
SynchroniCity IoT Data Marketplace

Release latest

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Documentation

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This project is part of the EU H2020 SynchroniCity project and it is based on the FIWARE Business API Ecosystem.

The SynchroniCity IoT Data Marketplace is a joint component made up of the FIWARE Business Framework and a set of APIs (and its reference implementations) provided by the TMForum. This component allows the monetization of different kind of assets (both digital and physical) during the whole service life cycle, from offering creation to its charging, accounting and revenue settlement and sharing. The SynchroniCity IoT Data Marketplace exposes its complete functionality through TMForum standard APIs; concretely, it includes the catalog management, ordering management, inventory management, usage management, billing, customer, and party APIs.

The SynchroniCity IoT Data Marketplace is not a single software repository, but it is composed of different projects which work coordinately to provide the complete functionality.

Concretely, the SynchroniCity IoT Data Marketplace is made of the following components:

- *Reference implementations of TM Forum APIs*: Reference implementation of the catalog management, ordering management, inventory management, usage management, billing, customer, and party APIs.
- *Business Ecosystem Charging Backend*: Is the component in charge of processing the different pricing models, the accounting information, and the revenue sharing reports. With this information, the Business Ecosystem Charging Backend is able to calculate amounts to be charged, charge customers, and pay sellers.
- *Business Ecosystem RSS*: Is in charge of distributing the revenues originated by the usage of a given data source among the involved stakeholders. In particular, it focuses on distributing part of the revenue generated by a data source between the SynchroniCity IoT Data Marketplace instance provider and the Data Provider(s) responsible for the data source.
- *Business Ecosystem Logic Proxy*: Acts as the endpoint for accessing the SynchroniCity IoT Data Marketplace. On the one hand, it orchestrates the APIs validating user requests, including authentication, authorization, and the content of the request from a business logic point of view. On the other hand, it serves a web portal that can be used to interact with the system.

CHAPTER 1

Index

Installation and Administration Guide The guide for maintainers that explains how to install it.

User Guide The guide for users that explains how to use it.

1.1 Installation and Administration Guide

1.1.1 Introduction

This installation and administration guide covers the [SynchroniCity IoT Data Marketplace](#) based on the [Business API Ecosystem](#) version 6.4.0, corresponding to FIWARE release 6. Any feedback on this document is highly welcomed, including bugs, typos or things you think should be included but aren't. Please send them by creating an issue at [GitHub Issues](#)

1.1.2 Installation

The SynchroniCity IoT Data Marketplace can be deployed with Docker. For all the components that made up the SynchroniCity IoT Data Marketplace (based on the [Business API Ecosystem](#)) it has been provided a Docker image that can be used jointly with docker-compose in order to deploy and configure the ecosystem.

Requirements

The SynchroniCity IoT Data Marketplace is not a single software, but a set of modules that work together for proving business capabilities. In this regard, this section contains the basic dependencies of the different components that made up the SynchroniCity IoT Data Marketplace.

Note: The SynchroniCity IoT Data Marketplace requires instances of MySQL and MongoDB running. In this regard, you have three possibilities:

- You can have your own instances deployed in your machine

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- You can manually run docker containers before executing the SynchroniCity IoT Data Marketplace
 - You can use docker-compose to automatically deploy both components
-

OAuth2 Authentication requirements

The SynchroniCity IoT Data Marketplace authenticates with the [FIWARE identity manager](<http://fiware-idm.readthedocs.io/en/latest/>). It is needed to register an application in this portal in order to acquire the OAuth2 credentials.

There you have to use the following info for registering the app:

- Name: The name you want for your instance
- URL: Host and port where you plan to run the instance. [http]|https://host:port/
- Callback URL: URL to be called in the OAuth process. [http]|https://host:port/auth/fiware/callback

You must also create a new role called ‘seller’ and assign this role to the user authorized to be seller (data provider) in the marketplace.

Deploying the SynchroniCity IoT Data Marketplace

As stated, it is possible to deploy the SynchroniCity IoT Data Marketplace using the Docker images available for each of its modules with *docker-compose*. In particular, the following images have to be deployed:

- *bae-apis-synchronicity* (<https://hub.docker.com/r/angelocapossele/bae-apis-synchronicity/>): Image including the TMForum APIs
- *biz-ecosystem-rss* (<https://hub.docker.com/r/conwetlab/biz-ecosystem-rss/>): Image Including the BAE RSS module
- *charging-backend-synchronicity* (<https://hub.docker.com/r/angelocapossele/charging-backend-synchronicity/>): Image including the charging backend module
- *logic-proxy-synchronicity* (<https://hub.docker.com/r/conwetlab/angelocapossele/logic-proxy-synchronicity/>): Image including the logic proxy module

For deploying the SynchroniCity IoT Data Marketplace the first step is creating a *docker-compose.yml* file with the following contents (or use the one provided in this GitHub repo):

```
version: '3'
services:
  mongo:
    image: mongo:3.2
    restart: always
    ports:
      - 27017:27017
    networks:
      main:
    volumes:
      - ./mongo-data:/data/db

  mysql:
    image: mysql:latest
    restart: always
    ports:
```

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```

        - 3333:3306
volumes:
  - ./mysql-data:/var/lib/mysql
networks:
  main:
environment:
  - MYSQL_ROOT_PASSWORD=my-secret-pw
  - MYSQL_DATABASE=RSS

charging:
  image: angelocapossele/charging-backend-synchronicity:v6.4.0
  restart: always
  links:
    - mongo
depends_on:
  - mongo
  - apis
  - rss
ports:
  - 8006:8006
networks:
  main:
    aliases:
      - charging.docker
volumes:
  - ./charging-bills:/business-ecosystem-charging-backend/src/media/bills
  - ./charging-assets:/business-ecosystem-charging-backend/src/media/assets
  - ./charging-plugins:/business-ecosystem-charging-backend/src/plugins
  - ./charging-settings:/business-ecosystem-charging-backend/src/user_
→settings
  environment:
  - PAYPAL_CLIENT_ID=client_id_here
  - PAYPAL_CLIENT_SECRET=client_secret_here

proxy:
  image: angelocapossele/logic-proxy-synchronicity:v6.4.0
  restart: always
  links:
    - mongo
depends_on:
  - mongo
  - apis
ports:
  - 8004:8004
networks:
  main:
    aliases:
      - proxy.docker
volumes:
  - ./proxy-conf:/business-ecosystem-logic-proxy/etc
  - ./proxy-indexes:/business-ecosystem-logic-proxy/indexes
  - ./proxy-themes:/business-ecosystem-logic-proxy/themes
  - ./proxy-static:/business-ecosystem-logic-proxy/static
environment:
  - NODE_ENV=development

apis:

```

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```
image: angelocapossele/bae-apis-synchronicity:v6.4.0
restart: always
ports:
  - 4848:4848
  - 8080:8080
links:
  - mysql
depends_on:
  - mysql
networks:
  main:
    aliases:
      - apis.docker
volumes:
  - ./apis-conf:/etc/default/tmf/
environment:
  - MYSQL_ROOT_PASSWORD=my-secret-pw
  - MYSQL_HOST=mysql

rss:
  image: conwetlab/biz-ecosystem-rss:v6.4.0
  restart: always
  ports:
    - 9999:8080
    - 4444:4848
    - 1111:8181
  links:
    - mysql
  depends_on:
    - mysql
  networks:
    main:
      aliases:
        - rss.docker
  volumes:
    - ./rss-conf:/etc/default/rss

networks:
  main:
    external: true
```

1.1.3 Configuration

The next step is providing all the configuration files required by the different components using the configured volumes. It is possible to find valid configuration files (as well as the `docker-compose.yml`) in this [GitHub repo](#).

As you can see, the different modules include environment variables and volumes. In particular:

Charging

The charging-backend-synchronicity needs the following environment variables:

- **PAYPAL_CLIENT_ID**: the client id of your application PayPal credentials used for charging users (a Sandbox account can be used for testing).

- **PAYPAL_CLIENT_SECRET**: the client secret of your application PayPal credentials used for charging users (a Sandbox account can be used for testing).

Additionally, the charging-backend-synchronicity image contains 4 volumes. In particular:

- */business-ecosystem-charging-backend/src/media/bills*: This directory contains the PDF invoices generated by the Business Ecosystem Charging Backend
- */business-ecosystem-charging-backend/src/media/assets*: This directory contains the different digital assets uploaded by sellers to the Business Ecosystem Charging Backend
- */business-ecosystem-charging-backend/src/plugins*: This directory is used for providing asset plugins (see section *Installing the Orion Query Plugin*)
- */business-ecosystem-charging-backend/src/user_settings*: This directory must include the *settings.py* and *services_settings.py* files with the software configuration.

More specifically, the *services_settings.py* includes:

- KEYSTONE_PROTOCOL: http or https
- KEYSTONE_HOST: host where is running the IDM (e.g., ‘idm.docker’)
- KEYROCK_PORT: port number where the *Keyrock* instance is listening (e.g., ‘8000’)
- KEYSTONE_PORT: port number where the *Keystone* instance is listening (e.g., ‘5000’)
- KEYSTONE_USER: admin username of the IDM (e.g., ‘idm’)
- KEYSTONE_PWD: admin password of the IDM (e.g., ‘idm’)
- ADMIN_DOMAIN: admin domain on the IDM (e.g., ‘Default’)
- APP_CLIENT_ID: Client ID of the Orion context broker registered on the IDM
- APP_CLIENT_SECRET: Client Secret of the Orion Context Broker registered on the IDM

Logic Proxy

The logic-proxy-synchronicity image contains 4 volumes. In particular:

- */business-ecosystem-logic-proxy/etc*: This directory must include the *config.js* file with the software configuration
- */business-ecosystem-logic-proxy/indexes*: This directory contains the indexes used by the SynchroniCity IoT Data Marketplace for searching
- */business-ecosystem-logic-proxy/themes*: This directory contains the themes that can be used to customize the web portal
- */business-ecosystem-logic-proxy/static*: This directory includes the static files ready to be rendered including the selected theme and js files

Finally, the logic-proxy-synchronicity uses the environment variable *NODE_ENV* to determine if the software is being used in *development* or in *production* mode.

Note: The *config.js* file must include an extra setting not provided by default called *config.extPort* that must include the port where the proxy is going to run in the host machine

Once you have created the files, run the following command

```
$ docker-compose up
```

Then, the SynchroniCity IoT Data Marketplace should be up and running in `http://YOUR_HOST:PORT/` replacing `YOUR_HOST` by the host of your machine and `PORT` by the port provided in the Business Ecosystem Logic Proxy configuration

Once the different containers are running, you can stop them using

```
$ docker-compose stop
```

And start them again using

```
$ docker-compose start
```

Additionally, you can terminate the different containers by executing

```
$ docker-compose down
```

Installing the Orion Query Plugin

The SynchroniCity IoT Data Marketplace is intended to support the monetization of different kind of data sources. The different kind of data sources that may be wanted to be monetized will be heterogeneous and potentially very different between them.

