Blueprint – Data Marketplace

Version 1.0 - Feb. 25th, 2019 - Alexey Sobolev

Introduction

The IOTA Foundation (IF) is a non-profit organization supporting the development and adoption of the IOTA Tangle, a permissionless Distributed Ledger Technology (DLT), particularly suitable for creating trusted information and value sharing across multi-stakeholder ecosystems. IOTA technology is open source. IF's agile approach to solutions creation leverages on identifying industry problems with real stakeholders, building PoCs and collaboratively testing and validating or refining assumptions.

A blueprint is a document that explains how IOTA technology is used to solve real problems and to support well defined business needs. It provides guidelines for other to replicate and deploy the developed solution into similar system and to test different business models.

A blueprint is generally easy to read and understand, but nevertheless, it provides enough clarity on how easy it would be to integrate the described solution into other systems. At the same time, it contains links to more technical resources available to developers.

This blueprint describes the implementation of the Data Marketplace project,, it is organized as follows:

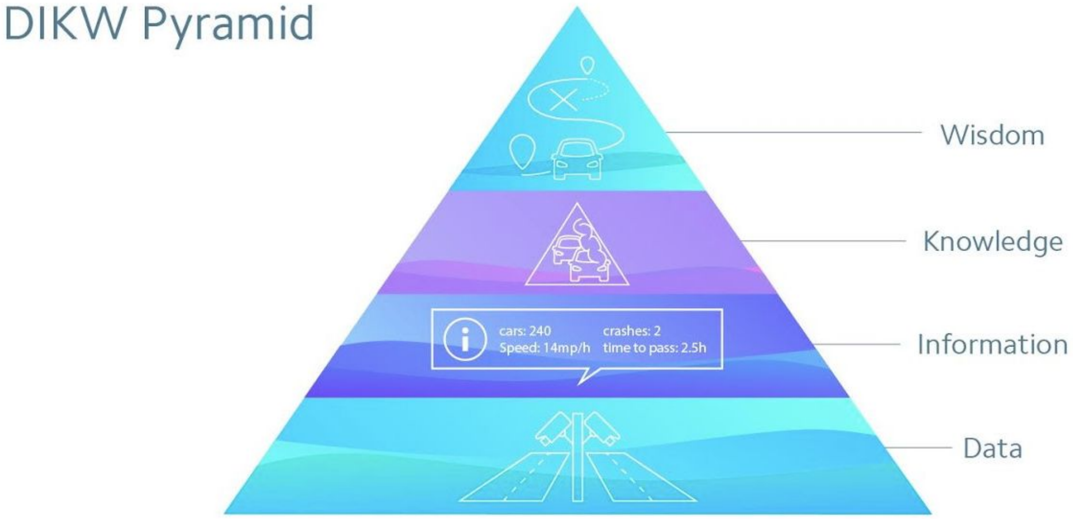
- We first describe the problem worth solving, underpinning the technical as well as business challenges associated with it and the benefits derived from developing a novel solution.
- We then present a technical architecture showing how a PoC leveraging IOTA Tangle and other IOTA technologies can be built and integrated with existing systems.
- We finally describe source code showing implementation patterns used and replicable for the integration of IOTA in a similar context. We also provide links to accessible resources useful to simplify deployment of the project.

Use case

The Data Marketplace is IOTA's most comprehensive pilot study thus far. The goal is to enable a truly decentralized data marketplace to open up the data silos that currently keep data limited to the control of a few entities. Data is one of the most imperative ingredients in the machine economy and the connected world.

Data first

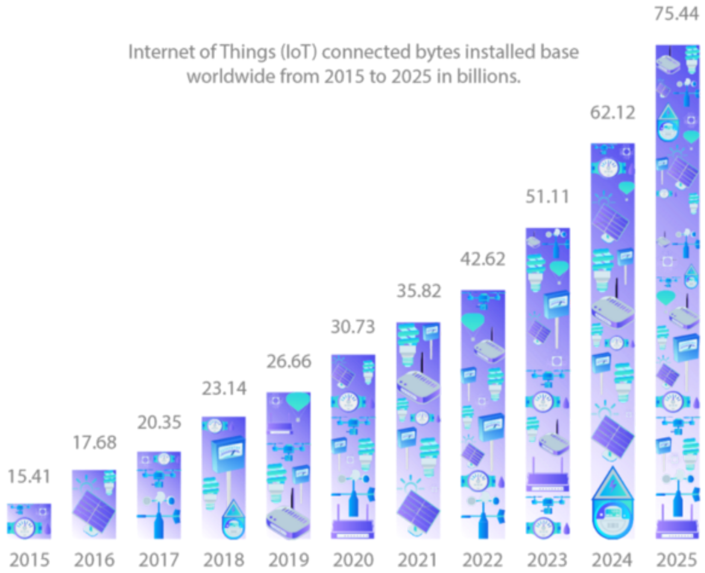
Data is one of the most fundamental ingredients in the machine economy and the connected world. It is the foundation upon which the other strata of the **D**ata—**I**nformation—**K**nowledge—**W**isdom (**DIKW**) Pyramid are dependent. Without this primary substrate, nothing can be established about the world. A datum (plural: data) is the raw value of a qualitative or quantitative variable; a pure unfiltered input from reality. Data sets that are structured and thus have had meaning extracted from them constitute what we consider to be information. Information tells us something concrete and coherent about the world through context. Contextualized information thus makes up what we know as knowledge, which in turn gives rise to our (and our machines') ability to make wise decisions. Wisdom is knowledge applied.



The illustration above shows how the different echelons of this hierarchy are intertwined. The sensors, here cameras, monitoring the road are receiving signals from the photons reflecting off the surface of their environment. This is **data**. The measured speed of the moving objects and their relative positions is the meaningful **information** extracted from these datum inputs. This information is next contextualized and distilled into **knowledge**, telling the drivers on the road via Over-The-Air updates that the road may be congested due to a crash, which allows drivers to apply the **wisdom** to take an alternative route.

