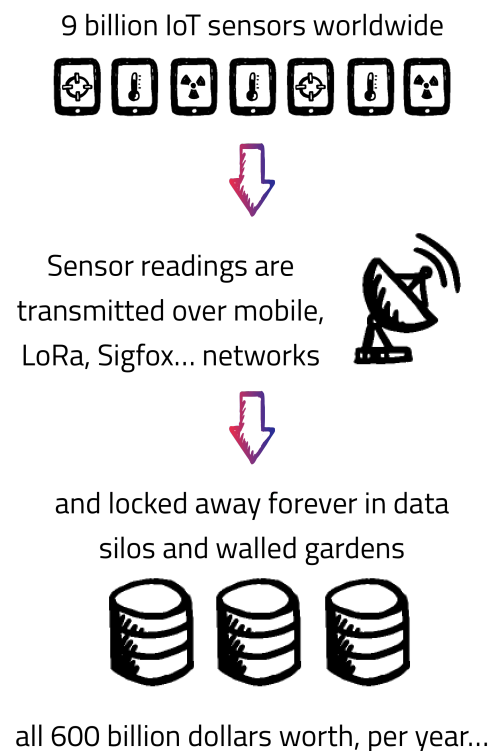
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The challenge

Individuals, companies, researchers and governments are spending hundreds of billions each year on buying and maintaining IoT sensors. The growth of the investment and applications in IoT is truly staggering and the high operation costs are a huge entry barrier. And yet, all data captured by these devices is locked up in silos and walled gardens.

The amount of money spent on IoT is truly staggering as is the number of devices already deployed. By 2016, the global market for IoT sensors surpassed 600 billion USD per year, which is expected to grow to 1.2 trillion USD per year by 2019. This include the purchase, installation and maintenance of sensors and the software packages to interpret and enrich the data. By 2016, there were no fewer than 9 billion sensors deployed globally, which is expected to grow to 33 billion by 2019².

And, whether for primary usage or enrichment and direct resale, the data remains grossly under-utilised and the utility for society locked away in closed organisational silos. Stifling innovation and holding back society as a whole.



Our solution

DataBroker DAO unleashes the potential of currently inaccessible, low value... data into the creation of new transversal Value Added Services. It prevents people with powerful ideas to rely on people with powerful operational resources, in a phased, pay-as-you-grow, MVP model. As with the financial markets, where the importance and value of company data have been apparent for decades, giving rise to Bloomberg Market Data, Thomson Reuters, FactSet and a lot of vendors, the same opportunity will emerge for IoT sensor data.

² State of the Market: Internet of Things 2016, Verizon

Doing so with a distributed foundational layer for the buying and selling of IoT sensor data we expect that unimagined uses of the data will emerge to create incredible value adding services that enrich the quality of life in our cities and our societies as a whole.

DataBroker DAO is the first marketplace for IoT Sensor data that will connect sensor owners with purchasers of the data directly, utilising existing infrastructure from telecommunication providers operating sensor connectivity networks based on GSM, LoRa, SigFox or via a proprietary gateway of the sensor owner.

In a sense, the DataBroker DAO can be likened to a “secondary market” for IoT sensor data and has been referred to as an “eBay” or “Amazon” for IoT sensor data.

Stakeholders

There are a number of stakeholders in the DataBroker DAO including sensor owners, network operators, data processors and data buyers. Below is a definition of each of these stakeholders.

Sensor Owners

Sensor owners are the stakeholders who have purchased IoT sensors and make the data emitted from their sensors available for sale via the DataBroker DAO platform. This is a diverse group who have generally purchased sensors in order to improve the efficiency of their operations.

The key role of Sensor Owners in DataBroker DAO is to sell the data from their sensors on the platform.

Data Buyers

Data Buyers are those stakeholders who will purchase data on the platform. This purchase may be to use the data in its raw form for their own purposes or to purchase the data with the intention of transforming/enriching the raw data to be resold with added value via DataBroker DAO (see Data Processor below).

The use of the data purchased by Data Buyers can be quite straightforward, for instance, purchasing temperature and rainfall data provisioned by a neighboring office building to have accurate local readings to the more complex, like purchasing data to train one's AI.

Data Processors

Data Processors are those Data Buyers who purchase data with the explicit intention of enriching the data and either reselling it or handling it for their clients. The enrichment may take many forms and Data Processors can be categorized by the level of insight provided³:

- Simple data services are the most common. Data brokers collect data from multiple sources and offer it in collected and conditioned form — data which would otherwise be fragmented, conflicted and sometimes unreliable.
- Smart data services provide conditioned and calculated data, with analytical rules and calculations applied to derive further insight from the collected data and aid the decision-making process.
- Adaptive data services apply analysis to a customer's request-specific data combined with data in a context store. This is a more advanced form of service.

It is estimated that there are more than 5,000 data processing companies worldwide relying on a vast array of open datasets published by government agencies and non-governmental organizations⁴ (Moore, 2016) in combination with their proprietary datasets and algorithms to enrich publicly available data.

These range from specialized boutiques, such as CB Insights, Fico, Intelius, etc. to large global consultancies such as McKinsey, Deloitte, PWC. It is estimated that 75 percent of analytics solutions will incorporate at least ten or more data sources from second-party partners or third-party providers by 2019⁵.

³ Moore, S. (2016, June 8). *How to Choose a Data Broker*.

⁴ *How to Choose a Data Broker*. Moore, S. (2016, June 8).

⁵ *How to Choose a Data Broker*. Moore, S. (2016, June 8).

It is expected that Data Processors will make up the majority of Data Buyers on the DataBroker DAO platform.

Network Operators

The data emitted by the billions of devices deployed globally flow across a wireless sensor network (WSN) operated generally (but not exclusively) by large telecommunications companies in each country. This may be a traditional GSM network, a LORA network or an alternative such as SigFox.

The key role of Network Operators in DataBroker DAO is to expose the gateway they operate to enable sensor owners to sell their data on the platform.

The diagram below demonstrates how these stakeholders interact in DataBroker DAO.

Who “wins” in this story?

Sensor owners (data providers) are able to directly monetise their data to generate passive income that will turn a sunk cost into a potential money maker and at least the opportunity to recoup some of their investments in IoT sensors (purchase, installation, maintenance, software licenses to interpret the sensor data). A sensor owner will earn between 80-89% of the amounts received and pay a small recurring fee for putting the sensor on the platform.

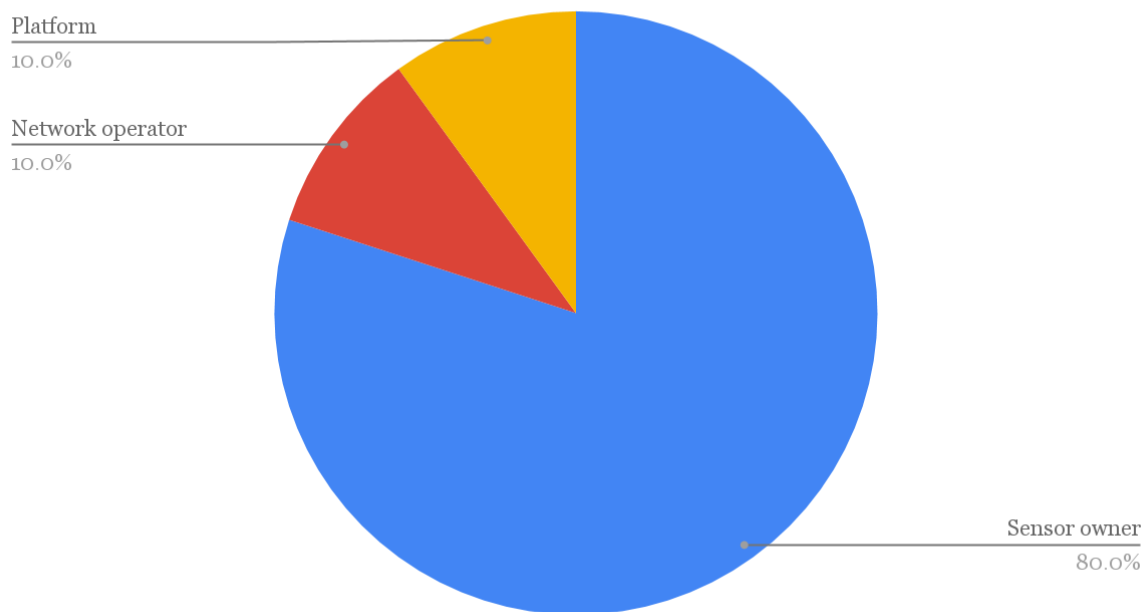
Data buyers and data processors get data as a service so do not need to make the upfront investment in hardware to get the data they require. Another advantage for both buyer types is that DataBroker DAO provides access to data that would otherwise be trapped in the data silos of sensor owners.