Additionally, for each type of data source different validations and activation mechanisms will be required. For example, if the data source is an NGSI entity, it will be required to validate that the provider is the owner of that entity. Moreover, when a customer acquires the access to that entity, it will be required to notify the Identity Management component that a new user has access to it.

The huge differences between the different types of data sources that can be monetized in the SynchroniCity IoT Data Marketplace makes impossible to include its validations and characteristics as part of the core software. For this reason, it has been created a plugin based solution, where all the characteristics of a data source type are implemented in a plugin that can be loaded in the SynchroniCity IoT Data Marketplace.

As you may know, the SynchroniCity IoT Data Marketplace is able to sell NGSI compliant data sources. To support this functionality, it must be installed the Orion Query plugin (also included in this [GitHub repo](#)) as follows

1. Copy the plugin file into the host directory of the volume `/business-ecosystem-charging-backend/src/plugins`
2. Enter the running container

```
$ docker exec -i -t your-container /bin/bash
```

3. Go to the installation directory

```
$ cd /apis/business-ecosystem-charging-backend/src
```

4. Load the plugin

```
$ ./manage.py loadplugin ./plugins/Orion.zip
```

5. Restart Apache

```
$ service apache2 restart
```

Note: For specific details on how to create a plugin and its internal structure, have a look at the [Business API Ecosystem Programmer Guide](#)

1.1.4 Sanity Check Procedures

The Sanity Check Procedures are the steps that a System Administrator will take to verify that an installation is ready to be tested. This is therefore a preliminary set of tests to ensure that obvious or basic malfunctioning is fixed before proceeding to unit tests, integration tests and user validation.

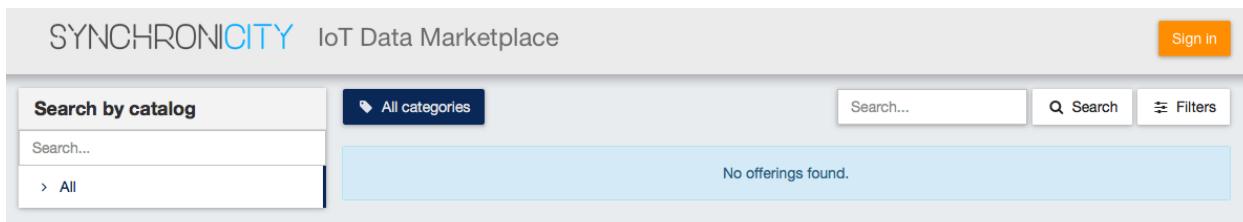
End to End Testing

Please note that the following information is required before starting with the process:

- * The host and port where the Proxy is running
- * A valid IdM user with the *Seller* role

To Check if the SynchroniCity IoT Data Marketplace is running, follow the next steps:

1. Open a browser and enter to the SynchroniCity IoT Data Marketplace
2. Click on the *Sign In* Button



3. Provide your credentials in the IdM page



4. Go to the *Revenue Sharing* section

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The screenshot shows the homepage of the SynchroniCity IoT Data Marketplace. The left sidebar has a yellow-highlighted 'Revenue sharing' section. The main area shows a search bar and a message: 'No offerings found.'

5. Ensure that the default RS Model has been created

The screenshot shows the 'Revenue Sharing' section. The left sidebar has a yellow-highlighted 'Revenue sharing' section. The main area shows a table with one row:

Product Class	Platform Percentage	Provider Percentage	Nº Stakeholders
defaultRevenue	30	70	0

6. Go to *My Stock* section and click on *New* for creating a new catalog

The screenshot shows the 'My Stock' section. The left sidebar has a yellow-highlighted 'My stock' section. The main area shows a table with a single row and a green 'New' button.

7. Provide a name and a description and click on *Next*. Then click on *Create*

The screenshot shows the 'My Stock' section of the SynchroniCity IoT Data Marketplace. On the left, a sidebar menu includes 'Home', 'My inventory', 'My stock' (which is highlighted in orange), and 'Revenue sharing'. Below these are 'Catalogs', 'Product Specifications', and 'Offerings'. At the top right, there are icons for 'Shopping Cart' (0 items) and 'customer'. In the center, a 'New catalog' form is displayed. It has two tabs: '1 General' (selected) and '2 Finish'. Under 'Step 1: General', there is a field 'Enter a name' containing 'My catalog'. Below it is a field 'Enter a description (optional)' containing 'This is a catalog'. A 'Next' button is at the bottom right.

This screenshot continues the 'New catalog' creation process. The '2 Finish' tab is now selected. The 'Name' field still contains 'My catalog'. Below it is a 'Status' section with a horizontal slider showing 'Active' (blue dot) and other options: 'Launched', 'Retired', and 'Obsolete'. Under 'Description', the text 'This is a catalog' is present. An orange 'Create' button is located at the bottom right.

This screenshot shows the 'My catalog' details page. The sidebar and top navigation are identical to the previous screens. The main area displays a 'My catalog' card with tabs for 'About' (selected), 'Parties', and 'Offerings'. Below this is a 'General' section with a 'Name' field containing 'My catalog' and a 'Status' section with a horizontal slider showing 'Active' (blue dot). The 'Description (optional)' field contains 'This is a catalog'. A green 'Update' button is at the bottom right.

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8. Click on *Launched*, and then click on *Update*

The screenshot shows the 'My Stock' section of the SynchroniCity IoT Data Marketplace. On the left, a sidebar menu includes 'Home', 'My inventory' (selected), 'My stock' (highlighted in orange), and 'Revenue sharing'. Under 'My stock', there are links for 'Catalogs', 'Product Specifications', and 'Offerings'. The main content area is titled 'My catalog' and shows a form for updating a catalog named 'My catalog'. The status is set to 'Launched' (indicated by a green dot on a timeline). The description field contains the text 'This is a catalog'. A green 'Update' button is at the bottom right.

9. Go to *Home*, and ensure the new catalog appears

The screenshot shows the main home page of the SynchroniCity IoT Data Marketplace. The sidebar menu is identical to the previous screenshot. The main content area features a search bar with 'All categories' and 'Search...' fields, and a 'Filters' button. Below the search bar, a message says 'No offerings found.' The 'Search by catalog' section shows a dropdown menu with 'All' and 'My catalog' options, where 'My catalog' is currently selected.

List of Running Processes

We need to check that Java for the Glassfish server (APIs and RSS), python (Charging Backend) and Node (Proxy) are running, as well as MongoDB and MySQL databases. If we execute the following command:

```
ps -ewF | grep 'java\|mongodb\|mysql\|python\|node' | grep -v grep
```

It should show something similar to the following:

```
mongodb 1014 1 0 3458593 49996 0 sep08 ? 00:22:30 /usr/bin/mongod --config /etc/mongodb.conf
mysql 1055 1 0 598728 64884 2 sep08 ? 00:02:21 /usr/sbin/mysqld
francis+ 15932 27745 0 65187 39668 0 14:53 pts/24 00:00:08 python ./manage.py runserver 0.0.0.0:8006
francis+ 15939 15932 1 83472 38968 0 14:53 pts/24 00:00:21 /home/user/business-ecosystem-charging-backend/src/virtenv/bin/python ./manage.py runserver 0.0.0.0:8006
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```

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```
francis+ 16036 15949 0 330473 163556 0 14:54 pts/25 00:00:08 node server.js
root      1572     1 0 1142607 1314076 3 sep08 ? 00:37:40 /usr/lib/jvm/java-8-
→oracle/bin/java -cp /opt/biz-ecosystem/glassfish ...
```

Network interfaces Up & Open

To check the ports in use and listening, execute the command:

```
$ sudo netstat -nltp
```

The expected results must be something similar to the following:

Active Internet connections (only servers)						
Proto	Recv-Q	Send-Q	Local Address	Foreign Address	State	PID/
tcp	0	0	127.0.0.1:8006	0.0.0.0:*	LISTEN	15939/
tcp	0	0	127.0.0.1:27017	0.0.0.0:*	LISTEN	1014/
tcp	0	0	127.0.0.1:28017	0.0.0.0:*	LISTEN	1014/
tcp	0	0	127.0.0.1:3306	0.0.0.0:*	LISTEN	1055/
tcp6	0	0	:::80	:::*	LISTEN	16036/
tcp6	0	0	:::8686	:::*	LISTEN	1572/
tcp6	0	0	:::4848	:::*	LISTEN	1572/
tcp6	0	0	:::8080	:::*	LISTEN	1572/
tcp6	0	0	:::8181	:::*	LISTEN	1572/

Databases

The last step in the sanity check, once we have identified the processes and ports, is to check that MySQL and MongoDB databases are up and accepting queries. We can check that MySQL is working, with the following command:

```
$ mysql -u <user> -p<password>
```

You should see something similar to:

```
Welcome to the MySQL monitor. Commands end with ; or \g.
Your MySQL connection id is 174
Server version: 5.5.47-0ubuntu0.14.04.1 (Ubuntu)

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affiliates. Other names may be trademarks of their respective
owners.
```

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```
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.  
mysql>
```

For MongoDB, execute the following command:

```
$ mongo <database> -u <user> -p <password>
```

You should see something similar to:

```
MongoDB shell version: 2.4.9  
connecting to: <database>  
>
```

1.1.5 Diagnosis Procedures

The Diagnosis Procedures are the first steps that a System Administrator will take to locate the source of an error in a GE. Once the nature of the error is identified with these tests, the system admin will very often have to resort to more concrete and specific testing to pinpoint the exact point of error and a possible solution. Such specific testing is out of the scope of this section.

Resource Availability

Memory use depends on the number of concurrent users as well as the free memory available and the hard disk. The SynchroniCity IoT Data Marketplace requires a minimum of 1024 MB of available RAM memory, but 2048 MB of free memory are recommended. Moreover, the SynchroniCity IoT Data Marketplace requires at least 15 GB of hard disk space.

Remote Service Access

N/A

Resource Consumption

Resource consumption strongly depends on the load, especially on the number of concurrent users logged in.

- Glassfish main memory consumption should be between 500 MB and 2048 MB
- MongoDB main memory consumption should be between 30 MB and 500 MB
- Python main memory consumption should be between 30 MB and 200 MB
- Node main memory consumption should be between 30 MB and 200 MB
- MySQL main memory consumption should be between 30 MB and 500 MB

I/O Flows

The only expected I/O flow is of type HTTP, on port defined in the Logic Proxy configuration file

1.2 User Guide

1.2.1 Introduction

This user guide covers the SynchroniCity IoT Data Marketplace based on the Business API Ecosystem version 6.4.0, corresponding to FIWARE release 6. Any feedback on this document is highly welcomed, including bugs, typos or things you think should be included but aren't. Please send them by creating an issue at [GitHub Issues](#)

This user guide contains a description of the different tasks that can be performed in the SynchroniCity IoT Data Marketplace using its web interface. This section is organized so that actions related to a particular user role are grouped together.

1.2.2 Profile Configuration

All the users of the system can configure their profile, so they can configure their personal information as well as their billing addresses and contact mediums.

To configure the user profile, the first step is opening the user *Settings* located in the user menu.

The screenshot shows the user interface of the SynchroniCity IoT Data Marketplace. At the top, there is a header with the logo 'SYNCHRONICITY' and the text 'My Inventory'. On the right side of the header, there is a shopping cart icon with '0' items and a 'customer' profile icon. Below the header, there is a navigation menu on the left with options: 'Home' (selected), 'My inventory' (highlighted in teal), 'My stock', 'Revenue sharing', 'Products', and 'Data orders'. In the center, there is a search bar with the placeholder 'Search...' and a 'List' button. To the right of the search bar, it says 'No products found.' Below the search bar, there is a sidebar with a user profile picture, the text 'customer', and the email 'customer@marketplace.com'. At the bottom of the sidebar, there are two buttons: 'Settings' and 'Sign out'.

In the displayed view, it can be seen that some information related to the account is already included (*Username*, *Email*, *Access token*). This information is the one provided by the IdM after the login process.

The profile to be updated depends on whether the user is acting on behalf an organization or himself. In both cases, to update the profile, fill in the required information and click on *Update*.

For users, personal information is provided.

The screenshot shows the 'Settings' page of the SynchroniCity IoT Data Marketplace. On the left, there's a sidebar with a 'Back' button and a 'Personal settings' section containing 'General' and 'Contact mediums' tabs. The main area is divided into two sections: 'Account' and 'Profile'. The 'Account' section includes fields for 'Username' (customer) and 'Access token' (MI4pgXBo6ITtYhjojOOpDGnMDb88D). The 'Profile' section contains fields for 'First name' (customer), 'Last name' (customer), 'Title' (Prefer not to say), 'Marital status' (Prefer not to say), 'Gender' (Prefer not to say), 'Nationality' (empty), 'Birth' (empty), 'Date' (1970-01-01), 'Country' (Prefer not to say), and 'Place' (empty). A green 'Update' button is located at the bottom right of the profile section.

Note: Only the *First name* and *Last name* fields are mandatory

Once you have created your profile, you can include contact mediums by going to the *Contact mediums* section. In the *Contact Medium* section, there are two different tabs. On the one hand, the *Billing addresses* tab, where you can register the billing addresses you will be able to use when creating orders and purchasing data.

To create a billing address, fill in the fields and click on *Create*

The screenshot shows the 'Settings' page under 'Personal settings'. On the left, there's a sidebar with 'Personal settings' and options for 'General' and 'Contact mediums'. The main area is titled 'Billing addresses' with a note: 'The billing addresses will be used in your orders.' Below this, there's a section for creating a 'New shipping address'. It includes fields for Email address (customer@marketplace.com), Postal address (Street, Zip Code 012345, City, State / Province, Country Aruba), Telephone number (Type Mobile, Number +44 7400000000), and a 'Create' button.

Once created, you can edit the address by clicking on the *Edit* button of the specific address, and changing the wanted fields.

The screenshot shows the 'Settings' page under 'Personal settings'. The sidebar has 'Personal settings' and 'Contact mediums'. The main area is titled 'Billing addresses' with the same note: 'The billing addresses will be used in your orders.' Below this, there's a section titled 'My billing addresses' showing a table of existing addresses:

Email address	Postal address	Telephone number	Actions
customer@marketplace.com	Street 012345 City (State) Aruba	Mobile, +447400000000	

The screenshot shows the 'Personal settings' section of the SynchroniCity IoT Data Marketplace. A modal window titled 'Settings' is open, specifically the 'Billing address' tab. The form includes fields for Email address (customer@marketplace.com), Postal address (Street), Zip Code (012345), City, State / Province (State), Country (Aruba), Telephone number (Type: Mobile, Number: +44 7400000000), and a note indicating the information is public. At the bottom are 'Update' and 'Cancel' buttons.

On the other hand, if you have the *Seller* role you can create *Business Addresses*, which can be used by your customers in order to allow them to contact you. In the *Business Addresses* tab you can create, different kind of contact mediums, including emails, phones, and addresses. To create a contact medium, fill in the fields and click on *Create*

The screenshot shows the 'Personal settings' section of the SynchroniCity IoT Data Marketplace. A modal window titled 'Settings' is open, specifically the 'Business addresses' tab. It displays a note that the information is public. Below is a 'New business address' form with a 'Medium' dropdown set to 'Email address' and an 'Email' field containing business@address.com. An orange 'Create' button is at the bottom right.

The screenshot shows the 'Business addresses' section of the settings page. It includes a table for existing addresses and a form for creating new ones.

My business addresses:

Medium	Details	Actions
Email address	business@address.com	

New business address:

Medium: Telephone number

Type: Mobile

Number: +44 7400000000

Create

The screenshot shows the 'Business addresses' section of the settings page. It includes a table for existing addresses and a form for creating new ones, including support for postal addresses.

My business addresses:

Medium	Details	Actions
Email address	business@address.com	
Telephone number	Mobile, +447400000000	

New business address:

Medium: Postal address

Street: [empty]

Zip Code: 01234

City: [empty]

State / Province: [empty]

Country: Aruba

Create

You can *Edit* or *Remove* the contact medium by clicking on the corresponding button

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The screenshot shows the 'Settings' section of the SynchroniCity IoT Data Marketplace. On the left, a sidebar lists 'Personal settings' with 'General' and 'Contact mediums' options. The main area displays 'My business addresses' with three tabs: 'Billing addresses' (selected), 'Business addresses', and a note stating 'This information is public so it may be viewed by anyone.' Below this is a table with columns 'Medium', 'Details', and 'Actions' for three entries: 'Email address' (business@address.com), 'Telephone number' (Mobile, +447400000000), and 'Postal address' (Street 01234 City (State) Aruba). At the bottom, there's a form for adding a new business address with fields for 'Medium' (set to 'Email address'), 'Email', and a 'Create' button.

1.2.3 Admin

If the user of the SynchroniCity IoT Data Marketplace is an admin, he will be able to access the *Administration* section of the web portal. This section is located in the user menu.

The screenshot shows the 'Administration' section of the SynchroniCity IoT Data Marketplace. The left sidebar includes 'Home', 'My inventory', 'Search by catalog' (with 'All' and 'My catalog' options), and a search bar. The main area shows a message 'No offerings found.' and a sidebar for the user 'admin' (admin@admin.com) with options for 'Administration', 'Settings', and 'Sign out'. The top right shows a shopping cart icon with 0 items and the user 'admin'.

Manage Categories

Admin users are authorized to create the system categories that can be used by *Sellers* to categorize their catalogs, data sources, and offerings.

To create categories, go to the *Administration* section, and click on *New*

The screenshot shows the SynchroniCity Administration interface. In the top left, it says "SYNCHRONICITY Administration". On the right, there's a shopping cart icon with "0" items and a user icon labeled "admin". Below the header, there are buttons for "Back", "List", and "New". A sidebar on the left has "Category" and "Categories" options. The main content area says "No categories found.".

Then, provide a name and an optional description for the category. Once the information has been included, click on *Next*, and then on *Create*