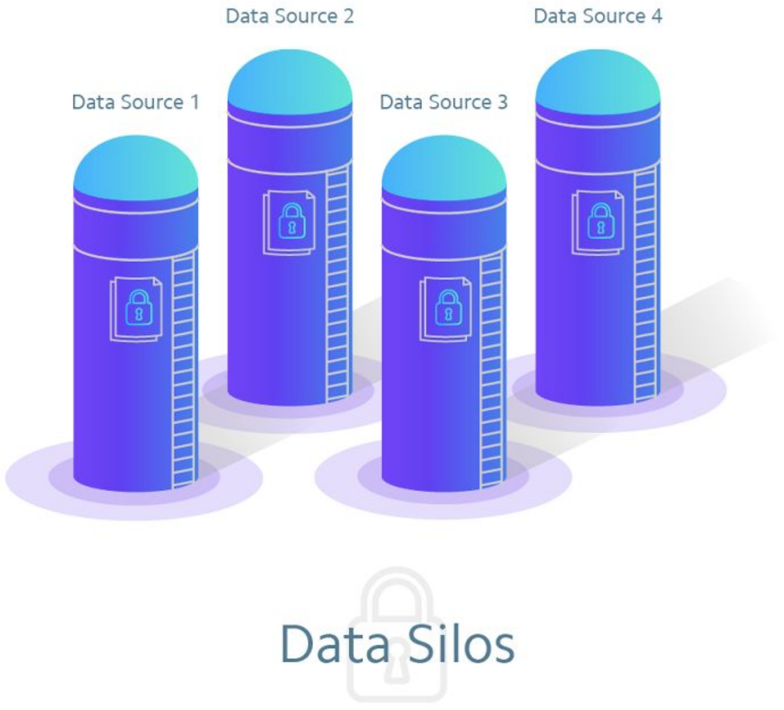
Machine Economy

Over the next next decade, there will be more than 75 billion connected devices that interact in different manners. This will give rise to a 'Machine Economy' where devices will trade everything from storage, computation/analytics to electricity and sensor data. The data trade in this pilot project will highlight and explore the potential of these developments. With the prospect of tens of billions of devices generating data, we will see a proliferation of data that is unmatched in history.



Data wants to be free, but not for free.

The largest obstacle preventing the fulfillment of the grandeur envisaged by 'Big Data' is the fact that the overwhelming majority of data remains locked in what is called 'Data Silos'.



Data silos do not, or at best very rarely, share its data outside its own closed environment. This leads to enormous quantities of wasted data, often over 99% is lost to the void, (source: McKinsey 2015) that could potentially contain extremely valuable information if allowed to flow freely in data streams that create an **open and decentralized** data lake that is accessible to any compensating party.

There are several reasons for the cumbersome and wasteful status quo. On the one hand, data wants to be free in the sense that its storage and transmission costs less and less over time; on the other hand, large quantities of data are extremely valuable and are not free to generate. These diametrically opposed conditions cause a gridlock that needs to be broken in order for Big Data to become truly big. A major cause of this is the fact that, while data sharing is becoming cheaper from a technological perspective, it is prohibitively expensive to sell fine, granular data in real-time due to intermediary fees—not to mention all the red tape one has to cut through in order to complete a single data purchase. These conditions make real-time data trade all but impossible. By 2025 it is projected that around 95% of all data will be generated by IoT devices in real-time (source: IDC 2017), so this is a pressing issue.

A third obstacle is the lack of ensured authenticity and audit trails of data. Before adoption of Distributed Ledger Technologies, data transmission protocols and databases were susceptible to various attacks, including ‘man in the middle’ attacks and data tampering. Data is only as valuable as it is valid. In short, if the data input is garbage, the output will also be garbage (GIGO).

This is why the IOTA protocol becomes necessary to unlock data’s gigantic potential.

IOTA Data Marketplace

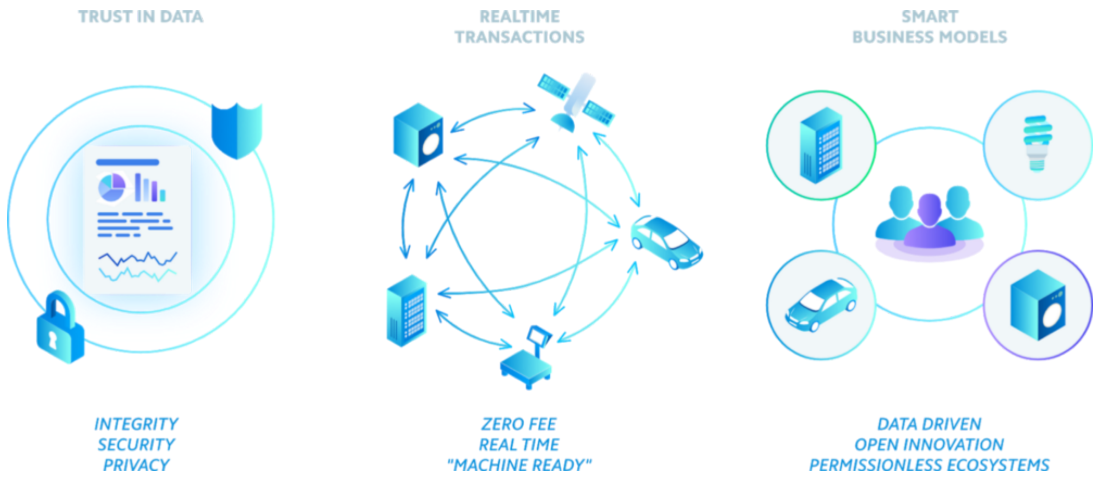
The IOTA Foundation launched the Data Marketplace (https://data.iota.org) as a Proof of Concept (PoC) and open innovation ecosystem.

As a not-for-profit organisation, the IOTA Foundation has developed this project to produce an open source technology and empower other organisations to shape their own IOTA-enabled data marketplaces, with associated products and services. IOTA's Data Marketplace PoC is not a launchpad for a future commercial service by the IOTA Foundation.

The growth of data marketplaces is an inevitable result of the IoT (Internet of Things) revolution. As physical assets such as ships, factories, vehicles, farms or buildings become digital, their digital twins will gradually act as secure data exchanges. As data streams surge across silos and carry value across organisations, traditional value chains will transition into a web of value. This paradigm will be more complex to administer, forcing business to rethink their competitive play as part of these ecosystems. Data marketplaces will emerge as a means to exchange data, monetise data streams and provide the basis of new “smart” business models. We refer to this new wave of value creation, for the Internet of Everything, as the “Economy of Things”.

Objectives of the initiative

To realise the potential of data marketplaces, several key challenges had to be addressed.



IOTA and its Data Marketplace initiative help to address these challenges with an initial Proof of Concept and a growing open innovation ecosystem. We invite all participants to help shape the IOTA technology as a common standard that works for all, and co-create new business models for the “Economy of Things”.