Network providers: gain scale and speed in the adoption of their network as the telecom connected to DataBroker DAO can present a win-back to their enterprise accounts, a clear USP. These network operators are the gateway through which the data flows to the DAO,

and as such, they are also paid out immediately for each sale in the platform and will receive 10% of the fee.

The DAO takes the remaining 1-10% of all funds, depending on market conditions, received on the platform to cover operating costs

Revenue distribution



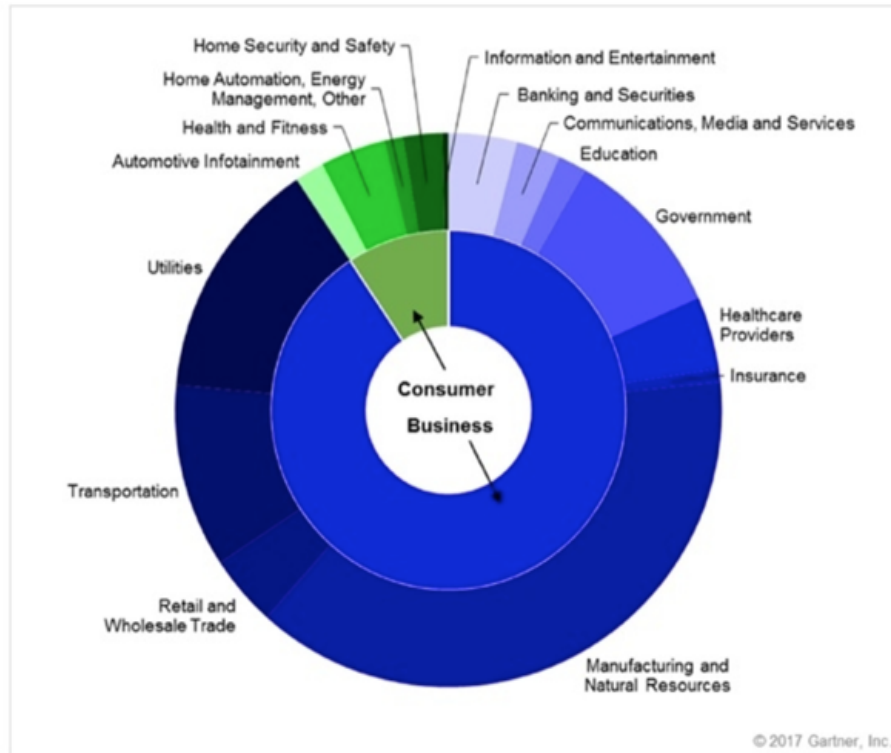
Who "loses" in this story?

Sensor manufacturers: While manufacturers will increase sales in the short run due to the higher profitability of IoT projects. However, on the longer term, "sharing" sensors may reduce their day-to-day sales. This can be balanced by higher replacements due to the higher amount of sensors in the field.

However, hardware margins are in a "race to the bottom" and are already razor thin. Sensor providers already make most of their money via software and services. From this perspective, the producer can pull resources and capital out of unprofitable hardware manufacturing and allocate these to successful SaaS offerings. From our discussions with manufacturers, they are very enthusiastic about this prospect.

Who will sell data?

There are a number of data sellers identified and the overview of the sectors already investing in sensors from Gartner highlights the key potential sellers of data for the years to come. The diagram below identifies the 2 groups (business, consumer) and the sub- groups that constitute each. It is clear that the business group is the main driving force in sensor deployment globally.



The business group is led by the following sectors:

Manufacturing and Natural Resources: the so-called industrial IoT consists of companies that are deploying sensors in order to improve operations. Their primary purpose for deploying sensors is to improve the efficiency of operations to reduce their cost base. DataBroker DAO presents the opportunity to sell selected data that will not reveal to competitors specifics of their manufacturing process.

Transportation: the data for transportation consists of both traffic and vehicle specific data. Traffic data includes for instance congestion and for instance data for shipping of goods like temperature sensors in food shipping containers. This also includes sensors for managing public transportation such as trains and busses. Vehicle specific data includes a wide array

of sensors in cars and trucks both personally owned vehicles and fleets measuring everything from CO2 emissions to speed to preventive maintenance.

Utilities and Government: Utility providers deploy sensors for “smart” utilities en-masse to deliver more efficient utility services to their clients including smart grids and smart meters primarily for electricity and water. Government sensors are also wide ranging including everything from water level sensors to detect flooding, air quality monitoring to smart street lights.

In addition to these sellers which represent the bulk of currently deployed sensors, we identify at least 2 additional growth areas in the coming years:

Smart City Initiatives: a roadblock for getting smart city initiatives off the ground is the upfront cost of populating the town with sufficient sensors to be meaningful. The DataBroker DAO platform provides a means to turn what is today a sunk cost and a perpetual maintenance expense into an investment with a 2-3 year payback period and a continuous income stream after that.

Agricultural sector: in Belgium today, 10% of farmers are “techie”. They have a drone flying around and 5-20 sensors deployed and some other automation in place. The sensors include for instance wind, temperature, barometric pressure, humidity, PH level in the soil. They use these to manage their farm and spend between 10-50k euro per year, and DataBroker DAO will provide the possibility to recoup some of this cost.

Who will buy data?

Aside from the data processors in the ecosystem, any company looking to commercialise a product that is data driven is provided with the opportunity to develop the product without having to invest in the hardware. The potential buyers are extremely broad.

- From the agricultural example above, two potential buyers jump out with > 1000 temperature sensors from nearly all regions of the country, the data is more

accurate and granular than the national weather service. They are a potential buyer as are tv and radio stations who, by buying data directly on the marketplace, cut out the national weather service in their purchase from the farmers.

- With >1000 PH level sensors covering most parts of the country, fertiliser companies would view this as a “honeypot” for their sales people.
- Smart City Initiatives can limit the upfront cost of populating the town with sufficient sensors and turn the expense into an investment with a 2–3 year payback period and a continuous income stream after that.
- Academics get access to the data from thousands of sensors and can buy data directly on the marketplace. This will result in a boost in the number of potential spin outs from academia as projects no longer have as high startup costs associated with buying and deploying a network of sensors.
- Public Transport data can be sold to entrepreneurs who can help to create applications such as mobile apps to help the general public find the perfect routes to their desired destination, this introduces an extra revenue source for local governments while improving the infrastructure around the public transportation systems.
- Self-driving technology companies could buy car sensor data to create the perfect self-driving AI and license this back to various car manufacturers.
- Environmental agencies can gather data from millions of sensors around the world, such as PH water sensors, to get insights into environmental change, impact of their programs and understand where to act.
- Energy corporations can purchase wind, weather & consumption data to plan new green energy initiatives and understand where to best place new wind or solar farms.

In short

The stakeholders in the IoT space have a lot to gain:

- Sensor owners can monetize their data and turn a sunk cost into a potential money maker and at least the opportunity to recoup some of their investments in IoT sensors.
- Network operators gain scale and speed in the adoption of their network as connected telcos can present a win-back to their enterprise accounts, a clear USP.
- Sensor manufacturers can stop the “race to the bottom” for production and pull resources and capital out of manufacturing and allocate these to more successful SaaS offerings.
- New types of buyers have unprecedented access to data and options to monetize their own data, in this category we see the entire booming and vibrant startup scene.
- Data processors have an eco-system to sell their services to the right people.

Obstacle to success

The biggest obstacle to the success of DataBroker DAO and the full valorisation of IoT sensor data is on the supply side of the equation. That is the adoption of the marketplace by data sensor owners who are generating data. DataBroker DAO enables sensor owners to sell their data directly to interested 3rd party data consumers and are thus provided with the opportunity to recoup their sunk costs for IoT sensor hardware and software (>600 billion USD today) incentivising them to provide access to their proprietary data.