The screenshot shows the "New Category" creation process. It's Step 1: General. It asks for a name ("Category") and an optional description ("Enter a description (optional)"). There's a note: "This is a new category!". Below that is a "Choose a parent category" dropdown. At the bottom right is a "Next" button.

The screenshot shows the "New Category" creation process. It's Step 2: Finish. It includes a "Name" field ("Category"), a "Status" slider set to "Launched", and a "Description" field ("This is a new category"). At the bottom right is a prominent orange "Create" button.

Categories in the SynchroniCity IoT Data Marketplace can be nested, so you can choose a parent category if you want while creating.

New Category

Step 1: General

Enter a name
Sub category

Enter a description (optional)
This is a sub category

Choose a parent category

Name	Last Updated
Category	a minute ago

Next

Existing categories can be updated. To edit a category click on the category name.

Status	Name	Last Updated
Launched	Category	a minute ago
Launched	Category / Sub category	a few seconds ago

Then edit the corresponding fields and click on *Update*.

General

Name
Sub category

Status

Active Launched Retired Obsolete

Description (optional)
This is a sub category

Update

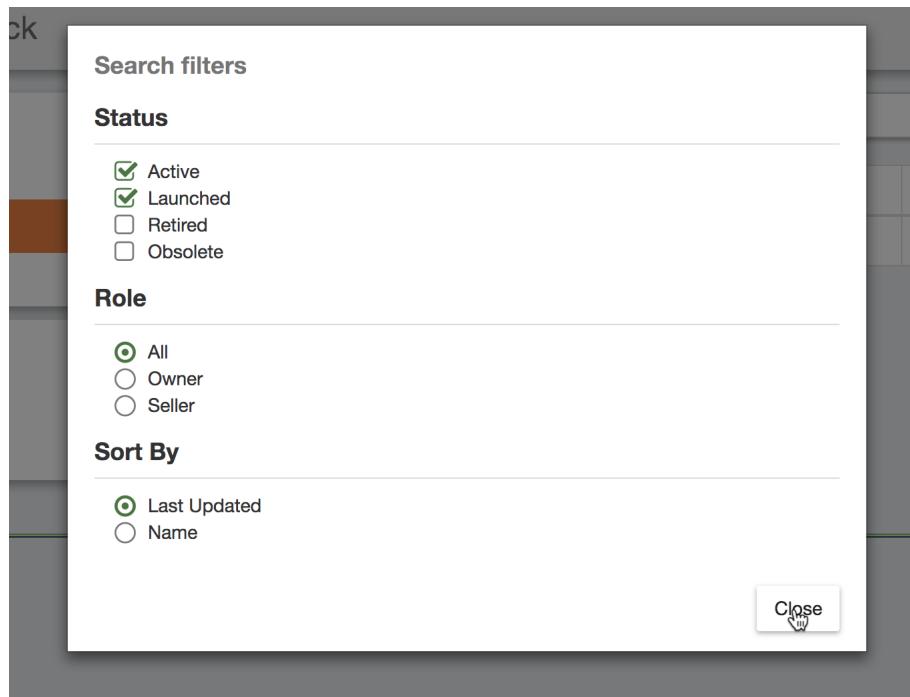
1.2.4 Seller

If the user of the SynchroniCity IoT Data Marketplace has the *Seller* role, he will be able to share and monetize his data sources by creating catalogs, data source specifications and offerings. All these objects are managed accessing *My Stock* section.

Status	Name	Role	Last Updated
Launched	My catalog	Owner	19 hours ago

Manage Catalogs

The *Catalogs* section is the one that is open by default when the seller accesses *My Stock* section. This section contains the catalogs the seller has created. Additionally, it has been defined several mechanisms for searching and filtering the list of catalogs displayed. On the one hand, it is possible to search catalogs by keyword using the search input provided in the menu bar. On the other hand, it is possible to specify how catalog list should be sorted or filter the shown catalogs by status and the role you are playing. To do that, click on *Filters*, choose the required parameters, and click on *Close*.



To create a new catalog click on the *New* button. Then, provide a name and an optional description for the catalog. Once you have filled the fields, click on *Next*, and then on *Create*

SynchroniCity IoT Data Marketplace, Release latest

The screenshot shows the 'New catalog' creation interface. On the left, a sidebar menu includes 'Home', 'My inventory', 'My stock' (highlighted in orange), 'Revenue sharing', 'Catalogs', 'Data source specifications', and 'Offerings'. The main area has tabs for 'List' and 'New'. A sub-section titled 'New catalog' shows 'Step 1: General'. It asks for a name ('New catalog') and a description ('This is a new catalog'). A 'Next' button is visible at the bottom right.

The screenshot shows the 'New catalog' creation process continuing to 'Step 2: Finish'. It includes fields for 'Name' (set to 'New catalog'), 'Status' (set to 'Active', with options for 'Launched', 'Retired', and 'Obsolete'), and a 'Description' field ('This is a new catalog'). A 'Create' button is at the bottom right.

Sellers can also update their catalogs. To do that, click on the name of the catalog to open the update view.

The screenshot shows a catalog list view. The sidebar menu is identical to the previous screens. The main area displays a table with columns: Status, Name, Role, and Last Updated. Two entries are shown: one for 'Launched' status named 'My catalog' (Owner, 19 hours ago) and another for 'Active' status named 'New catalog' (Owner, a minute ago). A 'New' button, a search bar, and filter icons are at the top of the list table.

Status	Name	Role	Last Updated
Launched	My catalog	Owner	19 hours ago
Active	New catalog	Owner	a minute ago

Then, update the fields you want to modify and click on *Update*. In this view, it is possible to change the *Status* of the catalog. To start monetizing the catalog, and make it appear in the *Home* you have to change its status to *Launched*

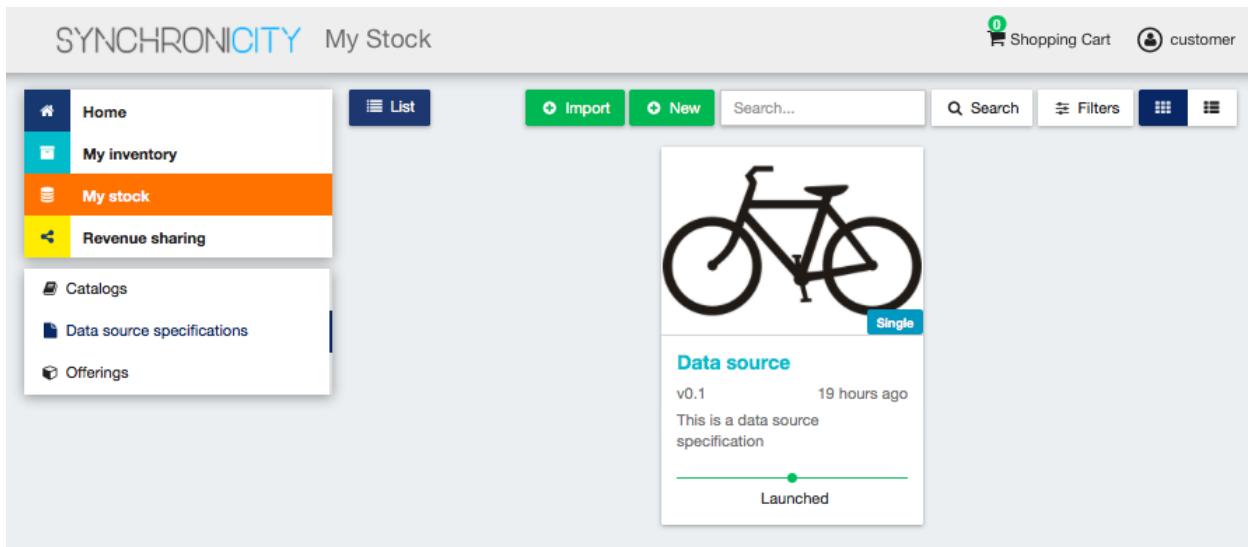
The screenshot shows the 'My Stock' section of the SynchroniCity IoT Data Marketplace. On the left, a sidebar menu includes 'Home', 'My inventory' (selected), 'My stock' (highlighted in orange), 'Revenue sharing', 'Catalogs', 'Data source specifications', and 'Offerings'. The main area is titled 'New catalog' with tabs for 'About', 'Parties', and 'Offerings'. It has sections for 'General' (Name: 'New catalog', Status: 'Launched'), 'Description (optional)' ('This is a new catalog'), and a green 'Update' button.

The screenshot shows the 'My Stock' section with the 'My stock' item selected in the sidebar. The main area displays a table of catalogs:

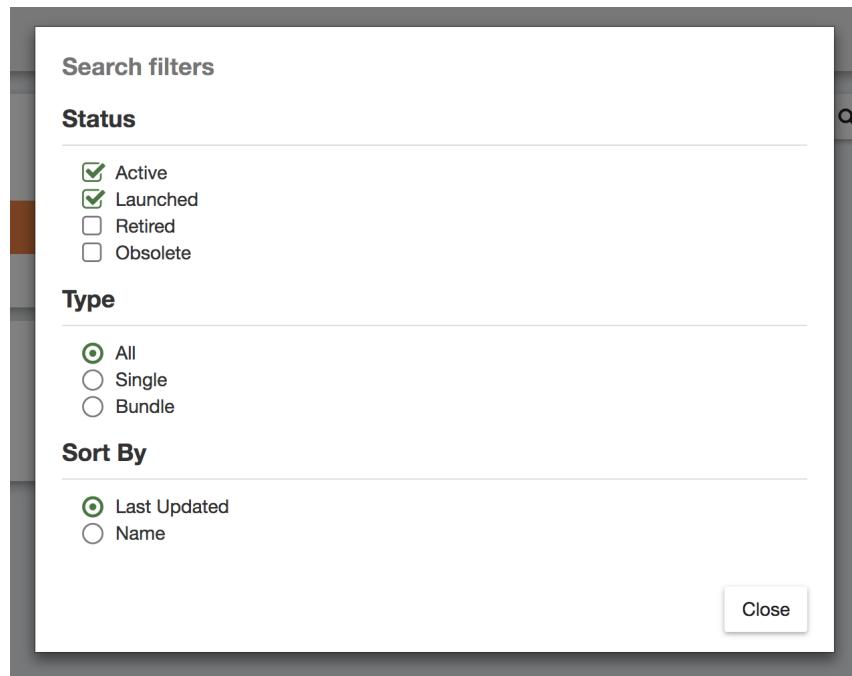
Status	Name	Role	Last Updated
Launched	My catalog	Owner	19 hours ago
Launched	New catalog	Owner	a few seconds ago

Manage Data Source Specifications

Data Source Specifications represent the data source being offered. To list your data source specifications go to *My Stock* section and click on *Data source specifications*.



In the same way as catalogs, data source specifications can be searched by keyword, sorted, or filtered by status and whether they are bundles or not. To filter or sort data source specifications, click on *Filters*, choose the appropriate properties, and click on *Close*



Additionally, it is possible to switch between the grid view and the tabular view using the provided buttons.

Status	Name	ID	Brand	Type	Last Updated
Launched	Data source	101	My brand	Single	19 hours ago

To create a new data source specification click on *New*. In the displayed view, provide the general information of the data source spec. including its name, version, and an optional description. In addition, you have to include the data source brand (Your brand), and an ID number which identifies the data source in your environment. Then, click on *Next*.

In the next step you will be required to provide the asset.

For providing the asset, you have to choose between the available asset types, choose how to provide the asset between the available options, provide the asset, and include all the required information.

SynchroniCity IoT Data Marketplace, Release latest

The screenshot shows the SynchroniCity IoT Data Marketplace interface. On the left, there is a sidebar with navigation links: Home, My inventory, **My stock**, Revenue sharing, Catalogs, Data source specifications, and Offerings. The main area has a header with 'SYNCHRONICITY' and 'My Stock'. Below the header, there are buttons for 'List' and 'New'. The 'New product' form is displayed, divided into steps: Step 1 General, Step 2 Assets, Step 3 Characteristics, Step 4 Attachments, and Step 5 Finish. Step 2 Assets is currently active. It includes fields for 'Digital Asset Type' (set to 'Orion Query'), 'How to provide?' (set to 'URL'), 'Asset URL' (containing 'http://pep.docker:7000/v2/entities/airquality'), 'Media Type' (set to 'NGSIV2'), 'Application ID' (containing 'c0fc8c23f7044861ad2e941d9774729e'), and 'Fiware-Service' (containing 'TenantRZ1'). A 'Next' button is at the bottom right.

Note: *Application ID* has to be the same application ID of the *Orion Context Broker* instance registered on the IdM where your data source belongs. *Fiware-Service* is the header used to register your data source as an entity on the *Orion Context Broker*. If your user does not have a provider role for that specific *Fiware-Service* (e.g., *TenantRZ1:provider*) you will not be allowed to publish data source specification for that entity.

The next step in the creation of a data source spec. is including its characteristics. For including a new characteristic click on *New Characteristic*

The screenshot shows the SynchroniCity IoT Data Marketplace interface. The sidebar and header are identical to the previous screenshot. The 'New product' form is now on Step 3: Characteristics. It shows a message 'No characteristic included.' and a button '+ New Characteristic'. The other steps (1 General, 2 Assets, 4 Attachments, 5 Finish) are visible but inactive. A 'Next' button is at the bottom right.

In the form, include the name, the type (string or number) and an optional description. Then create the values of the characteristic by filling the *Create a value* input and clicking on +.

The screenshot shows the 'My Stock' section of the SynchroniCity IoT Data Marketplace. On the left, there's a sidebar with links: Home, My inventory, **My stock**, Revenue sharing, Catalogs, Data source specifications, and Offerings. The 'My stock' link is highlighted. At the top right, there's a shopping cart icon with '0' items and a 'customer' profile icon. In the center, there's a 'List' button and a 'New' button. Below them, it says 'New product'. A navigation bar shows 'Step 3: Characteristics' and steps 1 through 5: General, Assets, Characteristics (which is selected), Attachments, and Finish. The main area is titled 'Step 3: Characteristics' and says 'No characteristic included.' It has fields for 'Enter a name' (containing 'New characteristic') and 'Choose a type' (set to 'string'). There's also a 'Create a value' field with a 'Characteristic value' placeholder and a 'Create' button. A note says 'Must be at least one value for each characteristic.' A 'Next' button is at the bottom right.

Once you have included all the characteristic info, save it clicking on *Create*

This screenshot is identical to the previous one, but it shows the 'Characteristic value' field populated with 'Characteristic value'. A radio button labeled 'Default' is selected. The rest of the interface, including the 'Create' button and the 'Next' button at the bottom right, remains the same.

Once you have included all the required characteristics click on *Next*

SynchroniCity IoT Data Marketplace, Release latest

The screenshot shows the SynchroniCity IoT Data Marketplace interface. On the left, there is a sidebar with the following navigation items:

- Home
- My inventory
- My stock** (highlighted in orange)
- Revenue sharing
- Catalogs
- Data source specifications
- Offerings

The main content area is titled "New product". At the top, there are buttons for "List" and "New". Below that, it says "Step 3: Characteristics". There are five numbered steps on the left: 1 General, 2 Assets, 3 Characteristics (highlighted in blue), 4 Attachments, and 5 Finish. In the center, there is a table with one row:

#	Name	Type	Values	Default	Delete
1	New characteristic	string	Characteristic value	Characteristic value	

Below the table is a button "+ New Characteristic". At the bottom right of the main area is a "Next" button.