The initiative’s objective was to:

1. **Produce an open source Proof of Concept**
2. **Explore business model innovation**
3. **Grow a co-creation ecosystem to foster permissionless innovation**

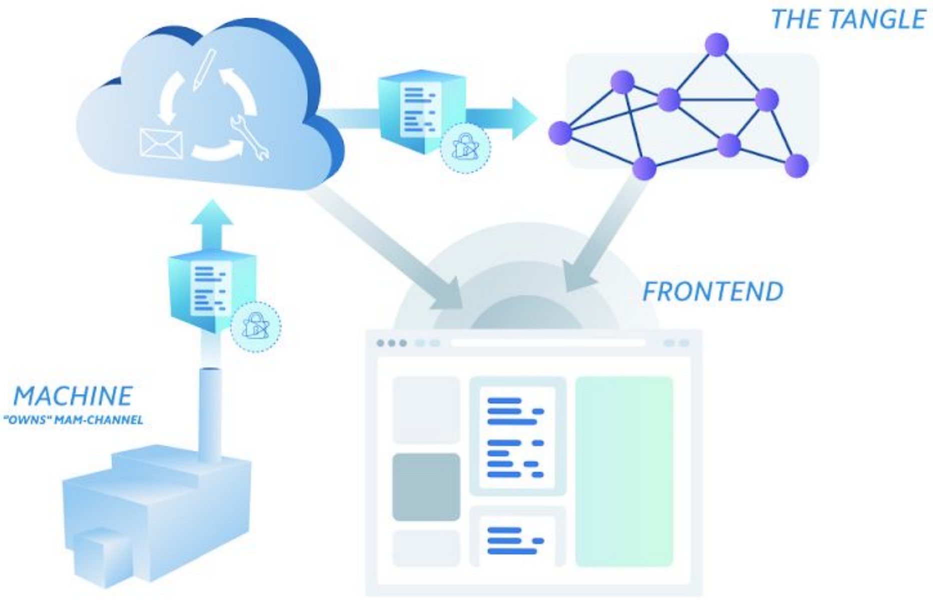
Like its technology, the IOTA Foundation’s approach to enabling innovation is open and permissionless. Our ambition is to enable the ecosystem to co-create and develop new IoT / M2M solutions and business models, but not to drive and push specific solutions to market.

The Data Marketplace is designed to enable an agile, experiment-driven and collective approach to innovation for its participants, but also for the IOTA Foundation itself. This initiative challenges the IOTA technology with the requirements of real life deployments and the demand of the Data Marketplace participants. We aim to adapt our technology to meet these demands.

Architecture

Running an open source project, like any human endeavor, involves uncertainty and trade-offs. We hope the architecture described below helps you to deploy similar systems, but it may include mistakes, and can't address every situation. If you have any questions about your project, we encourage you to do your own research, seek out experts, and discuss with IOTA community.

The architecture of our PoC (shown in Figure below) follows a pattern very similar to the one observed in real systems, where the sensor or any other device, cloud backend and distributed ledger (DLT) are interconnected.



Data Marketplace - Architecture Diagram

IOTA technologies are employed as both the communication mechanism between entities which stores the data on the Tangle.

The implementation of the Data Marketplace and sensor data submission functionalities are intended to be very lightweight, capable of running on embedded devices. They will only need to perform Tangle operations (e.g., producing and consuming MAM channels) and communicate with Web APIs. A limited amounts of storage is also assumed. The data consuming part is slightly more complex and needs the ability to transfer IOTA tokens for purchased data streams. Therefore access rights management add-on was implemented.

In the table you will find a list of all main components of the application

User authentication	OAuth with Google account, other types of authentication, like email/password can be enabled. Provides a unique API token and userID that are used for API communication and user identification.
Database	NoSQL cloud database, provides a permanent storage mechanism.
Cloud functions	Cloud functions (Lambda functions in AWS), that are triggered by an event or API call. Perform IOTA Tangle-related operations such as walled funding, token transfer for device stream purchase. Also perform Database-related operations such as creating used or device, managing device stream purchases.
Hosting	Cloud hosting for the Web portal.
Error logging	Provides access to error logs including request and response details to simplify issue investigations.
Web Portal	A web UI that allows easy device management and data stream fetching.
API	Set of APIs to perform all main functionality from a script or console.
Data submission template	Small NodeJS project with pre-filled device ID and API interface to Cloud backend. Provides examples for sensor data submission using different techniques.

The cloud backend part of the application is centralized. It runs on Google Cloud Platform, and can optionally run on Amazon AWS or Microsoft Azure.

The centralized cloud backend consists of the following components:
- User authentication (OAuth with Google account)
- User management
- Access rights management
- Device management (create/read/delete)
- Wallet management (wallet funding, tokens transfer)
- Device stream purchase tracking
- Error tracking and reporting

Wallet funding and token transfer operations are set as completed only after the confirmation from the node is received that the transaction was attached to the Tangle.

Cloud functions can be configured to change default values for:

- `depth` and `minWeightMagnitude`, that are typically different for IOTA devnet and mainnet nodes
- Whitelist page, where administrator users with predefined email addresses are allowed to administer devices

Sensors & Data

The Data Marketplace is agnostic to the sensors and the data that you connect to it. Any sensor that has the ability to transmit data and has an easy way to get regular data readings (e.g. through an API) can be used for the data marketplace. In order to submit the data to the marketplace, all you have to do is execute a script to submit data to the IOTA Tangle, which is the data structure behind IOTA.

Example Sensors to utilize

- Netatmo Weather Station
- Bosch XDK
- Samsung Artik
- Nordic Semiconductor Thingy:52
- Or simply a Raspberry Pi’s, with a sensor kit

Data Fields

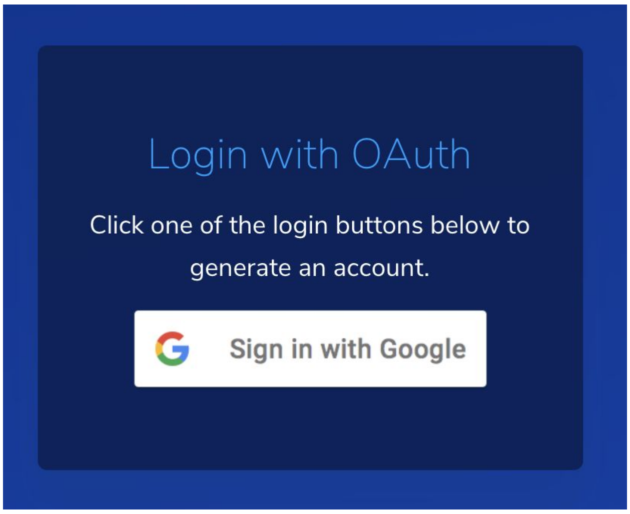
For each of your sensors, you have to define the correct data fields which will then be stored on the Tangle, and displayed on the Data Marketplace web portal to the purchaser. In general, just be descriptive with the data you want to store and sell.