Completeness of DataBroker DAO

In its 2016 report⁶, McKinsey identifies 6 key pillars to the construction of an IoT sensor data marketplace.

⁶ Johannes Deichmann, K. H. (2016, October). *Creating a successful Internet of Things data marketplace*.

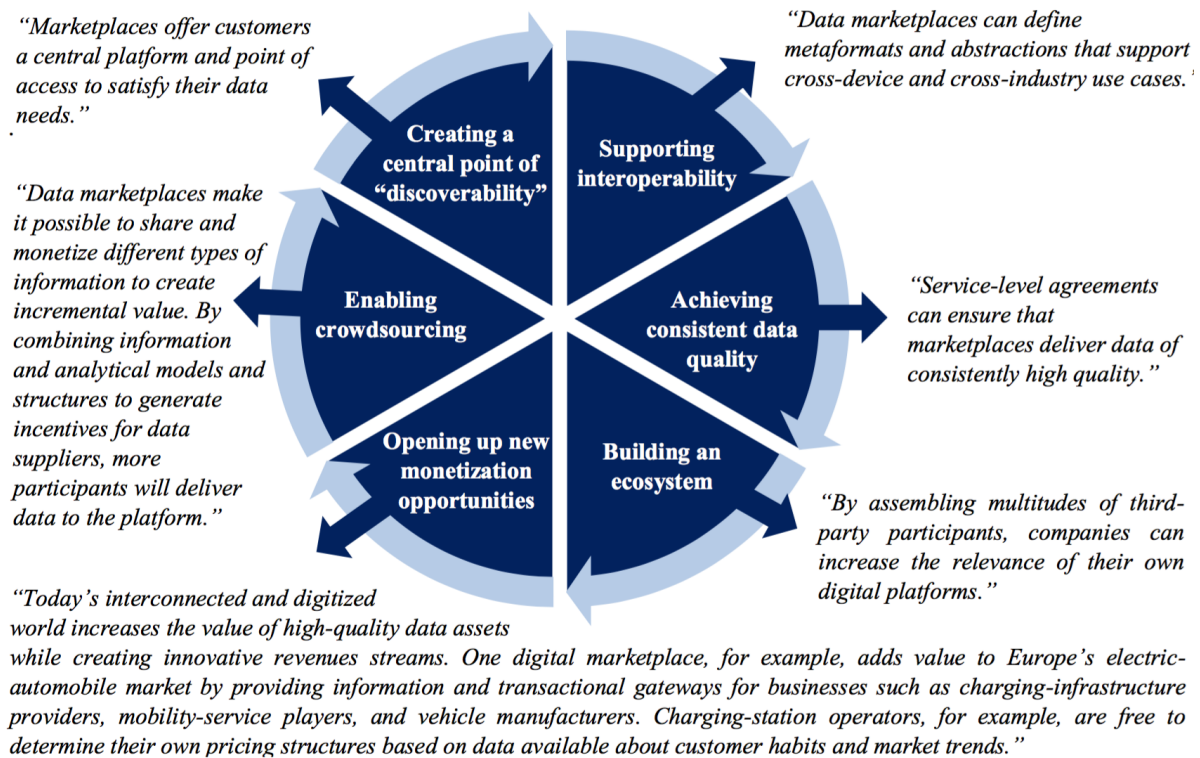


Figure 3: Own Figure based on Six key enablers (McKinsey - 2016)

Below is an assessment of the current beta version of DataBroker DAO based on these 6 pillars:

- Creating a central point of "discoverability": the DAO pulls together data that is otherwise locked in organisational silos controlled by the sensor owners.
- Supporting interoperability: the DAO defines standard metaformats for data descriptions and will integrate several processes to bring actual data into standardised formats in the next iteration of the platform.
- Achieving consistent data quality: data streams come directly from the gateway so there is no point in the process that is open to manipulation of data. In the next iteration of the platform, a reputation system that allows data buyers to provide feedback on data quality will be added to further enhance the controls on data quality.
- Building an ecosystem: the DAO brings the stakeholders in the IoT sensor data market together. It is the foundational layer of the ecosystem.
- Opening up new monetization opportunities: Sensor owners are incentivised through direct remuneration from data buyers. In a future iteration, the platform will introduce additional data enrichment and display options that service providers can

monetise through the platform. The roadmap includes graphical packages from mapping to charts.

- Enabling crowdsourcing: Sensor data is crowd-sourced directly from sensor owners.

Why use blockchain?

From a marketplace perspective using the public Ethereum chain enables the use of a fully built out financial ecosystem, with minimum of fees. Traditional fiat payment processors charge between 1 and 3% for money in and money out, while a purchase using the utility token costs around 0.003 USD⁷ in fees for purchases of any size.

Using a utility token over fiat currency also brings the advantage of 18 decimals. Combine the possibility to use extremely small fractions of the token with very low fees, and real microtransactions become possible.

From a decentralised network perspective it is also a perfect fit. Very large numbers of participants, in a trustless environment, transacting with each other is the definition of a perfect use-case.

From an ecosystem perspective we notice a lot of activity in the IoT sphere, solving a lot of hard problems for the future. And we are avid fans of these trailblazers knowing that the Databroker DAO is a great addon for many of these project, the missing link in the ecosystem.

A prominent new project in that space is IOTA⁸. We see the potential as a blockchain based network operator where the sensor owners have the opportunity to bypass some of the network operators. Besides data 'in' the system, we also see an opportunity for data 'out', to buyers and to data processors. Integrating with IOTA is planned in the technical roadmap as soon as they reach a somewhat stable version.

⁷ <http://ethgasstation.info/>

⁸ <https://iota.org/>

The architecture

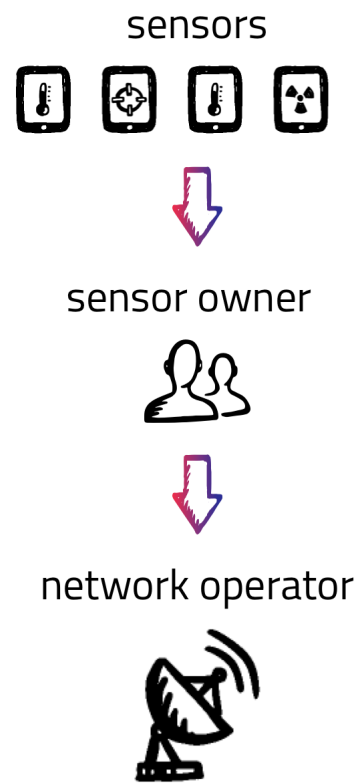
Identity management

Databroker DAO is a peer-to-peer marketplace of IoT sensor data. This data is created by sensors, and we are talking about billions of sensors. These sensors are owned by again a very large number of owners. These owners have contracted a network operator to transport the data generated by their sensors to a (mainly internet-) gateway for consumption.

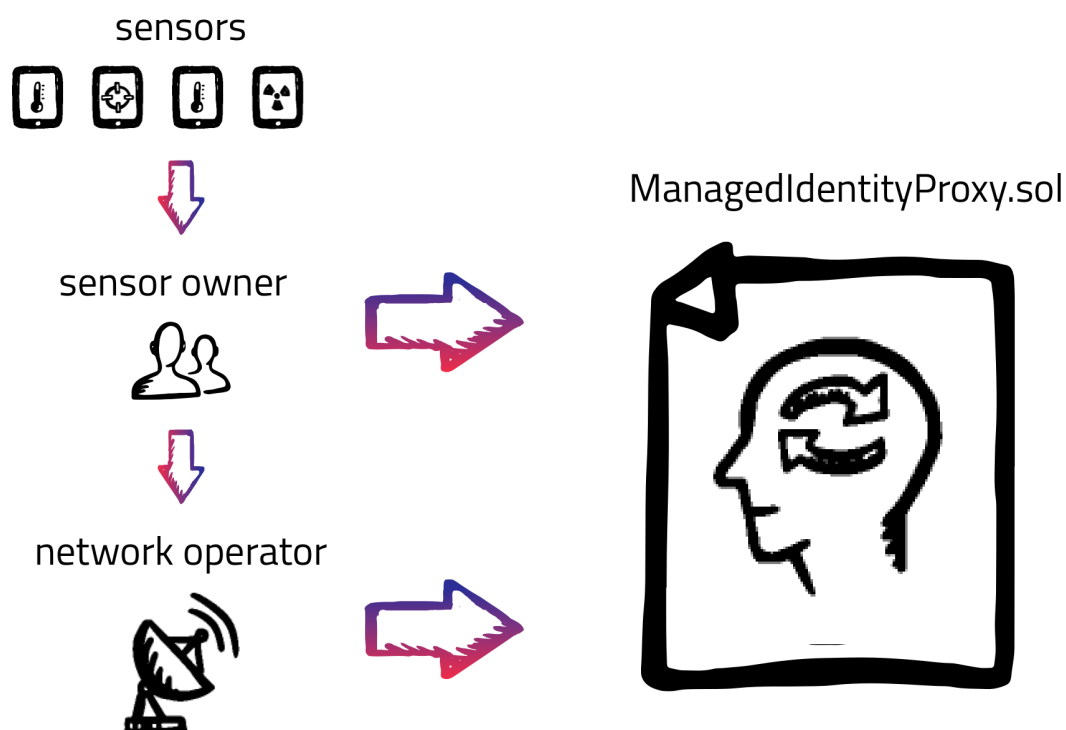
The network operator takes up the role of gatekeeper in regards to the data flowing through their gateway. They have performed all required KYC procedures on the sensor owners and they have identified and validated the sensors themselves. They are also guarding their network against unauthorised use. And in most regions, network operators do not have a monopoly resulting in a large amount of potential partners, but significantly reduced compared to the amount of owners or sensors.