In the next step you can include a picture for your data source spec. You have two options, providing an URL pointing to the picture or directly uploading it. Once provided click *Next* (Image credit for this example: [oNline Web Fonts](#))

The screenshot shows the SynchroniCity IoT Data Marketplace interface. The sidebar and navigation items are identical to the previous screenshot. The main content area is titled "New product". It has reached "Step 4: Attachments". On the left, the steps are: 1 General, 2 Assets, 3 Characteristics, 4 Attachments (highlighted in blue), and 5 Finish. In the center, there is a large input field containing a black cloud icon with the white text "CO₂". Below this field, there are two sections: "How to provide?" (with a dropdown menu showing "Upload picture") and "Upload picture" (with a file input field showing "Choose File 8c99a9e3d6eacf4c99f8334e7f4a0521.png"). At the bottom right of the main area is a "Next" button.

Once done click on *Next* and then on *Create*

New product

Step 5: Finish

Name	Version
Air quality	0.1

Status	Active	Launched	Retired	Obsolete
--------	--------	----------	---------	----------

Brand	ID Number
My brand	123

Description

This is an air quality data source

Characteristics

#	Name	Type	Values	Default
1	New characteristic	string	Characteristic value	Characteristic value

Attachments

Picture URL

http://proxy.docker:8004/charging/media/assets/customer/Airquality_8c99a9e3d6eacf4

Create

Sellers can update their data source. To do that click on the data source specification to be updated.

Icon	Name	Version	Last Update	Status
Cloud icon	Air quality	v0.1	10 minutes ago	Active
Bike icon	Data source	v0.1	20 hours ago	Launched

Update the required values and click on *Update*. Note that for start selling an offering that includes the data source specification you will be required to change its status to *Launched*

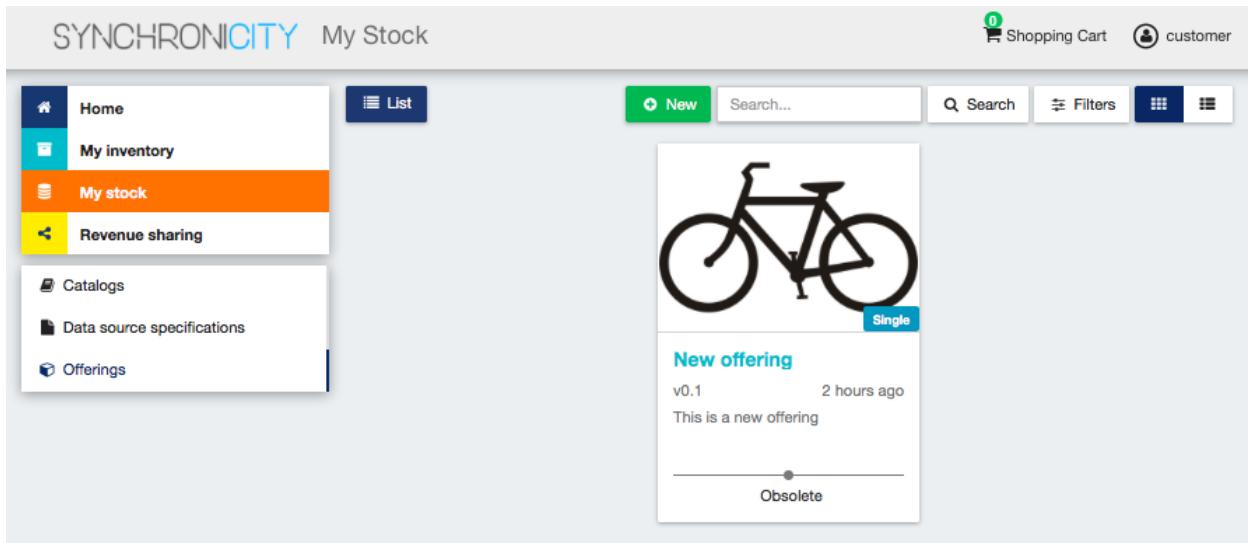
SynchroniCity IoT Data Marketplace, Release latest

The screenshot shows the 'My Stock' section of the SynchroniCity IoT Data Marketplace. On the left, a sidebar menu includes 'Home', 'My inventory', 'My stock' (which is highlighted in orange), and 'Revenue sharing'. Below these are 'Catalogs', 'Data source specifications', and 'Offerings'. The main area displays a 'CO₂' icon and the text 'Air quality'. A green 'Upgrade' button is visible. Below this, tabs for 'About', 'Characteristics', 'Attachments', and 'Relationships' are shown. The 'General' tab is selected, displaying fields for 'Name' (Air quality), 'Version' (0.1), 'Status' (set to 'Launched' on a scale from 'Active' to 'Retired' to 'Obsolete'), 'Brand' (My brand), 'ID Number' (123), and a 'Description (optional)' field containing 'This is an air quality data source'. An 'Update' button is at the bottom right.

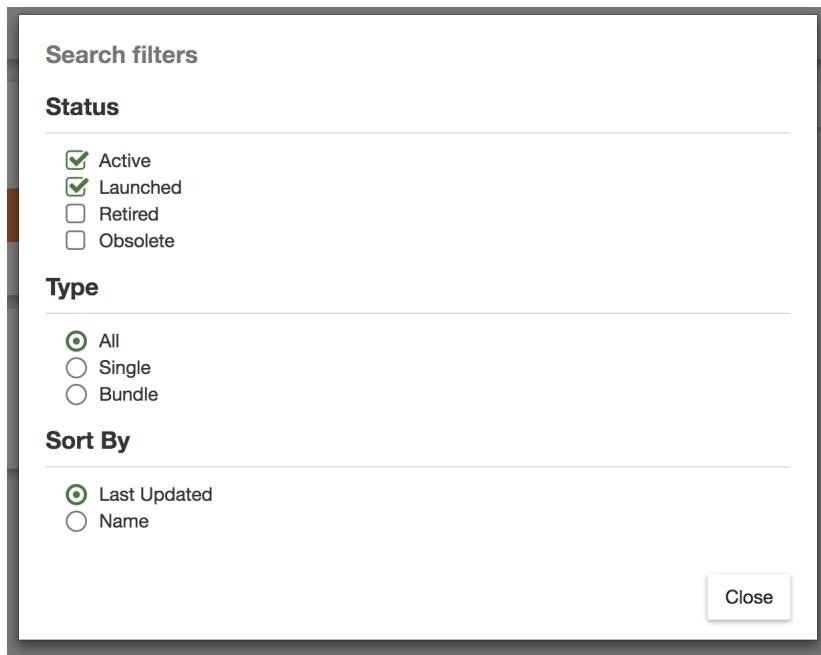
The screenshot shows the 'List' view of data offerings. The sidebar menu is identical to the previous screen. The main area displays two items: 'Air quality' (v0.1, launched a few seconds ago, single instance) and 'Data source' (v0.1, launched 20 hours ago, single instance). Each item has a preview image (CO₂ cloud and bicycle), a title, version, status, and a brief description.

Manage Data Offerings

Data Offerings are the entities that contain the license, pricing models and revenue sharing info used to monetize a data source specification. To list your data offerings, go to *My Stock* section and click on *Offerings*



The existing data source offerings can be searched by keyword, sorted, or filtered by status and whether they are bundles or not. To filter or sort data offerings, click on *Filters*, choose the appropriate properties, and click on *Close*



Additionally, it is possible to switch between the grid view and the tabular view by clicking on the specific button.

Status	Name	Product Spec.	Type	Last Updated
Obsolete	New offering	Data source	Single	2 hours ago

To create a new offering click on *New*. In the displayed form, include the basic info of the offering. Including, its name, version, an optional description, and an optional set of places where the offering is available. Once the information has been provided click on *Next*

In the next step, you can choose whether your offering is a bundle or not. In this case, offering bundles are logical containers that allow you to provide new pricing models when a set of offerings are acquired together. If you want to create a bundle you will be required to include at least two bundled offerings.

The screenshot shows the 'New offering' interface. The left sidebar has 'My stock' selected. The main area shows 'Step 2: Product Spec.' with a table of products:

Status	Name	ID	Brand	Type	Updated
Launched	Air quality	123	My brand	Single	43 minutes ago
Launched	Data source	101	My brand	Single	21 hours ago

Step 2: Product Spec.

Is a new bundle of products?

Next

In the next step you have to select the data source specification that is going to be monetized in the current offering. Once selected click on *Next*.

The screenshot shows the 'New offering' interface. The left sidebar has 'My stock' selected. The main area shows 'Step 2: Product Spec.' with a table of products:

Status	Name	ID	Brand	Type	Updated
Launched	Air quality	123	My brand	Single	42 minutes ago
Launched	Data source	101	My brand	Single	21 hours ago

Step 2: Product Spec.

Is a new bundle of products?

Next

Then, you have to select the catalog where you want to publish your offering and click on *Next*

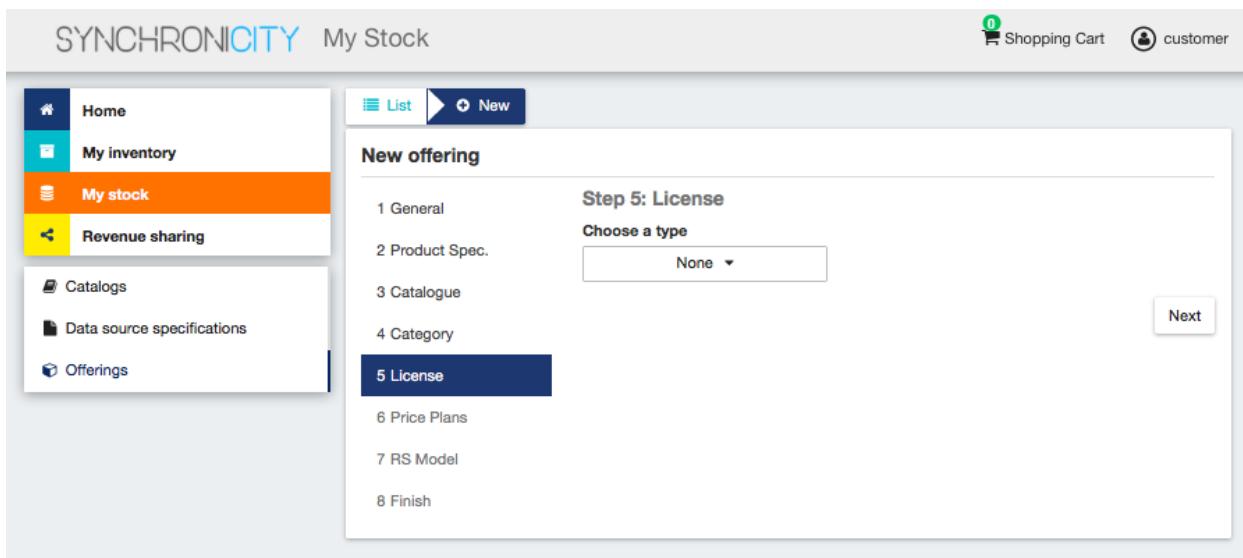
SynchroniCity IoT Data Marketplace, Release latest

The screenshot shows the SynchroniCity IoT Data Marketplace interface. At the top, there's a navigation bar with 'SYNCHRONICITY' and 'My Stock'. On the right, there are icons for 'Shopping Cart' (with 0 items) and 'customer'. The left sidebar has a vertical menu with 'Home', 'My inventory' (selected), 'My stock' (highlighted in orange), and 'Revenue sharing'. Below this are sections for 'Catalogs', 'Data source specifications', and 'Offerings'. The main content area is titled 'New offering' and shows 'Step 3: Catalogue'. It includes a search bar and a table listing two catalogues: 'My catalog' and 'New catalog', both of which are 'Launched' and owned by the user, updated 21 hours ago and 2 hours ago respectively. A 'Next' button is visible at the bottom right of the form.

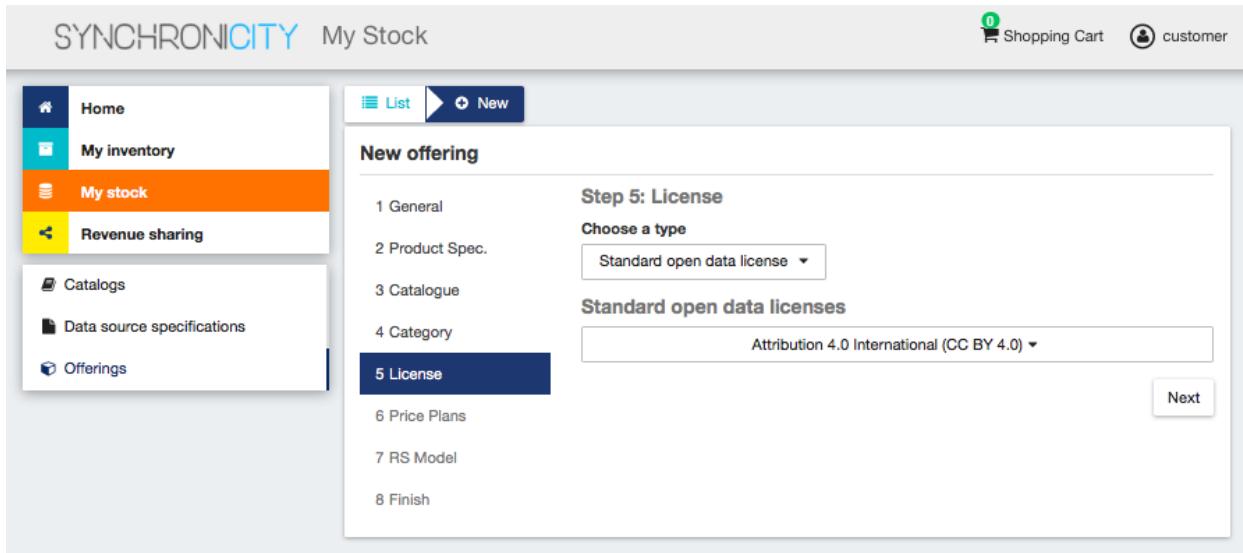
In the next step, you can optionally choose categories for your offering. Once done, click on *Next*.

This screenshot continues the 'New offering' process. The sidebar and main title remain the same. The main content area is now titled 'Step 4: Category' and includes a section for 'Choose categories (optional)'. A table lists three categories: 'Category' (updated 2 hours ago) and 'Category / Sub category' (updated 2 hours ago). A 'Next' button is located at the bottom right.

In the next step, you can specify the terms and conditions that apply to your offering and that must be accepted by those customers who want to acquire it. Note that the terms and conditions are not mandatory.



You have 3 options. You can select a standard open data license among the ones available



Or you can customize your license by using the wizard menu

SynchroniCity IoT Data Marketplace, Release latest

The screenshot shows the SynchroniCity IoT Data Marketplace interface. On the left, there's a sidebar with navigation links: Home, My inventory, **My stock**, Revenue sharing, Catalogs, Data source specifications, and Offerings. The 'My stock' link is highlighted. In the center, there's a 'New offering' wizard. Step 5 is 'License'. Under 'Choose a type', 'Custom license (wizard)' is selected. The 'Custom license (wizard)' section contains fields for 'Title' (set to 'Custom license') and 'Enter a description (optional)' (set to 'This is a custom license'). Below this, there are sections for 'Exclusivity' (Non-exclusive), 'Region' (United Kingdom), 'Purpose' (All purposes), 'Sector' (All sectors), 'Timeframe' (1 year), and 'Transferability' (No sublicensing right). A 'Next' button is at the bottom right.

Or you can describe your license by using the free-text form

This screenshot shows the same marketplace interface as the previous one, but the 'Choose a type' dropdown is now set to 'Custom license (free-text)'. The rest of the form is identical to the first screenshot, with the 'Custom license (free-text)' section containing 'Title' (Custom license) and 'Enter a description' (This is a custom license).

Once you have defined your license click on *Next*

The next step is the most important for the offering. In the displayed form you can create different price plans for your offering, which will be selectable by customers when acquiring the offering. If you do not include any price plan the offering is considered free.

To include a new price plan the first step is clicking on *New Price Plan*

The screenshot shows the SynchroniCity IoT Data Marketplace interface. On the left, there's a sidebar with links: Home, My inventory, **My stock**, Revenue sharing, Catalogs, Data source specifications, and Offerings. The main area has a 'List' and 'New' button. A 'New offering' wizard is open, showing steps 1 through 8. Step 6, 'Price Plans', is highlighted in blue. A message box says 'Step 6: Price Plans' and 'No price plans included.' with a 'New price plan' button. Other steps visible are General, Product Spec., Catalogue, Category, License, RS Model, and Finish.

For creating the price plan, you have to provide a name, and an optional description. Then, you have to choose the type of price plan between the provided options.

The available types are: *one time* for payments that are made once when purchasing the offering, *recurring* for charges that are made periodically (e.g a monthly payment), and *usage* for charges that are calculated applying the pricing model to the actual usage made of the acquired service.

If you choose *one time*, you have to provide the price and the currency.

The screenshot shows the 'New price plan' creation form within the 'New offering' wizard. The sidebar and navigation bar are identical to the previous screenshot. The main form has fields for 'Enter a name' (containing 'New price plan'), 'Choose a type' (set to 'ONE TIME'), 'Enter a price' (containing '10' with a dropdown for 'EUR'), and 'Enter a description (optional)' (containing 'This is a new price plan'). A 'Create' button is at the bottom, and a 'Next' button is on the right side of the form.

Once you have created your pricing model click on *Next*