Workflows

Devices management

Login

Proceed to the Dashboard page to login. Here you will see a Google OAuth login screen. Click the "Sign in with Google" button and a prompt should appear.

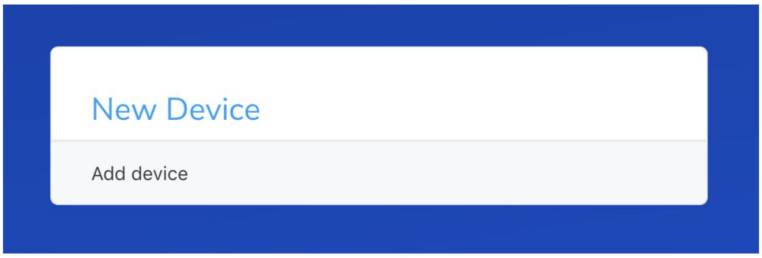


Login with OAuth

Click one of the login buttons below to generate an account.

Create new device

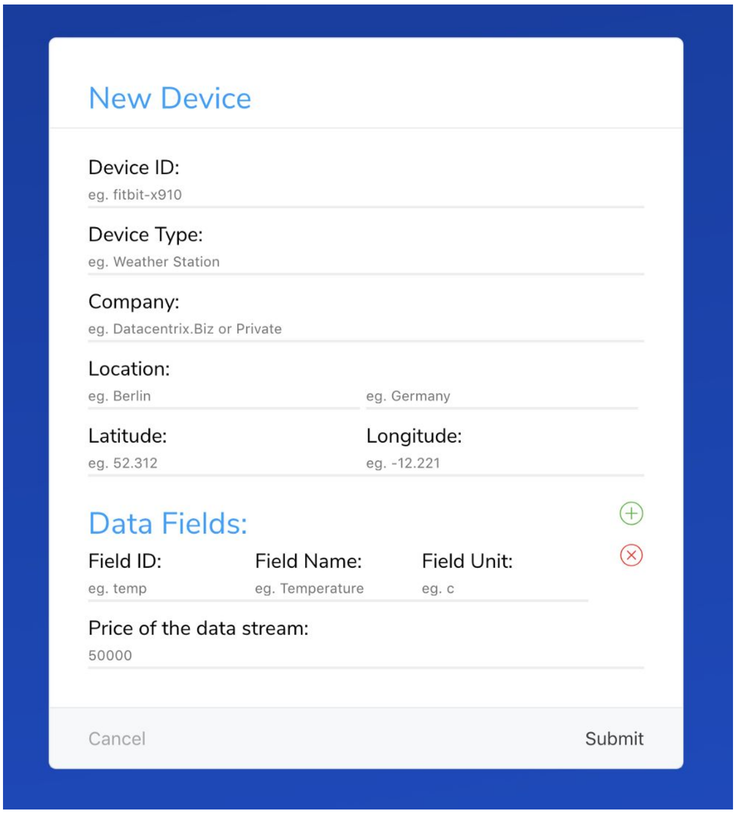
Proceed to the Dashboard page to create new device.
Once logged in you will see an option to create a new device.



New Device

You can create up to 5 devices per account with the default settings. This number can be adjusted upon request.

Enter some basic information about your device. Make sure you fill out the fields relating to the data streams you would like to collect.



New Device

Device ID:
eg. fitbit-x910

Device Type:
eg. Weather Station

Company:
eg. Datacentrix.Biz or Private

Location:
eg. Berlin eg. Germany

Latitude: eg. 52.312
Longitude: eg. -12.221

Data Fields:

Field ID: eg. temp
Field Name: eg. Temperature
Field Unit: eg. c

Price of the data stream:
50000

For each new device, we ask you to provide the following information:

- **Device ID**: This ID should be unique among all existing sensors and will serve as access key when purchasing a data stream. Please note that the ID must begin with a letter ([a-z]) and may be followed by any number of letters, digits ([0–9]), hyphens ("-"), and underscores ("_"). Max allowed length is set to 40 characters.
- **Device Type**: Plain text type description, that helps other Data Marketplace participants identify potential usage of the sensors' data stream. Typical examples: "weather station", "tracking device", "charging station".
- **Company**: Provide the name of the company that owns and maintains the sensor. This information creates more trust between sensor owners and Data Marketplace users who are interested in purchasing the data stream.
- **Location (city / country)**: This information helps to identify if the sensor data is relevant for purchasing. For example, some users might be interested in purchasing data streams from weather or environmental sensors located in a specific region.
- **GPS Coordinates (latitude / longitude)**: You can use a service like https://www.gps-coordinates.net/ to get the right GPS data for your sensor. We accept coordinates as a number of digits ([0–9]), that could be prepended by a hyphen ("-") for negative value, and a decimal separator ("."). Please do not enter any letters or special characters.
- **Price of the data stream**: Here you can define the cost of the sensor data. We do not restrict you with defining the value, but please keep in mind that without a preview and refund options, only a few customers will be ready to

pay a fortune for a data stream. On the other hand, setting a very low price might result in a total collected payment under 1/1000 of a cent.

We encourage you to check the current price of 1 MIOTA, which is 1000000 (one million) IOTA tokens.

We suggest that you set the price within the range of 1000 to 50000 IOTA tokens, depending on the cost and maintenance efforts of the sensor.

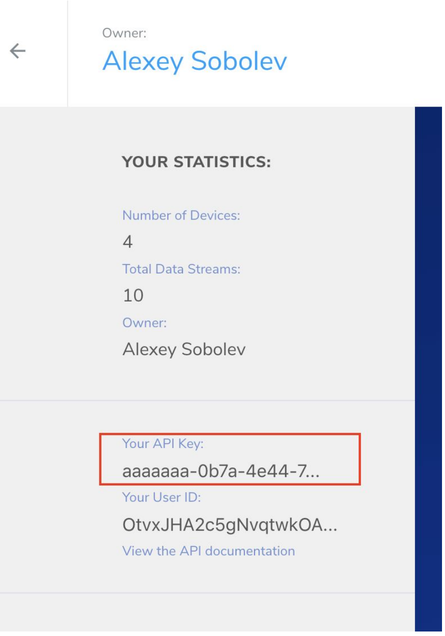
- **Data Fields**: The most essential part of the sensor configuration. Please provide information for every parameter that will be captured by the sensor and stored on the Tangle. You can add or remove fields by pressing the (+) and (x) buttons on the right.