For Databroker DAO partnering with these network operators is quite an advantageous scenario. By controlling and verifying the network operators, the platform has a way to manage and control the gigantic amount of sensors and owners by proxy.

This has a consequence for managing the identities of the sensors, owners and operators in the platform. Building on the work of end user identity management projects like uPort, the platform works with “Managed Identity Proxy” contracts. These proxy contracts contain the link to the sensor owner’s wallet and identity. Different from the end user solutions,



these proxy contracts are also linked to the identity of the owner at the network operator and can be controlled by that network operator.



This allows us to have full ownership by the sensor owner, combined with the ability of the network operator to control/automate their interaction with the system, and even handle end-user private keys until proper key management has become widespread and commonplace. This system will be open-sourced before the main token sale.

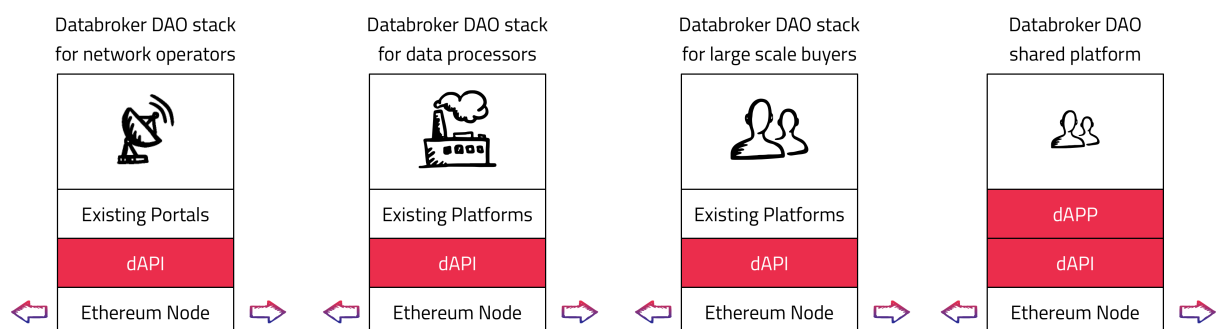
dAPP and dAPI

In the blockchain world, a large number of projects are building distributed applications or dAPPs. These client side applications interact directly with Ethereum or other blockchains. In many cases, for the sake of user experience, these applications are running on remote shared nodes like the ones Infura⁹ provides. While this is the only way to create user friendly end-user peer-to-peer applications, it has serious drawbacks for some of our use cases:

⁹ <https://infura.io/>

- **Single point of failure.** During some of the recent token sales, the client side applications coupled with high demand have brought these shared nodes to a halt. Not for the lack of trying or skill, but due to the sheer amount of RPC calls needed to perform certain functions on Ethereum smart contracts. In a high stakes sector, such failures are not an option.
- **Web interfaces and apps are nice, but the real value is in APIs.** In the current SaaS and cloud boom this is almost a given. You have no real product unless you also have an API for it. Slack, Zapier, Github, CRM and ERP systems, they all attribute parts of their success to their commitment to APIs.
- **More apps, more problems.** Adding an extra interface only makes it harder to use for the average user. The sensor owners already have an account with the operators. They have figured out how to work with them and are happy (and if not, they switch operators).

That is why we add in, what we call, a dAPI. Just like a dAPP, it's an API application that is deployed at each node. Primary usage of this dAPI is at the network operator, data processor and large scale data buyer sides, and not at the sensor owner or small scale buyers. They will use the (existing) interfaces provided by the network operators or the Databroker DAO dAPP.



Data distribution and storage

Billions of sensors generate huge amounts of data. And any company using IoT sensor data has their systems for processing it and is most likely not inclined to replace that system. This means we cannot enforce a new data storage system on them. Even more important, it is not the goal of the platform to store all IoT sensor data for eternity.

Built in the dAPI, there are connectors to integrate with the leading IoT and bigdata storage vendors, leaving the buyer the choice on where their data needs to be sent.

Now there is a valid use-case for blockchain in the storage of the data. The immutability and timestamping capabilities are worth something. On the one hand we allow batches of data sent to non blockchain repositories to be anchored on the Ethereum mainnet (using the Chainpoint spec¹⁰).

As an extra offering there are connectors to put the data directly in a hosted and shared Multichain (1500tx/s¹¹) and BigchainDB (going up to 1mio tx/s¹²) network. The current beta uses the Multichain connector exclusively to store the data.

On the roadmap

Discovery, reputation and curation

Another important role of the dAPP is the discovery and curation of data feeds. In the same way that the Apple app store needs top lists, and curated content due to the large number of applications offered, the marketplace will have to perform similar functions.

Having billions of sensors on a platform is great from a supply perspective, but it makes discoverability of just the sensors you need difficult. Tagging, categorisation, filtering and search capabilities fit right into the dAPP and where appropriate in the dAPI.

¹⁰ <https://chainpoint.org/>

¹¹ <https://www.multichain.com/blog/2017/06/multichain-1-beta-2-roadmap/>

¹² <https://www.bigchaindb.com/features/>

The quality of the data is a similar challenge. Using a combination of statistical and reputation tools combined with human curation the network operators, data processors and other buyers, the data feeds will be evaluated and scored on the trustworthiness of the data, in a peer-to-peer and trustless fashion.

Network operator integrations

The main road to mass adoption is integrating with network operators that enable the onboarding of millions of sensors in one go. The DataBroker DAO platform will be integrated with the gateways of these network operators.

We will be working on both common standards and libraries to ease integration, and perform the initial integrations for the first operators to join.

Data enhancement integrations

Having easy access to large amounts of data opens up a wealth of options for many startups across the globe. Enhancement and aggregation will provide even more valuable data than the raw data itself.

The team will look for, and work with partners to provide valuable services based on the raw data by providing libraries and integrations for commonly used tools. Integration with AI tools (like provided by the large cloud providers, or Tensorflow) come to mind.

The distributed stack

DataBroker DAO has been built to be production ready in 2017. Since it's inception early 2017, there has been a flood of interesting new and distributed projects that we all hope come into fruition the next few years.

As a best practice, the team is constantly evaluating these solutions and we plan to integrate the ones that help DataBroker forward or provide some sort of network effect that enhances the current offering.

A non exhaustive list of these potential integrations are the governance tools of Aragon, IOTA and Acorn as a network operators, and direct integrations with traditional (Shapeshift) and distributed token exchanges like Omega One.

At the same time there are several competing standards for identity management are in development (e.g. uPort) but none of them have enough market share or adoption yet to make it feasible to use them.