The screenshot shows the SynchroniCity IoT Data Marketplace interface. The top navigation bar includes 'SYNCHRONICITY' and 'My Stock'. On the right, there are icons for 'Shopping Cart' (0 items) and 'customer'. The left sidebar has a navigation menu with items: Home, My inventory, **My stock**, Revenue sharing, Catalogs, Data source specifications, and Offerings. The main content area is titled 'New offering' and shows 'Step 6: Price Plans'. It lists steps 1 through 8. Step 6 is highlighted in blue. A table shows a single price plan entry:

Name	Description	Price	Actions
New price plan	This is a new price plan	10 EUR	

Below the table is a button labeled 'New price plan'. At the bottom right of the main area is a 'Next' button.

In the last step of the process, you have to choose the revenue sharing model to be applied to your offering between the available ones. Once done, click on *Next* and then on *Create*.

The screenshot shows the SynchroniCity IoT Data Marketplace interface. The top navigation bar includes 'SYNCHRONICITY' and 'My Stock'. On the right, there are icons for 'Shopping Cart' (0 items) and 'customer'. The left sidebar has a navigation menu with items: Home, My inventory, **My stock**, Revenue sharing, Catalogs, Data source specifications, and Offerings. The main content area is titled 'New offering' and shows 'Step 7: RS Model'. It lists steps 1 through 8. Step 7 is highlighted in blue. A table shows a single RS Model entry:

Product Class	Platform Percentage	Provider Percentage	Nº Stakeholders
defaultRevenue	30	70	0

At the bottom right of the main area is a 'Next' button.

The screenshot shows the SynchroniCity IoT Data Marketplace interface. The left sidebar has a navigation menu with the following items:

- Home
- My inventory
- My stock** (highlighted in orange)
- Revenue sharing
- Catalogs
- Data source specifications
- Offerings

The main content area is titled "New offering". It consists of several sections:

- General: Step 8: Finish
General
Name: Air quality
Version: 0.1
- Product Spec.: Status
Active Launched Retired Obsolete
- Description: This is a new offering
- Places: City name
- Product Spec. (Table):

Status	Name	Type	Last Updated
Launched	Air quality	Single	an hour ago
- Catalogue (Table):

Status	Name	Role	Last Updated
Launched	New catalog	Owner	2 hours ago
- Categories (Table):

Name	Last Updated
New catalog	2 hours ago
- Revenue Sharing Model (Table):

Product Class	Platform Percentage	Provider Percentage	Nº Stakeholders
defaultRevenue	30	70	0

Create button is located at the bottom right.

Sellers can also edit their offerings. To do that click on the offering to be updated. In the displayed form, change the fields you want to edit and click on *Update*. Note that for start selling you offering you have to update its status to *Launched*

SynchroniCity IoT Data Marketplace, Release latest

The screenshot shows the 'My Stock' section of the SynchroniCity IoT Data Marketplace. On the left, a sidebar menu includes 'Home', 'My inventory' (selected), 'My stock' (highlighted in orange), 'Revenue sharing', 'Catalogs', 'Data source specifications', and 'Offerings'. The main area displays a large icon of a cloud with 'CO₂' inside. Below it, the product name 'Air quality' is shown, along with 'About', 'Price plans', and 'Categories' buttons. The 'General' tab is selected, showing fields for 'Name' (Air quality), 'Version' (0.1), 'Last Updated' (Today at 1:43 PM), and a status bar indicating the product is 'Launched'. A description box contains the text: 'This is a new offering'. The 'Places' section shows a 'City name' input field. A green 'Update' button is located at the bottom right.

The screenshot shows a list view of products. The sidebar menu is identical to the previous screenshot. The main area displays a list of products, with one item highlighted: 'Air quality' (version 0.1, launched). The product card includes a 'Single' button, the name 'Air quality', version 'v0.1', the last update time ('a few seconds ago'), and a description ('This is a new offering'). A status bar at the bottom of the card indicates the product is 'Launched'.

1.2.5 Customer

All of the users of the system have by default the *Customer* role. Customers are able to create orders for acquiring offerings.

List Available Offerings

All the available (*Launched*) offerings appear in the *Home* page of the SynchroniCity IoT Data Marketplace, so they can be seen by customers. Additionally, customers can select a specific catalog of offerings by clicking on it.

The screenshot shows the SynchroniCity IoT Data Marketplace homepage. On the left, there's a sidebar with options like 'My inventory', 'My stock', and 'Revenue sharing'. Below that is a 'Search by catalog' section with a dropdown menu showing 'All', 'My catalog', and 'New catalog'. The main content area features a large image of a cloud with 'CO₂' inside. Below the image, the offering is titled 'Air quality' with version 'v0.1' and a timestamp 'an hour ago'. It's described as 'This is a new offering' and is labeled 'Free'. A green 'Add to cart' button is at the bottom.

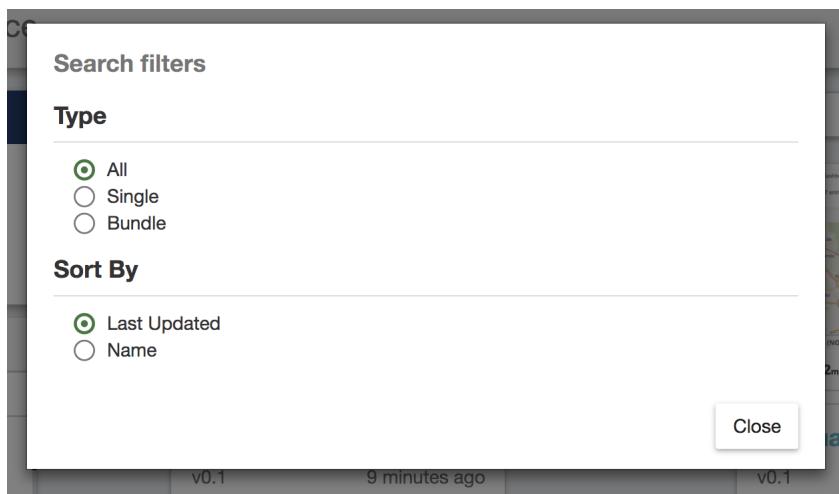
This screenshot shows the same marketplace interface, but the main content area is titled 'New catalog' with the sub-tile 'This is a new catalog' and a timestamp '3 hours ago'. The rest of the page, including the sidebar and the listing for 'Air quality', is identical to the first screenshot.

Moreover, customers can filter the shown offerings by category using the categories dropdown and choosing the wanted one.

SynchroniCity IoT Data Marketplace, Release latest

The screenshot shows the SynchroniCity IoT Data Marketplace interface. At the top, there's a navigation bar with the SynchroniCity logo, a search bar, and links for 'Shopping Cart' and 'customer'. On the left, a sidebar has options like 'Home', 'My inventory', 'My stock', and 'Revenue sharing'. Below that is a 'Search by catalog' section with a dropdown menu. The main area is titled 'New catalog' and contains a message 'This is a new catalog' with a timestamp '3 hours ago'. It features a search bar, a dropdown for 'All categories', and a 'Category' dropdown. A large image of a cloud with 'CO₂' inside it is shown, labeled 'Single'. Below it, the offering is named 'Air quality', version v0.1, updated 'an hour ago'. It's described as 'This is a new offering' and is 'Free'. A green 'Add to cart' button is at the bottom.

Customers can also filter bundle or single offerings using the *Filters* modal as well as choosing its sorting.



Customers can open the details of an offering by clicking on it. In the displayed view, it is shown the general info about the offering and its included data source, the characteristics of the data source, and the price plans of the offering.

The screenshot shows the product details page for 'Air quality'. At the top, there's a large black cloud icon containing the text 'CO₂'. Below it, the product name 'Air quality' is displayed. On the left, there's a 'Category' button. To the right, a 'Free' label and an 'Add to cart' button are visible. Below the main title, there are four tabs: 'About', 'Characteristics', 'Price plans', and 'Relationships'. Under the 'About' tab, there's a section for 'City name' with the note 'This is a new offering'. The 'Extra Info' section contains fields for 'Offering Version' (0.1), 'Product Name' (Air quality), 'Brand' (My brand), 'Last Updated' (Friday, April 6th 2018, 1:44 pm), 'Product Version' (0.1), and 'ID Number' (123).

Create Order

Customers can create orders for acquiring offerings. The different offerings to be included in an order are managed using the *Shopping Cart*.

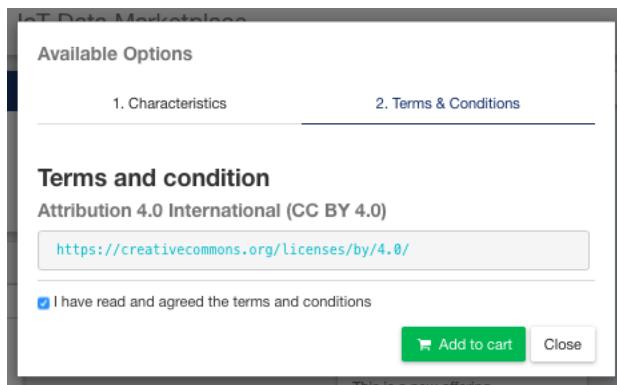
To include an offering in the shopping cart there are two possibilities. You can click on the *Add to Cart* button located in the offering panel when searching, or you can click on the *Add to Cart* button located in the offering details view.

The screenshot shows the shopping cart interface. On the left, a sidebar includes 'Home', 'My inventory', 'My stock', and 'Revenue sharing'. Below that is a 'Search by catalog' section with a search bar and options for 'All', 'My catalog', and 'New catalog'. The main area displays a product card for 'Air quality'. The card features a large black cloud icon with 'CO₂', the product name 'Air quality', its version 'v0.1', the last update time '2 hours ago', and the note 'This is a new offering'. It also shows a 'Free' label and an 'Add to cart' button. At the top of the main area, there are buttons for 'Shopping Cart' and 'customer'.

The screenshot shows a product detail page for 'CO2'. At the top, there's a large black cloud icon containing the text 'CO₂'. Below it, the text 'Air quality' is displayed. On the left, there's a 'Category' link. On the right, it says 'Free' and has a green 'Add to cart' button. Below the main title, there are four tabs: 'About', 'Characteristics', 'Price plans', and 'Relationships'. Under 'About', it says 'This is a new offering'. Under 'Extra Info', there are sections for 'Offering Version' (0.1), 'Product Name' (Air quality), 'Brand' (My brand), 'Last Updated' (Friday, April 6th 2018, 1:44 pm), 'Product Version' (0.1), 'ID Number' (123), and 'Relationships'.

If the offering has configurable characteristics, multiple price plans or terms and conditions, a modal will be displayed where you can select your preferred options

The modal window is titled 'Available Options' and contains two tabs: '1. Characteristics' (selected) and '2. Terms & Conditions'. Under '1. Characteristics', there are sections for 'New characteristic' (with a note 'This is a new characteristic' and a radio button for 'Characteristic value'), 'Asset type' (with a note 'Type of the data source described in this product specification' and a radio button for 'Orion Query'), 'Media type' (with a note 'Media type of the data source described in this product specification' and a radio button for 'NGSIV2'), 'Location' (with a note 'URL pointing to the data source described in this product specification' and a radio button for 'http://pep.docker:7000/v2/entities/airquality'), and 'Fiware-Service' (with a note 'Fiware-Service of the data source described in this product specification' and a radio button for 'TenantRZ1'). At the bottom right of the modal are 'Add to cart' and 'Close' buttons.



Once you have included all the offerings you want to acquire to the shopping cart, you can create the order clicking on *Shopping Cart*, and then on *Checkout*