Parameter information consist of 3 fields:

- **Field ID**: This ID should be unique among all other parameters for the specific sensor. Please note that the ID must begin with a letter ([a-z]) and may be followed by any number of letters, digits ([0–9]), hyphens (“-”), and underscores (“_”). Max allowed length is set to 40 characters.
- **Field Name**: Plain text parameter description that indicates the purpose of the field. Max allowed length is set to 40 characters.
- **Field Unit:** Physical quantities and units abbreviation, primarily in the International System of Units (SI). It can also be a unit of environmental measurements, like humidity, air quality, precipitation, wind speed or direction. Please keep the length of this field within 20 characters.

Alternatively you can use the API.

You will need your API key, which you can find on the Dashboard page. Click on it to copy.



Owner:
Alexey Sobolev

YOUR STATISTICS:

Number of Devices:
4

Total Data Streams:
10

Owner:
Alexey Sobolev

Your API Key:
aaaaaaa-0b7a-4e44-7...

Your User ID:
OtvxJHA2c5gNvqtwkOA...

Endpoint
https://api.marketplace.tangle.works/newDevice

POST

Request

```
{
   "apiKey": "aaaaaaa-0b7a-4e44-7777-ef661777b9d2",  /* text */
   "id": "star-wars-vehicles",                       /* text */
   "device": {                                      /* JSON object */
      owner: 'R7zlZYlhSGKDJ5KKZrw6sJ4CQvG2',
      sensorId: 'star-wars',
      type: 'Star Wars Vehicle',
      company: 'Galactic Empire Inc.',
      price: 100,
      date: '14 February, 2019 11:16 am',
      timestamp: 1550053001462,
      inactive: true,
      dataTypes: [
        { id: 'name', name: 'Vehicle Name', unit: 'name' },
        { id: 'model', name: 'Vehicle Model', unit: 'model' },
        { id: 'class', name: 'Vehicle Class', unit: 'class' },
        { id: 'manufacturer', name: 'Manufacturer', unit: 'manufacturer' }
      ],
      location:{
        city: 'Theed',
        country: 'Naboo'
      },
      lat: 40,
      lon: 20
   }
}
```

Response

```
{
   "success": true                    /* true or false */
}
```

or

```
{
   "error": error message
}
```

Get user devices

Proceed to the Dashboard page to get list of created devices.
Once logged in, the list of created devices is automatically retrieved.

You can have up to 5 devices per account with the default settings. This number can be adjusted upon request.

Alternatively you can use the API

Endpoint
https://api.marketplace.tangle.works/devices

GET

Request

```
https://api.marketplace.tangle.works/devices?userId=xlXMajjxTleDwIEG9SHddlCM
02&apiKey=1111-gfgfdfg-46467-dsbhsjs-jgu
```

Response

```
[                                             /* array of JSON objects */
   {
      "lon":20,
      "location":{
         "city":"Theed",
         "country":"Naboo"
      },
      "company":"Galactic Empire Inc.",
      "type":"Star Wars Vehicle",
      "date":"13 February, 2019 11:16 am ",
      "price":100,
      "lat":40,
      "sensorId":"star-wars-vehicles",
      "address":"YTGYEHBMEYPLIROTWBTLVZPOLJLXDLKSHNF9RXUPBGHSBCMXFGXNUKIWW",
      "inactive":true,
      "owner":"76D1ppAqXNOYPDCsEm9tAj5rPhG3",
      "dataTypes":[
         {
            "id":"name",
            "unit":"name",
            "name":"Vehicle Name"
         },
         {
            "name":"Vehicle Model",
            "id":"model",
            "unit":"model"
         },
         {
            "name":"Vehicle Class",
            "id":"class",
            "unit":"class"
         },
         {
            "id":"manufacturer",
            "unit":"manufacturer",
            "name":"Vehicle Manufacturer"
         }
      ],
      "sk":"IHOHDLGKDLSJJXA"
   },
   { ... }
]
```

Remove device

Proceed to the Dashboard page to remove a device.
You can remove a device by pressing the (X) button in the top right corner of the device card. Please be aware that the wallet seed associated with the device is also removed. That means that you can no longer withdraw funds that were transferred to the seed.

Alternatively you can use the API

Endpoint
https://api.marketplace.tangle.works/delete

DELETE

Request

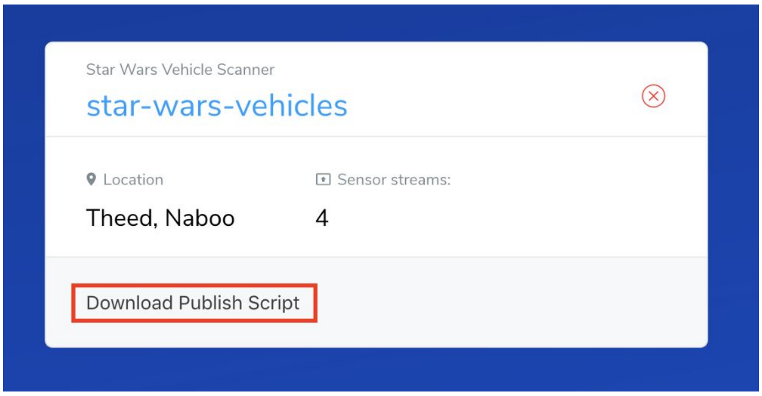
```
{
    "apiKey": "aaaaaaa-0b7a-4e44-7777-ef661777b9d2",  /* text */
    "deviceId": "star-wars-vehicles"                  /* text */
}
```

Response

```
{
   "success": true                          /* true or false */
}
```

Publish data to the Tangle

You can publish sensor data to the device MAM stream.
Each device card contains a link “**Download Publish Script**” at the bottom of the card. This link generates a series of files that contains all necessary configuration for a selected device and provides you with a usage examples and documentation on how to store data in the Tangle.

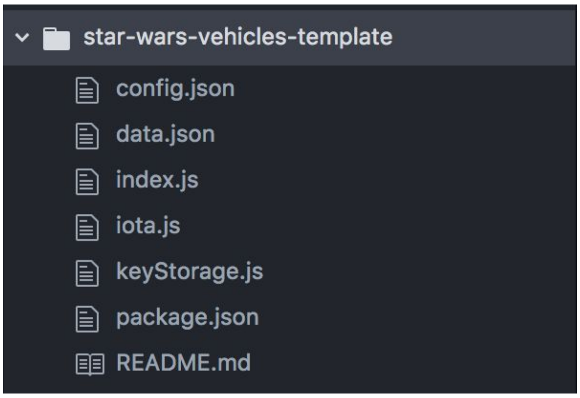


Click the “**Download Publish Script**” link. This will initiate the download of a preconfigured **.zip** archive.