The proof is in the pudding

The past few months the team has been hard at work to build the working platform. Leading up to the token sale we will open-source more and more of the code underlying the platform. Check out the beta version at <https://beta.databrokerdao.com>

The core features of the beta version of the platform are:

Wallet functionality

The screenshot shows the Databroker DAO beta version web interface. The interface is divided into a sidebar menu on the left and a main dashboard area. The sidebar menu includes links to Dashboard, streams, Datasets, My streams, Packages, Admin Stats, and Logout. The main dashboard area is titled "Dashboard" and contains several sections: "News" with three news items, "Balance" showing a balance of € 4893.74 and £ 21.7480, and "My purchased datastreams" which is a table with two rows of data. The table has columns for Name, Type, Frequency, and End Time. The first row is for a CO2 sensor on a bPost truck, and the second row is for a Temperature sensor in a container. Both rows have an "EXTEND ACCESS" button next to them. The interface also shows a sidebar with account information for Ethereum and Multichain.

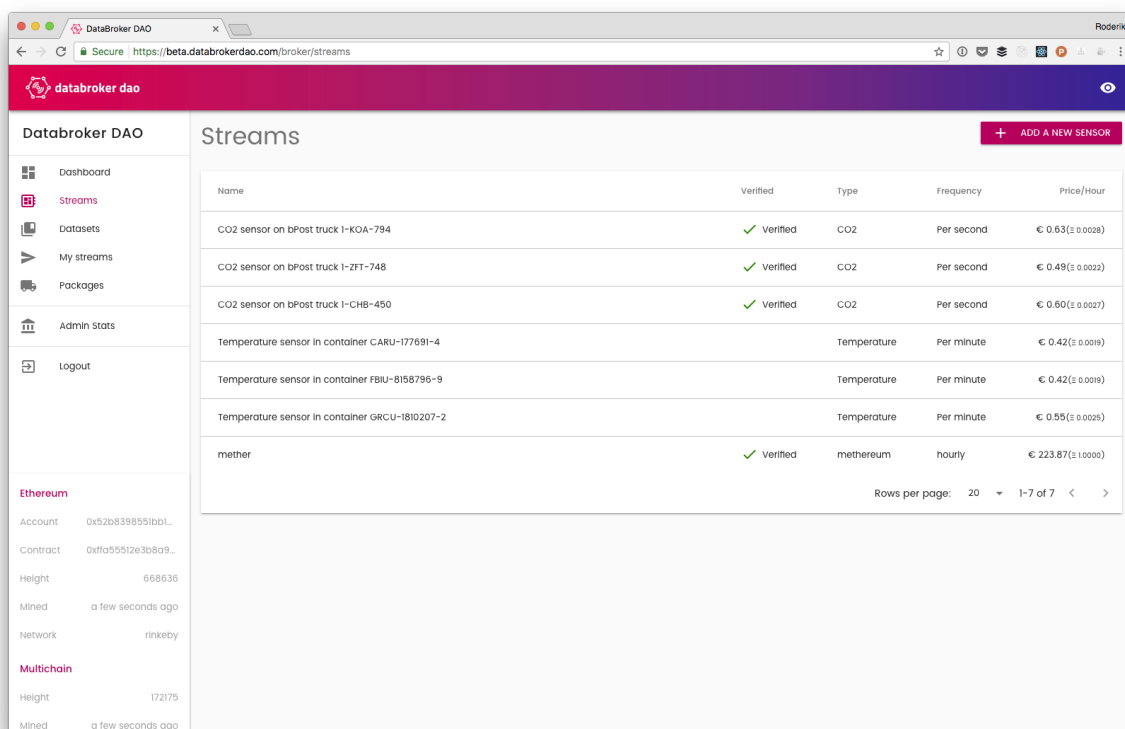
Name	Type	Frequency	End Time
CO2 sensor on bPost truck I-KOA-794	CO2	Per second	a month ago
Temperature sensor in container CARU-177691-4	Temperature	Per minute	a month ago

The platform will interact with normal Ethereum addresses and MultiSig contracts for its

core functionalities. Currently we do not integrate with any services, but for a public network deploy we would integrate with services like Shapeshift and exchanges to make the flow from fiat/crypto currencies to and from the DATA token as easy as possible.

The wallet views encourage people to keep their funds in DATA tokens if they expect to use them any time soon and not incur the transaction fees from converting. While this seems a non issue for experienced crypto traders, the target audience for the token are people and organisations that are currently embedded in a fiat world. Liquidity is a good thing, but value stored in the token itself is important as well.

Sensor data stream listings

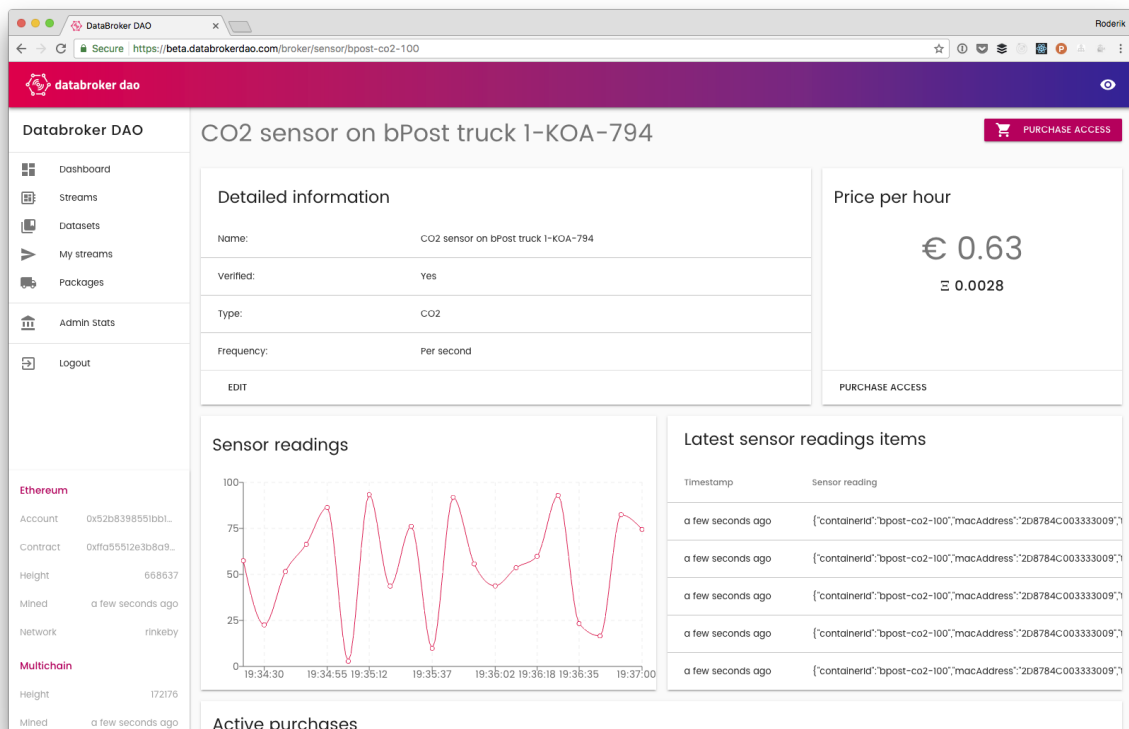


The screenshot shows the 'Streams' page of the Databroker DAO application. The page has a purple header with the 'databroker dao' logo and a navigation sidebar on the left. The main content area displays a table of sensor data streams. The table has columns for Name, Verified status, Type, Frequency, and Price/Hour. There are seven rows of data, including CO2 sensors on trucks, temperature sensors in containers, and a 'methether' stream. A '+ ADD A NEW SENSOR' button is located in the top right corner of the table area. Below the table, there is a 'Rows per page' dropdown set to 20 and a pagination indicator '1-7 of 7'.