The screenshot shows the main homepage of the SynchroniCity IoT Data Marketplace. On the left, there is a sidebar with links to "Home", "My inventory", "My stock", and "Revenue sharing". Below that is a search bar and a "Search by catalog" section with options like "All", "My catalog", and "New catalog". In the center, there is a search bar and a "MY SHOPPING CART" section. The shopping cart contains one item: "Air quality" (CO₂) x 1. The item details show "Air quality", "v0.1", "2 hours ago", and "This is a new offering". The price is listed as "Free" and there is a green "Added" button. At the top right, there are "Shopping Cart" and "customer" icons. A large green "Checkout" button is prominently displayed at the bottom right of the shopping cart area.

Then, you have to select one of your billing addresses.

Once you have provided all the required information you can start the order creation clicking on *Checkout*

The screenshot shows the "Confirm and checkout" page. At the top, there is a "Back" button and a "Checkout" button. Below that, there is a "Choose a billing address" section with three input fields: "Email address", "Postal address", and "Telephone number". The "Email address" field contains "customer@marketplace.com", the "Postal address" field contains "Street 012345 City (State) Aruba", and the "Telephone number" field contains "Mobile, +447400000000". Below this, there is a "Shopping Cart" summary for "Air quality" (Free). At the bottom right of the cart summary is another "Checkout" button.

If the offering has a price plan, you will be redirected to *PayPal* so you can pay for the offerings according to their pricing models

Store account's Test Store

 **PayPal**

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Podrá revisar el pedido antes de completar la compra.
Este vendedor necesita su dirección de facturación para realizar este pago.

[Cancelar y volver a Store account's Test Store.](#)

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Una forma más segura de pagar

No importa dónde compre, su información está más segura con PayPal: no compartimos sus datos con el vendedor.

Manage Acquired Data Offerings

The data you have acquired are located in *My Inventory*, there you can list them, check their status, or retrieve the access token required to access them. In this view, it is possible to filter your data by its status. To do that click on *Filters*, select the related statuses, and click on *Close*.

The screenshot shows the SynchroniCity IoT Data Marketplace interface. At the top, there's a header with the SynchroniCity logo, a shopping cart icon (0 items), and a user profile icon labeled "consumer". Below the header, the main navigation bar has "Home" and "List" buttons, followed by a search bar, a "Search" button, and a "Filters" button. The main content area displays a data source card for "Air quality" (Offering Name), version v0.1, which is active and will expire in 10 minutes. The card includes a "Single" button at the bottom right. On the left, a sidebar titled "My Inventory" lists "Products" and "Data orders". A modal window titled "Search filters" is open, showing a "Status" section with checkboxes for "Created", "Active" (which is checked), "Suspended", and "Terminated". A "Close" button is visible in the bottom right corner of the modal.

It is also possible to switch between the grid and tabular views using the related buttons

The screenshot shows the SynchroniCity IoT Data Marketplace interface with the "List" button selected in the navigation bar. The main content area displays a table with columns: Status, Offering Name, Offering Version, and Order Date. One row is shown, indicating an active offering named "Air quality" (Offering Name), version v0.1 (Offering Version), and active (Order Date). The table has standard header and data row styling.

You can manage a specific acquired data source clicking on it. In the displayed view, you can see the general info of the acquired data source, and the characteristics and pricing you have selected.

The screenshot shows a web-based IoT data marketplace interface. At the top, there's a header with the 'SYNCHRONICITY' logo and a 'My Inventory' section. On the right side of the header are icons for 'Shopping Cart' (with a green circle containing a white number '0') and 'consumer'. Below the header, a navigation bar includes 'Home', 'My inventory' (which is highlighted in teal), 'Products', and 'Data orders'. A secondary navigation bar above the main content area shows 'List' and 'Details' with a right-pointing arrow. The main content area features a large black cloud icon with the white text 'CO₂' inside it. Below the icon, the text 'Air quality' is displayed. Underneath this, there are several tabs: 'About' (selected), 'Characteristics', 'Access', 'Price plan', and 'Charges'. The 'About' tab contains sections for 'General', 'Description' (with the note 'No description provided.'), 'Offering' (listing 'Air quality'), 'Start date' (set to 'in 10 minutes'), and 'Terms and condition' (mentioning 'Attribution 4.0 International (CC BY 4.0)' and a link to 'https://creativecommons.org/licenses/by/4.0/').

The screenshot shows the SynchroniCity IoT Data Marketplace interface. At the top, there's a header with the SynchroniCity logo, a shopping cart icon with '6' items, and a user profile for 'consumer'. The main area is titled 'My Inventory' and shows a product card for 'Air quality'. The card features a large 'CO₂' icon inside a cloud shape. Below the icon, the title 'Air quality' is displayed. A navigation bar below the title includes 'About', 'Characteristics' (which is underlined), 'Access', 'Price plan', and 'Charges'. The 'Characteristics' section contains a sub-section titled 'New characteristic' with the note 'This is a new characteristic' and a selected option 'Characteristic value'. Other sections visible include 'Asset type' (selected 'Orion Query'), 'Media type' (selected 'NGSIV2'), 'Location' (selected URL 'http://pep.docker:7000/v2/entities/airquality'), and 'Fiware-Service' (selected 'TenantRZ1'). On the left, a sidebar menu lists 'Home', 'My inventory' (which is active and highlighted in teal), 'Products', and 'Data orders'.

Additionally, you can generate an access token for the data source accessing to the *Access* tab. To generate a new access token insert your IdM password and press the *Token* button.

The screenshot shows the SynchroniCity IoT Data Marketplace interface. At the top, there's a header with the SynchroniCity logo, a 'My Inventory' link, a shopping cart icon with '0' items, and a 'consumer' link. The main content area has a sidebar with 'Home', 'My inventory' (which is selected and highlighted in teal), 'Products', and 'Data orders'. The main panel shows a large 'CO2' logo inside a cloud shape, with the text 'Air quality' below it. Below the logo are five tabs: 'About', 'Characteristics', 'Access' (which is underlined, indicating it's active), 'Price plan', and 'Charges'. The 'Access' tab contains a sub-section titled 'Access' with a note: 'To generate an access token insert your password and press Token.' It has fields for 'Token' (containing a placeholder) and 'Password' (containing '*****'). To the right of the password field are two buttons: 'Generate' and a green 'Token' button.

This screenshot is similar to the one above, but it shows the result of generating a token. The 'Token' field now contains the generated token: 'us4Yaioyg71Ioky6um4bX9ZQRLhVmc'. The rest of the interface remains the same, including the 'Access' tab being active and the 'Token' button being green.

Access Acquired Data Offerings

To access and consume the data you have acquired, you first need to locate on the characteristic of your data source, the *url* pointing to that data and the *Fiware-Service*, if available, related to that data.

The screenshot shows the SynchroniCity IoT Data Marketplace interface. The top navigation bar includes 'Home', 'My inventory' (which is selected), 'Products', and 'Data orders'. The main content area displays a product detail for 'Air quality'. The product icon is a black cloud with 'CO₂' inside. Below the icon, the product name 'Air quality' is shown. A horizontal menu bar below the product name includes 'About', 'Characteristics' (which is selected), 'Access', 'Price plan', and 'Charges'. The 'Characteristics' section contains a sub-section titled 'New characteristic' with the note 'This is a new characteristic' and a radio button for 'Characteristic value'. The 'Asset type' section notes 'Type of the data source described in this product specification' and has a radio button for 'Orion Query'. The 'Media type' section notes 'Media type of the data source described in this product specification' and has a radio button for 'NGSIV2'. The 'Location' section notes 'URL pointing to the data source described in this product specification' and has a radio button for 'http://pep.docker:7000/v2/entities/airquality'. The 'Fiware-Service' section notes 'Fiware-Service of the data source described in this product specification' and has a radio button for 'TenantRZ1'. Both the 'Location' and 'Fiware-Service' sections are highlighted with red boxes.

You will also need to retrieve or generate a new token as shown in the previous section.

The screenshot shows the SynchroniCity IoT Data Marketplace interface. On the left, there's a sidebar with 'Home', 'My inventory' (selected), 'Products', and 'Data orders'. The main area has a title 'SYNCHRONICITY My Inventory' and a large icon of a cloud with 'CO₂' inside. Below it, the word 'test' is displayed. A navigation bar at the bottom includes 'About', 'Characteristics', 'Access' (selected), 'Price plan', and 'Charges'. The 'Access' section contains a note: 'To generate an access token insert your password and press Token.' It shows two input fields: 'Token' (containing 'mJbTIMwfn8lYcssMP3nnAWgfFViUBD') and 'Refresh Token' (containing 'ibFRhNqsiHi9huM3dG7KeNtXld5cRJ'). There's also a 'Password' field and a green 'Token' button.

Once you have these information you can use them to create your *request*. In this example we are using these information, specifically the *url*, the *X-Auth-Token*, and the *Fiware-Service* to build a *GET* request by using *Postman*. Note that the *Fiware-Service* might be optional if not present in the characteristic of your data source.

The screenshot shows a Postman request configuration. The method is 'GET' and the URL is 'http://pep.docker:7000/v2/entities/airquality'. The 'Headers' tab is selected, showing two entries: 'X-Auth-Token' with value 'us4Yaioyg71loky6um4bX9ZQRlhVmc' and 'Fiware-Service' with value 'TenantRZ1'. The 'Body' tab shows a JSON response with the following content:

```

1 - [
2   {
3     "id": "airquality",
4     "type": "Air-Quality",
5     "co2": {
6       "type": "Float",
7       "value": 23,
8       "metadata": {}
9     },
10    "temperature": {
11      "type": "Float",
12      "value": 23,
13      "metadata": {}
14    }
15  ]

```

To generate a new access token without accessing to the marketplace you can use the *Refresh Token*

The screenshot shows the SynchroniCity IoT Data Marketplace interface. At the top, there's a navigation bar with 'SYNCHRONICITY' logo, 'My Inventory' link, a shopping cart icon with '0' items, and a user profile icon 'rz_test_marketplace'. Below the header, a sidebar on the left has links for 'Home', 'My inventory' (which is selected and highlighted in teal), 'Products', and 'Data orders'. The main content area shows a large black cloud icon with 'CO₂' written on it. Below the icon, the word 'test' is centered. A horizontal navigation bar below the icon includes 'About', 'Characteristics', 'Access' (which is underlined in blue, indicating it's active), 'Price plan', and 'Charges'. Under the 'Access' heading, there's a note: 'To generate an access token insert your password and press Token.' Two input fields are present: 'Token' containing 'mJbTIMwfn8lYcssMP3nnAWgfFViUBD' and 'Refresh Token' containing 'ibFRhNqsiHi9huM3dG7KeNtXld5cRJ' (the 'Refresh Token' field is highlighted with a red box). Below these fields is a 'Password' input field and a green 'Generate' button next to a 'Token' button.

You will also need to retrieve the *appId* related to the data source that you wish to access. You can find the *appId* on the characteristic of your data source

SynchroniCity IoT Data Marketplace, Release latest

The screenshot shows a web interface for managing data assets. On the left, a sidebar menu includes 'Home', 'My inventory' (which is selected), 'Products', and 'Data orders'. The main content area displays a large black cloud icon with 'CO₂' written on it. Below the icon, the word 'test' is centered. A navigation bar below the icon includes tabs for 'About', 'Characteristics' (which is selected), 'Access', 'Price plan', and 'Charges'. Under the 'Characteristics' tab, there are sections for 'Asset type' (Orion Query selected), 'Media type' (NGSIV2 selected), 'Location' (URL: http://test.com/v2/entities?type=type224), and 'appId' (53626045d3bd4f8c84487f77944fa586). The 'appId' section has a red box around the value.

Once you have these information you can use them to generate a new access token by performing a *POST* request on this API

```
http://[marketplace_url]:[marketplace_port]/charging/api/token/refresh
```

with header *Content-Type: application/json* and body

```
{  
  "refresh_token": "ibFRhNqsiHi9huM3dG7KeNxld5cRJ",  
  "appId": "53626045d3bd4f8c84487f77944fa586"  
}
```

The screenshot shows the Postman interface with the following details:

- Method:** POST
- URL:** proxy.docker:8004/charging/api/token/refresh
- Body (JSON):**

```
1 ← {  
2   "refresh_token": "ibFRhNqslHl9huM3dG7KeNtXld5cRJ",  
3   "appId": "53626045d3bd4f8c84487f77944fa586"  
4 }
```
- Response Status:** 200 OK
- Response Time:** 778 ms
- Response Size:** 729 B