Once you download and extract the content of the archive, please open an IDE of your choice to start working with the script.

The archive structure is fairly simple, and contains a number of **.js** and **.json** files, along with the project documentation (**README.md**).

Please always read the **README.md** before you start using the script.

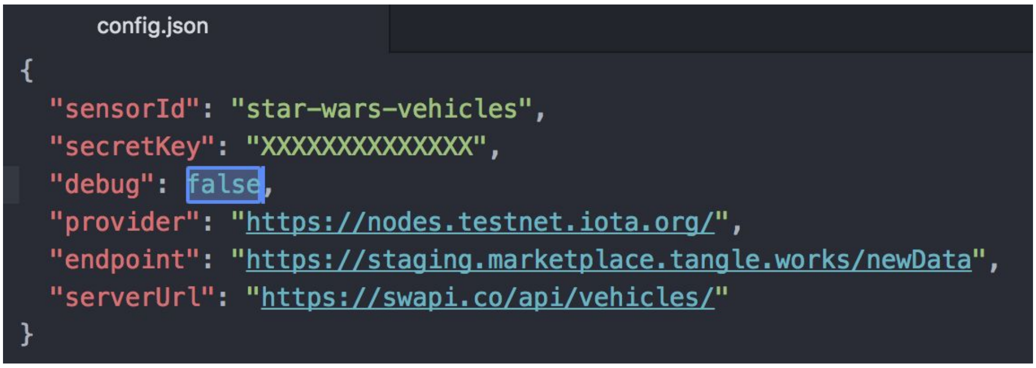


Install **Node.js** (if not done already).
Install a package manager (if not done already). We suggest to use Yarn or NPM.
Install packages by running `yarn` or `npm install`, depending on your package manager.

The script is pre-configured to publish data for the selected sensor. You'll find the sensor ID and it's secret key in the **config.json** file.

If you decide to use the same script for multiple sensors, please note that the secret key should be changed as well. Otherwise you won't be able to decrypt your published data.

By default the script runs in **debug mode**, which means that no data is published. All captured data is printed out in the console, so you can verify and adjust it. Once the payload looks good, you can disable **debug mode** by setting the **debug** variable to **false** in the **config.json** file (see screenshot below), and let data be published.



```
{
  "sensorId": "star-wars-vehicles",
  "secretKey": "XXXXXXXXXXXXXX",
  "debug": false,
  "provider": "https://nodes.testnet.iota.org/",
  "endpoint": "https://staging.marketplace.tangle.works/newData",
  "serverUrl": "https://swapi.co/api/vehicles/"
}
```

Please note that the [Proof-of-Work](#) operation is conducted for every data package, which might take up to 60 seconds depending on your hardware. Please take this into account and do not interrupt the script while running this operation.

See the [blog post](#) to learn more about publishing sensor data to IOTA Tangle.

Data consumption

Get all devices

You can retrieve a list of all available devices. Proceed to the [Demo](#) page to see the devices displayed on the map and also as pageable list.

Alternatively you can use the API

Endpoint
https://api.marketplace.tangle.works/devices

GET

Request

```
https://api.marketplace.tangle.works/devices
```

Response

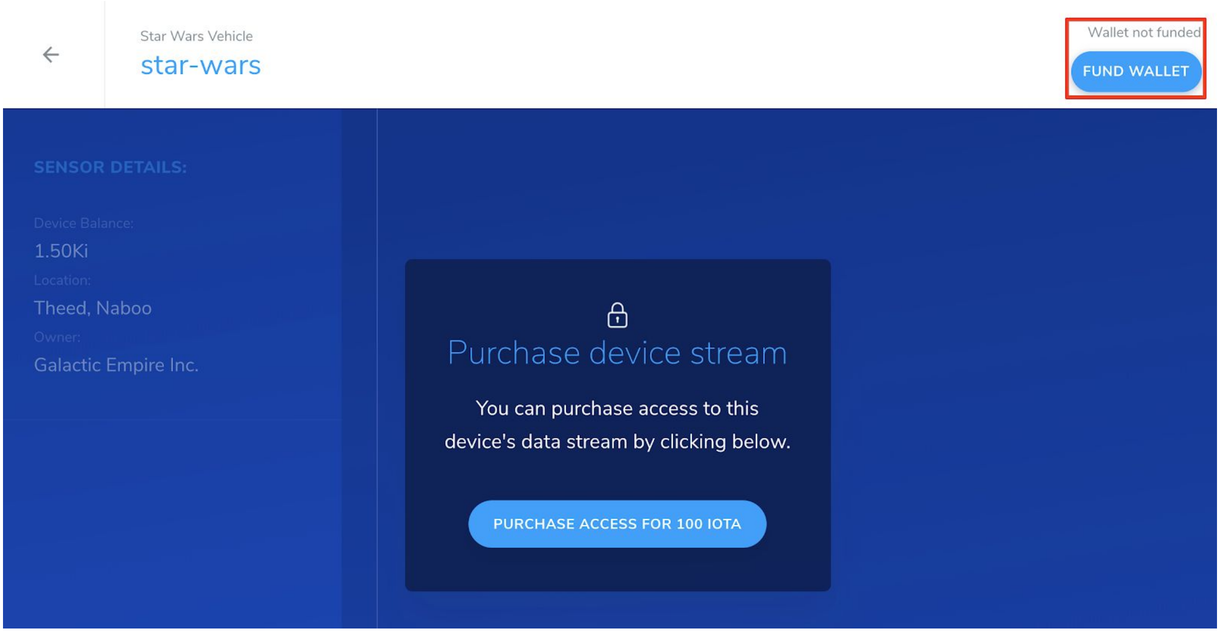
```
[                                        /* array of JSON objects */
  {
    "sensorId": "Hello",
    "type": "Weather Station",
    "value": "82913",
    "location": {
      "country": "Australia",
      "city": "Dianella"
    },
    "lon": "52.442",
    "lat": "-12.32",
    "dataTypes": [
      {
        "id": "temp",
        "unit": "c",
        "name": "Temperature"
      },
      {
        "name": "Humidity",
        "id": "hum",
        "unit": "hpa"
      }
    ],
    "owner": "OtvxJHA2c5gNvqtwkOA767QrAnE3",
    "address": "ZXYZZULDJWZTKFNNPAGIYQCVLCMLGTQEXJYBLEUOLJMLF9MY"
  },
  {...}
]
```

Create and Fund Wallet

You can fund a wallet as a new user with free IOTA tokens. We usually transfer between 100000 and 1000000 tokens for free to your new wallet.