Name	Verified	Type	Frequency	Price/Hour
CO2 sensor on bPost truck I-KOA-794	✓ Verified	CO2	Per second	€ 0.63 (± 0.0028)
CO2 sensor on bPost truck I-ZFT-748	✓ Verified	CO2	Per second	€ 0.49 (± 0.0022)
CO2 sensor on bPost truck I-CHB-450	✓ Verified	CO2	Per second	€ 0.60 (± 0.0027)
Temperature sensor in container CARU-177691-4		Temperature	Per minute	€ 0.42 (± 0.0019)
Temperature sensor in container FBIL-8158796-9		Temperature	Per minute	€ 0.42 (± 0.0019)
Temperature sensor in container GRCU-1810207-2		Temperature	Per minute	€ 0.55 (± 0.0025)
methether	✓ Verified	methether	hourly	€ 223.87 (± 1.0000)

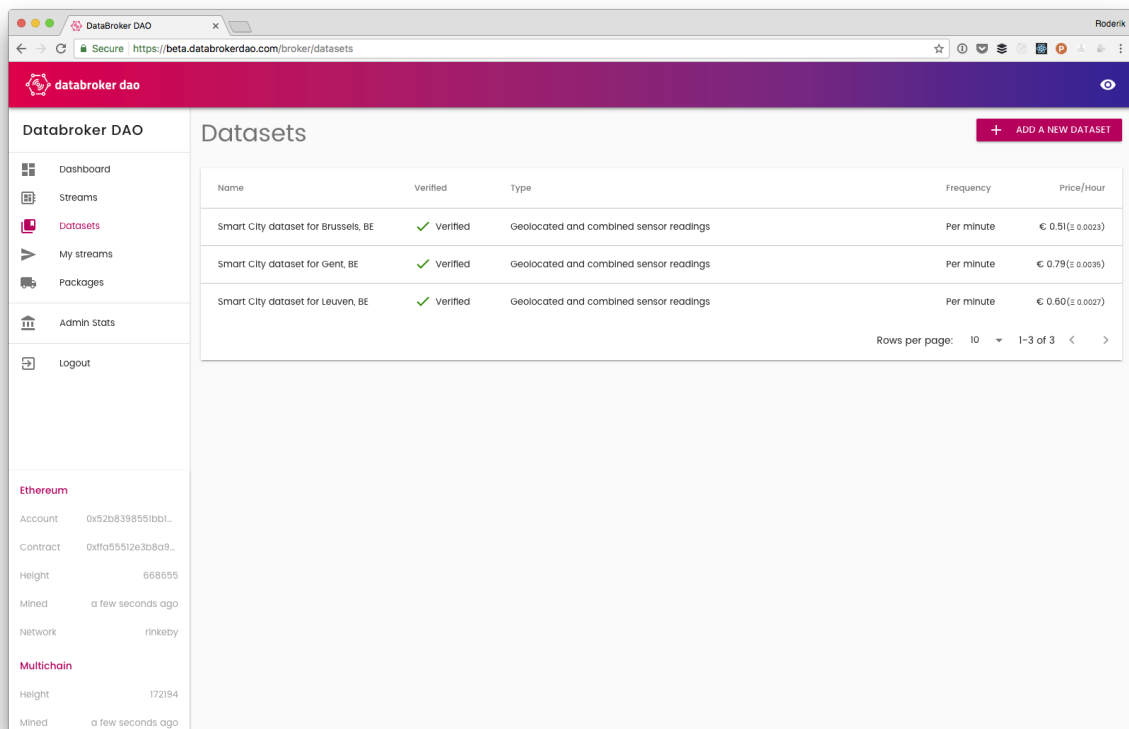
Sensors are being listed in the application for discovery of data. The current implementation is by design rudimentary and not built for billions of sensors. We were focussing on proving the platform and the implementation of discoverability, curation and reputation on a scale of billions of sensors is a monumental feat (e.g. the iOS app store). In the roadmap we have set aside time to build on this base and develop a solution at scale.

Sensor details



The main object in this ecosystem is the sensor itself. The detail pages give all information needed to determine if a sensor is what the buyer is looking for. Depending on the type of sensor these pages might be extended with cards containing geolocation information, reputation scoring, comments, similar sensors and more.

Dataset listings



The screenshot shows the Databroker DAO website interface. The header is purple with the 'databroker dao' logo on the left and a 'Roderik' user profile on the right. A navigation sidebar on the left contains links to Dashboard, Streams, Datasets (highlighted), My streams, Packages, Admin stats, and Logout. Below the sidebar, there are sections for 'Ethereum' and 'Multichain' with various account and contract details. The main content area is titled 'Datasets' and features a table with three rows of dataset listings. A '+ ADD A NEW DATASET' button is located in the top right corner of the table area. The table has columns for Name, Verified status, Type, Frequency, and Price/Hour. The bottom right of the table shows pagination controls: 'Rows per page: 10' and '1-3 of 3'.

Name	Verified	Type	Frequency	Price/Hour
Smart City dataset for Brussels, BE	✓ Verified	Geolocated and combined sensor readings	Per minute	€ 0.51 (± 0.0023)
Smart City dataset for Gent, BE	✓ Verified	Geolocated and combined sensor readings	Per minute	€ 0.79 (± 0.0036)
Smart City dataset for Leuven, BE	✓ Verified	Geolocated and combined sensor readings	Per minute	€ 0.60 (± 0.0027)

A lot of the added value in sensors only comes after analysing, aggregating and enhancing the data streams from sensors. The datasets in the platform function like a tertiary market where sensor buyers can do all kinds of smart things with the data, and resell them in easily consumed datasets.

Governance

The "DAO" in the DataBroker DAO name is not a marketing ploy. We believe that a platform at such a crucial crossroads between IoT and blockchain, with a global and wide variety of involved parties, will need a non-traditional governance model.

Though the community has learned a lot since initial DAO governance experiments, there is still a long way to go. Especially since a lot of the partners in this ecosystem are more enterprise minded at this time.

Since agility and flexibility are crucial in the early stages we decided that, since best practices and adoption of this model are still a moving target, Databroker DAO will be run

using a traditional company structure, until such a time we, in active collaboration with the community and industry, can determine a governance model that works for all parties involved.

The DATA token

The DATA token is a utility token in the Databroker DAO platform. The DATA token is a ERC20 compliant token with 18 decimals. The token will serve as the credits to buy and sell sensor data within the platform.

Why use a token?

Using a token over fiat or ETH allows us to use the divisibility that is needed to operate micro transactions in a market with over half a trillion individual devices that produce data in the range of every second.

Having this abstraction layer on top of ETH also prevents the token to be subject to the large fluctuations of the ETH price. The volatility of the DATA token will be more limited and can be controlled in a limited fashion with some market making using reserved funds and tokens.

The MiniMe token

Apart from the initial use in the platform, the token is based upon the MiniMe¹³ standard.

A MiniMe token is easy to clone. This means it allows us to create new tokens with an initial distribution identical to the original token at a specified block, either to upgrade the token contract, or to create spin of tokens for e.g. governance.

The token solidity code will be released on Github¹⁴ before the early token sale.

¹³ <https://github.com/Giveth/minime>

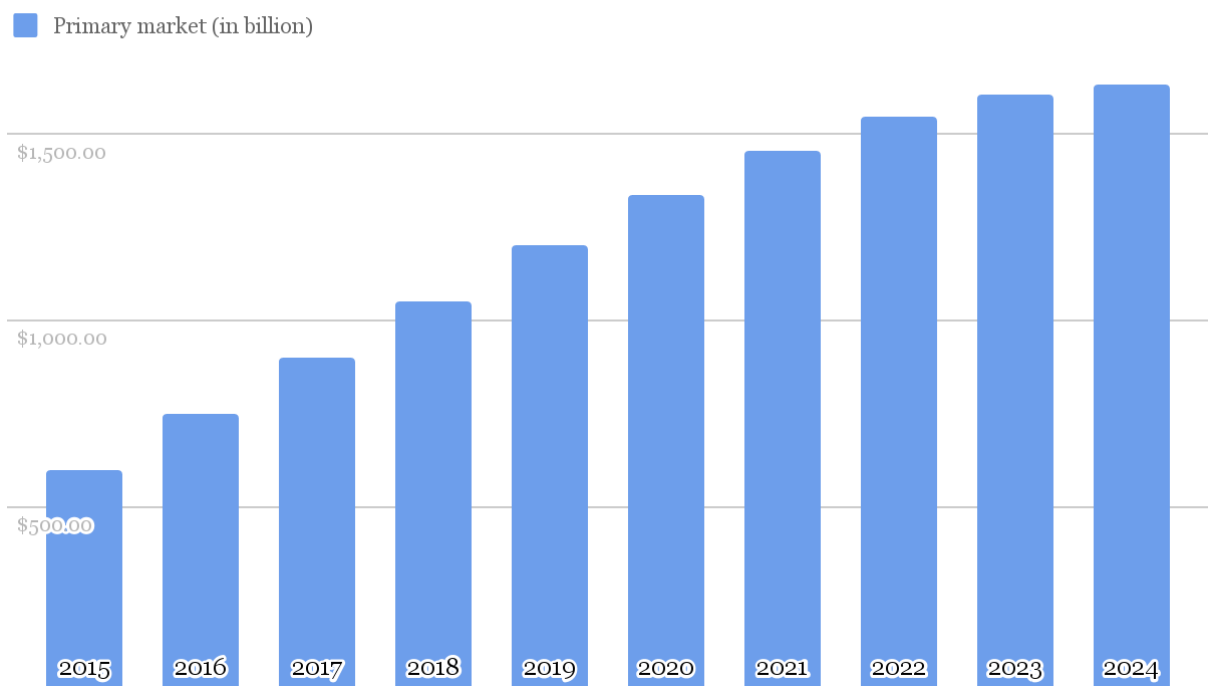
¹⁴ <https://github.com/DataBrokerDAO>

Size of the market

To determine the market potential and future worth of the token we need to look deeper at the potential market for IoT data.