Please note that `devnet` tokens can not be used on the `mainnet` or exchanged on any cryptocurrency exchange platform.

Select a sensor or device for which you want to purchase a data stream. Proceed to the [Sensor](#) page, in the top right corner you will find a button to fund your wallet.



Star Wars Vehicle
star-wars

Wallet not funded

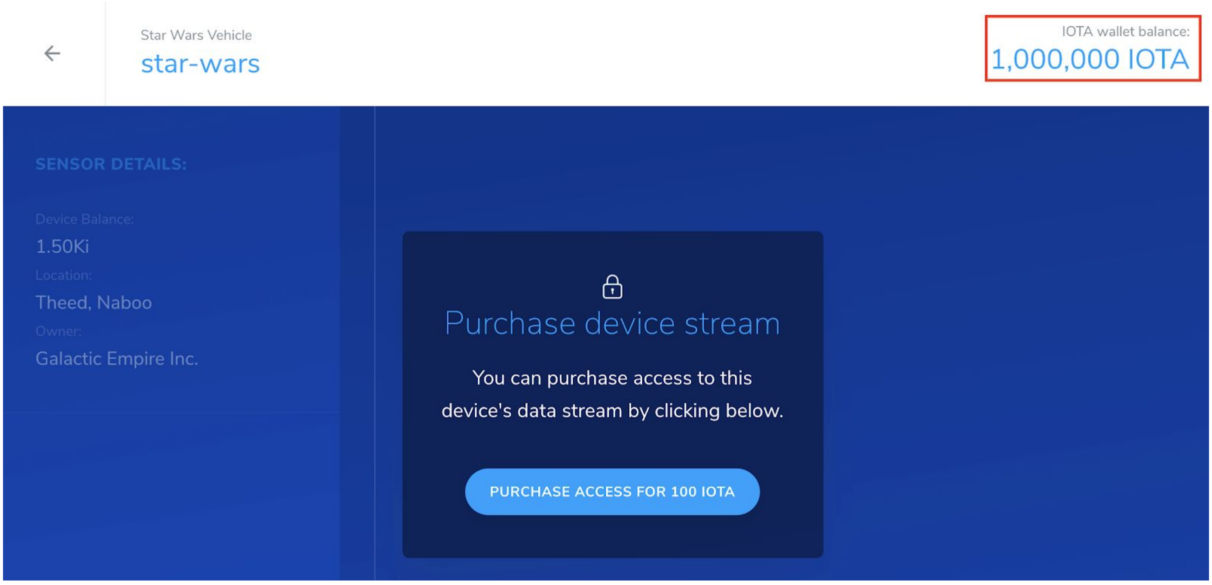
SENSOR DETAILS:

Device Balance:
1.50Ki
Location:
Theed, Naboo
Owner:
Galactic Empire Inc.

Purchase device stream

You can purchase access to this device's data stream by clicking below.

Please do not interrupt this operation by refreshing the page or navigating to another page of the application. Once IOTA token transfer is completed, the balance of the wallet is automatically updated.



Star Wars Vehicle
star-wars

IOTA wallet balance:
1,000,000 IOTA

SENSOR DETAILS:

Device Balance:
1.50Ki
Location:
Theed, Naboo
Owner:
Galactic Empire Inc.

Purchase device stream

You can purchase access to this device's data stream by clicking below.

Alternatively you can use the API

Endpoint
https://api.marketplace.tangle.works/wallet

POST

Request

```
{
    "userId": "xlXMajjxTleDwmeIEG9SHddlCM02"          /* text */
}
```

Response

```
{
   "success": true                                    /* true or false */
}
```

Get user

You can request user details, that contain wallet information.

Use the API

Endpoint
https://api.marketplace.tangle.works/user

GET

Request

```
https://api.marketplace.tangle.works/user?userId=xlXMajjxTleDwIEG9SHddlCM02
```

Response

```
{                                                  /* JSON object */
   "wallet":{
      "seed":"WSNPJGVKSBEBDPMOYNHPQPIFFEOM9TOYSBMI9SMWQVVFUXTPFOR9IDMLZG",
      "balance":1000000,
      "address":"IKBQMFTQUMWOWDVKRVSLSM9TOYNDJMANM9NCELFFDGMMMDOXVS9YURD",
      "keyIndex":0
   }
}
```

Query stream

You can request device data stream. Proceed to the Sensor page. If you already purchased the stream, data will be automatically loaded in chunks (20 packets per request). Scroll to the bottom of the page to automatically query the following 20 packets.

24.999996 C

Fetching packet 40 of 60

Alternatively you can use the API

Endpoint
https://api.marketplace.tangle.works/stream

GET

Request

```
https://api.marketplace.tangle.works/stream?deviceId=star-wars-vehicles&user
Id=xlXMajjxTleDwmeIEG9SHddlCM02&time=null
```

Response

If the device stream was not purchased

```
{
   "success": false
}
```

If the device stream was already purchased

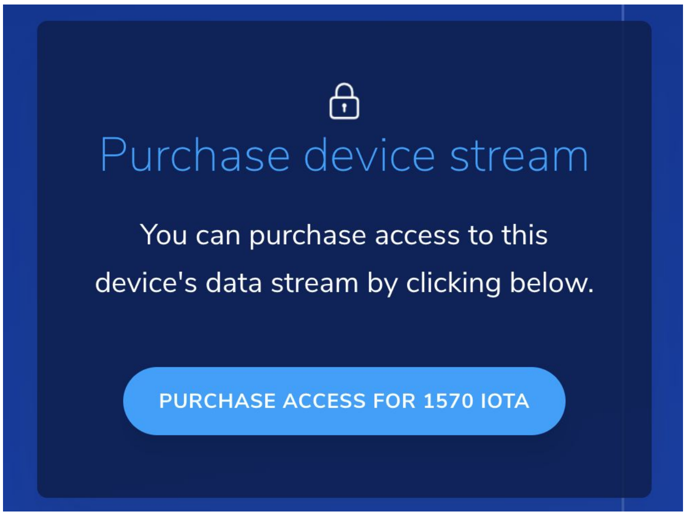
```
[                                          /* array of JSON objects */
      {
         "time":1550057296806,
         "root":"XXNHWURJOQIYSWGSSWDXMWQANZWCOGICPP9DXVR9KGSZ9MJEGEHFUIX",
         "sidekey":"GZ9FKCYWQTBKBIFIXUNCBYNAYRXTWXGXTNHKKSWFXSN9LMP9AOVK"
      },
      {
         "time":1550053854946,
         "root":"LNYSJXWON9OXFSXSVBK9RSOXMDAEDPXBNTKMMQJGQKSYSQDM9TXGPU9",
         "sidekey":"MGZHCGKQIINYSGYKKYQOFVYVOUMZC99EMPBNCXSEDPYLLUFD9ZFR"
      },
      { ... }
]
```