The market size of the primary market for IoT sensors grew from a 600 billion euro in 2015, to a staggering 900 billion in 2017. The market is projected to reach 1.3 trillion in 2020¹⁵ and up to 1.6 trillion in 2024.

Money spent on sensor purchases

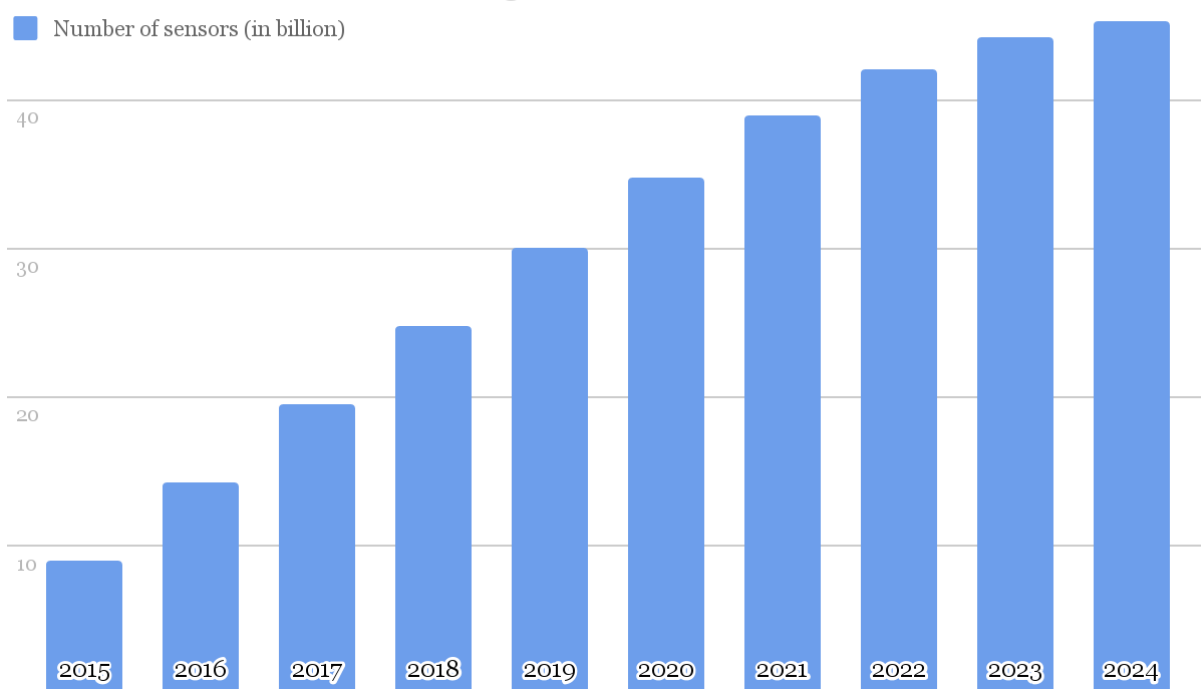


These numbers translate to 9 billion sensors in 2015, to 19 billion in 2017, 34 billion in 2020¹⁶ up to 45 billion in 2024. A staggering amount.

¹⁵ State of the Market: Internet of Things 2016, Verizon

¹⁶ State of the Market: Internet of Things 2016, Verizon

Amount of sensors transmitting data



An important distinction about DataBroker DAO's potential market size is that we are not looking for the size of the sensor market itself, but the market for the data they emit. Sensor owners purchase sensors for primary usage because they believe that what they can do with the data is more valuable than the cost of acquiring, deploying and maintaining the sensors.

The market for sensors does however provide a clear indication of the amount of data that is available for sale today and in the years to come. Estimating the market size for the data is then a function of estimating the demand for the available data.

We are cautious with our estimates of the potential market size for this data. In our economic models, we use the assumption that the value of the IoT data market is only 30% of the primary market value. This assumption translates into a market potential in 2017 of 270 billion USD, growing to 500 billion USD in 2024.

Again, to err on the side of caution, we factor in an adoption rate of DataBroker DAO by Sensor Owners of 0.5 percent in 2024. Half a percent of the 45 billion sensors in 2024 amounts to 225 million sensors connected to DataBroker DAO generating 2.5 billion USD in yearly transactions on the platform.

To put the 2.5 billion USD value into context, the Data Processing and Brokering market is estimated to generate 150 billion USD today in revenues¹⁷ and is expected to double in the next 4 years. DataBroker DAO will provide a new source of data supporting the further growth of this market with previously inaccessible and/or costly data.

We can draw a useful parallel comparison to the financial sector where publicly traded companies produce their annual statements for statutory reporting to regulators and shareholders (primary purpose). On the back of the pile of data generated, a whole host of companies, like Thomson-Reuters, FactSet and Interactive Data emerged to aggregate the data adding a layer of professional and consulting services on top. In doing so, they leverage the data produced for primary purposes (reporting to regulators and shareholders) to create an entirely new business and a host of value added services by leveraging the data.

Initial value of the DATA token

The goal is to have 1 DATA token covers the average value of the data from a sensor for one week. This allows us enough granularity (at 18 decimals) to work with micropayments, even after significant growth and price increases.

We determine the corresponding price per token by looking at the market predictions in the previous section for 2024. At that time we project to have 2.5 billion USD flowing through the platform for 225 million sensors.

$$\frac{2,500,000,000 \text{ USD/year}}{225,000,000 \text{ sensors/year}} = 11.11 \text{ USD/sensor/year}$$

The average sensor has a value of ~12 USD per year, ~1 USD per month, or 0,25 USD per week and as such the value of 1 DATA token should equate initially to this number.

¹⁷ Committee on commerce, science and transportation. (2013, December 18). *a review of the data broker industry: collection, use, and sale of consumer data for marketing purposes*.

We determine the maximum number of tokens issued to be 225 million, the amount of sensors on the platform in 2024.

Token sale

The token sale is split up in three phases. These phases include realistic targets to build and more importantly grow the platform over the next years.

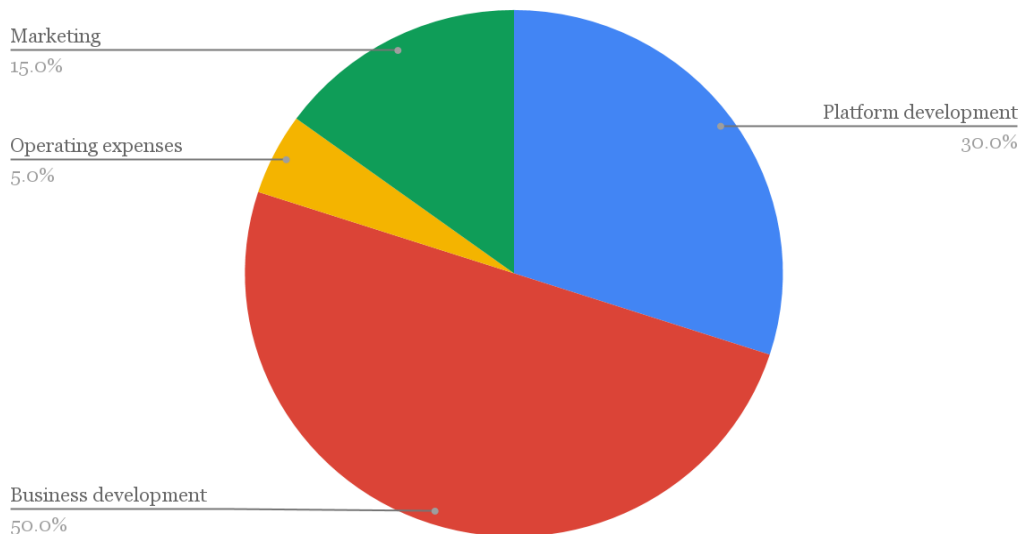
The baseline as described above is a platform with a functional beta version built, market tested across the globe the last few months and with significant interest from both suppliers and consumers of data.