This request returns an array of JSON objects, which contain information like MAM stream root and encryption key. This information is used to retrieve data from IOTA Tangle.
The data is retrieved in chunks. To retrieve the next chunk of data, determine the earliest (smallest) value of the time attribute from the response, and send this value as time parameter with the next request

```
https://api.marketplace.tangle.works/stream?deviceId=star-wars-vehicles&userId=xlXMajjxTleDwmeIEG9SHddlCM02&time=1550053854946
```

Purchase Data Stream

You can purchase device data stream using the balance of the wallet. You can fund your wallet with the free IOTA tokens for the first time.
Proceed to the Sensor page. If you have not purchased the stream, a message appears asking whether you would like to purchase the data stream for an amount, that was set by the device owner.
When you purchase device data stream from the web portal, your wallet balance is automatically updated.


Purchase device stream

You can purchase access to this device's data stream by clicking below.

Alternatively you can use the API

Endpoint

Request: https://api.marketplace.tangle.works/purchaseStream

POST

Request

```
{
    "userId": "xlXMajjxTleDwmeIEG9SHddlCM02",             /* text */
    "deviceId": "star-wars",                              /* text */
}
```

Response

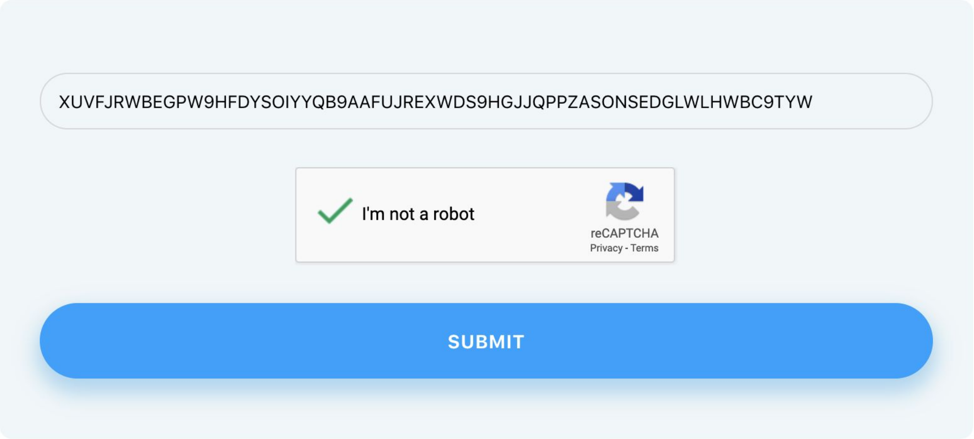
```
{
   "success": true                                    /* true or false */
}
```

Fund wallet with Faucet

If your wallet balance is low, you can fund it again using the IOTA Faucet.
We usually transfer between 100000 and 1000000 tokens for free to your new wallet.

Please note that `devnet` tokens can not be used on the `mainnet` or exchanged on any cryptocurrency exchange platform.

Proceed to the [Faucet]() page, enter your wallet address, that you can get by calling the `getUser` API endpoint. You also need to solve the captcha.



XUVFJRWBEGPW9HFDYSOIYYQB9AAFUJREXWDS9HGJJQPPZASONSEDGLWLHWBC9TYW

Deployment

Prerequisites for creating the project described in the blueprint:

- Hardware
  - Sensor or device that generates data. We support multiple types of devices like
    - Netatmo Weather Station
    - Bosch XDK
    - Samsung Artik
    - Nordic Semiconductor Thingy:52
    - Raspberry Pi's, with a sensor kit
- Software
  - Data Marketplace - https://github.com/iotaledger/data-marketplace
  - NodeJS - https://nodejs.org/
  - MAM - https://github.com/iotaledger/mam.client.js
  - Google Cloud
    - Web Server - https://firebase.google.com/docs/hosting/ serving static site
    - Authentication service - https://firebase.google.com/docs/auth/
    - NoSQL Database - https://firebase.google.com/docs/firestore/
    - Background Tasks & API Server - https://firebase.google.com/docs/functions/
  - or Amazon
    - Web Server - https://aws.amazon.com/s3/ serving static site
    - API Server - https://aws.amazon.com/api-gateway/
    - NoSQL Database - https://aws.amazon.com/dynamodb/
    - Background Tasks - https://aws.amazon.com/lambda/
  - or Azure
    - Web Server - https://azure.microsoft.com/en-us/services/storage/ serving static site
    - API Server - https://azure.microsoft.com/en-us/services/app-service/
    - NoSQL Database - https://azure.microsoft.com/en-us/services/cosmos-db/
    - Background Tasks - https://azure.microsoft.com/en-us/services/functions/
- Programming Languages
  - JavaScript/TypeScript
  - HTML/CSS
  - React Framework - https://github.com/facebook/create-react-app
- Required 3rd Party Licenses
  - Cloud service dependent
- IOTA Knowledge
  - Understanding of how MAM channels work

Instructions/technical concepts on creating the project:

The software configuration and deployment for all the entities is documented in the series of blog posts:

- https://medium.com/@lexerr/d54b29774f1a
- https://medium.com/@lexerr/eea5cbcd1eb7
- https://medium.com/@lexerr/47b608c527c9
- https://medium.com/@lexerr/b33d9856c852

Glossary Of Terms

- MAM - Masked Authentication Messaging is a second layer data communication protocol which adds functionality to emit and access an encrypted data stream, like RSS, over the Tangle https://blog.iota.org/introducing-masked-authenticated-messaging-e55c1822d50e

Additional Resources

- Data Marketplace Repository - https://github.com/iotaledger/data-marketplace
- Data Marketplace API documentation - https://data.iota.org/static/docs
- MAM Repository - https://github.com/iotaledger/mam.client.js
- iota.js Repository - https://github.com/iotaledger/iota.js