Early token sale

The goal of this early token sale is to bring the platform up to v1.0 readiness, and more importantly onboard a sizeable group of both consumers and suppliers of data.

The proceeds of the early token sale will be spent on growing the team to 8-10 people ranging from business developers, community and development profiles. Additional spending will be allocated to operational costs like infrastructure, office space, marketing and legal expenses.

Planned usage



During this early token sale we will be offering 5% of the tokens (11.250.000) at a rate of 1200 tokens per ETH (a 20% bonus compared to the main sale). We will allow overfunding of this goal to a maximum 15% of the tokens, allowing Databroker DAO to grow faster in preparation of the main token sale.

The early token sale starts on September 18st, 2017 at 16:00 CET and will run for 4 weeks unless the 15% hard cap is reached.

Unsold tokens will be sold in the main token sale.

During the early token sale, a referral system is in effect. Contributions via a referral link will result in a bonus of 5% of the tokens sold via a referral link. These tokens are part of the platforms reserve and do not increase or affect the total amount of tokens, nor the maximum amount of tokens offered.

Main token sale

The next phase for the platform will be global expansion and additional service offerings. Most of the funds will go into the business development to onboard the estimated amounts of sensors, network operators and consumers.

During the main token sale we will be offering a maximum of 60% of the tokens (minus the overfunded token percentage sold in the early token sale) at a rate of 1.000 tokens per ETH. Again the referral system will be in effect.

While the timeframe is flexible, we estimate to move into this phase some 6 to 8 months after the early token sale closes. During this period we will watch the token sale space closely to finetune the main token sale to the latest best practices. On technical, regulatory and organisational aspects.

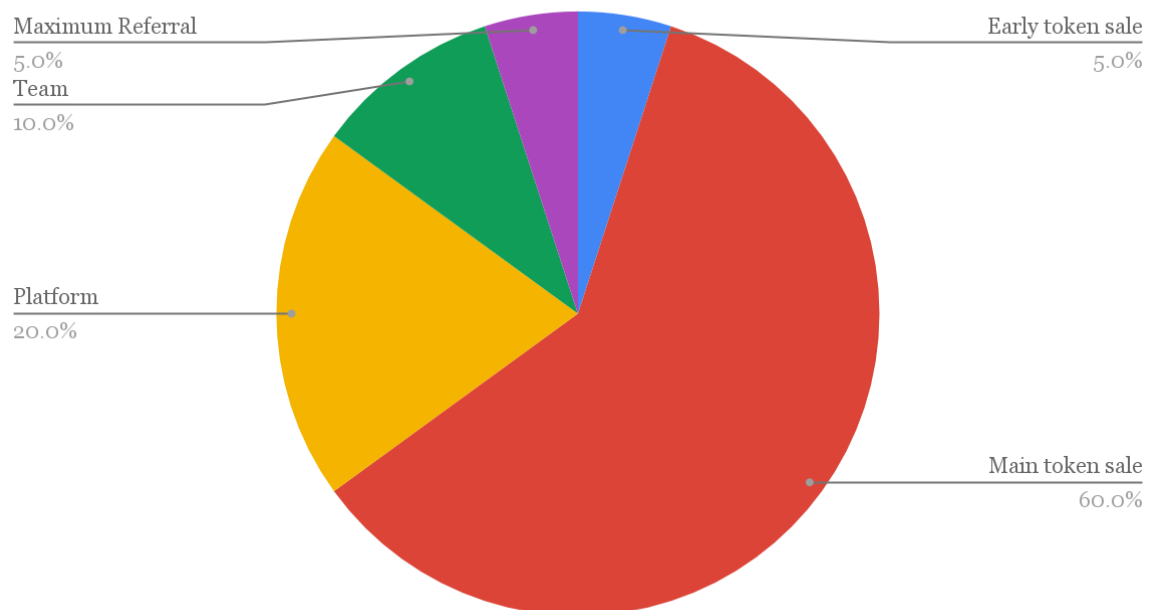
Reserved tokens and ETH

The platform will retain 25% of all tokens, minus all tokens needed for the referral scheme, plus all unsold tokens.

The purpose of these tokens is twofold. On the one hand, a reserve of tokens allows for follow-up sales to accelerate growth and allows the platform to do some limited market making. Crucial since the liquidity of a utility token is paramount in the functioning of the platform. At the same time, some of the raised ETH will also be kept in reserve for these market making purposes.

An additional 10 percent of the tokens are reserved for the team fund. The majority of the team fund will be distributed to team members joining the platform and will be vested in stages over 3 years, and the unvested tokens return to the fund in case the team member leaves the team. The rest is distributed to current team members and advisors.

Token distribution at maximum referral levels



ETH price fluctuations.

All numbers in this white paper will be recalculated with a market value of ETH before the start of each sale period.

ETH raised is hedged over a basket of other crypto, fiat currencies and traditional low-risk financial instruments to minimise the effect of price fluctuations. This hedging might occur even during the sale events.

The team

Some history

The DataBroker DAO was conceptualised at SettleMint in late 2016. The dynamics of the market and the opportunities it brings immediately sparked the development of the first proof of concepts.

After the first beta was completed in February, it has been on the road to tradeshow, pitch competitions and blockchain challenges across the world to test its market viability. We have demoed the platform in London, Dublin, Berlin, Singapore, Dubai, Jeddah, Salt Lake City, New York, Paris and Tokyo. The result was astounding, people love the idea and the product, and interest from manufacturers and network operators has been encouraging.

In June, the decision was made that the project itself has too much potential to not run with a dedicated team and that a token sale was better suited to the project than traditional VC rounds.

About SettleMint

SettleMint is a Belgian based startup focussed on creating tools to make building blockchain applications easy by any IT team.

All the work and R&D is encapsulated in a distributed middleware called Mint which consists of 4 SDK. Notary, which deals with anything related to recording information on blockchain, but also IPFS and swarm. Provenance for supply chain tracking. Ballot box for voting and last but not least Marketplaces for functionality ranging from tokens to exchanges of digitally traded products. All the while supporting a wide range of public and

private blockchain solutions like Ethereum, Bitcoin, Multichain, BigchainDB and the Hyperledger projects.

Mint is used in the DataBroker DAO. The marketplaces SDK and smart contract templates are used for the marketplace part of the project, while the Notary SDK is used in the archiving and sharing of the data part of the project. A yearly licence fee will be paid out of the revenue of the platform as compensation.

Teammembers



Matthew Van Niekerk

Born and raised in Canada, Matthew moved to Japan after completing his economics degree. In Japan he founded and subsequently exited two companies. Moving on to get an MBA in Belgium, he joined a large financial institution, performing a variety of roles ranging from COO of the consumer finance business line to head of platform innovation for the brokerage and crowdfunding platform. In 2016, he left the bank and co-founded SettleMint.



Roderik van der Veer

Roderik has always been fascinated by technology. He got engaged in web in 1999, worked in the IT development sector and as CTO grew a traditional marketing agency into a digital powerhouse. He exited this business to focus on blockchain technologies when he co-founded SettleMint in 2016.



Els Meyvaert

As the only born and raised Belgian and after getting a degree in communication, Els worked as account manager in various financial institutions until she moved back to her first love, communication. As account director, she handled communication for the largest FMCG group in Belgium before joining SettleMint.



Dylan Damsma

The most recent addition to the team has built up extensive experience in digital marketing and growth marketing working as Marketing technologist at Mindvalley, Customer Success Manager at AutopilotHQ and besides that launching a successful crypto community named "Cryptominded".

Advisors



Jonathan Johnson
President, Medici
Ventures, Inc.



Richard Kastelein
Blockchain News,
Cryptoassets Design
Group



Lawrence Pluym
Investment Banker &
Crypto trader



Julien Marlair
Business
Development and
Innovation manager
at Proximus

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